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# The PAKISTAN DEVELOPMENT REVIEW

## Papers and Proceedings

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**of the**

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## Inaugural Address

AHSAN IQBAL

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ  
Asalam-o Alaikum

President Pakistan Society of Development Economists (PSDE) and Vice Chancellor of Pakistan Institute of Development Economics (PIDE) Dr Asad Zaman, Secretary Planning, Secretary PSDE, distinguished economists, eminent scholars from overseas, and young economists of Pakistan.

Ladies and gentlemen, it is indeed a great honour and privilege for me to be the chief guest at the opening ceremony of the 31st Annual General Meeting and Conference of Pakistan Society of Development Economists. I happen to be a teacher as well as the politician, so, I promise you to be succinct while inaugurating the Conference. It is a matter of great pride to acknowledge that the tradition initiated by the Society in 1982 continues with great strength. All credit goes to Prof. Nawab Haider Naqvi, one of the founding fathers of this tradition. It is also a tribute to the sincerity of those who are keeping this tradition alive. I hope this tradition of knowledge sharing and intellectual debate will be of practical benefit to the development journey of Pakistan. I am sure that it will go on uninterrupted in future as well, and through such platforms we will be getting new ideas and solutions to our problems. Allama Iqbal also penned down such thoughts:

جہاں تازہ کی افکارہ تازہ سے ہے نمود  
کہ سنگ و خشت سے ہوتے نہیں جہاں پیدا

I hope that this conference will also bring novel ideas and way out for our development.

Ladies and gentlemen, it is a firm belief of the current government and of Ministry of Planning, Development and Reform that in this rapidly evolving digital age, no economy can prosper without investing in its human capital. We have been ignoring it for far too long and now paying the price for it. For a competitive knowledge based economy, it is practically impossible to stay on the path of development without investing in human capital. Making Pakistan a knowledge based economy is one of the seven pillars of the Vision 2025, and this gathering of economists is indeed a promising prospect as it brings together the brightest of minds. I would also like to highlight here

Ahsan Iqbal is Chancellor of the Pakistan Institute of Development Economics, and Federal Minister for Planning, Development and Reform, Government of Pakistan, Islamabad.

that Pakistan Society of Development Economists (PSDE) has undoubtedly played a significant role in promoting the culture of scholarly and inspiring debates. Such scholarly gatherings play an anchor role against the odds and challenges that confronts Pakistan. As we all know that Pakistan has been up against a myriad of issues while maintaining economic growth, but continuity of this conference, for last three decades coupled with the participation of esteemed scholars from all over the world stands evident to the fact that we are on the right track. Business alone as usual is not a solution for Pakistan's development issues and that is why economists and scholars from home and abroad can put their acts together to devise rational policies for our development.

I have a staunch belief that such intellectual gatherings can certainly help a great deal in finding out ways and means to amend the downtrodden economic situation that we are facing today. In the 1960s, Pakistan was considered as an emerging economic giant like Japan. 1965 war hampered our progress and development to quite some extent, but we never adopted sagacious and serious policies to uplift our economic development either. In 1991 Pakistan was leading the development debate and progressive journey in South Asia. It was the first country to adopt economic reforms, deregulation, privatisation, liberalisation and promote active role of the private sector but we got off track. We abandoned that path whereas our neighbouring economies like India, adopted those policies and followed them consistently to take the lead in 2013. Economies like Bangladesh and the rest are doing much better than Pakistan.

We need to seriously ponder over, where we went wrong. Pakistan, no doubt, is blessed with the top economists, civil servants, and bureaucrats and our private sector is not inferior to or no less than those of the other countries at all. That is where Pakistan is at the crossroads and unable to figure out that what worked for other countries did not work for us. I personally believe that we never had consistency in our policies. Every democratic or autocratic force have tried bizarre economic policies which has landed us in a gridlock situation. Ever if say for the sake of the argument that Pakistan lacked endowment funds and resources but to counter that argument, we have examples of countries like South Korea and Japan, who started their journey to the economic progress from the dust of ashes and with meagre resources and reached the pinnacle of success. So, to speak of this lack of resources and endowment funds issues would be a lame excuse for our failure. To my understanding, for economic prosperity, the pre-requisite is the political stability, which matters the most, and that is what we never had. A country cannot be nurtured under the clouds of uncertainty and instability, in our case, we could not buckle up political stability to ensure economic prosperity. Unfortunately, compared to all the success stories elsewhere, we failed to have the right coupling of politics with economy and that has cost us to a great extent. The only way to make up for what Pakistan has lost, therefore, is the continuity of democracy along with consistency in rational economic policies, in a stable and secure political environment.

I second Dr Asad Zaman's view that Pakistan has been ignoring the vitality and worth of human resource development over the years, which in itself is the biggest of losses. Constructing dams, making highways and towering infrastructure without developing a nation is not going to lead us towards success. Our second failure is that Pakistan has suffered under the dictatorial governments for 35 years, and in that period social sector was completely ignored. The worst part was that the Gross Development

Product (GDP) persistently went down and in the budget allocations priority was given priority to the security apparatus, thereby ignoring the social sector like education and health, which explains today's fractured socio-economic condition of Pakistan. We need to invest in our social sector so that a balanced socio-economic platform can prevail in the country. Pakistan stands somewhere in the middle income countries as far economy is concerned and as far as the social indicators are concerned, they fall among those of the least developed nations. It is direly needed to invest in the social capital, in the human resources so that a balanced socio-economic condition can be achieved. Our third problem, and which is a historical one, is that we could never distinguish between the development and growth. Raising GDP to six percent or above cannot be an indication of development, which we thought was synonymous to development. In order for development to take place, the growth rates have to be made more meaningful and inclusive. The best example that comes to my mind is that in 1960s, we had a decade of development which we celebrated with great pomp and show, but since the growth rate was not meaningful it led to two humungous distortions. One, it created, social inequality and regional disparity which led to the separation of East Pakistan. Second, it compelled us to nationalise the industries and the situation came back to the square one as far as gain in development was concerned. So if growth is not exclusive and, if growth is not meaningful, it will not provide a sustainable development platform. Therefore, it is very important that we learn from our past mistakes.

Distinguished guests, this conference comes at a very opportune time as it has been a year ever since the launch of vision 2025. Now it is the time to reflect, get feedback and identify constraints so that fine-tuning can be made to our plans. I sincerely hope that this conference may achieve its aims of vision 2025 and can take into account the ground realities and propose framework for just and suitable development.

Ladies and gentlemen, in spite of political instability and mushroom growth of terrorism and all that, Pakistan still managed to progress on the economic side and now it is in the top 10 emerging economies of the world, which is a very positive indication. All we have to do is to maintain this growth rate, which is surely possible with the continuity of democratic norms in the country. The Fiscal Year 2014 registered some remarkable achievements which also include the inflation which has hit the lowest level since 2003-04. Moreover, historical agreement with the Chinese Government on China-Pakistan Economic Corridor (CPEC) has changed the profile of Pakistan. This economic project will prove to be a game changer for Pakistan's future and it is attracting rest of the states too to invest and take part and get benefits. Despite unprecedented challenges Pakistan is up against, there are major achievements which need to be mentioned. For instance, we had a successful review with the IMF; the introduction of Ujala Education Foundation (UEF), the principal aim of which is to provide the best quality education to the less privileged segment of rural society, at an affordable cost; we have witnessed decline in unemployment and poverty rates; and burden on the banking system, particularly on the Central Bank, has also been reduced.

The bad news is that Pakistan contribute 0.8 percent of greenhouse emission gases, placing it amongst the top five countries of the world, which is going to be badly affected by the climatic changes. I hope that the developed countries and the international

community realise their responsibility to help under developing countries, which are paying the price for the irresponsible development of developed countries.

Ladies and gentlemen, successful people, successful organisations and successful nations do not operate in a reactive mode; rather, they operate in a proactive mode. Civilised nations plan ahead of their time and determine what they want to achieve in future and that is why no business and organisation can be successful, unless it has the right business model and plans. These are the two prerequisites for success of any business organisation. If we look at all the successful countries, their leadership developed a vision for two, three or seven decades. In 1979, when Mr. Deng Xiaoping charted a new course for China. In 1979, he gave his nation a target to achieve certain things by 2049. Likewise, in Malaysia Dr Mahathir crafted a 30-year long vision to enlist his country among the developed nations by 2020. It is not that we need to do something out of the world. Every successful economy and country looks into the future, determines the challenges and opportunities and then charts out a proactive road map towards harvesting the opportunities and safeguarding itself from the vulnerable situations.

Dear participants, as you all are aware the global economic landscape has changed dramatically in the last couple of decades. Human civilisations which were considered agrarian societies for thousands of years, changed to industrial ones. In order to be aligned with the successful nations, we have to take a plunge into a new world order, into a new era which has new rules, different from what we used to recognise in the past and that is something what Iqbal predicted decades ago:

آئین نو سے ڈرنا، طرز کہن پہ اڑنا  
منزل یہی کٹھن ہے قوموں کی زندگی میں

The most critical time for nation is to adopt and absorb the new world order. Hugging the old systems to run a state for good, will not lead a state towards success.

It was in this backdrop that the Ministry of Planning, Development and Reform decided to develop a vision for Pakistan economy, to sustain development.

Ladies and gentlemen, Vision 2025 also tries to integrate its seven pillars in a unitary framework and that would serve as a launching pad for the fulfilment of sustainable development goals. This Vision is an outline of the mission provided by the father of the nation, Quaid-e-Azam Muhammad Ali Jinnah. That mission was:

Life of the common men must improve and this was a very clear vision of our Quaid that “Pakistan must improve the life of the common man by creating opportunities for each and every citizen of Pakistan, regardless of gender, religion, ethnicity, regardless of background and region etc. Every Pakistani must be free and must have all opportunities of growth and fulfilment of his or her dreams in life,” said Mr. Jinnah.

Keeping that vision of Quaid in mind CPEC can mend our multifaceted issues ranging from economy to the societal. Let me reiterate the fact that it is about transforming the entire region, neighbouring countries will also reap the fruits of this project. We are also in the process of launching multidimensional poverty index in consultation with the UNDP, which would help in gauging the extent of progress made to fulfilment of SDGs. There is a dire need of proactive approach and a result-oriented strategy to achieve SDGs, so that the mistakes, committed in case of MDGs, are not repeated. Government is keen on the localisation of these goals, because these are meant

to secure our future, and not just fulfilling the international obligations. In a nutshell, the sustainable development goals are actually national development goals. Educated children, taking care of mothers, looking after our environment, promoting job opportunities, improving security, providing equal opportunity, creating partnerships and all that are not only meant to fulfil the international commitment. The present government has also established an SDGs unit in the Planning Commission to effectively implement and execute the goals beside monitoring the performances in the provinces.

In the end, I would highlight the fact that there is a gap between knowledge and implementation in Pakistan and that seems to be the nucleus of our present downfall. I have been attending and participating in a number of conferences, and it gives me a great deal of satisfaction to say that there is neither a lack of understanding of issues hindering Pakistan socioeconomic progress, nor is there low quality research on the economic issues in Pakistan. This is evidenced from the agenda of the present conference with its insightfully chosen themes of panel discussions, lectures and papers, which will also become abundantly clear in next three days from the deliberations of the conference. Unfortunately, in Pakistan there is lack of communication and engagement between academia and government departments, which needs to be seriously worked upon. I would also like to strongly urge the policy-makers, and the government functionaries to engage with PIDE and other institutions alike to make use of their research that is of high quality.

I once again congratulate Dr Asad Zaman and his team at PIDE for hosting this annual event and ensuring participation of the relevant experts. I wish all the distinguished, national and international delegates, fruitful discussion and an enjoyable stay in the beautiful city of Islamabad. While summing my speech I would like to conclude with the Iqbal's verses:

خبر نہیں کیا ہے نام اس کا، خدا فریبی کہ خود فریبی  
عمل سے فارغ ہو مسلمان بنا کے تقدیر کا بہانہ  
میسر آتی ہے فرصت فقط غلاموں کو نہیں  
ہے بندہ حر کے لئے جہاں میں فراغ

اور آخر میں اقبال نے اپنے لئے کہا

چھیڑو سرود ایسا کہ جاگ اٹھیں سونے والے  
رہبر ہیں قافلوں کی تابع جبین تمہاری

پاکستان زندہ باد

*The Quaid-i-Azam Lecture*

**Governance, Institutional Reforms and  
Modernisation of Public Sector**

UGO PAGANO

It is a matter of great honour for me to deliver the Quaid-i-Azam memorial lecture. He is an everlasting source of inspiration for me due to his two unmatched attributes, i.e. tolerance and determination. To me, this combination of qualities in Jinnah made him a symbol of glory and grandeur. Tolerance in particular can play an instrumental role in changing a society's outlook, and Jinnah set an example for us for being an emblem of tolerance. Tolerance with all its manifestations in different facets of life is direly needed in our society. For instance, religious, ethnic and racial tolerance can be considered as the first step towards forming a sound and rational society. In the same way, this gathering today has given me immense satisfaction, as different views from different schools of thought are assimilated and tolerated.

While knowing Jinnah, I owe him huge amount of reverence for another reason and that is his generous love for Allama Iqbal. While peeping into Iqbal's life, it is revealed that he is an incarnation of knowledge and wisdom. I am thoroughly impressed by one of Iqbal's quintessential quote, i.e. "the reason asks questions and love gives answers". This saying is relevant to an Italian Marxist and a political philosopher Antonio Gramsci who in his imprisonment wrote masterpieces, and they were mostly against the prevailing beliefs and norms. Keeping this phrase in mind, I sincerely wish that the Vision 2025 may be accepted with the passion of reason because this is inevitable; however, we should never lose the optimism of will as well. Now what economics has to offer about the Vision 2025? The state governs the decision process, institutional reforms and modernisation of the public sector. But at the same time, all of the

human institutions are costly. Alternatively, economic transactions within the market cost a lot due to the costs associated with the prevailing institutional framework. This is equivalent to Friedman apt phrase which states that there is no concept of “free lunch”.

Institutional Economics conveys a message that all institutions are costly, and for this reason technological or other changes induce a process of institutional substitution or institutional innovation. Alternatively, institutional reforms involve a change in the set of costly institutions. Now if we look at the orthodox approach which implies differently. In other words, in the orthodoxy, we see that the public sector is some sort of remedy to some markets failures. However, this view is wrong for various reasons. For instance, when the market fails, it implies the failure of the prevailing set of institutional framework which itself is market mechanism. However, public sector may not be the necessary solution as public sector may even fails more than the market mechanism. Thus, an institutional failure has to be compared with other institutional failures.

Economics should not look for the goals of correcting some imperfections in otherwise imperfect institutions. It should rather study real life loops of behaviour as well. For instance, as Iqbal said that economics should study the ordinary business of human life that's simple—closer to what the subject matter should be. The other befitting example comes from the renowned British economist Mr Ronald Harry Coase. He adds one consistent theory and understands that consistency is very important. Why he had a consistent theory? In his writings, he wrote two important articles. One was about the theory of the firm and the other was about social cost and externality. In the first one he has claimed that, in the word of zero transaction cost, the firms would not exist. Firms exist only because the decentralised market mechanism is costly. In order to reduce the costs of decentralised exchanges that are need for production process, we need some organisational structure in the form of firm. In the second article, Coase state that, in the world of zero transaction cost, there would have been no externalities. Alternatively, costless market mechanism could solve market failures in terms of externalities. Both contributions implies same conclusion, i.e. in the absence of transaction cost, both the firms and state intervention are not justified. Thus, we have costly institutions and we have mixed solutions in reality. Mixed solution that is arising from different mix of institutions is due to the fact that some institutions are better in handling some transactions than some other institutions. Institutional change implies that the new institution would be a costly substitute. In other words, new institution should be productive enough in order to offset the additional costs associated with substitution. Neo-classical approach implies that economic development in a country can only be achieved by improving the mix of costly institutions.

Now, let us define how Coase's analysis explains some changes. Take the example of information technology which is a shining example in Coase's 1937 article. The introduction of information technology implies that it will give a change to the mix of institutions; but what we need to know that how it would change the mix between the market and firms? Let us explain the answer of how with the example of 1930s information technology, i.e. telephone lines which were some revolutionary change. As compared to the market mechanism, telephone lines were cheaper, implying that the introduction of telephone lines decreased the cost of economic transactions. Alternatively, the telephone lines change the mix of institutions in favour of the firms.

Thus, technological changes are continuously altering this institutional mix, and this is very interesting view; but there is something missing in this view, how we change this mix? The change in the mix implies that the selection between the market mechanism and firm for the execution of transactions mostly depends on the efficiency of each mode. If we presume that the mix is automatically changing and adjusting without problems; then the on-going debate on institutional reforms in Pakistan will be useless. In this view, markets would produce the right type of reforms and would adjust the mix according to the changing conditions. However, this is not the case in reality. There are meta-markets where we substitute the market transactions for firms. In fact, this is contradiction to the autonomy of markets in the selection of optimal mix. If some costless meta-institutions like market were able to capture the optimal institutional mix for each new technology, then all economists would have been in consensus on the same institutional development. However, there are no costless meta-institutions; and in each stage, institutional change is constrained by the costly institutions within which the change shall take place. The norms are set by the capabilities of an interest in changing some institution. In fact, the change is not made in some perfect vacuum; rather, it is made in some preceding institution. The constraints that are given by this particular institution are always conditioning, and narrowing the possibilities that we possess, and the thing that is narrowing the possibilities is capability of the agents to interpret the situation and try to change this situation. The nature of these constraints becomes clear once we introduce the concept of institutional complementarities.

When things are costly, it becomes worthwhile to try to substitute one for the other in such a way to achieve the best result. Only, in a world of costless institutions, institution substitution would not exist. Likewise, when things are costly, the necessity for complementarity arises. Just like the complementarity for physical goods, the complementarity for institutions is important. For instance, there is complementarity in the traditional system of state and the market mechanism. Namely, market system would work better if a judicial system works well, and if it does not work well, perhaps it is better to have a very large firm

where all the interactions take place inside the firm. However, even different interactions within the same firm are complementary, i.e. one function of the firm support the other functions within that firm. Thus, there are all sorts of complementarities, and they are important because they imply that it is difficult to change one institution without bringing supporting change in other institutions. This idea is really formalised by Masahiko Aoki—a Japanese economist who unfortunately died recently. He said that the costly institution cannot be substituted with costless institutional environment which becomes evident in case of institutional complementarity. Alternatively, institutional complementarity makes the substitution of institutions costly.

We should really ask how the existence of one institution may influence the cost of running the other institutions. How, for instance, the existence of judiciary influence the cost of running markets? Institutional substitution occurs in a certain moment of history and at a specific location. The possibilities of institutional substitution are led by various factors, including the existing institutions and their webs of complementarities. As Polanyi anticipated, social actors can make lasting changes on reality only by substituting the existing web of institutional complementarities. Another important point that is found in Polanyi and is underlined in Asad Zaman's paper is that the misconception of the existing complementarities is an important factor in shaping the institutional framework or in increasing the institutional substitutability. In other words, the lack of knowledge with regard to complementarities usually becomes the agent of change. Thus, the conceptions and misconceptions of social actors are important institutional change.

Now I will apply this entire methodological framework to what may be call—the knowledge economy. As the Minister has emphasised that the knowledge is becoming increasingly important for all countries. We are really dealing with a new sort of economy, and any successful change has to consider the nature of economic position that we have. Now what is the nature of the knowledge? Why knowledge? How it intensively makes such a big difference? First of all, knowledge is really the classic case in which we have the human activity producing and acquiring knowledge that is both means and ends. Human curiosity has always been there. Humans cannot stop being curios. At the same time, knowledge is an important factor in improving human conditions and producing better goods. Second, knowledge is a non-rival good. As Jefferson (President of the United States) said in a meaningful passage “knowledge is like a candle”. Light can be spread to new candles without decreasing its flames. Alternatively, all the individuals in a society can use the same knowledge without consuming it. We all can use the same chemical formula without consuming it. In contrast, we cannot use the same machine without overcrowding. So, knowledge as an input is non-rival which is very important. It follows that the regularisation

of knowledge is not granting a right to use knowledge as it is always available because of non-rivalry; rather, it is simply excluding others from its use. When I say that I own this piece of knowledge, I am not just saying that I have been allowed to use it. I could also use it before. It means others cannot use it now. By a patent, I am the only one who is allowed to do that type of use. So the ownership of a machine does not deprive others with the right of having identical machines. By contrast the ownership of the piece of knowledge deprives others of the right of having identical piece of knowledge. In fact private knowledge is a monopoly and treating it as an ordinary private property is really abnormal type of misconception. It has an enormous influence or impact in shaping modern world that we should not undervalue.

If we look at 1982, then the intangible things that you could not touch were only 38 percent of assets of the top 5 hundred firms in the world. In 1992 that was 62 percent and now they are 89 percent. Now the things like machines in comparison to trademarks or patents and all other things are becoming less important for the firms. It leads the firms to transform from one type of complementarities to another type of complementarities. In one case, the government and universities produce knowledge as a public good. Everyone can use it and then, we have got competitive markets. The numerous competitors combined with knowledge as a public good yield a lot of benefits, so these two things are really complementary. This complementarity is equivalent to that of the judiciary and the market mechanism. Again, one side belongs to public and the other side belongs to private parties. Now coming to the second complementarity in which one produces exclusive knowledge with some patent. In this type of exclusive knowledge, there is an exclusive intellectual monopoly, i.e. only the producer can use this type of knowledge. In other words, markets are closed to competitors; and when this is the case, then the production of knowledge can be worthwhile only for few organisations that have sufficient market power. In this way, we have transformed from one set of complementarities to another set of complementarities.

In recent years, the weight of second type of complementarity has become much more important than the first set of complementarity. In particular, intellectual property implies that there can be a lot of inequalities among firms. This is because an annex of the agreement TRIPS of WTO is supposed to sanction countries that break the Intellectual Property Rights (IPR). Now, intellectual property rights became global and stronger and it can cause different firms to diverge. Some firms will enjoy natural circle when intellectual property rights induce them to develop capabilities and capabilities lead them to acquire intellectual property rights. It implies that firms can develop skills and can enjoy the fruits of the developed skills as they are protected by some patents. In this way, no one can stop firms from investing in more skills. However, it is very

tough to enforce that annex of TRIPS. Firms can be trapped in a vicious circle where they are going to develop the skills and because of the lack of complementary intellectual property, they do not get the intellectual property rights due to the lack of skills needed for the intellectual property rights. In particular, this problem is acute, when some firms innovate and some other firms block them due to their intellectual property rights. In other words, an exclusive right to use some knowledge that is important for the innovations of others can block research. So, you can easily get some polarisation of firms, with these different types of characteristics and in fact there is a complementarity between the skills of some firms and their rich intellectual property, and the fact that some other skills are fairly low in other firms and they have got poor intellectual property. Some of them are in vicious circles and some are in herbaceous circles.

Now in certain way, this intellectual property can be seen as a form of protection. How? Suppose that you are a U.S. firm and you put pressure on your government either by having a very high tariff for foreign firms or by having a strong intellectual property rights. What will you prefer? Obviously intellectual property rights ... because even the highest tariffs cannot completely block inputs and cannot prevent other firms from producing for their own domestic markets. Thus, through property rights, firms get global protection for their skills.

In WTO, there has been a lot of propaganda for having free trades for certain commodities. However, there were really some tough statements about protections in all knowledge and private intellectual assets. So this is important, especially, to understand the current crisis. It is commonly accepted that the recent financial crisis was due to the saving glut. Yes, we agree that the crisis was due to the famine of good investment opportunities. However, the monopolisation of global economic opportunities has contributed to this famine of investment opportunities. In the crisis of the thirties, protectionism was considered as one of the worst consequences of financial crisis. However, unlike IPR, even the highest tariff can at most protect the national industry against foreign competitors. In the recent downturn, protectionism is in its new form of global IPR.

IPR may be a cause of the financial crisis. How? Observe that IPR adds up to efforts due to incentives. If you know that you can acquire intellectual property rights you are going to invest more because you want to acquire particular intellectual property. However, there is also an associated blocking effort by IPR. This is because awarding IPR to someone implies blocking others from investment in this type of knowledge. There is the incentive effort and there is the blocking effort. However, what is interesting is that the incentive effort is immediate. If you are enforcing IPR, everyone is going for the good rush. Onwards, you colonise the version of territories and you may find that many scenes are blocked so that the blocking efforts come later. Actually, these things

are occurring very rapidly in recent years as there is huge rise in investment in research after the introduction of TRIPS.

All of these complementarities imply that we face a serious knowledge economy paradox. The non-rival nature knowledge could raise favour for more and even self-managed firms but it is used to create artificial economies of size which make cheap production at precision and defiance of private knowledge possible only for big businesses. We say knowledge privatisation that needs to provide incentive to investors to see human capital could be argument as compared to more firms having cheap non-rival public knowledge. If there were no patents and knowledge was available to everyone for free; then, the small firms could all use this public knowledge. Alternatively, you would give the powerful incentives by making them small and making them effective profit seekers. By now, because of the mobilisation of intellectual capital the knowledge economy can become the most unfriendly environment for small firms. Only large firms can exploit economies of scale and scope that are due to the ownership of knowledge. In particular, when knowledge is privatised, it is really favouring the size; and it is a source of favour in economy of scope. In other words, one piece of knowledge is useful only when it is used in some other pieces of knowledge, and there are both strong economies of scale and scope that arise when you privatised knowledge.

A great increase in inequality is stemming from the fact that if you make a lot of knowledge from the public to the private sphere. Granting monopoly to knowledge is associated with the widespread vicious circles where so many firms may drop because of dissuasion that do not have intellectual property and they do not develop those skills and vice versa. We should try to understand the cause that knowledge is a global public good, everyone can use in this world. But at the same time, we have got that different nations free ride on others. This is because the countries which are producing knowledge are paying for it; however, making it free for other countries imply that they will free ride on the producers of knowledge.

So, there is a dilemma. One the one hand, you have to control the inequities associated with the privatisation of knowledge, and, on the other hand, you have to control the free riding associated with making knowledge as a global public good. In order to solve this dilemma, we need a global institution which takes this into account. It is better to use pre-existing institutions which change their nature, keeping in view this dilemma. Take the case of WTO in this scenario. Well, you could say that with a little change of language which consider that free riding on the production of public knowledge of either nation should be seen as a damaging form of unfair competition where rider reaps the benefits of rather costly investments. The WTO should be reformed in such a way that this unfair competition is tamed. If you want to participate in

international trade, you should not free ride on the knowledge produced by others and everyone should supply this public knowledge proportionally to its place and wealth in the international community. In particular, it should be decided that the participation in international trade requires a fraction of GNP (increasing more than proportionally with national wealth of each member state) to be invested in open science and to be made available to all countries as a global common good. In this way, we will derive a super multiplier and multiplier could increase when government expenditure helps to transfer knowledge from the private to the public sphere. This is why knowledge is a super multiplier. Each time that you are move something, that is knowledge, from the private to the public sector, you are basically creating two effects. First, if you compensate the former monopolists, it gets more money and more competition, so he invests more in research. Second, others have got more investment opportunities, so you get some form of super multiplier.

Knowledge privatisation is of course linked very much with global inequality. Privatisation of knowledge is being particularly damaging for the large majority of the firms located in the low income countries. In the past, these countries were supposed to share the fruits of technological progress. The monopolisation of innovative technological paths involves an opposite mechanism. Rich countries at the frontier of knowledge introduce high protectionism for their products, while advocating free trade for the commodities produced by poor countries. Excessive knowledge privatisation tends to increase inequality among and within countries. Now this is the dark feature. It is a dark picture because finding the agreement among the foreign countries is not easy in the present situation. We should try to understand which one is the knowledge policy that you follow given this international situation and of course countries like Pakistan and Italy individually cannot put pressure to have these changes at international level, there is something that they can do. Pakistan (similarly to Italy) has a majority of small family controlled firms and this is not something, at least from our experience, that you can easily change in the short period. These firms cannot easily reap the economies of scale and scope entailed by the investments in intellectual capital. One should try to have small firms co-operating with a modernised public sector that is able to exploit its many complementarities with small business.

At the end, I would recommend to encourage the joint discussions among firms' associations and universities. These joint discussions should work on the future of technological trajectories and their monopolisation by particular firms. Also, at times, provision of funds to joint projects of universities and firms is also required for a prosperous future. Now, of course, this sort of analysis means that we are an economy which is based on more family controlled firms. You know that the occasional analysis by itself is not very useful. You should consider it as

a starting point. In the medium period, you cannot usually change and build policies that are complementary to the situation; otherwise, you are not going to succeed. At this time public sector may be a substitute for big corporations and it is complementary to small family controlled firms in economy. The corporations should all be absent and majority will be exploiting the others and may be more costly than the state interventions. However, it is not a perfect solution because the public sector itself is a costly substitute for other institutions as there is corruption and other terrible things that are associated with the public sector. Of course in America you would definitely do something different, here you know we are not in US or we are here or we say that in Italy and US is a long story in this respect. Moreover, this type of state interventions takes for granted the highly imperfect international arrangements of intellectual property. It is complementary to the international settings that are beneficial to be changed, but a single country has not the power to change given when a state tries to modernise its public sector. However, it is my hope that Pakistan along with other countries eventually succeed to reform the international public sector, because knowledge is a global public good and hence it requires global solution.

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*The Allama Iqbal Lecture*

**Achieving Sustained, Indigenous and  
Inclusive Growth**

SUNG-HEE JWA

**I. INTRODUCTION  
DILEMMA OF STAGNATION AND POLARISATION**

The world economy is now facing paramount problems such as long term stagnation of economic growth and worsening income distributions (or economic polarisation). This is even more embarrassing, because the humans have been seeking more equal society during the post-WWII era by engaging in the revised capitalism or social democracy by the most of capitalist developed economies, the balanced growth strategies under social democracy by most of the developing economies and more dramatically the socialist economic regime by the already collapsed socialist blocs, not to mention the still barely surviving North Korea. “Growth stagnation and economic polarisation” is not the one which has been intended and anticipated by policies but is opposite to intention as well as expectations. Some of the critics on capitalist economy have been arguing that this is the outcome of the fundamental contradiction of the capitalist economy from the Marxian perspective and/or the result of the neoliberal policies since the 1980s [Piketty (2014) and Stiglitz (2012)]. However, if one understands that the neoliberalism had short-lived only during the Thatcher-Reagan era, of course with some lingering effects, this episode can be seen as a typhoon within the tea cup. In this regard, broadly speaking, the common underlying institutions of post-war political-economy regime of the world economy can properly be called as the economic equality-seeking “egalitarian democracy” which includes the revised capitalism and social democracy, not to mention the socialism. Therefore, one can see that the efforts to create more economically equal society or in other words, the shared growth have in fact created more unequal as well as growth-stagnated economies against the intention as well as expectation. This seems to be the fundamental dilemma faced now by the world economies and these are perhaps waiting for the economic as well as any other social science profession to come up with a solution to it. Of course, some naive Marxists or leftist economists would claim that this phenomenon of the worsening income inequality is simply the fact of the capitalist economy, i.e., the fundamental contradiction of the

Sung-Hee Jwa is Chair Professor, Park Chung-Hee School of Policy and Saemaul, Yeungnam University, The Republic of Korea.

capitalism, so that the answer is to strengthen further the redistribution. This has been the main tenet of egalitarian economic policy regimes to support the egalitarian democracy ever since the post-war era.

However, the mainstream camp is often heard to say this may be “a new normal” to sustain for some time, which seems implying they do not know why this is happening and how to deal with this, either [Summers (2013) and Krugman (2013)]? In fact, this confession by the mainstream is partly understandable because the mainstream used to be the architect or supporter of the political economy regime, such as the revised capitalism as well as social democracy all along since the post-WWII.

The theme of this lecture, *how to achieve the sustained, indigenous and inclusive growth* is also related to this issue. The world has been seeking the inclusive growth models during the post war period by adopting revised capitalism, social democracy and even the now debunked socialist economic system. Development economics has also preached a balanced growth as the key goal of economic development. However, the world is now experiencing an even more worsened outcome, “growth stagnation and income polarisation”. Ironically, seeking the inclusive growth ended up with ‘exclusive stagnation’. This raises the question then, what has been wrong with economists’ tool kit for not being able to achieve the desired inclusive growth. While the theme of this lecture is in fact exactly the *raison d’être* for the economics subject, but the economics profession has been failing to deliver the right answers till now.

The order of presentation of this paper is as follows; Section II will briefly but critically review the literature on the institutional approaches for inclusive growth. Section III will briefly present a General Theory of Economic Development (GTED) as the basis for the discussion of inclusive growth. GTED will argue that Economic Discrimination (ED) by markets, corporations and government is a necessary condition for economic development while egalitarianism by any of them will be sufficient condition for economic stagnation. ED means treating the different differently while egalitarianism is an anti-thesis to ED. This approach will also provide an answer to the current economic dilemma faced by the global economies. Section IV will present four different political-economy orders and discuss their implications for inclusive growth together with empirical experiences. It argues that “liberal market democracy” and “developmental state” all incorporating “ED policy paradigm” are development-friendly and also serve well for inclusive growth objective. Section V will dwell on the dramatic experiences of Korea’s best inclusive growth during the developmental state followed by the exclusive stagnation in recent decades. This section will also compare the Korean and Pakistani experiences very briefly over the last 60 years and attempt to explain why they turn out to have once been so different, but to be getting so similar now. Section VI will conclude the paper by mentioning about the fundamental nature of capitalist economic development and about how GTED is compared with the mainstream neoclassical growth accounting approach.

## II. BRIEF OVERVIEW OF EXISTING ARGUMENTS

We have developed a general theory of economic development which can deal with this issue more systematically. This paper will try to answer the theme question by applying the new theory referred to as GTED here. Before that, let us quickly go over

some of the attempts reported in the existing literature, which have been trying to encompass the so-called development-friendly institutions.

First, Douglass North (1990) has argued that Private Property Rights (PPR) and Economic Freedom (EF) are the prerequisite for economic development and moreover the new institutional economics (NIE) school of thought has been strongly arguing the importance of economic institutions for economic development. However, their development-friendly institutions are in many cases not well-defined and sometimes became obscure because even PPR and economic freedom have not been enough to generate development in many cases. While they sound persuasive when arguing “Institutions do matter, they have been failing to provide the clear answer to the question, “what institutions do really matter for development?”. However, these arguments are now very well received so that the so-called Washington consensus already accommodated them into the shopping list of consensus for economic development policies.

Second, the Washington Consensus on economic development policy derived from NIE, neo-liberalism and mainstream neoclassical growth theory suggests that the free market supported by the institutions of PPR (private property rights) and economic freedom is the most important instrument for economic development, and therefore, the laissez-faire, free market policy will take care of economic development under the stable macroeconomic environment. Now the Washington consensus list is extended to include PPR, EF, privatisation, deregulation, education, R&D, rule of law, SOC (social overhead capital), free trade, and macroeconomic stability by combining the Neoclassical arguments as well as NIE. This approach rightly emphasises the free market but do not fully appreciate the important roles of government as well as corporation. Such mainstream consensus seems insufficient to explain diverse developmental experiences in the history. I don't think this approach is able to explain the current problems of the world economy, low growth and bipolarisation under the most up to date free market system as well as full-dress democracy.

Third, recently, Acemoglu and Robinson (2012) as one strand of NIE propose the concepts of inclusive institutions as development-friendly institutions while extractive ones as development-unfriendly ones from which now the word, “inclusive” becomes very popular, implying the institutions for a shared growth. They define extractive institutions as nondemocratic and exploitive institutions confirming the common sense understanding while defining the inclusive institutions as democratic institutions together with the PPR and economic freedom as usually argued by new institutional economics. Interestingly they are supporting the now most popular political regime, a plural democracy especially including social democracy seeking economic equalities as the inclusive institutions. This argument, however, is not able to explain why then most of the democratic market economies are facing a non-inclusive stagnation after their long effort for inclusive growth in post war era as mentioned above. Fourth, “egalitarian democracy” seeking economic equality including social democracy as well as welfare state under the revised capitalism has become a dominant political economic system in the world. The most serious weakness of all these approaches turns out to be their vulnerability to economic equality ideology, which is not much different from the now-debunked socialist economic ideology as will be more elaborated in order. They do not mind the danger that equality can cause damage to economic development.

This paper will go beyond the existing NIE perspective by developing a theory of the political economy system to handle the issue of the role of the state in economic development. In principle, there could be two types of states in terms of economic development; one is development-friendly state (DFS) and the other is development-unfriendly state (DUFS). DFS must be able to implement appropriate economic policies for economic development. Pre-requisites for DFS include (1) knowing appropriate theories and policies for economic development; and (2) ability to mobilise political support for necessary economic policies among general public as well as politicians, which in turn requires the state to keep a majority of population embodied with development-friendly ideology consistent with appropriate economic policies. It is because in the 21st century, democracy is developed to the extent that most of economic institutions and policies are determined or strongly influenced by the majority party's ideology. Any state that does not meet those two conditions would be classified as a DUFS.

In sum, DFS should be able to disseminate the right ideology suitable for economic development according to appropriate theories of economic development. This means that ideology, which so far has been treated as an exogenous variable in mainstream economics, becomes indigenised as a choice variable. In addition, the theory of economic development which has been in disarray for several decades should be reformulated to provide correct guides to judge which ideology is development-friendly.

### **III. A GENERAL THEORY OF ECONOMIC DEVELOPMENT (GTED): A BRIEF OVERVIEW**

#### **1. Economic Discrimination(ED) as the Basis of Development**

A GTED [Jwa (2015) and forthcoming in (2016)]<sup>1</sup> consolidates the existing debates on the role of the market vs. government and incorporates the role of corporation by going beyond the neoclassical growth accounting approach. GTED accepts the complexity-view of economic development [Beinhocker (2006)] by interpreting the development as a non-linear order transformation process from a wagon-economy to railway, to automobile, to airplane, to spaceship economy, rather than to a more-wagons-economy like in neoclassical growth model, and thereby rightly views the modern corporation as the complex organisation of capitalist economy, the locomotive of order transformation of economic development. It also tries to overcome the weakness of NIE by seeking the answer to the question, what institutions are development-friendly. GTED intends to be “general” by “standing on the shoulders of the giants”.

GTED starts with a new interpretation of the function of the markets, and discovers the new role of the modern capitalist corporations as the key feature of capitalist economy which is not in the agrarian economy and the positive role of government, all for economic development. The key organising concept of GTED is “economic discrimination (ED) based on performance” and argues all three players, markets, corporations and government should function as an economic discriminator, which is the key necessary condition for economic development. This ED concept is already well established in the West by the maxim, “the God Help those who help

<sup>1</sup>Also see my other works in the references for more details.

themselves”, and in the Orient by the maxim, “Never fail to reward a merit or let a fault go unpunished”, “dispensation of justice” or “信賞必罰 in Chinese (신상필벌 in Korean)”<sup>2</sup> in 2200 years ago by the Chinese philosophers known as the School of Law or the Legalism. ED has been the fact of life all along with the long history of human evolution. ED means treating economic difference differently but does not imply anything like political or social discrimination. GTED incorporates ED mechanism as the key principle of economic development. A short overview of GTED is in order.

## 2. Role of Market and Nature of Development

First, the function of markets is redefined here. Markets in the real world, different from the perfectly competitive markets in the textbook, discriminate economic agents according to their economic achievements and direct resources and wealth to the successful agents, which is in fact what we all are doing in everyday life. Markets thereby press to create economic inequalities and motivate them to work harder. In this sense, markets are a motivational discriminator just like a god who helps those who help themselves. This economic discrimination (ED) and motivational function is in fact the essential role of markets that make them an important institution for economic development. In this view, any mechanism strengthening the market’s discrimination function and thereby providing motivation by helping acknowledging differences in economic outcomes will necessarily help promote economic development.

Seen from this perspective, PPR system and economic freedom, in fact, can be a means for creating economic differences and inequalities and as a result motivating economic agents to work harder, and therefore, should be good for economic development. In this regard, the capitalist market economy with unfettered PPR and economic freedom may have more chances to grow. But this is not the end of the story as will be seen in the following.

Second, development is a complex, cultural evolutionary process of free-replication of or free-riding on others’ success knowhow, thereby the mass of people becomes successful, which is the very nature of non-linear order transformation process of development. Markets, however, cannot handle such free-riding problem successfully especially because market transactions are faced with positive transaction costs. Economic leaders that serve as sources of success knowhow therefore tend to disappear from the market. Markets alone are not very good at producing the critical mass of economically successful role models to lead the transformation process. This may be called market failure of ED and motivation, a new kind of market failure which is different from the textbook case. Markets alone are not enough to create developmental process, theoretically as well as historically as vividly exhibited by the long history of economic stagnation during the agrarian economy as well as the modern day catch-up failure by the many underdeveloped market economies.

Here, the introduction of a secure PPR system may help improve the market’s power of discrimination but not enough to solve the free-riding problem since knowhow of success is intrinsically so difficult to be identified that it may become prohibitively costly to fully assign and enforce PPR for it. So, market economy is destined to be trapped in the developmental failure despite the spread of the capitalist market economy.

<sup>2</sup>“Reward a merit but punish a demerit”. Korean as well as Chinese has the same meaning.

### 3. Role of Corporation

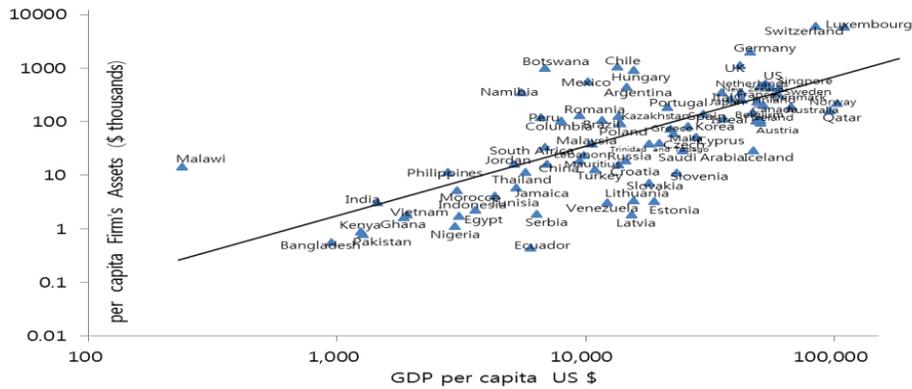
Third, the natural solution to developmental failure is the private firm as an organisation based on the command-control mechanism which can therefore, avoid transaction costs (or save information costs) and solve the market failure by internalising knowhow-free-riding activities. The firm comes into existence to take advantage of the markets' failure of ED and turn itself into an expert in ED. Especially, the modern joint-stock corporation is a new social technology to arise in the capitalist economy as an emergent complex organisation from the individually or family owned black-smith firms in agrarian economy and is able to expand its capital base and capability to take business risk even to the unlimited scale. Theoretically, the market failure of economic development during the long history of agrarian economy had been due to the lack of such complex organisations. Then the natural question should be why many of capitalist economies in the globe are failing in catch-up even with the modern corporate system as well as market economy.

The clue for an answer lies in the very nature of development, free-riding on the shoulders of the giants. In the market places, the successful corporations are destined to be subject to the free-riding on their success-knowledge by the followers and therefore, the market fails to produce such successful corporations on a large scale. In this context, modern developmental-friendly state (DFS) as public organisation has also been the important supplement to the market by promoting the growth of such corporations. Here, we find the positive role for the government as well as corporation for economic development. With the corporate-promotion role of the government, the modern corporations have eventually been the strong supplement to the market in the capitalist economy during and since the industrial revolution. Note that private joint stock company began to appear and burgeon from the mid-17th century, became formally legalised by England in the early 19th century after a century-long dark age under the bubble Act during the 18th century [Micklethwait and Wooldridge (2003)], and has finally played the key locomotive role for the industrial revolution as well as for the development of capitalist economy. The visible hand of modern corporations has begun to supplement the invisible hand of the markets.<sup>3</sup> Without the corporate growth, the economy is destined to stay at or move back to the agrarian economy as seen in the case of the very under-developed economies as well as the failed socialist economies. Now the corporate sector in capitalist economy substitutes for the land in agrarian economy as the home of survival of humans as only about less than 5 percent of GDP as well as total jobs in most of developed economies stems from the agriculture.

Now the modern corporations are helping achieve the shared and inclusive growth of capitalist economy as shown by Figure 1 and Figure 2. In this vein, capitalist economy should have been named as "corporate economy", not "market economy". Note that the joint stock company is the unique social technology only in the capitalist economy, while market exchange has been ubiquitous ever since the hunter-gatherer era. Modern corporation shouldn't be regarded any more as an evil monster for creating economic inequalities as argued by Karl Marx or any other critics on Capitalism.

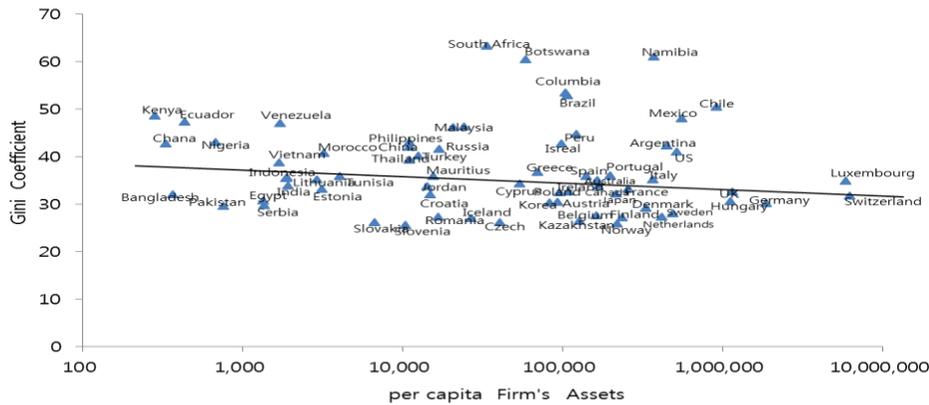
<sup>3</sup>See Chandler (1977) for a similar argument.

**Fig. 1. Corporate-led Growth**



Note: GDP per capita and per capita Firm's Assets (77 countries as of 2013). Source: SMP Capital IQ & World Bank.

**Fig. 2. Corporate-led Inclusive Growth**



Note: Per capita Firm's Assets and Gini coefficient (70 countries for 2008 to 2013). Source: SMP Capital IQ & World Bank.

**4. Role of Government**

Fourth, GTED reinterprets markets as motivational economic discriminator which can be the logical basis for the role of government for economic development. The government should help correct the market failure of solving free-riding problems by introducing the socio-economic institutions that can help those individuals and corporations who help themselves but are not fully rewarded. The market institutions should be upgraded and reinforced to fully match the rewards to the performances. Market ED-function reinforcement should be the key role of the government for development. This new interpretation of the role of the government is diametrically opposite to the now most popular paradigm of political economy regime seeking economic equalities, as the prime goal of the government policy and different from the main stream economics profession which has been prone to supporting such egalitarian political economy regime.

According to a new interpretation of markets, the market can be interpreted as exercising an industrial policies (IP) everyday by picking better performers and providing more resources to them. In this regards, IP can be re-interpreted as an ED and motivational mechanism. Successful government IP should supplement and reinforce the market's ED function, i.e. the market-led IP by helping those individuals and corporations who help themselves rather than going against or disregarding them. IP should pick the market winners ex post, after the market outcome, rather than pick the winners ex ante, before the market outcome, which can help avoid the difficult question of how to pick the winners in ex ante in the traditional debates.

Seen from this perspective, Japanese and Korean industrial policies were successful precisely because both were implemented in an economically highly discriminatory manner so as to re-enforce the market discrimination and motivational function. That is, IP always helped those corporations that helped themselves, based on their market performances. In this sense, "industrial policy" should be renamed as discriminatory "corporate promotion policy," which could help correct the market and developmental failure. By this corporate-promotional IP, the corporations can become to play the role of the locomotive for inclusive economic development by overcoming the free-riding problem. (see Figure 1 and Figure 2.)

GTED argues that the capitalist economy is a "corporate economy". Then a question may arise as to how promote corporations for inclusive growth in substitution for traditional industrial policy. Governments can select a specific industry for promotion in the name of import substitution policy or new industry promotion policy while the implementation of those policies can be successful only by "corporate promotion policy". Some lessons can be learned from the experience of successful corporate promotion policy like Korea. The corporate promotion policy can be named as "corporate-ED policy" which can be implemented as follows;

- (1) SME policy supported the better performing firms with more financial as well as tax benefits according to their performance, and they were given the choice to take over the poorly performing firms.
- (2) Better performing exporters were given more financial support and tax benefits and were guided to take over the lower performing exporters.<sup>4</sup>
- (3) Privatisation policy will always allow the better performing corporations to take over the SOEs based on the ED paradigm without any political consideration.
- (4) In the process of so-called industrial restructuring, the insolvent firms should always be allowed to be taken over by the solvent, competitive firms.
- (5) Any corporate policy for economic development should keep to the ED principle.

However, there may arise some concern about potential danger of conglomeration and the resulting monopoly power by the adoption of ED principle. This issue has always

<sup>4</sup>Accurate actual market performance evaluation is the key for the success of ED export support policies. If it is necessary to amplify ED-support system further, one can introduce "a nation-wide export contest" which selects and recognises the best and better exporters based on their actual export performances and thereby publicises them to be widely known to banks and financial market which are always looking for them for support.

been on the table for economic policy discussion but without successful solution. Demsetz (1974), and Alchian and Allen (1977) argue that monopoly results either from government protection or efficiency: The same applies to conglomeration. If the source of monopolisation or conglomeration is the efficiency, not the government protection, then the solution can be rationally devised, while otherwise one should remove the protections. In the efficiency-driven case, care should be taken not to confuse “ability” with “incentives” to abuse [Alchian and Allen (1977)]. Ability does not necessarily imply the incentive. Threat of market power can be tackled by stronger competitive pressure of potential as well as actual rivals. It is good to open the market not only for domestic competitors but also for foreign competitors to check the incentives to abuse. Even if the direct regulation as an alternative may have popular political appeal, it is not advised to resort to such direct regulation on the growth of corporations as used to be the case for many economies including Korea now. This policy has a serious danger to kill the very incentive to grow on the part of corporate sector which in turn harms the inclusive growth. The policy should concentrate to minimise the incentive to abuse by bringing actual as well as potential competitive threat as much as possible while the incentive to grow should be maintained as high as possible by allowing freer choice of investment.

The ED feature of successful government policies is not confined only to the cases of successful IP, and is generally applicable to the most cases of economic or public policies. Successful economic policies turn out to be economically discriminatory, while failed policies are egalitarian disregarding difference in performance. This is against the popular egalitarian argument that the government should intervene against market outcomes in order to correct the economic imbalances created by the market economy. In this case, markets will revenge by simply standing still, resulting in stagnation and no-development.

##### **5. Ideology and politics in Development**

Fifth, Ideology or mindset is one of the key informal institutions constraining the economic behaviour and performance. In this regard, the most important development-friendly ideology such as “can-do spirit” or “self-help spirit” should be embodied into the peoples’ way of thinking in order to have ‘a sustained and indigenous growth and development’. According to Korean experience, the economic discriminatory policy regime being repeatedly enforced is very important on top of simple education and/or propaganda. Especially, Korea’s “can-do spirit” turns out to have been created by the repeated application of government’s discriminatory economic policies helping only those who help themselves such as Saemaul Undong (new village movement), export-promotion policies and IP for HCI drive. Note that ‘a sustained and indigenous growth can only be achievable if the people’s mindset is changed into a development-friendly one’.

In this regard, politics becomes so important, as the political parties translate the informal institutions such as prevailing political ideology into the formal institutions which constraints economic behaviour and performance as an incentive structure of the society. Therefore, the politics as a framer of economic policy regime in the democratic political system should be ready to accommodate the principle of ED lest the law and regulations go against the ED. Politics as well as government should support ED if they

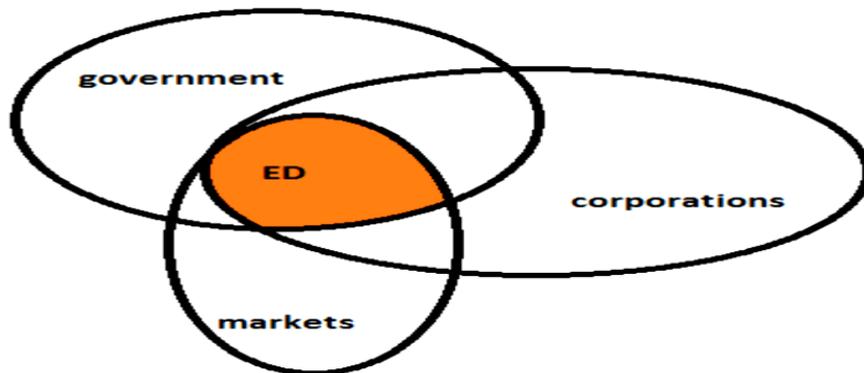
can be development-friendly. They should however make sure to avoid the egalitarian trap, while the equality of opportunity before the law should be fully guaranteed.

### 6. Holy Trinity of Economic Development, Markets, Corporations and Government

Now, let me consolidate the arguments. Discriminatory economic institutions embodying the principle of treating economic differences differently, i.e. ED paradigm and respecting the ideology of helping those who help themselves are good for development, while egalitarian institutions that treat economic differences equally especially by disregarding economic excellence will hinder economic prosperity. Markets cum PPR system and economic freedom may be good for the survival of the economy, but they need to be supplemented by economic discrimination by the government and private organisations if there could be any chances for real economic take-off and catch-up in the development game. I have been arguing 'that ED is a necessary condition for economic development, while economic egalitarianism is a sufficient condition for economic stagnation'. In fact, "ED and motivation by the market as well as government and corporation is a necessary condition for economic development" is the key message of condensed development experiences of Japan, Korea and China as well as extended western development experiences.

Figure 3 summarise the general theory of economic development in which the holy trinity of economic development, markets, corporations and government should altogether keep to the principle of ED to be development-friendly. It should be remembered that ED paradigm has been the basis not only for the post-war success of Korea under Park Chung-Hee, China under Deng Xiao Ping, Singapore under Lee Kwan Yew, Malaysia under Mahathir and Taiwan in 60s-70s as well as the industrial revolution of the now developed economies but also for all the successful civilisations in history. Furthermore, ED paradigm has always been the key success factor for the corporate management. Now, the ED paradigm which was born even longer than 2000 years ago is being reborn in recent years with the behavioural economics and experimental economics [Gneezy and List (2013)] as well as with management science [Welch (2005)]. Egalitarianism disregarding the excellence in social as well as economic performance can never be useful for the prosperity of any society. Don't forget the memory of the demise of socialist economies which was exactly due to the lack of ED paradigm.

**Fig. 3. Holy Trinity of Economic Development [Jwa (2015)]**



## **7. Implications of GTED on Public Policies and Global Economic Dilemma**

In general, there can be two different kinds of public policies; one is economic development policy and another is social (empowerment) policy. So far in economic policy discussion, there has not been much concern about the different nature of two policies except for the common-sense understanding that the former is for creating value-added while the latter is just for helping the low income people or the under-privileged to survive or sustain even without new value creation. Along with this line, both policies have been regarded as better to support as many policy objects as possible and as much as possible too. Now it seems the case that economic policies as well as social policies all degenerated to the egalitarian (support) policies without any incentive differentiation depending on the responses, positive or negative, by the recipients, i.e., ED mechanism. As a result, both policies have been unfriendly to growth and development as well as unsustainable as they lack an incentive scheme to create new value-added or growth, which in turn hurts the soundness of public finance.

Now, GTED strongly implies that economic policies should recover their fundamental nature of ED support principle if they can really help develop economy and also the social policies should be reformed to be based on the ED principle if they are to be self-sustainable by creating new value-added. Therefore, public policy in general should adopt ED support principle. In this new framework, not only the economic but also social policies would contribute to growth and development on top of being financially sustainable. Especially, it should be recognised that this new ED social policy framework will greatly help improve its own financial sustainability compared to the traditional incentive-lacking social policy.

Balanced development ideology has been the leading egalitarian policy paradigm. Redistributive welfare policies and social empowerment policies have been egalitarian, lacking the ED principle so that incentive to grow has been discouraged while moral hazard has been encouraged. Thereby the sustainability of the egalitarian policies has been greatly damaged, ending up with financial difficulties for the implementing States. In the midst of low growth and less job creation with the loss of developmental self-help spirit influenced by the egalitarian incentive structure, the size of middle income people is destined to dwindle, thus leading to polarisation.

According to GTED, this scenario seems the most plausible reason for the current global economic problem; egalitarian economic and social policies, killing the incentive to grow and encouraging moral hazard, low growth and no job creation with more social welfare demand, increasing pressure for government expenditures for welfare without corresponding tax revenues, mounting government debts global financial crisis with low growth and income polarisation. Having the social policy as well as the economic policy killing the very incentive to grow, how could we expect the growth and development? One can characterise the current situation as an “egalitarian trap”. GTED implies it is imperative for developed as well as underdeveloped economies to get out of “egalitarian trap” if they want to get over the low growth and bipolarisation dilemma. The solution is to turn to the market democracy keeping to the ED principle as will be argued in the next section.

#### **IV. DEVELOPMENT-FRIENDLY POLITICAL-ECONOMY REGIMES FOR INCLUSIVE GROWTH**

This section will apply GTED to discover the development-friendly political-economy order for inclusive growth. The theme of this paper, “sustained, indigenous and inclusive growth” can be achieved if ED principle becomes embodied into the socio-economic institutions so that ED incentive structure is so firmly built into the system and strictly enforced that the members of the society change their behaviour and eventually their mindset consistently with ED principle in the sustained and indigenous manner. Therefore, it is necessary to investigate the role of mindset or ideology as informal institution and politics as framer of formal institutions in development.

##### **1. Ideology of Equality and Development**

According to the ED paradigm, the political ideology as well as political institutions allowing economic differences and inequalities as a natural outcome of the development and at least not regarding them as contradiction of capitalist economy as far as the majority becomes improved materially will tend to be development-friendly, while the opposite ideology and political institution favouring economic equalities such as equality of economic outcomes and/or equality of substantive economic opportunity will become development-unfriendly.

Here, some note on the development-friendly concept of equality should be in order. Will equality be a good friend with the economic development under the ED paradigm? Equality before the law can most naturally be a good friend with economic development as it allows the markets to work for ED. Equality of opportunity can be commensurate with development, if it is interpreted as equality of opportunity before the law but cannot be so, if it is interpreted as a substantive opportunity implying the equal capability to achieve as the former interpretation, but the latter will not allow the market to work for ED. Note that an equal capability will naturally lead to an equal outcome except for the case of interruption by difference in luck. Finally, equality of the outcome will obviously kill any incentive to grow as it means a socialist economic system.

From this perspective, one can easily see the potential danger with the ideology of “economic democracy”. Economic democracy seeks substantive democracy by eliminating the economic differences and thereby equalising economic powers among people, organisation, lest unequal economic resources do not unequally and unfairly influence the democratic process [Dahl (1985)]. While it sounds great for an ideal democracy, however, it is destined to go against the function of the market ED and to become development-friendly.

##### **2. Political institutions and Development: The Political Economy Order**

The two wheels of the Democracy Cart are liberty and equality. The issue with liberty is that it seems easily subdued by egalitarian ethos especially in modern-day democracies that have emphasised “equal rights.” Central to ideal democracy, for example, is the “*one man one vote*” mechanism, which provides an easy environment for egalitarian ethos to thrive. However, such *egalitarianism* has tended to permeate into all aspects of life, being translated into “equal opportunity” in economic capability rather

than before the law, “equal outcome”, etc. This adversely affects economic development, because economic development is based on ED.

According to the ED paradigm, one can classify political economy regime into 4 different combinations of political order and economic orders as shown in Table 1; A+C=market democracy, A+D=social democracy, B+C=developmental state and B+D=totalitarian regime. Here, it can easily be seen that A+C and B+C are development-friendly because they are adopting ED economic policies while A+D and B+D are development-unfriendly because they are under economically egalitarian regime. Therefore, seen from this perspective, as far as economic development is concerned, political order being democratic or authoritarian is not crucial while choice of economic order becomes very crucial. Even politically authoritarian states can be development-friendly if they are economically discriminatory by adopting ED policies. On the other hand, even liberal democracies can lead to economic stagnation if they become economically egalitarian.

Note that this 4-regime classification is different from the 2-regime classification, inclusive vs. extractive institutions by Acemoglu and Robinson (2012). Our classification is much richer than theirs in that our totalitarian state is exactly same as the extractive institution while our classification amounts to subdividing the inclusive institution into 3 different regimes, developmental state, market democracy and egalitarian democracy. Even inclusive institution can fail to develop if it becomes economically egalitarian. Interestingly they seem to imply the inclusive regime as if egalitarian democracy which is develop-unfriendly according to ED perspective. On the other hand, even authoritarian political regime can become a development state for inclusive growth by implementing ED economic policy regime. In this regard, their two regime classification of inclusive and extractive institutions is not much different from the classification of democratic and nondemocratic order which however is not much helpful in discerning the DFS or DUFS.

Table 1  
*Political-Economy Matrix of Social Order*

|                 |                                      |                                    |
|-----------------|--------------------------------------|------------------------------------|
| Political Order | (A) Liberty (Equal Political Rights) | (B) Authoritarian                  |
| Economic Order  | (B) Economic Discrimination(ED)      | (C) Egalitarianism (Equal Outcome) |

Source: Jwa and Yoon (2004a).

### 3. Historical Experiences of Growth and Development

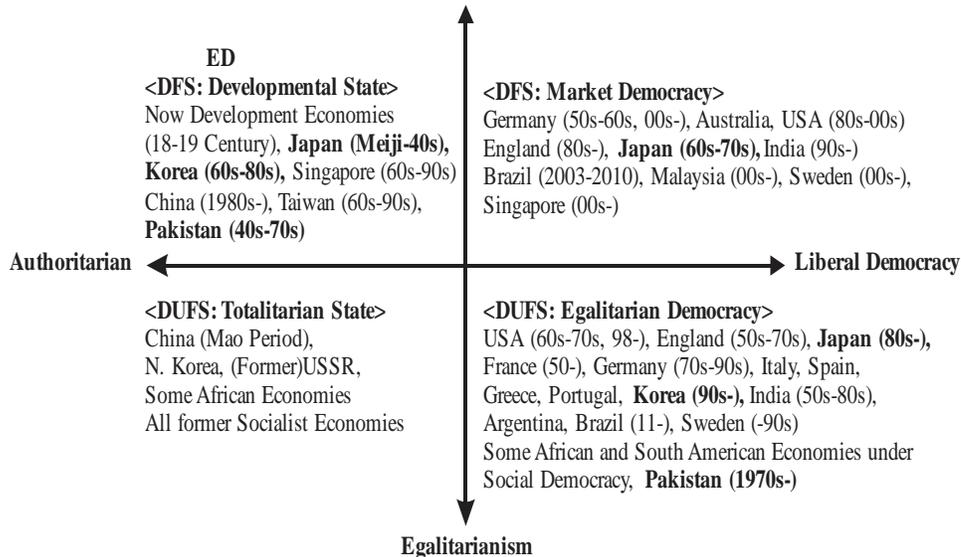
With this framework of political economy regime, one can consistently map out diverse experiences of economic development into 4-different quadrants as shown in Figure 4. This mapping table is from Jwa (2004, 2006 and 2016).

Some interesting observations are in order:

- (1) History seems to reveal the sequential movement of developmental cycles, from totalitarian, to developmental state, to market democracy and to Egalitarian democracy, or from totalitarian state to egalitarian democracy, or back and forth between market and egalitarian democracy.

- (2) Market democracy seems to be not a stable regime and many economies which had once been growing dynamically under market democracy tend to degenerate to the egalitarian democracy. This may be due to the inherent populist nature of democracy which tries to democratise the economy. To avoid this it may be necessary to devise a mechanism to economise the democracy or to minimise the incentive to democratise economy.

**Fig. 4. Political-Economy Axis of Social Order**



#### 4. How to Create Development-Friendly Ideology and State

Condensed development experiences of Korea, Japan, and China imply that repeated application of economic institutions and policies based on ED principle will help change peoples' ideology toward being development-friendly. Conditions for this are: (1) ED leadership is required who understands ED principle and is determined to introduce and implement the nation's economic institutions which is consistent with ED principle as listed below. (2) Some firewall must be built between economic policy-making and politics in order to minimise the egalitarian populism. The strategy of "economising the politics" may be necessary. Examples of such ED leadership who once succeeded in changing the nation's ideology towards DFS are as follows: leadership in Meiji Japan, Park Chung-Hee in Korea, Lee Kwan-yew in Singapore, Deng Xiao ping in China, Thatcher in England, Lula da Silva in Brazil, Manmohan Singh in India, Mahathir in Malaysia and maybe Reagan in USA, to name a few as can be confirmed in Figure 4.

#### 5. A List of Development-Friendly Institutions for Inclusive Growth

GTED can now provide a rather comprehensive list of development-friendly institutions and policies for sustained, indigenous and inclusive growth from the ED perspective. Institutions could include market democracy, individual and corporate

economic freedom, private property right system, rule of law, and any institution to help reduce transaction or information costs, stable macroeconomic environment, stable political environment, corporate-friendly socio-economic environment, etc. Policies could include economic policies to differentiate incentives in terms of taxes and subsidies and financial supports depending on performances such as SM&E promotion, agricultural support, regional development, R&D support, educational support, etc. Social empowerment policies including various social and welfare policies should also help those who help themselves based on ED if the sustainability is to be improved.

## **6. Economic Development Needs an Economic Theory of Ideology**

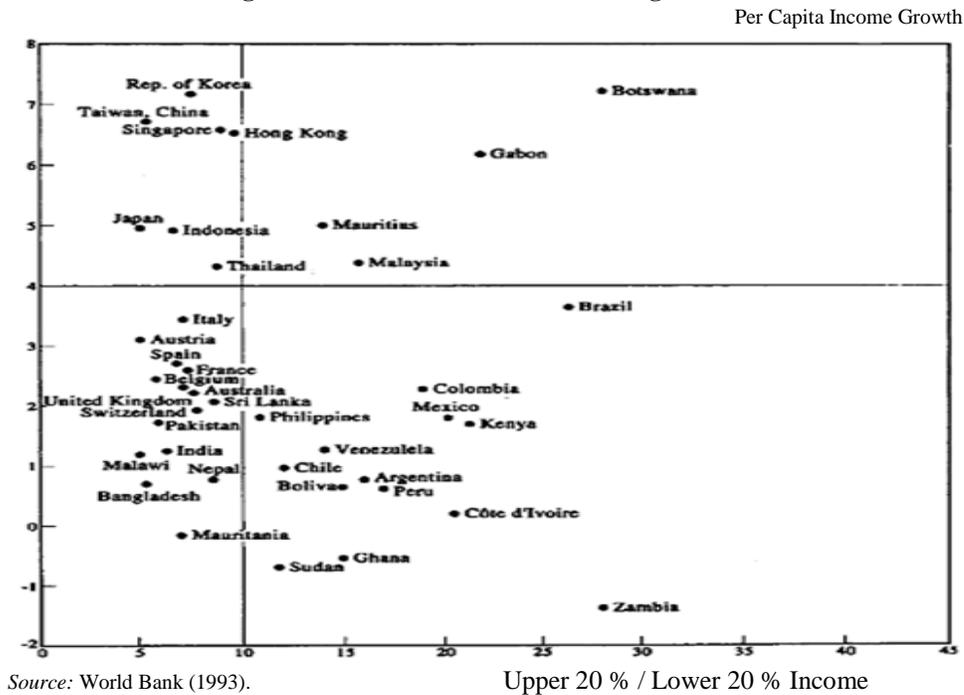
Economic science has so far been lacking an economic theory of ideology and politics and degenerated as providing technical advices to achieve national agenda set by political ideologies. As a result, it became a subsidiary science to political science. This has been the main reason for the egalitarian economic policy regime to widely spread out to the global economies in the name of helping everybody equally regardless of their economic efforts and achievements, and thereby causing most of global economies to degenerate towards stagnation for several decades. Now, it seems most of the globe is covered with the DUFSS while the DFS becomes a dying species. Economic science should provide a theory to discriminate political ideologies based on their economic development implication, and help prevent unfounded political ideologies from producing development-unfriendly institutions and thereby, not only harming the inclusive growth but the dynamism of the global economy. The new GTED based on the ED paradigm is an attempt to contribute to such an effort.

## **V. KOREA: THE BEST INCLUSIVE GROWTH LED BY ED-LEADERSHIP FOLLOWED BY EXCLUSIVE STAGNATION**

### **1. Korea's Miracle led by Park Chung-hee's ED Leadership**

Korea has been praised as one of the best shared or inclusive growth experiences during the developmental era since 1960s-1980s as shown in Figure 5 [World Bank (1993)]. In this era, Park Chung-hee leadership was so critical for inclusive growth. First, he always tried to economise the politics, that is, to prevent the populist democracy from distorting ED principle in economic policy making and implementation by leaning even to rather authoritarian regime, in spite of severe criticism by the domestic opponents as well as foreign allies. Second, he always respected ED-market principle, and applied and implemented ED principle to all economic as well as social policies by helping those who help themselves. Third, he always kept to the ED-corporate promotion policies to help grow the corporations as a means of expanding economic territory, instead of "Colonisation by Strong Army under the imperialism". Finally, he was truly a leader with firm commitment to economic development for people and was clean without corruption. Park's leadership can be dubbed as "ED leadership".

Fig. 5. Korea's Shared Growth During 60s-80s



Economic policies under Korea's era of developmental state all adopted the ED policy which created keen competition among corporations, entrepreneurs, and rural towns;

- (1) Export Promotion policy by helping only those who deliver better export performance.
- (2) Heavy and Chemical Industry Drive (import substitution policy) by allowing only most or more capable exporters to enter the HCI sector.<sup>5</sup>
- (3) Promotion of SME to large corporation by helping only those who perform better in export.
- (4) Saemaul Undong (SU: rural development drive) by helping only those who deliver positive outcome with self-help spirits. With ED incentive structure built into SU by helping only those who help themselves, SU could change the mindset as well as behaviour of rural people in a sustainable and indigenous way.

Note that Park's ED leadership was able to change the peoples' ideology, historical tradition, and culture into being development-friendly by keeping to the dictum of "the God help those who help themselves."

<sup>5</sup>Korean government required the potential entrants to provide the minimum 25 percent of large capital requirements of the HCI and the government loaned the remaining 75 percent. So only the best export performers were able to enter the HCI. If this is to be applied to the Pakistani case, for example, one may probably think of allowing better exporters to take over the SOEs with reasonable prices by requiring a certain minimum own seed-capital to be put in which is not debt-financed.

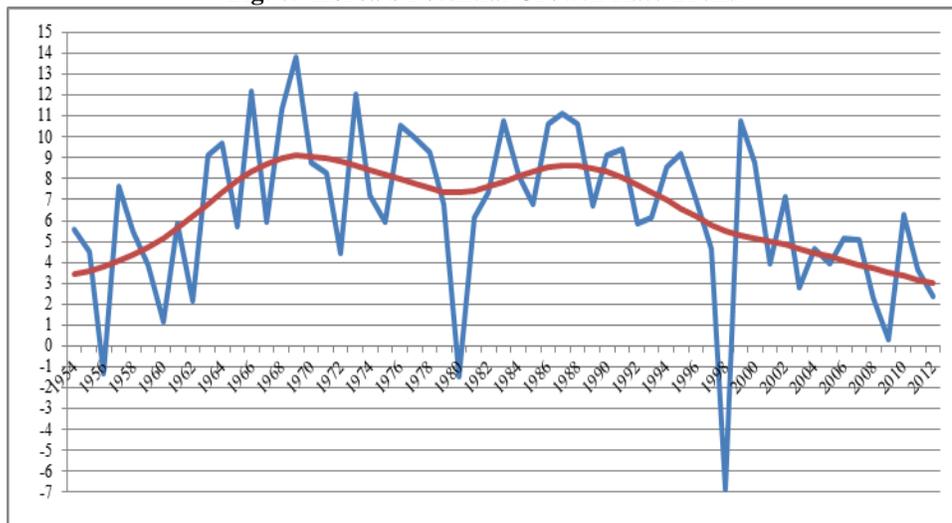
## 2. Korea's Exclusive Stagnation Led by Egalitarian Democracy

Korea turned away from the Park Chunghee paradigm to egalitarianism under Egalitarian Democracy since the late 1980s. Since then, Slowly first and rapidly later on, Korea has fallen into the “egalitarian trap” to make things even out, disfavours the large, rich, and growing people, organisations, corporations, schools and regions, etc., over the small, weak, poor and stagnating ones. Specific examples are as follows;

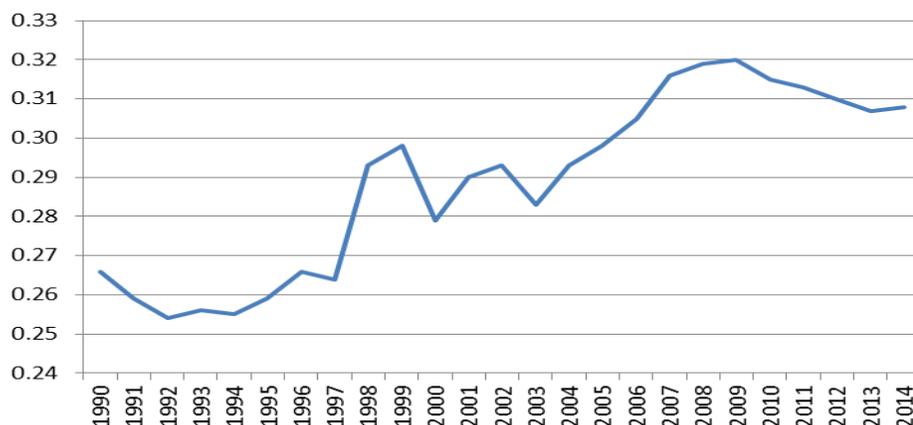
- (1) Regulate the large corporations because they are big, becoming stumbling block to economic democracy.
- (2) Support S&ME because they are small, weak, not because they are doing good.
- (3) Support farmers because they are weak, not because they behave as self-help and are doing good.
- (4) Regulate metropolitan region and support all locals equally to achieve a balanced regional development.
- (5) Disfavour Seoul universities but favour local universities for a balanced growth in university and regions.
- (6) Introduce surtax on the rich.
- (7) Introduce educational system to equalise the students performances across the schools and regions.
- (8) Economic development policy in general and industrial policy specifically turned into egalitarian policies (Ex. Venture promotion, New industry promotion, Green growth initiative, creative industry promotion, etc.).

ED principle has not been at work. The economy has not performed as in the earlier stages of economic development as shown in Figure 6. Is this the end of Korea's economic development? This will be so unless Korea turns into a liberal Market Democracy by getting out of Egalitarian Democracy.

**Fig. 6. Korea's Potential Growth Rate Trend**



Source: The author's own calculation by applying the Hodrick-Prescott (H-P) filter. Note: Blue; actual GDP growth rate, Red; potential GDP growth rate.

**Fig. 7. Korea's Worsening Income Distribution since 1990s**

Source: Bureau of Statistics, Korea.

Note: Gini Coefficient (Urban Households).

### 3. Pakistan Compared with Korea

Now it is time to bring the implications of GTED to explain why Pakistan is lagging behind Korea in terms of growth since 1970s even if Korea learned development knowhow from Pakistan in the early stage of development. What made the difference and similarity between Korean and Pakistani economic performances during the last 70 years?

Korea and Pakistan began their growth game from almost the same starting line in late 1940s. Pakistan took the lead until the end of 50s and Korea even learned about how to write economic development plan from Pakistan. Both had run at the similar pace up to the end of 60s. However, the growth pace began to turn favourable to Korea since 1970s. Since then Korea outpaced Pakistan with unbelievable margin for longer than 40 years. Now in terms of the level, Korea already reached at the level of lower group of developed economies while Pakistan is still working hard to catch up. However, for a decade or so, Korea's growth is rapidly slowing down, converging to and even becoming lower than Pakistan. What makes these differences?

From the GTED perspective, the key factor for the divergence between the two since 70s seems to lie in their different policies toward corporations. In the early 1970s, Pakistan took the radical turn to the policy of nationalising major corporations while Korea amplified her corporate promotion policy by adopting the Heavy and Chemical Industry (HCI) drive even on the top of the strong supportive policies to exporting firms. Pakistan took the nationalisation policy of corporate sector from 1972 to 1976 under the banner of Economic Democracy as follows:<sup>6</sup>

- (1) 1972: 31 large corporations including 22 family-owned and managed corporate groups were nationalised.
- (2) 1973: Constitutional reform to legitimise the nationalisation of large corporations for de-concentration of economic power, and protection of SM&Es and farmers.

<sup>6</sup>Wikipedia

- (3) 1974: 13 commercial banks, over a dozen insurance companies, two petroleum companies and 10 shipping companies were nationalised.
- (4) 1976: More than 2000 traders in agricultural sector were nationalised in order to eliminate the middleman's margin.

On the other hand, Korea continued a journey toward a corporate-led growth strategy up until the late 1980s while she began to deviate from it since then after political democracy. From the 1990s, Korea turned to the egalitarian economic policy regime which is not much different from the Pakistan since 1970s. Pakistan since 1990s has been trying to privatise the SOEs without much success judging from the corporate-ED policy perspective. Now both economies are suffering from the anti-large corporation policies which seem to be the cause for the slow growth in spite of many contemporary innovative policy initiatives by both countries.

## VI. CONCLUDING REMARKS

As a few final words, this paper warns against the now-most popular sentiment among the world intellectuals and even economic professions that economic inequality is the “devil monster” while economic equality is the Angel. It should not be forgotten that “economic inequality is a necessary condition for economic development, while economic equality is the sufficient condition for economic stagnation”. Natural inequalities emerging from markets' as well as government discrimination function based on the actual performances should be most welcomed, while artificial social as well as economic inequalities arising from the government arbitrary intervention to favour special groups with political motivation should be actively driven out of the society. After all, capitalist economic development is the natural process of unequal but shared and inclusive development.

In this regard, it is worthwhile to recall the process of development, free-riding on the others' success knowhow. This in fact implies that having prosperous neighbour is good for our development as we do exploit them, which becomes the basis for inclusive growth. However, remember that Karl Marx and pro-socialism ideologists have been arguing the other way around that having prosperous neighbour is bad for our development, as they will exploit us. GTED implies Karl Marx is standing on his head.

Finally, it is time to see how GTED is compared with the now most popular neoclassical growth accounting model (NGAM). Unfortunately NGAM is nothing more than an accounting theory or even worse a tautology to describe the endogenous variable by another set of endogenous variables without knowing the exact exogenous explaining variables. This is the reason why NGAM has hard time explaining the current no-development situation or market collapses in certain countries/regions. Note that only the explanation by fundamental causing, exogenous variables can help provide solution, which is what GTED intends to do. Why some countries are but others are not able to develop, given the same international conditions of capital market, labour market, technology market, trade openness and the similar domestic institutions and furthermore, why the world economic growth has now been performing worse than before, even with much more developed levels of the human and physical capital and technology as well as much more refined domestic market institutions, are not readily explained by NGAM.

NGAM as well as Washington consensus tells us tautologically what to do in order to be a developed economy through accounting analysis but never tells us how to achieve what to do for a development. How to achieve a sustained, indigenous and inclusive growth is what GTED intends to answer by trying to discover the fundamental exogenous factors to explain the process of development. GTED approach concludes that ED incentive system is the key and necessary condition to unlock the mystery of economic development as it can help create something even out of nothing. Modern corporations as well as individual farmers, researchers, individual workers and even the public servants motivated under the ED-incentive system can in a concerted manner create physical capital, human capital and technology, thereby economic development, from a lower level and facilitate the objectives of a sustainable, indigenous and inclusive growth.

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*The Mahbub Ul Haq Memorial Lecture*

**Private Sector Led Growth and  
the Entrepreneurship**

SIMON QUINN

Dr Mehboob Ul Haq is surely an inspiration for anyone like me, who is interested in working with applied data and thinking about how that might be used to inform economic policy in useful ways. It is possibly application to usefully inform policies.

Coming to the topic, it is important to consider two things. Firstly, what do the firm actually do, and secondly, what one should think about private sector as essentially fulfilling. Hence, there is a need to find out the most pressing research questions that need to be considered in this regard. I would start with the most fundamental question i.e. what does the firms do? Some would say it is a straight forward question. Firm takes different factors of production, sticks them together and then ends up with some output. As economists, we traditionally think obviously about the Cobb Douglas production function, which reflects concept of production. I am not going to talk today about the technology and capital, but I will discuss about workers role in production in a more holistic / comprehensive way.

Imagine a firm in Pakistan that have a number of workers. Let us call them “N” and these workers have different abilities and qualities, so how would one calculate the total productivity, output or total contribution of the labour force. The simplest way to do this is just to add them up and say that the total labour contribution is the sum of the individual labourer’s contribution. This means that if one were to improve the productivity of the first worker, then yes, it would improve the firm’s productivity, however, it will not affect the productivity of any other worker of the firm. In practice, let us suppose in a firm in Sialkot, there are two women workers producing soccer balls, and to know their productivity we sum their output. Hence, if one out of these two women increases her production, it will be imagined as the increase in firm’s total productivity (without affecting the productivity of the other woman) and that will be imagined as a good thing.

But let me change the hypothetical situation a little bit and suppose that these two women are not producing soccer balls but they are producing something a little bit complicated namely a space shuttle. The space shuttle according to National Aeronautics and Space Administration (NASA), have more than two million different parts. So, in

Simon Quinn <simonquinn@economics.ox.uk> is Associate Professor and Deputy Director, Centre for Study of African Economies, University of Oxford, Oxford, UK.

such complicated situation, how can one define the typical concept of production? Suppose we have one part an o'ring,<sup>1</sup> and suppose I have asked about the risk of its failing. As the production function is additive, we should not stress too much. Surely, the effect on total output would be less than 1 to the ratio millions of its current performance. Of course, we know from our extreme example that this not the way of working in this high technical industry.

Hence, we came to know that for many production processes, not just as complicated as the space shuttle, we need not merely add different resources that we have, but rather to combine these in a much more complex fashion. It is the manner which requires the other part of the process to work well, if one part of the process has any meaningful contribution. So back to our soccer ball factory in Sialkot, we might think that soccer ball production is a very simple process. That is true up to a point but a soccer ball has 32 different panels. If I am buying a soccer ball, I would not be happy if only 31 of those 32 parts were properly stitched together; I would rather like the total 32 pieces to be properly stitched, in order to have it of any value. So another way to think about what is happening in this Pakistani manufacturing firm is to take a simple numeric example. Suppose, worker 1 is successful in her task with the probability of let us say 0.9 percent, suppose worker 2 has the probability of success 0.7 percent and suppose both of these women need to do their job right in order to produce the output. What is the probability that a firm manages to produce the output? Well it is not the sum, it is the product with probability 0.63 percent. This is the idea of Kremer's (1993) paper, the o'ring theory of economic development, which is highlighted here today and which I think is under appreciated contribution in the development economics.

Not to add but to multiply the workers productivity is what Kremer said exactly and is demonstrated here. The first reason that this is very profound is that we can say, what if we improve the performance of the first worker when the true production process is characterised by an o'ring function. In that case, it is not a good thing for the firm that the first worker has become more productive with the extent to reach her increase in productivity matters rather it is determined fundamentally by the productivity by all of the other workers. But why does this matter? I think there are two really important implications which have direct relevance to Pakistan. The first of these is that heterogeneity matters in form of what is called persistent productivity differences. Secondly, it implies that management matters. Management is certainly doing something very complicated in trying to combine the parts of a firm effectively. I want to talk about both of these very important implications one at a time.

Let me start by talking about heterogeneity. As just explained, if one increases the productivity of one worker that will automatically increase the productivity of all the other workers. This is called positive assortative matching which means that different firms might employ workers of different qualities. But within each firm (and admittedly in this simple example) we end up employing all of the workers having the same quality. So some firms in Pakistan would be full of excellent workers and would produce more complex goods, while other firms might have less excellent workers and would produce less complex goods. We often think of aggregation or agglomeration policies (like business parks and export processing zones) but this idea says that agglomeration begins

<sup>1</sup>An instrument that prevent excess leakage from the solid rocket boosters.

at the level of the firm, and I found a beautiful explanation of this idea by non-other than Steve Jobs who was not trying to explain the O'ring theory of development, rather he was trying to explain his thoughts about the success of the apple corporation. He said, A players (the best workers) do not want to work with B and C players, so it becomes a sort of policing where firms only hire more A players to build up these pockets of players and it propagates.

So what does this mean empirically? Hsieh and Klenow (2009) looked at the distribution of total factor productivity i.e. firm's productivity taking across three different countries i.e. India, China and the USA. The graph presented by them was in the log scale and one can say by looking at it that India has the lowest average productivity followed by Chinese firms, followed by American firms. That seems apparently right but when assessed deeper, I would say that what is immediately apparent is not about the average. The fascinating thing about that graph in my view is that it's all about the dispersion, and this shows that even in the modern capitalist economies, even in firms that appear quite similar in many aspects, we can see massive heterogeneity in terms of productivity.

I think heterogeneity is very important for two reasons. First that when we are talking about the private sector we should not fall in the trap of thinking about a representative firm, worrying that "How my policy will affect the representative firm?". We must think about the distribution of different types of coexisting firms, almost as if an eco-system of different firms, that together comprise the private sector. Second, even though the O'ring theory predicts that we should see heterogeneity in different types of firms, it does not give us any firm prediction about how wide that heterogeneity should be. In particular, if we think that there are important policies that distort the effect of operation of firms, then we should also expect to see greater dispersion in productivity. This is the interpretation of Hsieh and Klenow (2009) as to why in China and India we have greater dispersion of productivity than in the United States.

This work that has been replicated last year in a paper by two researchers from the Lahore School of Economics (LUMS) (using the data from 'Punjab census of Manufacturing and Industries') and you would see that the results are broadly similar. What does this mean though? Well the dispersion in different firms productivity might be a measure of the extent of distortion in an economy. So let's compare the four different contexts, I am about to show you that all are right. That's exactly what the O'ring theory states. As a result, a firm can figure out that it is behind, know what it needs to do, trying hard to do it, and yet may not be able to get the many pieces of the organisation sufficiently coordinated to get the job done. So that is the part of the challenge of management but I am only here to speak about the private sector.

Many of you are working in the public sector and it is quite possible that you may think that are exactly some of the problems faced by the public sector. There is a research funded by the International Growth Centre through the (LUMS) that does actually look directly into the production processes in Sialkot soccer ball factories. This is the typical traditional dice that is used to make the soccer ball. So you have hexagonal dices and pentagonal dices. What the researchers did was to replace the pentagonal dices by the design that turns out with less wastage. So, this is the technology that improves productivity and surely every firm should adopt it. In fact, what the researchers found to

the surprise of everyone is that the vast majority of the soccer ball manufacturers in the soccer ball industries in Sialkot, when offered this technology of improvement, did not take it. Why not? Researchers looked further into this and it was founded that the new dice slows cutters down. If cutters are paid a pure per-piece rate, their effective rate falls in the short run. Realising this, the workers resist adoption. In other words, something that is good for the firm as a whole may not be compatible regarding individual's incentives. So, there is real challenge for management not just to stick stuff together but to coordinate the different incentives at work under the same firms' roof. So what this could mean for some of the current research challenges around private sector in Pakistan? This may not be compatible regarding individual's incentives a universal description but I would highlight a couple of interesting things that come out of these findings.

The first question is simple, if entrepreneurship matters for firm's performance (and O'ring theory implies that it does) then how do we identify the promising entrepreneurs? It is clear that some people are not very entrepreneurial though one of the interesting aspects was to judge one's entrepreneurial abilities by running 'business plans' competitions. These competitions are targeted to young aspiring entrepreneurs who would love to have the opportunity to start a business if only that opportunity was financially supported. I, along with a co-author at Stanford University (USA) conducted the aspired business plans competition in Ethiopia, Tanzania and Zambia where a young entrepreneur presented a new business idea that he/she wished to be funded. It was presented not to a panel of professors but to people who actually know running business in Zambia; successful established managers of small and medium enterprises. We asked those managers to enter the following questions among other questions (on a scale between 0 and 100) that what is the growth potential of the business idea and what were their recommendations to invest? If they think that (out of the twelve different applications) they have seen the best application, then the best applicant gets a US \$1000 from the funds provided by the World Bank.

Well, the consequence of this is best summed up by this graph here. The x-axis depicts the place they have come up in the competition and the y-axis indicates the probability showing that person is self-employed about six months after winning the competition. This shows that if one finds aspiring entrepreneurs, support them with a US \$1000 (which may not be much, I-phones think about the benefits of a potential growing enterprise), the probability of self-employability can increase by about 30 percentage points. One might say that it is not a big deal, but it is. Let us say that there are people out there with interesting creative ideas about new businesses and they cannot get those ideas funded at the moment, then it does have the potential implication for the policy. In fact in Nigeria, in a competition run by the Nigerian government, the government awarded 1200 prizes of an average of US \$ 50,000. This huge expense generated 7000 additional jobs, generated more investment, higher sales and higher profits. Hence business plans' competition is an idea that can bring better managers to the front, a legitimate interest of the government to find those people and support them to get their businesses off the ground.

Second question, if firms are fundamentally heterogeneous (and if we should not be thinking about the average manufacturing firms) then how should we think about financing those firms' investment? I have two ongoing projects which think about this

idea in the Pakistani context. These projects do not involve me, coming as an outsider with a brilliant new idea, for financing new investment in Pakistan. Rather both of these projects are trying to draw upon existing evolved established local wisdom about financing. Think about using that local wisdom as a way of further encouraging firms' growth. It is now fair to say that there is a robust body of research suggesting that the traditional micro lending model is not effective for supporting firm growth. It does not mean that it does huge harm but it does not do a lot of good either. And I think a lot of praise that we hear about the micro-finance is now much moderated as a result of this recent research.

So the question is, "Are there better ways of doing micro-finance?" Let me give you just two suggestions. The first is inspired by, among other things, the work of Rutherford in South Asia who spent a lot of time in India and other places in South Asia and was thinking about some of the local institutions that he observed. He said that saving up is the most obvious thing to convert savings into lump sums. It allows lump sums to be enjoyed in future in exchange of series of savings now. Rutherford made a more certain point which states that another way to turn the same series of savings into the lump sums and that is to get someone to give the lump sum first as a loan and then in return one may use the savings to repay the loan over time. This is what he calls "saving down". All of which is to say that motivation behind taking a loan is actually driven by the desire to save. We can think about this idea in the context very familiar in Pakistan namely the "savings committee". So let suppose that we have participants who pays Rs 200 each for five days and receives Rs 1000 on the sixth day. This is what Rutherford would term "saving up". But of course as the committee would commence, some of the committee member would draw on the different day and would receive Rs 1000 on the first day and then they repay it back. One might call it a loan, but Rutherford would call it a form of savings. This is saving down while he also talks about "saving through".

This form is very familiar in Pakistan and this is the evolved wisdom of "savings committee", which is sometimes called RSCA-Rotating Savings and Credit Association. So, we thought this structure is clearly very insightful, thinking "could this be a part of future for bank offered financial products"? So we went to Sargodha, working with National Rural Support Programme (NRSP) and implemented a simple pilot trial in which the NRSP offered products like this. However, NRSP did not form a group of savers but rather it played the role of all the other members of the committee, taking that counterparty role. So it took the evolved wisdom of a "savings committee" but tried to offer the individual savings product with the view that it might overcome some of the incentive problems that sometimes exist in term of group lending.

We implemented this idea two years ago in Sargodha and we asked the participant in the end what they thought about the product. We had over 90 percent saying that they understood how the product worked, 80 percent saying it helped them to commit the savings, about 2/3rd said it helped them to resist pressure, almost everyone said that they were glad they participated and about 90 percent saying they would recommend the product to a friend. Now to me this is not solid evidence that this product is necessarily a good thing. So to get solid evidence, we need to do more research and we have ongoing analysis, supported again by the Internal Growth Centre which was implemented in Bhakkar and Chakwal, about a year ago, in a larger trial and we are running a larger trial

again now also with the NRSP. So I would not say that this is the answer but it might be a part of the answer to draw on the established wisdom of savings committee to allow for returns in the context of heterogeneous opportunities.

There is of course another structure, which is potentially very interesting and known to the people of Pakistan i.e. the “Islamic finance”. We draw upon the Islamic finance, in order to think about the advantages in terms of allowing better productivity for heterogeneous firms. It was fascinating to read in a report by the International Monetary Fund (IMF) this year that Islamic finance has the potential for further contributions. It was emphasised that it is the emphasis on assets based financing and risk sharing feature of Islamic finance that it could provide support to small and medium enterprises as well as the investment in the public infrastructure. This can happen through a full scale micro equity product, where the financial institution directly has the choice to take equity stake in a small firm. It could also happen, as the IMF implies, through a lease based product, essentially exploiting the traditional diminishing Musharika kind of structure. So the IGC project tries to test the latent demand of the entrepreneurs in Pakistan at the micro enterprise level for this kind of financial product.

I have talked a lot about the firms, but the word “Firms” does not appear in the title of the talk, the title is rather about the “Private Sector”. And I want to finish, somewhat provocatively, by asking “Does private sector need always to mean firms?” I think there is one fascinating way, in particular in which Pakistan is really a model for many developing countries and that is the depth and the extent of engagement through community organisations. So one of my research projects that I am sharing in Pakistan with Pakistan Poverty Alleviation Programme (and that also supported by the IGC), is thinking about the way that local support organisations organise themselves and the incentives they face all across Pakistan. So we have a project in which we are working with 836 local support organisations across Pakistan. What we are trying to do is to recognise the work of those local support organisations and to think about whether there are simple (low cost, minimum disturbance) ways in which we might help those organisations to streamline the target they aimed for and the way in which they report to their partner organisations and ultimately to the Pakistan Poverty Alleviation Fund (PPAF).

So, what we have done among those 836 Local support Organisations, we have broken them up into different groups in a randomise experiment. Those different groups are faced with certainly different reporting and monitoring requirements, so we were giving those posters to 119 out of 836 local support organisations. It was basically asking information from the Local community organisations on a very wide range of activities in a lot of different ways. But what is the implications, if we can streamline that and emphasise on something that we really like to have numbers on. We were basically asking those community organisations to report the number of men on the executive body, the number of women on the executive body and the number of men and women on the governing body at the local support organisation. So the community organisations were required to meet and think about this, they also have to report the number that brings those different weights (11, 4 and 1) attached to the different forms of representation, and which lead to an aggregate score. That score can lead to something very gentle, a little prize ceremony and a general kind of thanks but the score makes it

salient to the local support organisation the fact that the peak body of PPAF is very serious about expanding the representation and particularly the representation of women in local support organisations.

We also have another 119, where they have to report about the men and women involved in governance, without having scores attached, and then we repeat those cases where we look into the number of services and the information campaigns that are provided. The result for that are a long way off and I do not know what the results will be but the point I am trying to make is, if we think about the local support organisations, we are not going to call them 'firms'. Rather they are the private sector and they are a very crucial part of the contribution of the private sector to growth in Pakistan. They are the part that faces many of the same issues in terms of the heterogeneity, management and coordination that we saw in the O'ring theory.

So to sum up, first I think that combining workers and perhaps by implication combining capital is not just about aggregation. It is also about interaction. As a result this is one reason that productivity differs substantially across firms. However it is not the only reason, another really important reason that Pakistan has such a large dispersion of productivity across its firms, at least in Punjab, is potentially due to the large distortions in the market place. Second, I think it reminds us that management and more generally the entrepreneurship is not just a mechanical problem and it is not about sticking things together, instead it is a complicated coordination of different tasks and different competing interests. The implications I suggest for research is that we can do more to identify the towns of potential entrepreneurs and business plans competitions are one way of doing this. Third, I think there is plenty of scope especially here in Pakistan, as there is a lot of enthusiasm among financial institutions, to think about creating financial innovations that might be more efficient than traditional micro lending. And as I say, not creating financial innovations invented by some professor sitting in Oxford but, the ones that have already been invented here in Pakistan which can possibly be scaled up and formalised within the financial institutions more effectively. Finally I think that the most of the key challenges facing firms in terms of the entrepreneurship, management, coordination, project choice, reporting and many more are also faced by the community organisations. So, if we are thinking about the role of the private sector in growth, we have to remember the important innovative work done by the local support organisations as well.

Thank you very much for having me; it is a privilege to deliver a lecture in the honour of such a fantastic economist.

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*Sarfraz K. Qureshi Memorial Lecture*

**A Nexus Approach to Food, Water, and Energy:  
Sustainably Meeting Asia’s Future Food  
and Nutrition Requirements**

SHENGGEN FAN

Agricultural and food production systems in Asia must undergo a significant transformation in order to meet the concurrent challenges of increasing food, water, and energy demands amid on-going climate change. This is particularly true in countries in South Asia, including Pakistan, where hunger and undernutrition persist and natural resource are increasingly strained. Sustainable intensification with a focus on nutrition is particularly crucial to provide adequate and nutritious food for all without further damages to the planet. However, a silo approach to meeting the demands of a growing, increasingly urbanised, and wealthier population is no longer acceptable. Instead, capitalising on the inter sectoral linkages between food, water, and energy can more effectively minimise trade-offs and maximise synergies across concurrent efforts to improve water, energy, food, and nutrition security sustainably.

**INTRODUCTION**

Maintaining the status quo in Asia’s agriculture and food systems is not sufficient to meet the expected food demands of the region in a rapidly transforming socioeconomic environment with dwindling natural resources, and a changing climate [FAO (2009)]. Amid parallel pressures from economic development, the ability of Asia’s agricultural and food production systems to generate adequate food and nutrition over the coming decades will rely heavily on food production systems that can more efficiently use limited water and energy resources, while adapting to and mitigating climate change [FAO (2011); ADB (2013a)]. Many of the current policies and programmes in Asia across the food, water, and energy sectors are fragmented and uncoordinated, failing to account for the interconnections among these three sectors, and thus risking the sustainability of the region’s natural resources—with adverse consequences for future food security and nutrition in Asia [ADB (2013a); UNESCAP (2015)]. For the region to make great headway toward achieving multiple Sustainable Development Goals, including ending hunger and undernutrition, major steps are needed to promote sustainable intensification of agriculture under a “nexus” food-water-energy approach.

Shenggen Fan is Director General, International Food Policy Research Institute (IFPRI), Washington, DC., USA.

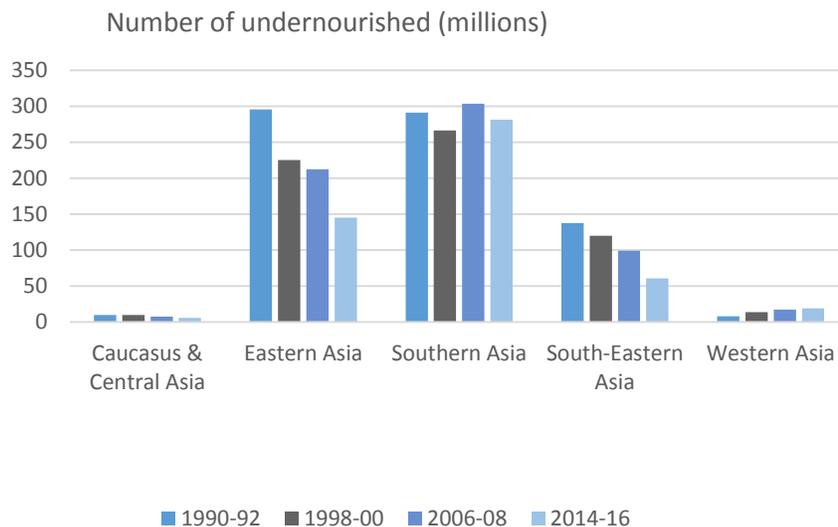
## FOOD SECURITY AND NUTRITION SITUATION IN ASIA

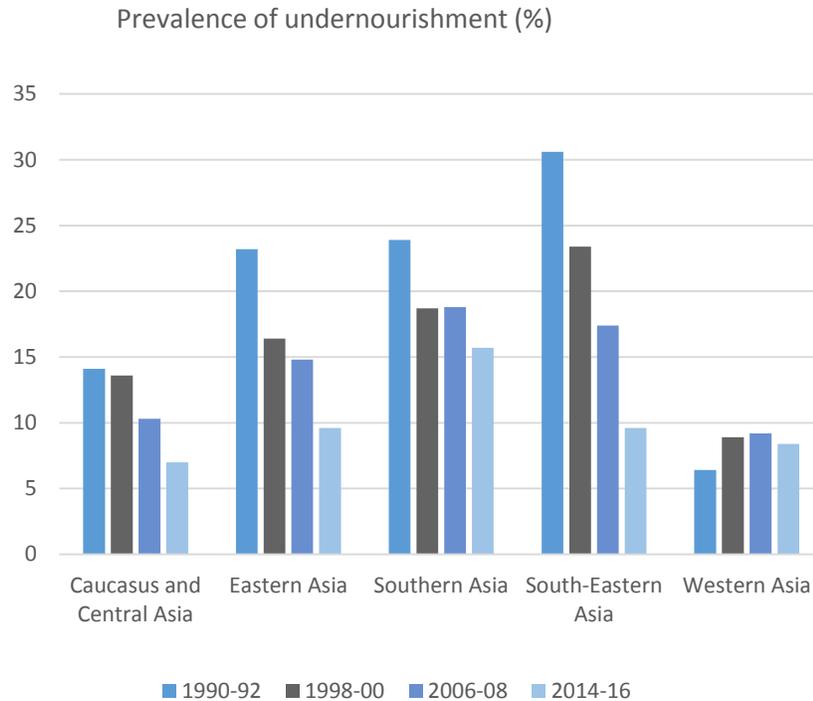
### Hunger Remains Prevalent

As a whole, Asia is home to approximately two-thirds of the world's 795 million people who suffer from undernourishment, defined as the level of food intake insufficient to meet dietary energy requirements [FAO (2015)]. Over the last three decades, the number of undernourished people has steadily declined in the region, from 742 million in 1990-92 to 512 million in 2014-16, the overwhelming majority of whom live in China and India. During the same period, the share of the population who suffers from undernourishment in Asia has been cut in half, from approximately 24 percent in 1990-92 to 12 percent in 2014-16—meaning that the region has achieved the Millennium Development Goal (MDG) of halving the proportion of undernourished people by 2015.

A more sub-regional breakdown reveals variability in hunger reduction (Figure 1). Eastern Asia (mainly China), the Caucasus and Central Asia, and South-Eastern Asia have experienced large declines in undernourishment in terms of both prevalence and absolute numbers, while hunger reduction has been much more muted in Southern Asia. In fact, the number of undernourished in Pakistan has increased by 44 percent from 1990 to 2015, and the prevalence of hunger has hovered from 22 to 25 percent in that time period [FAO (2015)]. Undernourishment trends are more discouraging in Western Asia, where the number of undernourished has more than doubled over the last three decades and the prevalence of undernourishment has hovered around 10 percent after increasing from 6 percent in the early 1990s, owing to a growing population combined with political instability and economic decline in a number of countries in the sub-region. Accordingly, both Southern and Western Asia have not matched the same level of success as East Asia and South-Eastern Asia in meeting the MDG goal of halving undernourishment.

**Fig. 1. Undernourishment in Asia**



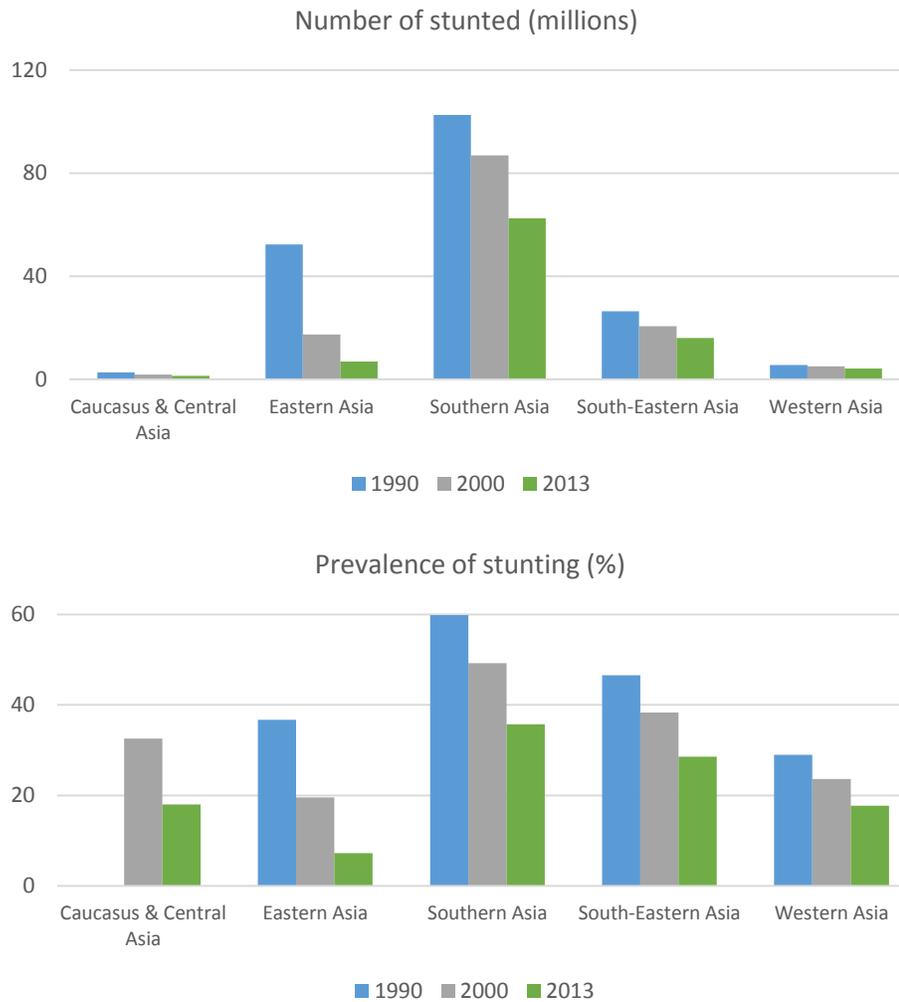


Source: FAO (2015).

### Undernutrition is also Widespread

Going beyond a strict focus on caloric intake, indicators of nutritional outcomes help to paint a fuller picture of the food security and nutrition situation in Asia. Deficiencies in essential micronutrients among children are extremely widespread in Asia, including anaemia (50 percent), vitamin A deficiency (34 percent), and iodine deficiency (30 percent) [FAO (2013)]. This burden is especially evident in Southern Asia (in countries such as Afghanistan, India, Nepal, and Pakistan), where levels of micronutrient deficiencies are among the highest in the world. Such deficiencies have the potential to weaken the cognitive and physical development of children and adolescents and to reduce the productivity of adults due to illness and reduced work capacity. For example, the economic cost of micronutrient deficiencies in India has been estimated to be 0.8 to 2.5 percent of GDP, which equals US\$5.8-26.8 billion [Stein and Qaim (2007)].

Another important indicator of nutritional outcomes is stunting (height-for-age), which captures the long-term effects of dietary deprivation (often beginning with maternal undernutrition). Asian countries have had significant success in reducing the prevalence of stunting among children (from 48 to 25 percent between 1990 and 2013—a decrease of approximately 100 million children) [UNICEF-WHO-World Bank (2015)]. However, significant variation exists across sub-regions (Figure 2), with Southern Asia continuing to have one of the highest incidence and number of stunted children in the world. For example, prevalence of stunting in Pakistan has remained at 43 to 45 percent from 1992 to 2012 [UNICEF-WHO-World Bank (2015)].

**Fig. 2. Stunting among Children in Asia**

Source: UNICEF-WHO-World Bank (2015).

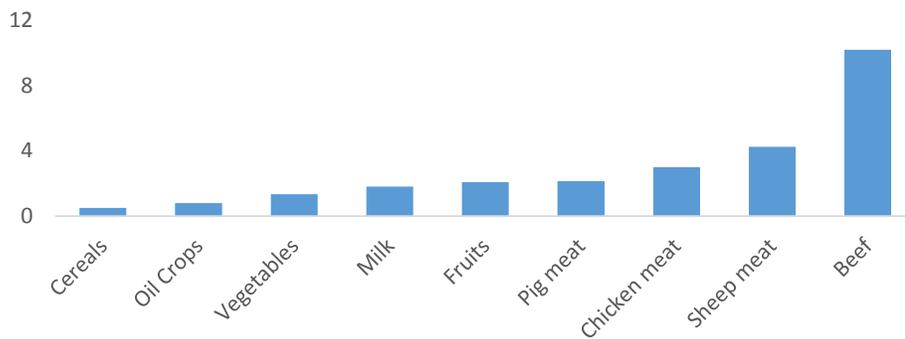
### CHANGING PROFILE OF ASIA'S POPULATION

Continued global population growth and changing demographic patterns coupled with income growth will put increased pressure on food production systems. By 2050, the world population is projected to reach 9 billion, and nowhere is this trend more evident than in Asia, where the population has almost quadrupled from 1.4 billion to 4.3 billion between 1950 and 2014 and is projected to increase further to 5.2 billion by 2050 [UN Population Division (2014)]. Over the last several decades, this growth has come predominantly from urban areas. Current projections indicate that almost two-thirds percent of the population will live in urban areas by 2050 (compared to 18 percent in 1950 and 48 percent in 2014). At the same time, Asia's population is becoming wealthier, with per capita gross domestic product throughout emerging and developing Asia

increasing from \$566 in 1980 to \$8,526 in 2013, and is expected to rise further to \$13,132 in 2019 (current international dollars PPP) [IMF (2014)].

The transition toward a more urban and wealthier population in Asia—combined with the rise of supermarkets and emergence of modern supply chain in the region—has translated into changing patterns of food demand [Reardon and Timmer (2014)]. Consumption baskets throughout Asia are shifting from staple foods such as rice toward more high-value foods such as meat, dairy, fruit and vegetables, as well as toward more processed food [Pingali (2007); Timmer (2013)]. Over the next two decades, projections show that per capita consumption of meat, vegetables, and fruit is estimated to increase by approximately a third to a half in Asia, while the consumption of cereals will decrease [Msangi and Rosegrant (2011)]. Because meat-based food systems require more natural resources, such as water (Figure 3), than a vegetarian diet with equivalent nutritional value, this shift in food demand will have significant environmental implications. A closer look at a meat-based diet reveals that the water footprint varies across different types of animal production systems (ranging from grazing to industrial) and feed characteristics (such as how much and what the animals eat and the feed origin) [Mekonnen and Hoekstra (2014); Gerbens-Leenes, *et al.* (2013)].

**Fig. 3. Water Footprint of Selected Food Products (Litre/Kcal)**



Source: Mekonnen and Hoekstra (2014).

### **GROWING NATURAL RESOURCE DEMAND AND STRESSES IN THE FACE OF CLIMATE CHANGE**

The increased and intensified use of many natural resources, including water and energy, has been critical in boosting global agricultural output in the past half century [FAO(2009)]. The expanded use and often poor management of these resources has contributed to their scarcity and degradation which threaten the capacity of agricultural systems to improve future food security and nutrition.

#### **Water**

Water is an indispensable component within agricultural production systems; as such, agriculture is vulnerable to water scarcity, but it also contributes to the problem. Asia is home to approximately a third of the world's renewable freshwater resources but per capita water resources throughout Asia were about a quarter of the global average,

with the exception of Southeast and Central Asia, whose per capita water resources were greater than the global average [UNESCAP (2015)].

Asia is already facing substantial pressure on its water resources. Currently, Asia withdraws 22 percent of its internal renewable water resources annually (compared to the global average of 9 percent), a rate that leaves the region at significant risk of impending water scarcity [WWAP (2012)]. In fact, looking at a regional disaggregation of water withdraw reveals that Western, South, and Central Asia use 56-62 percent of their water resources, which is above the “critical threshold” of 40 percent that indicates “unsustainable” water withdrawals and water-insecure river basins (Ibid.) In Pakistan, despite substantial water resource endowments, water demand exceeds supply, causing significant withdrawal from reservoirs such that their storage capacity is limited to a 30-day supply [ADB (2013b)].

Agriculture is by far the largest user of water in Asia, with water withdrawals for agricultural use ranging from 73 percent in developing countries in East Asia and the Pacific to 91 percent in South Asia [World Bank (2015)]. Currently, irrigated land accounts for 44 percent of cultivated land in Asia, and approximately 70 percent of the world’s area equipped for irrigation is found in Asia (primarily India and China) [FAO (2015)]. In recent years, expanding irrigation systems have contributed to an increase in groundwater extraction in Asia, with current extraction rates 2-2.5 times their 1980 levels in China and India; groundwater currently supplies 55 percent and 30 percent of irrigation water in South and East Asia, respectively [WWAP (2012); FAO (2012)]. Since extraction rates often exceed natural replenishment in many areas, water tables have fallen in parts of Asia. Recent satellite data points to falling groundwater levels in major crop producing areas such as the Indus Basin aquifer between India and Pakistan as well as the Indian states of Rajasthan, Punjab, Tamil Nadu, and Haryana due to high irrigation and population demands, threatening future agricultural output and potable water supplies [Rodel, *et al.*(2009); Richey, *et al.*(2015); Chinnasamy and Agoramoorthy (2015)].

Water stress is already a reality in parts of Asia. According to the Asian Development Bank’s (ADB) Water Security Index, three-fourths of countries in Asia are suffering from low levels of water security, especially in South Asia and parts of Central and West Asia [ADB (2013b)]. Under an assumption of business as usual practices, China and India will be home to 2.7 billion people in areas of high water stress by 2050 (compared to 1.4 billion in 2010) and will face a 25 and 50 percent gap respectively, between water demand and supplies in 2030 [Veolia Water (2011); WRG (2012)]. Water stress in Pakistan is projected to be extremely high in 2040, with the ratio of withdrawals to supply at over 80 percent, according to the World Resource Institute’s Aqueduct Water Stress Projections [Lu, *et al.*(2015)]. Although, efficiency-promoting improvements and changes in cropping patterns (such as a shift from rice to wheat) will help Asia in reducing its use of water resources in irrigation, areas such as South Asia will continue to use critical levels of their renewable water resources for agricultural production [Alexandratos and Bruinsma (2012)]. Intersectoral competition for water will further complicate agriculture’s access to water resources.

## **Energy**

Efforts to meet the increasing demand for finite energy sources are indirectly and directly linked to Asia’s food security and nutrition. With its high population and economic growth, Asia is increasingly at the centre of global energy consumption.

Between 2011 and 2040, global energy demand is set to increase by 37 percent, of which 60 percent will come from developing countries in Asia (primarily within the industrial and buildings sectors) [OECD/IEA(2014)]. For Pakistan, where electricity demand has increased exponentially in the 2000s alongside stable GDP growth, energy shortfalls have led to severe power cuts resulting in 2.5 percent GDP loss, unemployment for over half a million industrial labourers, and a loss of exports valued at US \$1.3 billion [Perwez and Sohail (2014)]. Currently, the country is facing an energy crisis and the gap between energy demand and supply is widening over time [Naseem and Khan (2015)].

Rising energy demand and prices, in conjunction with growing interest in clean and renewable energy sources, have made biofuel production more profitable and attractive in recent years (underpinned by government mandates and subsidies). Asia is home to a growing market for biofuel, and China, India, Malaysia, the Philippines and Thailand are becoming the leading regional producers [OECD/FAO (2014)]. Continued biofuel expansion and increased competition with food crops for agricultural resources can have significant implications for food systems within Asia by increasing food prices and decreasing the consumption levels of key staple commodities, resulting in higher rates of undernourishment [Rosegrant, *et al.*(2010)].

Rising energy prices also have the potential to increase the cost of agricultural production, affecting both production costs and market prices. Critical components of the agricultural production process, such as irrigation, planting, and harvesting, are increasingly dependent on energy [von Grebmer (2012)]. Additionally, the price of energy is closely linked to the prices of inputs and post-farm gate services, such as fertilisers and transport.

Water use is another dimension to the relationship between energy and food systems as the water demands of energy and agriculture can often be in conflict. Increased hydroelectricity generation through the construction of dams in Asia has the potential to improve or worsen water availability for irrigation, depending on the location of agricultural activities in relation to the hydropower plants [WWAP (2014)]. Water-intensive coal production and demand will continue to dominate Asia's energy mix. Upward trends in Asia's coal production and consumption markets will have important environmental (and thus food security and nutrition) implications due to the high water requirements of coal mining operations, and their potential to degrade water quality [OECD/IEA (2014)]. Moreover, policies that promote government-subsidised energy provision in countries such as India have artificially deflated the cost of irrigation pumping for many farmers, leading to the unsustainable overdraft of groundwater in many areas [FAO (2012)].

### **Climate Change**

Increased climate variability and extreme weather conditions are expected to severely affect agriculture in Asia—with floods and droughts predicted to increase in both magnitude and frequency accompanied by higher temperatures and sea level rise [World Bank (2013)]. These climatic variations are likely to affect agriculture in the region by degrading water and land quality (through saltwater intrusion) and altering cropping seasons, the spread of pests and diseases, and irrigation requirements. One of the “hot spots” in Asia for climate change vulnerability is the Mekong River Delta (a

major rice producing area in Southeast Asia), where the projected rise in sea levels will result in rice production falling by about 11 percent over the next three decades. South Asia is especially vulnerable to extreme precipitation patterns due to its low per capita water storage capacity [ADB (2013b)]. While climate change will have varying effects on irrigated yields across Asia, potentially lower precipitation and warmer temperatures in South Asia are projected to decrease rice, wheat, and maize production by 14, 44-49, and 9-19 percent, respectively, compared to production without climate change [Nelson, *et al.* (2009)]. The effects of climate change in Asia are also projected to result in higher prices of major staple crops (rice, wheat, maize, and soybeans), lower calorie availability, and increased undernourishment among children. These impacts would be particularly harsh for low-income countries and poor people, who largely depend on agriculture as a source of food and income, and have limited capacity to adapt.

At the same time, it is important to note that food production systems also contribute to climate change through the generation of greenhouse gases (GHGs). Most significantly, the agriculture sector accounts for 24 percent of global GHG emissions, making it the second largest source of GHGs after energy production [IPCC (2014)]. Regionally, Asia is the greatest contributor to agricultural GHG emissions, accounting for 47 percent of global GHGs from agriculture, with the most agricultural emissions coming from South Asia [FAO (2015)]. While countries such as Pakistan through its Vision 2025 have made reducing emissions a priority, international climate finance, transfer of technology and capacity building will be needed to establish and implement commitments to climate change policy [WRI (2015)].

#### **SUSTAINABLE INTENSIFICATION IS ESSENTIAL TO MEET ASIA'S FOOD AND NUTRITION REQUIREMENTS**

Maintaining the status quo in agriculture is not sufficient to meet expected agricultural demands [Global Harvest Initiative (2014)]. For example, if agricultural productivity in East Asia continues to grow at the current rate then the region will meet only 67 percent of its food demand by 2030, while South and Southeast Asia will meet 87 percent of its food demand. According to a recent study, meeting food and nutrition requirements over the next several decades will require the more intense use of inputs, namely increased rates of crop water and fertiliser use, alongside increased productivity; however, such input intensification has the potential to come with a high cost to the environment [Grafton, *et al.* (2015)].

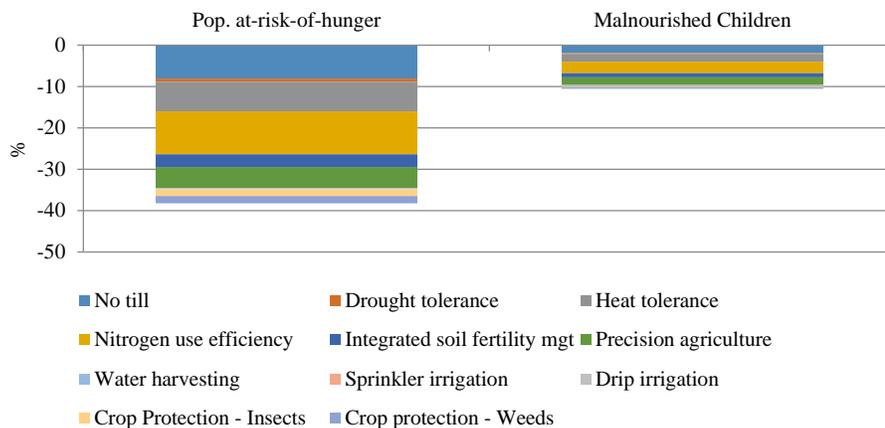
Sustainable intensification will thus be critical to meet Asia's growing demand for nutritious foods while preserving the region's natural resources while adapting to and mitigating climate change. In the recent years, a great deal of policy and research has been directed toward sustainable agricultural intensification, which is commonly defined as form of production in which "yields are increased without adverse environmental impact and without the cultivation of more land"[UK Royal Society (2009)]. Originally used in reference to low-yielding agriculture in Africa South of the Sahara, calls for more environmentally-friendly pathways within modern high-intensity food production systems have gradually become a more prominent feature in food security discourse since the early 1990s amid increasing population, consumption, and environmental pressures [Chen (1990); Tilman (1998); Garnett and Godfray (2012); Montpellier Panel (2013)].

However, because “sustainable intensification” is more of an aspirational framework rather than an endorsement of a particular agricultural production system, vigorous debate persists regarding what it will look like on the ground [Garnett and Godfray (2012)]. In recent years, discussions around sustainable intensification have shifted emphasis away from an overwhelming production-oriented perspective toward a greater balance between “sustainability” and “intensification” and the inclusion of both technological and socio-economic approaches regarding food demand, nutrition, governance, food losses and waste, distribution, and governance issues [Loos, *et al.* (2014); Garnett, *et al.* (2013); Garnett and Godfray (2012); Foresight (2011)]. This approach embodies the entire food system, for which new tools to understand it are in development. For example, the forthcoming Global Food System Index can provide accountability and help governments set priorities to tackle weak nodes in the system across six key dimensions: inclusive, nutritious and healthy, sustainable, climate-smart, productive, and business-friendly [IFPRI (2015)].

Whether or not countries embark on a more climate-smart pathway will have significant implications for food security and nutrition over the coming decades (Figure 1). The conventional world scenario assumes a business as usual approach without the use of climate-smart agricultural practices and technologies such as no-till and the use of drought tolerant varieties. In contrast, the climate-smart world scenario entails an approach that takes into account the use of such practices and technologies. In particular, the sustainable world scenario puts emphasis on water and energy conservation and climate change adaptation and mitigation through increased investments in practical and technological innovations.

Under a climate-smart world scenario in which all climate-smart practices and technologies are employed, for example, the number of malnourished children would decrease by over 10 percent compared to levels projected under the conventional world scenario. The population at risk of hunger decreases by nearly 40 percent in the climate-smart scenario compared to the baseline conventional scenario.

**Fig. 1. Impacts of Improved Practices and Technologies on Food Security and Nutrition.**



Source: Adopted from Rosegrant, *et al.* (2014).

### **WAY FORWARD—ADOPTION OF A FOOD-WATER-ENERGY NEXUS APPROACH TO ACHIEVE MULTIPLE SDGs**

Efforts to improve food, water, and energy security for better nutrition and greater sustainability need to reflect the crucial linkages between all three sectors and their potential to promote or constrain growth in the other sectors. The issues and challenges that affect food, water, and energy in Asia are extensively interwoven. Food security and nutrition are simultaneously dependent and in competition with water and energy systems, through channels such as irrigation, mechanised agricultural production, biofuels, and hydropower [UNESCAP (2013); Rasul (2014)]. For example, poor water quality with high mineral and metal content (such as arsenic) combined with minimal energy resources and infrastructure for water treatment can result in reduced yields and contaminated food supplies that adversely affect the health of consumers [e.g. Talukder, *et al.* (2014); Bustingorri and Lavado (2014)].

In order to meet increasing demand for nutritious foods, countries in Asia need policies and investments that promote sustainable intensification of agriculture grounded in “nexus” thinking that capitalises on the inter-sectoral linkages between food, water, and energy. Adopting a nexus approach to dealing with concurrent food, water, and energy demands has the potential to promote cross-sectoral synergies and minimise the trade-offs more effectively than a more isolated, “silo-like” policy planning. A nexus approach will also be critical for countries in Asia and beyond to achieve national goals such as Pakistan’s Vision 2025, as well as global goals such as the SDGs. For example, in order to end extreme poverty, hunger, and malnutrition (SDGs 1 and 2) while promoting sustainable production patterns (SDG 13) much attention must be paid to the intersection of the food, water, and energy sectors.

#### **INCREASE NEXUS-RELATED KNOWLEDGE AMONG STAKEHOLDERS**

Greater awareness and information on the water and energy implications of current food security and nutrition policies, and vice versa, are needed by all stakeholders, including farmers, different ministries, civil society, and the private sector. We have to move toward generating new data and metrics that measure the performance of food production and environmental systems in a holistic manner. This includes developing and using indicators such as nutrients per drop of water, or per kilowatt of energy. There is also a need for cost-benefit analysis of nexus-based versus business-as-usual approaches. In addition to collecting new data, mechanisms and platforms are also needed to share existing data in relation to agricultural production, energy generation, and water supplies and quality among stakeholders across the three sectors using a common language. Such efforts should also include sharing information on successful interventions through mechanisms such as online knowledge exchange platforms, allowing stakeholders to adapt and scale-up best practices. For example, the G20 Food Loss and Waste platform launched by IFPRI and FAO brings together information, advice and knowledge on good practices to reduce food loss and waste, making this information more easily accessible to countries and regions.

**Promote Policies that Internalise Synergies between Food, Water, and Energy Security**

More efficient and sustainable management of natural resources can be achieved through policies that provide consumers with the proper signals about the true value of resource provision required to produce foods. Economic incentives to promote resource-use efficiency include resource management pricing that internalises the social and environmental costs and benefits of agricultural production, including the gradual elimination of agricultural subsidies that encourage the overuse of agricultural inputs such as water and fertilisers. Additional policies to promote sustainable and healthy diets, such as converting subsidies from staple crops to investments for more nutritious crops, can help improve nutrition outcomes. However, because efforts to internalise the full cost of agricultural production can potentially raise food prices, a strong social protection system is needed to assist and compensate poor consumers and producers. In fact, better-targeted, more productive, and flexible social protection policies are needed both to ensure that poor consumers and producers are not priced out of accessing potentially more expensive food and natural resources and to offer long-term productivity-enhancing opportunities for the poor to escape poverty, food insecurity, and undernutrition.

**Develop and Distribute Nexus-Promoting Agricultural Technologies and Practices**

Increased investment in agricultural research and development should focus on new technologies and practices that raise food security and nutrition while enabling more efficient and location-specific use energy and water resources. Special focus should be especially placed on addressing the threat to food production from dwindling water supplies and more variable rainfall patterns through innovative tools that range from monitoring and early warning systems to water saving technologies and practices and risk management measures. Similarly, steps in the right direction to improve nutrient use efficiency include remote sensing by satellite and wireless communications. Crop bio-fortification and diversification efforts also offer the opportunity to increase yields and nutrition while allowing for more efficient use of inputs such as fertiliser and pesticides; however, biotechnology development should be accompanied by well-balanced and regulatory system that simultaneously promotes innovation and ensures the safety of consumers and the environment. High-quality and effective delivery and extension channels, alongside complimentary investment in infrastructure (such as roads, water storage, and irrigation) are needed to strengthen access to these technologies in developing countries—especially by smallholder farmers.

**Develop Enabling Institutional Environment to Promote Nexus Approach**

Institutional reforms at different levels and scales within and across food, water, and energy sectors have the potential to help producers, consumers, and policymakers to work together to make more well-informed decisions regarding natural resource management and provision while also increasing food security and nutrition. Cross-sectoral legal and regulatory frameworks that clearly define resource rights and targets should be accompanied by strong monitoring capacity, reallocation mechanisms (either market or administrative), and sanctioning and dispute resolution systems. Innovative mechanisms and governance processes that support vertical and horizontal collaboration

among all stakeholders, from both the public and private sectors, can be a useful tool to integrate nexus thinking across the three sectors. At the same time, building and strengthening the capacity, accountability, and authority of existing coordinating mechanisms (both government- and market-led) to undertake integrated planning and cross-sectoral communication are needed to bolster the food-water-energy security nexus—allowing for bottom-up policy experiments with systematic monitoring and feedback processes to adjust policies and mechanisms.

## CONCLUSION

Food, water, and energy security are crucial for better nutrition, sustainable long-term economic development, and human well-being and there are strong linkages between all three sectors. A food-water-energy nexus approach is key for the sustainable intensification of Asia's agricultural and food production systems. Interconnections between water, energy, and food sectors means that policies that benefit one area can translate into increased risks or co-benefits in another. It is therefore important to develop complementary solutions that minimise these trade-offs and promote synergies across efforts to improve food, water, and energy security, as well as nutrition and health. Achieving multiple SDGs depends on such an approach. Cross-sectoral benefits must be explored that promote winning solutions in all three areas, especially focusing on innovation in institutions, policies, information, and technologies. We can no longer afford to work in silos if we want to achieve truly sustainable development, food security, and adequate nutrition for all.

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## **Analysis of Infrastructure Investment and Institutional Quality on Living Standards: A Case Study of Pakistan (1990-2013)**

GHAMZ-E-ALI SIYAL, SAJJAD HAIDER KHAQAN,  
AHSEN MUKHTIAR, and ATTA UR REHMAN

In this study, the relationship of Infrastructure Investment and Institutional Quality (CIM) on Living Standards of people was analysed for Pakistan. This paper comprises of trend analysis of institutional quality for different periods of governments of Pakistan coupled with an empirical analysis of the model. The empirical estimates are comprised of unit root test, Johansen Cointegration, VAR analysis and Granger Causality tests for the sample of 1984–2013. The trend analysis depicts fluctuations of Institutional Quality in different governments due to different political conditions of every period. The empirical analysis shows that there exists long standing relationship between the Institutional Quality, Infrastructure Investment and living standards of people. However, the VAR analysis shows that the coefficients of only Institutional Quality and Living Standards of People (previous year i.e. lag variables) resulted significance in affecting living standards of the people. The Granger causality result shows bi-directional and uni-directional relationships among variables. The results in our study indicate bi-directional relationships of Living Standards of People (GDPC) with Institutional Quality (CIM). Secondly, CIM and Infrastructure Investment (Developmental Expenditure) are having uni-directional relationship. Thirdly, Population and Institutional Quality (Contract Intensive Money) are having uni-directional relationship. Fourthly, GDPC and Infrastructure Investment carry a uni-directional relationship.

*JEL Classification:* E02, F41, H53, O1, O4, P23.

*Keywords:* Institutional Quality (Contract Intensive Money (CIM), Infrastructure Investment (Developmental Expenditure), Trade Openness, GDP per Capita, and Population.

### **INTRODUCTION**

In economics literature, we get wide explanations of how significant the capital is for the economy? It plays a positive role in the economic development, as it works as an intermediate input in production process which improves quality and quantity of infrastructure in a country [Kessides (1993)].

Ghamz-E-Ali Siyal <ghamzealisiyal@gmail.com> is Student of MS Economics, S3H, NUST, Islamabad. Sajjad Haider Khaqan is Research Scholar, Pakistan Institute of Development Economics, Islamabad. Ahsen Mukhtiar is Scholar, Institute of Economics, Faculty of Business, Economics and Social Sciences CAU Kiel University, Germany. Atta Ur Rehman is Student of MS Economics, S3H, NUST, Islamabad.

Infrastructure contributes immensely to economic and social activities possible by providing public health, education services and buildings for community activities, railways, airports, hospitals, schools, roads, sewerage systems and reservoirs etc., that are major part of infrastructure investment [Sedar (2007)]. Simultaneously, infrastructure investment also enhances private sector activities at micro-level of economy. It reduces cost of production, opening up new markets, providing new opportunities for production and trade. It also contributes to social wellbeing which improves standard of living and reduces poverty [Adeola (2005)]. Similar results were found by the study of Ford and Poret (1991) in which impact of infrastructure on private sector productivity for 11 Organisation for Economic Cooperation and Development (OECD) countries. It concluded that there is a significant role of investment in infrastructure on private sector of the most developed countries like United States, Canada etc. While, considering the case of developing countries, the recent study of Jerome and Ariyo (2004) considered impact of infrastructure investment on poverty reduction in Nigeria. The results supported positive role of investment in infrastructure, but there was no significant decrease in poverty. The investment done in infrastructure had not targeted poor natives.

Government is considered responsible for investing in infrastructure of developing countries. However, in developing countries, concentration of infrastructure in the domain of the public sector leads to immense failures of these services due to high macro-risk arising from political instability and poor governance which reduces government credibility [Okoh and Ebi (2013)]. Different studies were conducted on analysing impact of public investment on growth and the results of these studies found that when government credibility is on the higher side, public investment is more responsible for increasing productivity in the economy [Aschauer (1989)].

Pakistan is considered as one of developing countries that are striving hard to progress and contains window of opportunity in the modern world [World Bank Report (2014)]. After observing role of infrastructure investment, National Trade Corridor Improvement Programme (NTCIP) was initiated by Pakistan in 2005, to improve infrastructure so that it can fulfil the demand of economy more efficiently. The main objective of that programme was to reduce the cost of doing business and improving the quality of services [Siddique and Pant (2007)]. Similarly, public investment on physical infrastructure (rural roads, village electrification and irrigation) and social infrastructure (rural education and health) have contributed positively on Total Factor Productivity [Nadeem and Javed (2011)]. However, the disease of Corruption has severely affected the institutional quality of Pakistan. It's ranking on institutional quality indicators like government effectiveness, rule of law and corruption is below average in South Asian countries [Khan and Khawaja (2011)]. Due to Poor governance and lack of law and order situations, corruption Index ranked Pakistan on 127th among 177 countries in 2013. Highly unequal societies may adversely influence the quality of institutions. These include concentration of political power, social and ethnic fragmentation etc. [Nigar (2010)]. Apart from these complexities, higher proportion of youth will be a source of high demographic dividend.

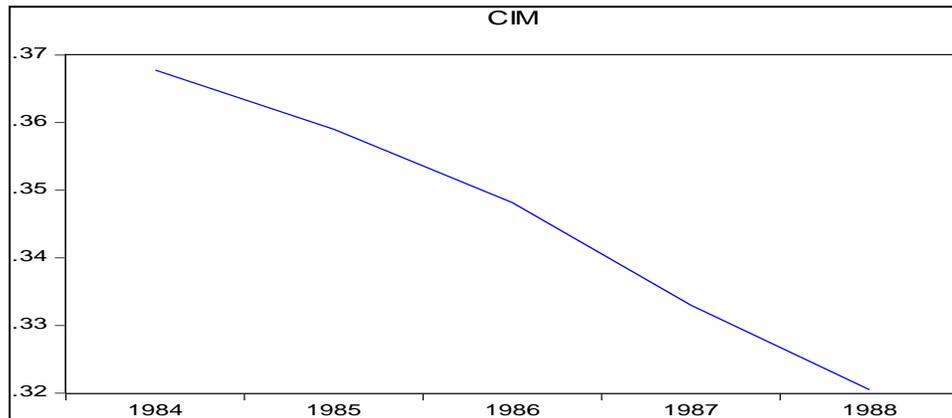
### **Tabulation of Variables**

In this study, we discuss and critically analyse the behaviour of important variable i.e., Institutional Quality (Contract Intensive Money) for the entire time span (1984-

2013). The Data is segregated into different period for analysing role of Institutional Quality in different governments. In these periods, Pakistan was switching between democracy (Benazir Bhutto's and Nawaz Sharif government) and dictatorship (General Zia and General Musharraf's regime).

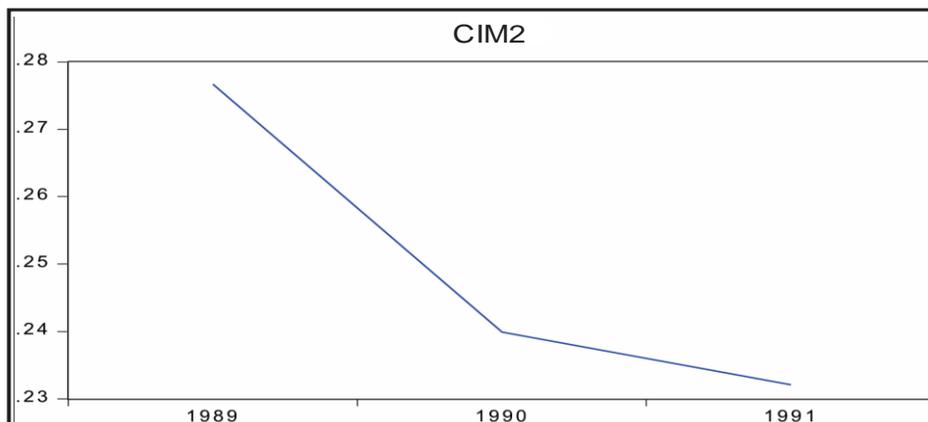
The variable of Institutional quality is defined by CIM represents Contract intensive money index, according to Okoh and Ebi (2013) is a newly developed index which measures the enforceability of contracts and security of property rights. It is an indicator of Institutional Quality. CIM ranges from 0-1. A high score means high security of property rights and enforcement of contracts and low score tells poor security of property and contract rights. Further to this patterns of CIM are given below:

**Graph 1.1. Since 1984–1988**



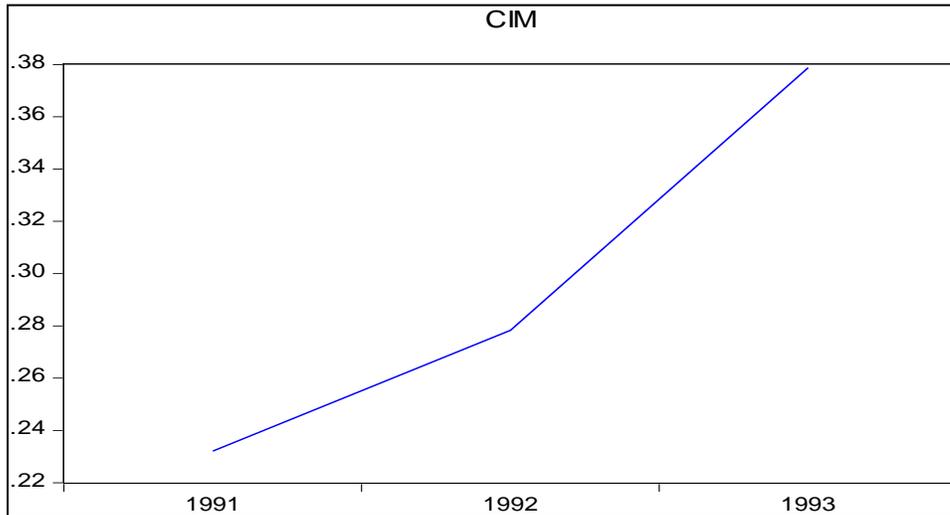
The above Graph depicts gradual decrease of Institutional Quality variable from 1984's till 1988. Initially, it was almost 0.37 percent and ended on 0.32 percent as we move right from 1984 till 1988. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

**Graph 1.2. Since 1989–1991**



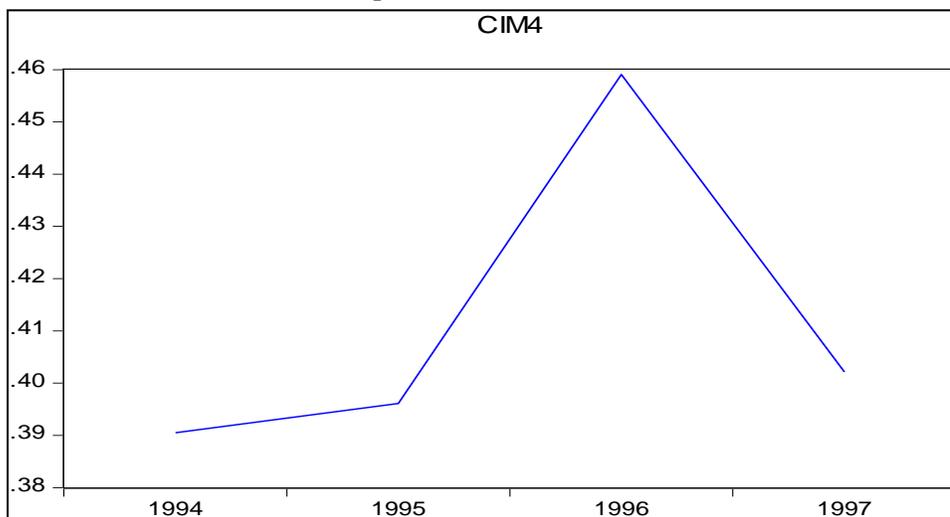
The above Graph depicts a sharp decrease of Institutional Quality variable from 1989 till 1990 and further rate of reduction has reduced after 1990 to 1991 but remained decreasing. Initially, it was between 0.28 percent and 0.27 percent but in 1991 reached near 0.23 percent. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

**Graph 1.3. Since 1991–1993**



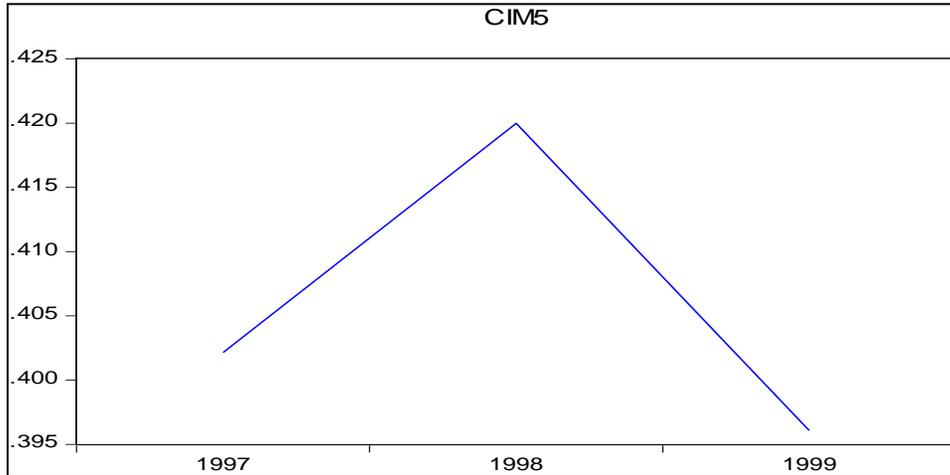
The above Graph shows gradual increase of Institutional Quality variable from 1991 till 1992 but after that it increased sharply from 1992 till 1993. Initially, in 1991 it was near 0.24 percent and finally reached at 0.38 approximately. The upward increase of Institutional Quality variable (CIM) is in response to political stability [Clague, *et al.* (1999)].

**Graph 1.4. Since 1994–1997**



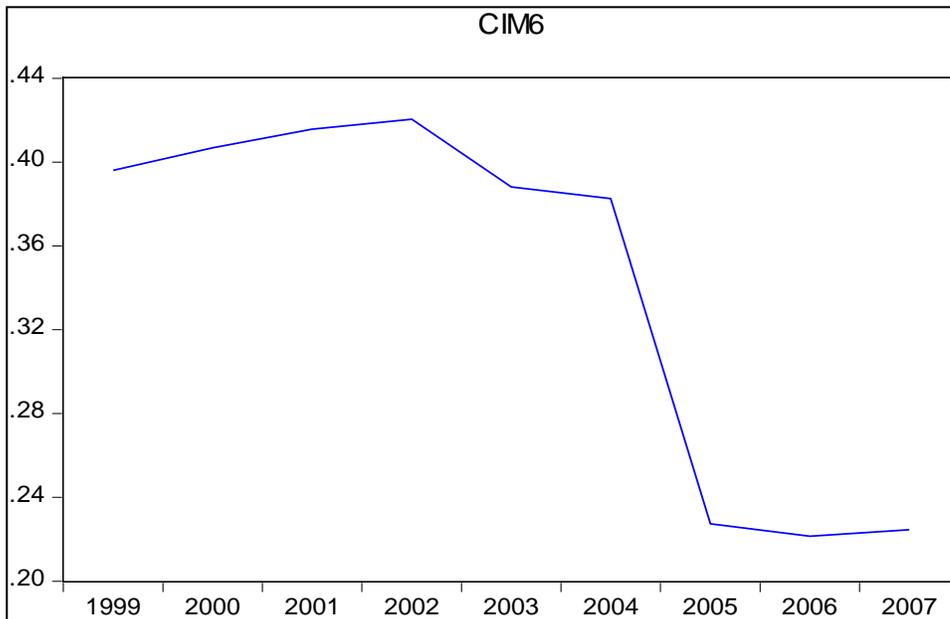
The above Graph shows a gradual increase of Institutional Quality variable from 1994 to 1995 and after it shows sharp increase trend from 1995 till 1996 but after 1996, it went under sharp reduction. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

**Graph 1.5. Since 1997–1999**



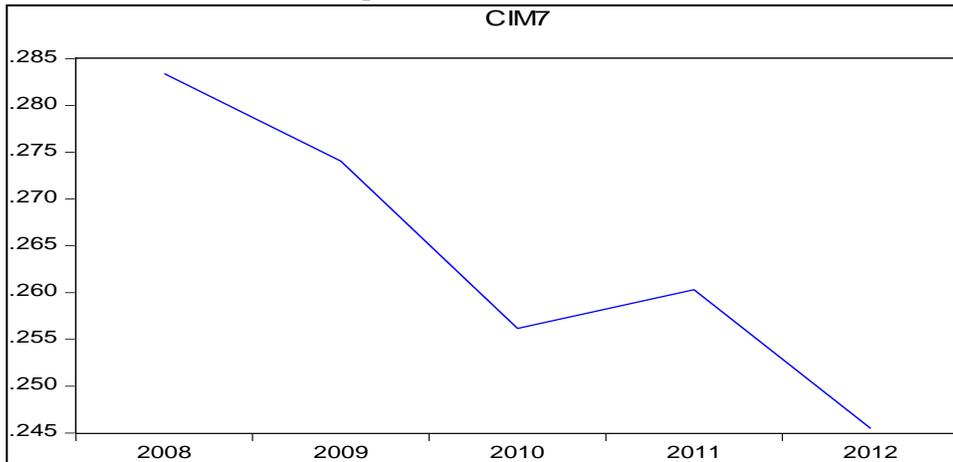
The above Graph shows a gradual increase of Institutional Quality variable from 1997 to 1998 but after 1998 it started to decrease. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

**Graph 1.6. Since 1999 to 2007.**



In the above Graph indicates a stable increase of Institutional Quality variable from 1999 till 2002 and after it reduced with gradual speed till 2004 (Mid) and further reduced with sharp decrease till 2005 and continued for lower rates. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

**Graph 1.7. Since 2008 to 2012**



The above Graph shows a gradual decrease with Institutional Quality from 2008 till starting of 2010, and after 2010 it started to increase till 2011. After 2011, it started to reduce till 2012. The downward decrease of Institutional Quality variable (CIM) is in response to political instability [Clague, *et al.* (1999)].

In the above tabulation, general interpretations of Institutional Quality variables are discussed. The empirical objectives of this paper are as follows:

- To analyse trend of Institutional Quality (CIM Variable) in different periods of governments for Pakistan.
- To assess empirically long run relationship among Infrastructure investment, Institutional Quality, and Economic growth.
- To assess the direction of relationship among Infrastructure investment, Institutional Quality, and Economic growth.

## LITERATURE REVIEW

The infrastructure plays a vital role to boost productivity of different economies [Ford and Poret (1991)]. The public infrastructure investment is important for increasing economic growth of the country. In the case of US, the non-military public investment is far more important in increasing aggregate productivity than military spending. The core infrastructure such as street lights, highways, airports etc., contributes more to productivity than other form of infrastructure [Aschauer (1989)]. The investment in

transport sector has reduced share of domestic transport and it also reduces transport cost associated with passenger movement. Improved safety and reliability of transport operations and reduction in environmental and accident cost. The transport sector development has positive impact on macro aggregates such as growth and exports [Siddique and Pant (2012)].

The consequences of infrastructure investment on per capita were studied which concluded that the infrastructure induces the long run growth effects, like telephones, paved roads and electricity generating capacity provided close to growth maximising level on average, but in some countries over-supplied and in some under-supplied [Canning and Pedroni (2004)]. In contrast to above results, investment in infrastructure may result into negative consequences. The main reason behind this is that there was no consideration given to poor during investing in infrastructure. In order to get rid of such problem, infrastructure reforms are undertaken in the context of appropriate market and regulatory frameworks [Jerome and Ariyo (2004)]. Similarly, another study revealed that lower infrastructure investment reduced the quality of institutes related to power generation sector. It lead to lower supply of electricity by power plants and resulted into infrastructure failure in Nigeria [Adenikinju (2005)]. Hence, weak institutions are a bad sign for economy because institutions play an anchor role in the success or failure of economic reforms [Addison and Lutz (2003)]. Even the countries with abundant quantity of natural resources need institutional quality because the impact of natural resources on economic growth is non-monotonic in institutional quality [Boschini, *et al.* (2003)].

Siddique and Pant (2012) studied to quantify the impacts of development of transport sector in Pakistan. This study used different observational parameter that includes cost of transportation such as congestion, pollution, and accident. This model measures benefits by the change in prices in the transport sector. The study concluded that tax financed investment has reduced share of domestic transport and cost of nonfactor services in the total value of commodities. Along with that it also reduces transport cost associated with passenger movement. Improved safety and reliability of transport operations and reduction in environmental and accident cost. The transport sector development has positive impact on macro aggregates such as growth and exports.

After doing literature review, a gap was found which needed to be addressed, as there was no study earlier conducted to observe the impact of infrastructure investment and institutional quality on livings standards of people of Pakistan. Therefore, this research paper is conducted with a suitable methodology to empirically test the main objectives. The presence of institutional quality and infrastructure investment together helps us to understand about living standards of the people of Pakistan.

## DATA AND THEORETICAL MODEL

### Data Description

#### Country

For this study, we consider Pakistan which is a developing country. The role of government credibility and infrastructure investment play a vital role in determining the living standards of people, especially for a developing country.

### ***Variables***

The variables used in this model are GDPC, CIM, DEXP, OP, and POP. These variables are defined as given below.

The Gross Domestic Product Per Capita (GDPC) is an indicator that determines the per capita income in the economy, as GDP is considered the total income produced by an economy. Mathematically, GDP is divided with its population to know the GDP per capita. Its data is observed from the World Developmental Indicator (WDI) and its unit is current LCU. The second variable is CIM that is self-calculated which is defined as the proportion of money supply that is not held in the form of currency i.e. kept in the bank accounts and other financial assets. The ratio of CIM ranges from 0-1 and indicates the faith of Investor in government ability and willingness to enforce financial contracts. It gives picture of government role and performance in regulating banks [Knack and Kugler (2002)]. Further to this, we made some changes in main formula to improve strength of variable. Originally, formula for Contract Intensive Money (CIM) was  $M2-C/M2$ , where M2 is broad money indicator and C is currency. We used M1, narrow money, instead of currency 'c' that improved strength of variable as now we observe ratio of time deposits or savings with M2 (broad money). It depicts that when people have higher faith in governments (or progress of general institutions) then they will invest in that economy. Otherwise, they would not be investing so by aforementioned changes we observed time deposits or savings instead of just currency. Development expenditure is the variable that shows only developmental expenditures in millions and data was extracted from the State Bank of Pakistan web site. The Trade Openness (TO) shows openness of trade and it is found from World Developmental Indicator (WDI) in the trade percentage contribution in GDP. Finally, the population is taken as final variable that is taken from Pakistan Economic Survey (PES) and it is measured as millions unit.

### ***Data Source***

The Time series data was used for all the variables. All the data was obtained from the WDI, and PES (various editions).

### ***Sample Size***

To estimate infrastructure investment and institutional quality impact on the living standards in Pakistan, data over annual frequencies from 1984-2013 was used on various variables that was obtained from the above mentioned sources.

## **METHODOLOGY**

### **Methods of Estimation**

#### ***Unit Root Tests***

This ADF test stands for Augmented Dickey Fuller, it was applied to analyse stationary of the data set. In case of time series data, stationarity remains an issue and ADF test is applied to know unit root presences and avoid chances of inaccurate

estimates. This test tells us about integration of order i.e., I(0), I(1), or higher for which we know how many times it is needed to be differenced to get data stationarity. This test possesses three levels of equations that are related to constant, trend, and trend and intercept analysis.

$$\Delta M_t = \gamma M_{t-1} + \sum (\delta_j \Delta M_{t-j}) + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$\Delta M_t = \alpha + \gamma M_{t-1} + \sum (\delta_j \Delta M_{t-j}) + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

$$\Delta M_t = \alpha + \beta t + \gamma M_{t-1} + \sum (\delta_j \Delta Y_{t-j}) + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

Where,  $t$  is the time index,  $\alpha$  is an intercept constant called a drift,  $\beta$  is the coefficient on a time trend,  $\gamma$  is the coefficient presenting process root, i.e. the focus of testing,  $p$  is the lag order of the first-differences autoregressive process,  $e_t$  is an independent identically distributes residual term.

The difference between the three equations concerns the presence of the deterministic elements  $\alpha$  (a drift term) and  $\beta t$  (a linear time trend).

**Co-integration Test: The Johansen-Juselius (JJ) Method**

This test was given by Johansen (1988, 1991, 1992) and Johansen-Juselius (1990, 1992). This test helps in finding more than one co integration vectors conditional to variables number more than two. Such technique is used because sometimes variables may form several equilibrium relationships in the model. So Johansen approach is used for multiple equations. When, we have Integration of Order (1) for all variables, we applied the Johansen-Juselius (JJ) Method. With the help of following equation, we describe Johansen-Juselius (JJ) Method given below,

$$\Delta Z_t = \Pi_j Z_{t-j} + \Phi_j \Delta Z_{t-j} + \dots + \Phi_{k-j} \Delta Z_{t-k+1} + \delta + e_t$$

The important parameter here is matrix  $\Pi$  of the Johansen-Juselius method. The matrix  $\Pi$  can be substituted as  $\Pi = \alpha\beta$ , where  $\beta$  is the co integrating vector and  $\alpha$  is the speed of adjustment vector. The maximum eigenvalue test ( $\lambda_{max}$ ) and the trace test ( $\lambda_{trace}$ ) are employed to test for the value of  $\gamma$  on the basis of the number of significant eigenvalues of  $\Pi$ . The above mentioned test statistics are distributed as  $X^2$  with the degrees of freedom  $(n-k)$  where  $\gamma$  is the value of rank and  $N$  represents the number of endogenous variables. If the values calculated are less than the critical values at the proper degrees of freedom and significance level then null hypothesis are accepted.

**VAR (Vector Auto Regressive) Analysis**

This test of Vector Auto Regression (VAR) estimates linear interdependencies among multiple time series. The VAR analysis treats each variable symmetrically in structural sense with its equation explaining its evolution based on its own lags and other variables lags. The VAR analysis helps to calculate long run coefficient values of parameters.

If we consider z-th order VAR, represented as VAR(z), is

$$M_t = c + A_1 M_{t-1} + A_2 M_{t-2} + \dots + A_z M_{t-z} + E_t$$

Where, the  $l$ -periods back observation  $M_{t-l}$  is called the  $l$ -th lag of  $M$ ,  $c$  is a  $k \times 1$  vector of constants (intercepts),  $A_i$  is a time-invariant  $k \times k$  matrix and  $e_t$  is a  $k \times 1$  vector of error terms satisfying.

### Granger Causality Test

The standard Granger causality test observes the casual relationships among two variables. It examines that whether current changes in variable  $y$  can be explained by past changes in other variables like  $u$ ,  $v$ , and  $w$  etc., along with the explanations provided by past changes in  $y$  itself. The variables are interchanged to see the causality in other directions. There are possible few relationship types,

Unidirectional causality:  $x$  granger causes  $u$ ,  $v$  and  $w$ .

Bidirectional causality: different variables causing in two directions.

Independence: neither variable causes each other.

The variables  $x$ ,  $u$ ,  $v$ , and  $w$  must be stationary for implication of standard Granger Causality test. The standard Granger causality regressions based on properly differenced stationary variables because most of the variables are non-stationary in their level forms. The mathematical equation for Granger causality will be considered with  $p$  and  $q$  lags as given below,

$$Y_t = \alpha + \phi_1 Y_{t-1} + \beta_1 X_{t-1} + \beta_2 X_{t-2} + e_t$$

As  $\beta_1$  and  $\beta_2$  are measure of the influence of  $X_{t-1}$  and  $X_{t-2}$  on  $Y_t$ . If  $\beta_1 = 0$  so  $X$  does not indicate a Granger cause  $Y$ .  $X$  Granger causes  $Y$  if any or all of  $\beta_1, \dots, \beta_q$  are statistically significant.

## RESULTS AND DISCUSSIONS

In this chapter, the results are discussed of the above mentioned methodology. Following are the results of above mentioned tests:

### Unit Root Tests Results

We apply Augmented Dickey fuller test to determine the stationarity of the variables. Table 4.2 shows the results of ADF tests.

Table 1.1

*Augmented Dickey Fuller (ADF) Test*

| Variables | ADF Test  |                |
|-----------|-----------|----------------|
|           | Level     | 1st Difference |
| GDPC      | 1.760880  | -3.497348**    |
| DEXP      | -1.485990 | -2.801917***   |
| CIM       | -1.425500 | -4.164978*     |
| OP        | -2.484238 | -6.371949*     |
| POP       | 1.62722   | -97.69536*     |

Note: \*, \*\*, \*\*\* significant at 1 percent level, 5 percent level, 10 percent level.

Based on the ADF test, all variables on constant appear to be non-stationarity at levels but stationarity at first difference. Hence, it is concluded that these variables are integrated of order 1 i.e. I (1).

### ***Johansen Cointegration Analysis***

If all the variables are stationary at first difference or higher order we can use co-integration. The relationship among institutional Quality, infrastructure investment, and living standards of people in the model was determined using co-integration methodology given by Johansen and Juselius (1990). The study finds that there exists statistically significant relationship among aforementioned variables. Table 4.3 shows results of Johansen's test for co-integration test.

Table 1.2

*Determination of the  $\gamma$  ( $\Pi$ ) based on  $\lambda_{\max}$  and  $\lambda_{\text{trace}}$  Test Statistics*

| Eigenvalues | $\lambda_{\max}$ | $\lambda_{\text{trace}}$ | Critical Value   | Critical Value           | Prob.  |
|-------------|------------------|--------------------------|------------------|--------------------------|--------|
|             | Statistics       | Statistics               | $\lambda_{\max}$ | $\lambda_{\text{trace}}$ |        |
| 0.971300    | 74.56777         | 161.6084                 | 33.87687         | 69.81889                 | 0.0000 |
| 0.884688    | 45.36231         | 87.04065                 | 27.58434         | 47.85613                 | 0.0000 |
| 0.670772    | 23.33111         | 41.67833                 | 21.13162         | 29.79707                 | 0.0014 |
| 0.551741    | 16.85006         | 18.34722                 | 14.26460         | 15.49471                 | 0.0181 |

Source: Eviews 6.

This starts with comparison of trace statistics, Max-Eigen statistics and critical values. The value of trace statistics is greater than Max-Eigen statistics and similarly for critical value exceeds 95 percent in trace from Max-Eigen statistics respectively. The null hypothesis is rejected clearly as shown in this table by probability values that are highly significant and alternative hypothesis is accepted which means that there exist long run relationship among variables. Hence, it is concluded that there exist four co-integration relationship equations in this study.

### ***VAR (Vector Auto Regressive) Analysis***

After the results of Johansen co-integration, we apply VAR (Vector Auto Regressive) analysis to do multivariate analysis with their long run coefficient results. These coefficients helps us to determine effects of variables on dependent variable i.e., GDP per Capita. The model equation for VAR analysis given below with result table,

$$\begin{aligned} \text{GDPC} = & C(1)*\text{GDPC}(-1) + C(2)*\text{GDPC}(-2) + C(3)*\text{CIM}(-1) + C(4)*\text{CIM}(-2) \\ & + C(5)*\text{LDEXP}(-1) + C(6)*\text{LDEXP}(-2) + C(7)*\text{LPOP}(-1) \\ & + C(8)*\text{LPOP}(-2) + C(9)*\text{TRD}(-1) + C(10)*\text{TRD}(-2) + C(11) \end{aligned}$$

Where, two lags are considered for every variable i.e. GDP per capita, Institutional Quality (CIM), Infrastructure Investment (Log DEXP), Population (Log POP), and Trade (TRD).

Table 1.3

## VAR Results

| Variables          | Coefficient | P-values      |
|--------------------|-------------|---------------|
| GDPC(-1)           | 0.842001    | 0.0016        |
| CIM (-1)           | 607.2476    | 0.0167        |
| CIM (-2)           | 355.4430    | 0.2280        |
| DEXP (-1)          | 16.58484    | 0.4612        |
| DEXP (-2)          | 0.125277    | 0.9959        |
| LPOP (-1)          | -5299.707   | 0.8087        |
| LPOP (-2)          | 5437.402    | 0.7979        |
| TRD (-1)           | 0.622353    | 0.8977        |
| TRD (-2)           | -0.052966   | 0.9914        |
| Constant           | -2317.302   | 0.8601        |
| R-squared          | 0.985467    | Durbin-Watson |
| Adjusted R-squared | 0.976918    | stat1.923294  |

In the above table, we consider coefficients of aforementioned model, which comprises of only two significant variables; GDPC (-1) and CIM. The coefficient of GDPC (last year) affects GDP per Capita (Current) with 0.84 magnitudes. Similarly, institutional quality (last year) is affecting dependent variable GDP per capita for with coefficient of 607.24 magnitudes. The coefficients of other variables are satisfactory but p-values are not significant for which we don't consider their effects as significant. The R-squared and Adjusted R-squared values are high and show 'Goodness of fit' of the model with a satisfactory value of Durbin-Watson stat.

Further to this we applied Wald test to check joint effect of lag variables on dependent variables. Therefore, we applied the test and found following results,

Table 1.4

## Wald Test (Joint Hypothesis)

| Variable              | Null Hypothesis                                     | P-Value | Result   |
|-----------------------|---|---------|--|
| GDPC (-1) & GDPC (-2) | No Joint Effect of GDPC (-1) and (-2) $C(1)=C(2)=0$ | 0.0008  | There exist a joint effect of GDPC (-1) and (-2) on GDPC.  |
| CIM (-1) & CIM (-2)   | No Joint Effect of CIM (-1) and (-2) $c(3)=c(4)=0$  | 0.0417  | There exist a joint effect of CIM (-1) and (-2) on GDPC.   |
| DEXP (-1) & DEXP (-2) | No Joint Effect of DEXP (-1) and (-2) $c(5)=c(6)=0$ | 0.6097  | There exist no joint effect of DEXP (-1) and (-2) on GDPC. |
| POP (-1) & POP (-2)   | No Joint Effect of POP (-1) and (-2) $C(7)=C(8)=0$  | 0.1704  | There exist no joint effect of POP (-1) & POP (-2)         |
| TRD (-1) & TRD (-2)   | No Joint Effect of TRD (-1) and (-2) $c(9)=C(10)=0$ | 0.9907  | There exist a joint effect of TRD (-1) & TRD (-2)          |

Similarly, we get two variables that possess joint effect on GDP per Capita; GDPC lags and CIM lags. The other variables like Development Expenditure, Population and Trade are not having joint effect on GDP per capita (Living Standards of People).

### GRANGER CAUSALITY MODEL

It is necessary to check the direction of relationship among variable. The results of Granger causality are given below, by considering probability value to accept or reject null hypothesis. Table 1.5 shows alternate hypothesis and probability of all variables.

Table 1.5  
*Multi Granger Causality Analysis*

| Alternate Hypothesis         | F-statistics | Probability | Accept/Reject |
|------------------------------|--------------|-------------|---------------|
| CIM does Granger Cause GDPC  | 5.85831      | 0.0123      | Accept H1     |
| GDPC does Granger Cause CIM  | 2.95236      | 0.0810      | Accept H1     |
| GDPC does Granger Cause DEXP | 15.5217      | 0.0002      | Accept H1     |
| POP does Granger Cause CIM   | 4.90462      | 0.0218      | Accept H1     |
| CIM does Granger Cause DEXP  | 2.68888      | 0.0985      | Accept H1     |

Source: Eviews 6.

The results obtained from standard Granger Causality test shows that the alternative hypothesis is accepted which means one variable is causing other variable. The table shows Probability value for accepting or rejecting null hypothesis. As Probability values are significant that null hypothesis is rejected. The probability values are considered up to 0.10 or 10 percent but higher than this value is considered insignificant up to 1 or 100 percent.

The results in our study show bi-directional relationships of the living standards of people with institutional quality. Secondly, Institutional Quality (CIM) and infrastructure investment (developmental expenditure) are having uni-directional relationship. Thirdly, population and institutional quality (Contract Intensive Money) are having uni-directional relationship. Fourthly, living standard of people (GDPC) and Infrastructure Investment (Development Expenditure) are having uni-directional relationship.

### CONCLUSION AND RECOMMENDATIONS

This study analysed role of Infrastructure Investment (Development Expenditure) and Institutional Quality (CIM) on Living Standards of people (GDPC) for Pakistan. This study used unit root test, Johansen Co-integration, and Granger Causality in methodology. The results of Unit root test showed that all the variables were stationary at 1st Difference i.e. Integration of Order I (1). On the basis of that we applied Johansen Co-integration in which we got 4 long run co-integration equations which proved that there are long run relationships among all variables. Thirdly, we applied VAR analysis for estimating long run coefficients and Wald test for estimating joint effect of variables on dependent variables. In VAR analysis, we got only two variables to be affecting significantly. Finally, Granger Causality to check direction of relationship among variables that which variable is causing other variable. The results of Granger causality shows 5 relationships which are either bi-directional or uni-directional and are given below:

The results in our study show bi-directional relationships of Living Standards of People (GDPC) with Institutional Quality (CIM). Secondly, Institutional Quality (CIM) and Infrastructure Investment (Developmental Expenditure) are having uni-directional relationship. Thirdly, population and institutional quality (Contract Intensive Money) are having uni-directional relationship. Fourthly, living standard of people (GDPC) and Infrastructure Investment (Development Expenditure) are having uni-directional relationship. The VAR analysis tells us Institutional Quality and GDPC of previous year is responsible for effecting significantly on Living Standards of People currently. The Development Expenditure did not contributed significantly in the long run because majority of Development expenditure is focusing more on physical infrastructure rather than social infrastructure like education and health etc.

The study concludes Infrastructure Investment facilitates Institutions to increase their productivity by skilled labour (social infrastructure) and reducing their cost and time (physical infrastructure). It results into increasing economic growth due to its positive influence. Similarly, when economy is open for trade, the competition increases. institutions improve their quality to remain on the path of progress.. The better the institutions are, the higher the output is generated. It leads to higher per capita income of people. Infrastructure investment in the shape of social and physical infrastructure helps people directly and indirectly. It even reduces poverty by enhancing living standards of people, if it targets poor natives.

This study recommends that governments should increase their infrastructure investment, especially social expenditure health, education, action population to improve institutional quality and living standard of people.

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## Replacing Contracts with Handshakes: A Study of Social Networks of Entrepreneurs in the Weaving Sector

MOINA RAUF and ZAHID PERVAIZ

Informal institutions like kinship based networks play a crucial role in business activity. The flow of information in such networks, based on trust and reciprocity helps in creating an environment where opportunism is curtailed and relational based governance mechanism prevails. This paper studies, whether such factors play a role as an alternative governance mechanism for contracts as opposed to the formal institutions or not. The effectiveness of such network factors hinges on the network structure, and therefore network density and network size are taken as independent variables. Though network density was positively and significantly related to the use of social networks for management of breach of contracts, network size was negatively related to management of breach of contracts. Network size and network density were positively related to ex-post transaction costs of dispute resolutions however, they were not statistically significant.

*JEL Classification:* D850, O17, L14

*Keywords:* Social Capital, SMEs, Transaction Costs, Entrepreneurship, Networks

### 1. INTRODUCTION

Academics have paid great attention to the relationship between entrepreneurship and social capital. However, social capital is a multidimensional term and encompasses many concepts under its umbrella. Various academic disciplines use social capital and multiple tools and techniques which are present in academic literature for its conceptualisation and measurement. Academic work which focuses on firm embeddedness and social capital is dominated by studies from the developed economies, where the data on social capital is collected from various databases. Such studies on developing or underdeveloped economies are limited. This study would contribute to the existing knowledge on this subject and would attempt to quantify the social capital of entrepreneurs through measurements of various dimensions of their social network.

In contemporary literature, we often find social networking facilities and social networks being used interchangeably. However, our understanding of social networks is exclusively the relationships and ties that an individual is connected to rather than the social networking facilities. This social network can be facilitated through various means including web based activities but that is not a focus of this paper.

Moina Rauf <moeena.rauf@gmail.com> is PhD Candidate & Lecturer, NCBA&E. Lahore. Zahid Pervaiz is Assistant Professor, NCBA&E. Lahore.

An important function of social networks for entrepreneurs among many others is their ability to reduce transaction costs. In developing countries the formal institutional arrangements for conflict resolution are not very reliable which leads to a great dependence on informal mechanisms for honouring contracts [Khan (2011); Nicholas and Maitland (2007)]. This situation arises because either means of contract enforcement are completely ignored by the state, or are too costly to enforce. The option left to the businesses is to rely on alternate means of contract enforcements in such situations. Contracts can be made binding with the help of trust and reciprocity among members of the society [Nicholas and Maitland (2007)].

Small and medium sized enterprises (henceforth SMEs) in power loom textile weaving sector in Pakistan are the focus of this paper. Cotton weaving is the largest sector within the total SMEs operating in the country with a share of nearly 20 percent. Pakistan's Small and Medium Enterprise Development Authority (SMEDA) recently estimated that 95 percent of private enterprises in the industrial sector employ less than 100 employees.<sup>1</sup> These firms employ approximately 78 percent of the non-agricultural labour force in Pakistan and contribute over 30 percent to Pakistan's GDP and 25 percent of the country's exports of manufactured goods. This sector caters to both the domestic demand of fabric as well as makes low end use grey fabric for exports.

The major contribution and source of information of the study has been the collection of primary data which was collected through a questionnaire and also through informal interviews with the respondents. Despite a great number of studies being available on the social capital and entrepreneurship, very few of them focus on the developing countries. This study generates its significance from the fact is that it has contributed to the scant literature on the relationship of social capital and entrepreneurship in the developing countries. It is a micro-level study which utilises primary data gathered through a questionnaire which adds to the meticulousness and reliability of the results produced from the study. Moreover, it has tried to map the social networks of entrepreneurs in Pakistan in the weaving sector which is a unique attempt through primary data gathering.

The study of the role social networks in reduction of transaction costs for businesses opens up the door for further research in the theory of firm, and the role of social networks as an effective conduit for knowledge transfer and information sharing for firms.

## 2. LITERATURE REVIEW

Studies under the network theory literature provide great understanding of the institutional environment of the entrepreneurs and the social capital of entrepreneurs. Studies of entrepreneurship that acknowledge social capital as a crucial asset of entrepreneurs, seconds institutional economics theory that entrepreneurs, like any economic agent are not isolated from society unlike the assumption in orthodox economics. Entrepreneurs are nested in their relationships and affected by their environment and their social capital actually acts as an asset just like physical capital. To gain understanding of the impact of these relationships on economic activities, we

<sup>1</sup>There is no uniform definition of the SME in the country and every organisation defines them according to its functional requirements.

consider it critical to study the social network, or in other words, the set of ties and relationships that an entrepreneur has. The work of Aldrich and Zimmer (1986) clearly mentions the social aspects of businesses and the role of such interactions in contributing to learning in firms. Varied academic disciplines provide insights to study of entrepreneurial networks. Despite such diversity in the academic roots of such studies, all tend to agree to the benefits of such networks for businesses. The answer to the basic question of why networking is important for entrepreneurs varies according to the academic discipline from which such study originated. These studies give various explanations of why networks are formed, governed and the nature of such contents that are exchanged in networks. In the following section, an overview of the theoretical and empirical work is presented which provides understanding of the role of the networks in entrepreneurial process. This overview would lead to development of the conceptual framework later on.

The first section examines classical works on the theories of social capital, networks and firms. Later on, we zoom in into the current research that has a timeline of the present decade. Last section develops a conceptual framework.

Many scholars have studied the role of social capital and networking for entrepreneurs from various perspectives like transaction costs approach [Coase (1984); Williamson (1979, 1996); Salancik and Pfeffer (1978); Zucker (1987)]. The social network approach has been widely used to understand the benefits of social networking to entrepreneurs from a sociological perspective [Birley, *et al.* (1991); Granovetter (1983, 1985, 2000, 2005); Johannisson (1988); Ostgaard and Birley (1996); Uzzi (1996, 1997)].

Transaction cost approach analyses firm networking from an economic point of view. The social network analysis explains networking from a sociological point of view. In this section, the study briefly highlights the theoretical understanding of these approaches to networking. Our major objective is to document all the relevant academic work that has taken place in these disciplines to create foundations for the conceptual framework of this paper.

Transaction cost theory has been widely used to explain the reason for networking among businesses [Williamson (1979)]. A transaction means a transfer of a good or a service between technologically separable interfaces [Williamson (1979, 1996)]. Thus, the transaction costs simply means all costs involved in a transfer of goods and services from one unit to another. The characteristics of transactions are: they are always asset specific, in small numbers, and uncertainty and bargaining are always involved. Transactions become costly because of these characteristics. Reduction of these costs leads firms to either vertically integrate or to search for substitutes to the market. [Williamson (1979, 1996)].

In the studies of joint ventures in developing countries, Kogut (1997), argues that higher levels of trust in informal networks reduces transaction costs for entrepreneurs. Trust works in two ways: it reduces the time and costs of negotiation and bargaining and reduces uncertainty associated with transactions [Minniti and Bygrave (2001); Uzzi (1996)]. Thus the transaction cost approach to entrepreneurial networks gives a good theoretical background to the understanding of social capital and its relationship to business activity. The limitation of this approach is that it does not give empirical insights on the subject.

The studies which empirically capture the dimension of social capital are found in the social network analysis approach. The social network analysis approach views business transactions in the light of the social relationships that exist between two people.

The social network analysis approach to entrepreneurship relies on two principles: first, gathering of resources from external sources is a component of the entrepreneurial process. These resources are not limited to capital only but also include abstract concepts like ideas, knowledge, advice and moral and emotional support. Secondly, to get access to these resources, the entrepreneurs seek the contribution of his social network. So, the social network becomes a source of provision of resources necessary for the entrepreneurial network.

According to the social network approach, every individual has social ties and these social ties are vital for the entrepreneurial process [Aldrich and Zimmer (1986); Birley, *et al.* (1991); Johannisson (1988); Ostgaard and Birley (1996)]. One of the critical aspects of a social network is its ability to provide information to the entrepreneur which is available without effort and cost. Such information is available through existing friends [Aldrich and Zimmer (1986); Birley (1986); Birley, *et al.* (1991)] and family members [Özcan (1995)] particularly in developing countries. Another feature of social network is the provision of financial support [Aldrich and Zimmer (1986); Özcan (1995)].

Information and resource sharing and collectively working out solution of problems are some benefits of social ties [Uzzi (1996)]. These benefits accrue because of the social network according to the social network theory. In the words of Uzzi (1996, 1997), embeddedness of social ties is, “*the degree to which commercial transactions take place through social relations and networks of relations that use exchange protocols associated with social, non-commercial attachments to govern business dealings*”. Authors like Granovetter (1985), consider social networks to act as a cushion for entrepreneurs against distrust and uncertain situations. Social ties help in creation of opportunities for new business ideas and innovations too since they encourage entrepreneurs to take risks for innovation under uncertain conditions [Gulati (1995); Gulati and Gargiulo (1999)]. In other words, social networks help in the reduction of transaction costs.

Inkpen and Tsang (2005) have studied the role of social capital to analyse the transfer of knowledge among network members. They have defined three dimensions of social capital namely, structural, cognitive, and relational. All these three aspects of social capital affect knowledge transfer [Inkpen and Tsang (2005)]. This study sets the stage for developing further investigation for understanding the role of networks in disseminating knowledge.

Another significant study from Zhou and Poppo (2010), suggests that legal enforceability increases the use of contract over relational reliability. In other words, relational enforceability of contracts is important when legal enforcement is weak. Using a survey results of 399 buyer–supplier exchanges in China, the study makes important conclusions that: (1) explicit contracts are used more rather than relational trustworthiness when legal system is strong (i.e., asset specificity, environmental uncertainty, and behavioural uncertainty); and (2) on the other hand, if legal system is weak, then relational trustworthiness plays central role in contract enforcement for protection of transactions. These results endorse that under conditions of greater legal enforceability, the use of relational reliability would become unimportant and vice versa.

Morales and Fernandez (2010) introduce some specific insights regarding social networks of firms in order to investigate factors involved in innovation. This study compares a sample of 220 manufacturing firms in the Valencia Region (Spain). The conclusions from the study were that there was a positive relationship between social capital, that is trust and shared ideas, and involvement of local institutions with innovation in firms of the region [Molina-Morales and Martínez-Fernández (2010)].

Findings from a survey of 241 Chinese firms indicated that business ties affect performance more than political ties, and both effects depend on institutional and market environments. Key conclusions from the study are that when legal enforcement is ineffective and technology is rapidly changing, business ties become more useful than political ties [Sheng, *et al.* (2011)].

Zhou, *et al.* (2012) add to the existing knowledge on the ongoing debate whether economic and social governance mechanisms function as substitutes or complements regarding inter firm transactions. Based on a sample of 168 foreign buyer–local supplier exchanges in China, the study finds that relational governance complements written contracts but acts as a substitute to control opportunism. When formal law enforcement is weak, relational governance provides a proxy for legal institutions for compliance of contracts.

Feigenberg, *et al.* (2013), suggested that the risk of default and timely loan repayments among microfinance clients dropped as the interaction among the recipients increased. In their long-run survey data and results of follow-up experiment reveals the economic returns to social interaction, and provides insights in to causes of the reduction of transaction costs in the collective lending model.

In a macro level study by Turkina and Thai (2013), three social capital factors—networking, interpersonal trust, and institutional trust—provide an explanation for variations in immigrant entrepreneurship across countries. Social capital plays a significant role in high-value added immigrant entrepreneurship in particular and immigrant entrepreneurship in general [Turkina and Thai (2013)].

In a specific case of the knowledge economy, Westlund, *et al.* (2014), reiterate the value of social capital for firms for benefitting from local systems of innovation. Proximity and network connections make it possible for firms to reduce transaction costs and exchange information smoothly specially when the interaction takes place in a knowledge economy rather than manufacturing based economy.

Some particular studies on developing countries further establish the important role of social capital for business performance. A study on women owned businesses in Tanzania by Tundui and Tundui (2013) found that apart from human and physical capital, higher levels of social capital among entrepreneurs was a major contributor to higher profits. Moreover, it was the bridging social capital which was most useful for business performance. Moreover, the role of personal networks as conduits of information has been studied extensively by various authors across various countries. In developing countries, social networks help specifically in spreading information about technology. Studies such as Munshi (2014) illustrate in great detail that for the developing countries, the importance of social capital is manifold. Not only does it act as an alternative social safety net in the absence of institutional support, social networks also work as conduits of information flows and developing a sense of peer monitoring which leads to success of

many self-governed community development initiatives. Banerjee, *et al.* (2013) have further illustrated this line of thought using field experiments from the microfinance lending programs in Peru. Their study demonstrated that it was the peer pressure which acted a significant incentive to the motivation of timely repayments. A similar study in another developing country substantiates the works of Banerjee, *et al.* (2013) that peer pressure acts as an enforcement mechanism in lending programs in Philippines. When loans are given to recipients along with a co-signer who is known to the recipient, the loan repayment is timely [Gine and Karlan (2008)]. Another example of the strong enforcement effects can be seen in the field experiment study on consumer credit in South Africa by Bryan, *et al.* (2012) their referrals from trustworthy people played a key role in advancing consumer loans. Heath (2011) has studied the reduction in information asymmetries in the context of Bangladeshi garment industry. She explains that employers take advantage of the enforcement capability of social networks. The enforcement mechanism is used as a technique to reduce moral hazard by punishing the referrers and the referred employee for low output.

This review provides us with insights into the subject of entrepreneurial networks and we see that the theme of social networks appears frequently in the context of entrepreneurial networks. While this review might not be exhaustive, it does establish that the presence of such networks has been acknowledged and studied in the existing body of literature. Existing studies have all defined social networks as informal ties and relationships with one's family, friends and acquaintances and the same definition would be followed in this paper as well.

## 2.1. Conceptual Framework

After defining the role of networks for reduction in transaction costs, what still remains to be answered is the role of various network characteristics in transaction cost reduction. As was discussed earlier, social ties can either be dense or sparse. An important aspect of contribution of social capital to entrepreneurial research is the dynamic of social structures. Network structure is defined as the pattern of direct and indirect ties between actors. Variety of measures drawn from the network analysis literature explains how social network attributes affect knowledge flows and impact entrepreneurial process. Network size is the most straightforward measure, defined as the number of direct links between a focal actor and other actors. Analyses of network size measures the extent to an entrepreneurs receives various resources [Aldrich, *et al.* (1989); Aldrich and Zimmer (1986)].

The access to diverse information however, is better explained by the network structure in terms of strength of social ties. Granovetter's (1973) notion of weak ties, explains how diverse resources can be accessed in terms of new ideas which lie outside the immediate social circle of an individual. A similar, complementary concept is bridging social capital in the form of structural holes or absence of ties. According to [Burt (1997a)], such unconnected ties bring in information which would otherwise not be accessible by the entrepreneurs if he remains within a closed social group. Such bridging social capital not only diversifies the sources of information but also provides opportunities to influence other networks with whom the entrepreneur is not directly connected to [Krackhardt (1995)]. Due to access to novel information as a result of

bridging ties, firms can improve performance [Zaheer and McEvily (1999); Zaheer, *et al.* (1998)].

Another aspect of network structure is the density of contacts of the social network. A network can have few loose connections or a tightly knit set of ties where all contacts know each other. Loose contacts are sparse networks and tightly knit connections are dense networks. Density is measured by the extent to which an actor's contacts are interconnected. Certain actors may be better connected and hence have a competitive advantage over those who are poorly connected. Burt (1997a) and Coleman (1988) present opposing views on the density of networks and its usefulness. Coleman (1988) notes that a densely knit group of actors or dense networks have higher social capital and therefore have an advantage over those groups of actors who are poorly connected. On the other hand, Burt (1997a, 1997b) argues that sparse social networks, implying that the actors have few connections between them, are more beneficial. He says that such networks bring greater access to new information about resources and opportunities. This happens because of the uneven spread of information. According to Burt, dense network would bring in redundant information. Structural holes bring in no redundant information and within this non-redundant information are opportunities which can be turned into profits. Therefore, according to this stream of thought, structural holes, instead of dense networks give more competitive advantage. However, the theory is silent on the role of networks as governance mechanism. Through reputational effects, transaction costs might be lowered, but in presence of structural holes, the peer pressure effect might be non-existent.

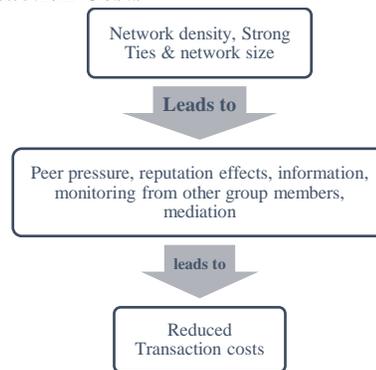
Another characteristic of networks is the strength of ties among network members. Stronger ties will enhance the feelings of reciprocity and trust towards group members. The source of strength in relationships depends upon various factors. For this paper, we have used frequency of contact, duration of relationship and entry in the network as factors which determine the strength of relationship among group members. Longer duration and frequent meetings help in building the bonds between group members and also the likelihood of sharing more information. The entry into one's network is the first block of trust in any relationship. If someone is a distant family member or related to another family member or belongs to same caste/biraderi, it adds more weight to the strength of the relationship.

### **2.1.1. Networks as Alternative Governance Mechanism**

Small firms, unlike the large enterprises, do not have enough resources at their disposal to counter transaction costs since they are inherently resource starved. This situation makes the need for networking even more important for smaller firms. As Williamson has argued that the economic functions can be performed within the boundaries of hierarchical firms, or by the market processes. But for small firms, both options are not viable especially in developing countries. Networking is one of the best solutions given in the literature for the development of small firms in developing countries because networking lies between the hierarchy and the market [Nicholas and Maitland (2007)]. Small firms have to obtain resources from external actors. In literature review in previous sections, it is seen that the network relationships have many benefits for the firms. For smaller firms, their social ties are vital for their survival and due to

their embeddedness in their social environment, the high level of trust plays an important role. As transaction cost theory has suggested that transaction costs are too high for small enterprises, the social network theory has provided a solution to the reduction of transaction costs by analysing the mediating role of social networks for business related costs. Costs of enforcement and monitoring of contracts, instead of being enforced through legal methods are curtailed by the fear of peer pressure and the risk of loss of reputation in the social networks. Thus, social networks act as an alternative governance mechanism to formal procedures of reduction in transaction costs. The figure below reflects these thoughts in a concise manner.

**Fig. 3.1. Conceptual Framework for Relationship of Network Attributes and Transaction Costs**



The integrated conceptual framework takes into account all these aspects of networks. Our study setting provides a good opportunity to analyse these elements within social networks of entrepreneurs because on one hand, as a typical case of a developing country, the formal institutional mechanisms are weak, expensive and time consuming which presents greater likelihood of very high transaction costs but on the other hand the social structure and informal ties play a very crucial role in the everyday business life in Pakistan and therefore there is a greater likelihood of relying on informal means for minimising transaction costs.

In line with the earlier discussion on network literature, this paper proposes that: in the presence of a dense set of relationships, the transaction costs would be lowered for small businesses. As suggested in the studies in the earlier sections, dense networks can be sources of information and also a form of peer pressure. Therefore, in the presence of such networks, transaction costs associated with monitoring and enforcement of contracts would be lowered.

## 2.2. Hypothesis of the Study

- (i) A dense social network lowers ex-post transaction costs of contract enforcement.
- (ii) A dense social network lowers ex- post transaction costs of dispute resolution.
- (iii) Stronger Ties lower ex-post transaction costs of contract enforcement.
- (iv) Stronger Ties lower ex-post transaction costs of dispute resolution.

### 3. DATA, METHODS AND ESTIMATION OF THE MODELS

In the case of SMEs, there were two problems: firstly, SMEs are still not properly defined in the country and every government department and financial institution uses its own definition according to its operations. The power loom sector which is the focus of this study is under the non-mill or informal sector and therefore government databases have only some vague idea about their exact numbers [Khan (2011); Memon (2011); Pakistan (2009, 2014); SMEDA (2007); Pakistan (2013)]. The SMEs data base in Pakistan is very fragile and unreliable due to regular change of survey units definitions, partial sector wise coverage with bias to manufacturing, too aggregative nature of the data, non-continuity of surveys, non-compilation of data on important aspects such as overall and sector wise [Dasanayaka (2011)]. The most reliable data bases available with government are the three statistical bureaus (now these three bodies amalgamated). But that also do not specifically give exact contribution of SMEs alone. Therefore, we could not use make use of available data sources from various department due to lack of consistency and unavailability of official data on power loom sector [Dasanayaka (2009, 2011)].

The location of data collection was the city of Faisalabad in the province of Punjab in Pakistan. Since minimal relevant secondary information is available on power loom weavers [Khan (2011)], we consulted some key organisations for identifying firms. Initially, Small and Medium Enterprise Development Authority (SMEDA) was contacted. There are two business associations of the power loom weavers. We consulted the All Pakistan Power Loom Association for information about weavers and creating contact.

#### 3.1. Method and Variables

The study is cross sectional in nature, embarking on an exploratory study to gather information on social networks of the entrepreneurs and its use as an alternative governance mechanism. In line with all the existing literature and best practices on similar subject, a primary data collection was done to obtain required information [Babbie (2013); Burt, Kilduff, and Tasselli (2013); De Lange, *et al.* (2004); Haythornthwaite (1996)]. A social network questionnaire was prepared and quantitative data was collected using a set of questions regarding various aspects of entrepreneur's operation and details of his social network. At first the questionnaire was tested and revised later on.

The weaving segment firms are all in the unorganised, non-mill sector and there is no accurate data available on them regarding exact number of firms. The most widely used measure for firms is their productive capacity in terms of number of loom. We chose only those units which were identified with the help of the Pakistan Power Looms Association, SMEDA, and the small industries departments.<sup>2</sup> We collected data from hundred and twelve entrepreneurs from Faisalabad.

<sup>2</sup>SMEDA and Small Industries Departments are vital in locating entrepreneurs for our study. These two government organisations are responsible for maintaining and collecting statistics on SMEs in the country. Policy formulation pertaining to all affairs of the SMEs is through these two government departments. Therefore, their help in identification of the entrepreneurs of power loom sector was reliable and saved time and efforts for the field research.

- **Independent Variables: Network Variables**

The variables used in this study are network size and network density. Network size is taken as the total number of alters the entrepreneur is connected to. It is measured by simply counting the unique relationships or alters of the entrepreneur. Network density measures the presence of structural holes in the network or in other words, it measures the connectedness of the ego's ties among each other. A value of one indicates maximum density and zero means none of the contacts know each other. Tie strength is a measure of strength of relationship among network members. Tie strength measures the strength of relationship with each individual identified by the ego. Frequency of contact, duration of relationship and entry into the network determine the strength of relationship with each individual.

The data for these variables was collected through the social network questionnaire and the variables were calculated using the UCiNet software.

- **Dependent Variable: Transaction Costs**

In light of the existing literature and gathering from the discussions of the entrepreneurs, the following were the most important transaction costs identified and therefore to operationalise these thoughts, we created proxy variables on that information to measure them.

- (1) Contract Enforcement Costs

Respondents were asked to answer the question and what do they do in case of non-compliance with contracts.

- (2) Dispute Resolution

Respondents were asked question regarding the role of their networks for dispute resolution. They were asked to choose the possible method of handling business disputes.

For both variables, the respondents were given options whether they chose formal dispute resolution mechanisms like legal action or contacted the police etc., or used their social network for mediation and resolution. If the respondent chose the social network for dealing with transaction costs, the response was given a value of 1 and 0 otherwise.

### 3.2. Estimation of Model

Two models have been presented in this paper for testing of statistical hypothesis. At first a Linear Probability Model (LPM) was constructed which tested all the hypotheses. A linear regression model with a dependent variable that is either 0 or 1 is called the Linear Probability Model, or LPM. The LPM predicts the probability of an event occurring, and, like other linear models, says that the effects of X's on the probabilities are linear. However, LPM comes with certain restrictions [Gujarati (2012); Maddala and Lahiri (1992)]. Some of the limitations of LPM are presence of heteroscedasticity, possible violation of linearity assumption and error terms which are not normally distributed [Gujarati (2012)]. However, before the advent of computer applications, which have made calculating binary response models very easy, the LPM was widely used due to its simplicity [Gujarati (2012)]. The following sections present both types of models.

**3.2.1. Linear Probability Models**

*Management of Breach of Contract and Network Variables*

| Dependent Variable = Management of breach of contract through social network |              |             |       |
|--|--------------|-------------|-------|
| Variable   | Coefficients | t-statistic | Prob. |
| Constant   | -0.371       | -2.41       | .017  |
| Network Density  | 1.171        | 10.35       | .000  |
| Network Size   | -.001        | -0.009      | .992  |
| Tie Strength   | 0.46         | 2.32        | 0.02  |
| R Square = 0.5   |              |             |       |

The first hypothesis about significance of network density in cases of breach of contract also finds support in LMP model. Network density is positively and significantly related to breach of contract situations ( $b= 1.127, p < 0.1$ ). However, there appears to be a negative relationship between network size and use of network in cases of breach of contract. This relationship however, is not statistically significant in the model. The model explains 50 percent of the variation in the dependent variable.

*Dispute Resolution and Network Variables*

| Dependent Variable= Management of dispute resolution through social network |              |             |      |
|---|--------------|-------------|------|
| Variable  | Coefficients | t-statistic | Sig. |
| Constant  | -0.37        | -2.41       | 0.01 |
| Network Density   | 1.17         | 10.35       | 0.00 |
| Network Size  | -0.001       | -0.009      | .99  |
| Tie Strength  | 0.46         | 2.32        | 0.02 |
| R Square = 0.50   |              |             |      |

The second hypothesis was related to dispute resolution and network density. In the LMP regression model, though use of network for resolution in cases of disputes was positive in the presence of higher density of network, it was not statistically significant ( $b= 1.17, p < .01$ ). The model explains 50 percent of the variance in the dependent variable.

**3.2.2. Binary Logistic Models**

*Management of Breach of Contract and Network Variables*

| Dependent Variable = Management of breach of contracts through social networks |              |             |       |
|--|--------------|-------------|-------|
| Variable   | Coefficients | Z-Statistic | Prob. |
| Constant   | -3.39        | -4.29       | .000  |
| Network Density  | 4.29         | 6.58        | .000  |
| Network Size   | 0.01         | 0.33        | .736  |
| Tie Strength   | 1.85         | 2.02        | .043  |
| McFadden R Square=0.448  |              |             |       |

Network size was not statistically significant to our model suggesting that a mere presence of a social network does not imply that the network would also be utilised for overcoming transaction costs. The other two variables about network characteristics throw more light on the role of social networks as alternative dispute resolution mechanisms. Both network density and tie strength are significantly and positively linked to the dependent variable and thus the hypothesis finds support in the statistical model. Denser networks and stronger ties among network members encourage the use of social networks for overcoming transactions.

The Pseudo R square used in the model is McFadden R square which is a popular choice among econometricians. A McFadden value between 0.2-0.4 is highly desirable and considered a good fit. The McFadden value for our model is 0.44 which suggests that the model is a good fit.

*Dispute Resolution and Network Variables*

| Dependent Variable= Management of dispute resolution through social network |              |             |       |
|---|--------------|-------------|-------|
| Variable  | Coefficients | Z-Statistic | Prob. |
| Constant  | -3.39        | -4.29       | 0.000 |
| Network Density   | 4.29         | 6.58        | 0.000 |
| Network Size  | 0.02         | 0.33        | 0.736 |
| Tie Strength  | 1.85         | 2.02        | 0.042 |
| McFadden R Square= 0.45   |              |             |       |

The dependant variable was positively related to network density and statistically significant. Tie strength is also positively linked to the dependent variable and statistically significant. Therefore, it can be gathered that in the presence of denser networks, the chances of a social networks being used as an alternative governance mechanism are higher. On a similar note, stronger ties among network members are more likely to encourage group members to use their social network for resolving disputes.

Since a traditional R square does not exist for binary models as opposed to the OLS models, many attempts have been made by econometricians to create a Pseudo R square. In the second model, a Pseudo R square, McFadden R square is used, which is a popular choice among econometricians. A McFadden value between 0.2-0.4 is highly desirable and considered a good fit. The McFadden value for our model is 0.48 which suggests that the model is a reasonably good fit.

### 3.3. Comparison of LPM and Binary Logistic Models

As discussed earlier, Binary Logistic models are the more preferred choice of technique in case of binary depend variables because it gives reliable results. In OLS, there is no constraint that the predicted values of Y estimates fall in the 0-1 range; indeed, predicted Y is free to vary between negative infinity and positive infinity and therefore it would violate the linearity assumption of OLS. LPM comes with certain restrictions [Gujarati (2012); Maddala and Lahiri (1992)]. Some of the limitations of LPM are presence of heteroscedasticity, possible violation of linearity assumption and error terms which are not normally distributed [Gujarati (2012)]. However, before the advent of

computer applications, which have made calculating binary response models very easy, the LPM was widely used due to its simplicity [Gujarati (2012)].

In the case of our results, though the hypotheses have been supported or the relationships have been established between dependent and independent variables.

The conclusion of the results is that both LPM and BLM in our case do not give contradictory results and move in the same direction in terms of significance of variables.

#### 4. REFLECTIONS AND DISCUSSION

The results of this empirical study support the hypotheses proposed in the study. It was clear that entrepreneurs solely rely on networking for almost all aspects that they were questioned about. The family run businesses dominate the industry in Faisalabad and nearly all segments of the value chain are related to each other in some way [Khan (2011)]. Since, most of the cluster is dominated by few families; nearly everyone is related to each other in way or the other. The peer pressures created by such an environment guarantees that contract are honoured and there is a very little reliance on formal dispute resolving institutions [Khan and Ghani (2004); Nicholas and Maitland (2007)].

The society's features of trust and reciprocity have made it possible that small loans are taken out from other businesses without the need for any written contract. Such informal institutions bring efficiency in the economic process and reduce uncertainty [Nicholas and Maitland (2007)]. The power of informal institutions in reducing transaction costs cannot be matched by the formal mechanisms of dispute resolution (courts) and provision of credit (banks and other formal financial institutions). Many businessmen would find the formal institutions unnecessary and tedious. Moreover, the embedded institutions of trust and reputation in social circles help in reducing uncertainty to providing an environment where economic agents can come together and assume risks.

Social sanction and market limitations are the most common instruments for the enforcement of contracts and the recovery of loans. Recourse to the legal system of the country is uncommon since such financing is by its very nature conducted without reference to the legal system. The informal institution of reciprocity and trust are so firmly embedded in the business networks that there is hardly any need for formal regulations for ensuring that contracts would be honoured.

##### 4.1. Conclusions

The presence of a social network would not necessarily lead to reduction in transaction costs; rather it is the structure of the social network that would establish that. This conclusion can perhaps explain the differences that occur in regional business growth, despite having similar policies and financial circumstances. Lastly, this study paves room for further investigation in the nature of networks other than density which makes them more useful for businesses. It is beyond the scope of this paper to analyse the deeper characteristics of the social networks, but it can stimulate further research in this direction.

##### 4.2. Policy Lessons

It has been observed that social network of the entrepreneurs of SMEs has been beneficial in reducing the transaction costs associated with conducting business by acting

as an alternative governance mechanism that ensures contracts are honoured and providing the information on credibility of partners. Thus, an environment with higher levels of trust that promotes social capital would be conducive for promotion and growth of businesses. There are various channels through which public policies can be helpful in creation and support of high trust environment. Through conscious public policy measures, the use of tools and ideas can create a sense of solidarity, collectiveness and citizenship which has an important effect on social trust, in the way of creating the idea of interdependency between all actors of a society instead of a social imaginary built on self-preservation.

In the case of Pakistan in particular, policies which can directly impact social interaction of citizens are those which target spaces of public discourse are housing and social composition of schools. Education policies which target reducing segregation on the basis of faith, income and ethnicity and so forth can lead to feelings of unity and solidarity among the citizens and thus create opportunities for accumulation of social capital.

Similarly, housing policies in Pakistan governing spatial equality, which minimise segregation based on income levels would lead to building solidarity and developing empathy for others. Such policies are especially important for heterogeneous societies like Pakistan.

In Pakistan, strengthening of local bodies can be an effective public policy tool as well to engage the social capital at grass roots level in formal decision making.

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## **Restructuring of WAPDA: A Reality or a Myth**

ZAINAB KHALID and MUHAMMAD IFTIKHAR-UL-HUSNAIN

Serious financial crisis in Pakistan energy sector, mainly due to poor governance, rising fuel prices and rampant corruption, led to the decision of corporatisation of Water and Power Development Authority (WAPDA) in 1992. However, this decision has been highly debated in the context of its socio economic benefits as the energy crises continues unabated. This study, by using semi-structured interview from energy experts in the power sector, attempts to find the factors that withheld the positive effects of this decision. The objective is to provide useful input to frame future energy policy to overcome critical energy crises in Pakistan.

The study concludes that the decision of corporatisation of WAPDA was a forced decision without proper homework recommended by the International Monetary Fund (IMF) which worked as an obstacle to achieve required targets in context of energy crises. However, expert opinion shows that unbundling of WAPDA if managed adequately in line with the ground realities would help bring in the competition in market and support the neoliberal theory which calls for deregulation of businesses and privatisation of publicly owned assets, thus minimising the state intervention. Therefore, the only choice for the government is to move forward with the reforms to frame efficient and effective power policy. Chile, with successful power reforms, is the example quoted by the experts to be followed by Pakistan to overcome load shedding and black outs.

*JEL Classification:* H7

*Keywords:* Energy, Pakistan Energy Sector, WAPDA, Neoclassical Theory, Corporatisation, Privatisation, Restructuring, Governance

### **1. INTRODUCTION**

Energy supports economy in multi dimension always and provides vital features which play a fundamental role in the social, commercial, industrial and economic sector development [Ghosh (2000)]. The claim of neoclassical theory that land, capital and technology are the only major economic factors, and the energy from sources like oil, coal, hydro and Sun comes as intermediate input in the economy, doesn't justify the role energy plays in the economic production [Alam (2006)]. The neoliberal theory believed in "free market economy" and voiced for free individual choice with minimum state intervention. The theory called for deregulation of businesses and privatisation of publicly owned assets thus minimising the role of a welfare state [Kotz (2000)].

Zainab Khalid <xanab.khalid@hotmail.com> is Assistant Programme Office, High Research Centre, Department of Development Studies, COMSATS, Abbottabad Campus. Muhammad Iftikhar-ul-Husnain is Assistant Professor, COMSATS Institute of Information Technology, Islamabad.

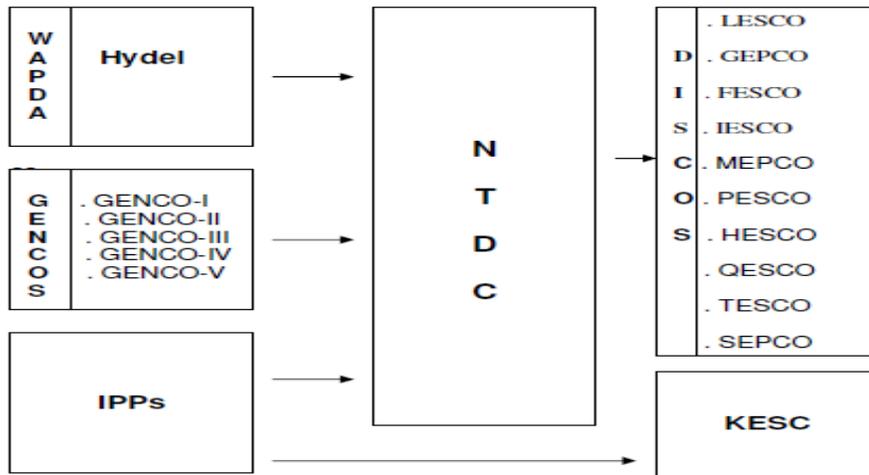
A deregulation trend of electric utilities was observed in many countries including the United States and European and Asian countries in 1990s [Goto and Sueyoshi (2010). Chang (2007) state that deregulation of a vertically integrated utility into its components like distribution, transmission and generation is expected to bring competition and remove the ambiguity in the regulation sector which will enable the investors to take the production and investment decisions efficiently but Sioshansi (2006) and Woo, *et al.* (2003) state that the outcomes of deregulation seen in the energy market are mixed. India and Pakistan, the evolving countries, also adopted the deregulation of electricity sector the reasons being the burden of price subsidies, low service quality, inadequate revenue collection, high network losses, and poor customer service [Saleem (2002)]. Furthermore, the United States also influenced the third world countries, directly or indirectly via donor agencies to adopt the neoliberal policies [Kotz (2000)].

Serious financial crisis in Pakistan energy sector, mainly due to poor governance, rising fuel prices and rampant corruption, led to the decision of corporatisation of WAPDA in 1992 that has not been completed yet. To unbundle WAPDA was based on the expectation of higher investment by National Transmission and Dispatch Company and distribution companies (DISCOs) would improve the decaying system of transmission and distribution which never materialised thus making the decision highly debated in the context of its socio economic benefits as the energy crises continues unabated. This study, by using semi-structured interview from energy experts in the power sector, attempts to find the factors that withheld the positive effects of this decision. The objective is to critically view the decision of corporatisation of the public entity (WAPDA) and provide useful input to frame future energy policy to overcome critical energy crises in Pakistan.

## **2. WATER AND POWER DEVELOPMENT AUTHORITY, PAKISTAN**

WAPDA was created in 1958 as a semi autonomous statutory body to regulate the power and hydel development in the country [Kessides (2013)]. Its main purpose was to look after, expand and channelise the power sector it in one direction [Javaid, *et al.* (2011)]. In 1992, this arrangement was reconsidered due to the economic burden, inefficiency of WAPDA, customer dissatisfaction, problems with financiers [Amjad and Baloch (2012)]. However, the United States also influenced the third world countries, directly or indirectly via donor agencies to adopt the neoliberal policies [Kotz (2000)]. The government decided to corporatise the power wing of WAPDA, the plan involved un-bundling the power sector in to several power generation, transmission and distribution companies and eventually privatise them. In addition an independent institution, a regulatory authority, National Electric Power Regulatory Authority (NEPRA) with the major task to regulate the sector was created in 1997 and Pakistan Electric Power Supply Company (PEPCO) was also established to oversee the corporatisation and privatisation of power sector in 1998 [Arshad and Usman (2007)]. In 2007, the monolithic utility of WAPDA was split into WAPDA and Pakistan Electric Power Company (PEPCO). The Board of Directors of PEPCO approved its dissolution in 2012 and the its functions were first transferred to National Transmission and Dispatch Company (NTDC) and later to Centre for Power Purchase Agency (CPPA) [Kessides (2013)].

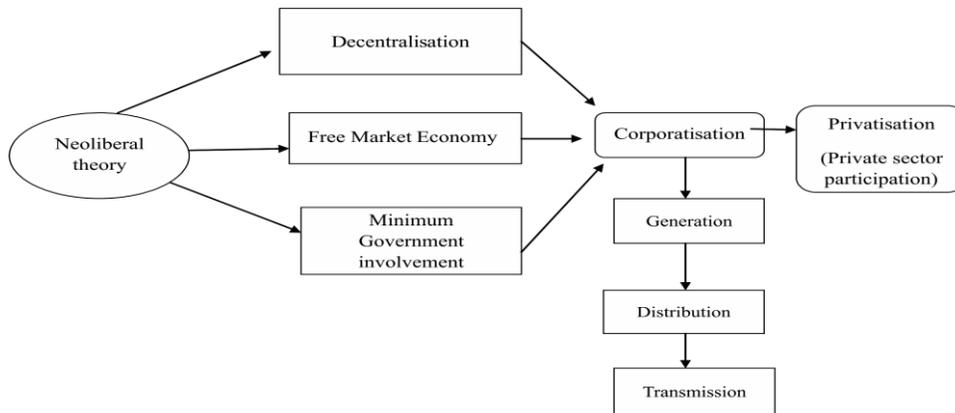
**Fig. Restructured Power Sector of Pakistan**



Source: Report by Islamabad Chamber of Commerce and Industry (2011).

### 3. ANALYTICAL FRAMEWORK

According to Botterud (2003) the classical theory was revived as ‘Theory of neoliberalism’. The theory believed in the ‘free market economy’ which would bring in competition, reduce the government involvement and regulation and thus lower the prices. This study revolves around the theory of neoliberalism which leads to restructuring and corporatisation of the state led power utilities along with involvement of public utilities in the form of privatisation. Many developing countries adopted the neoliberal theory but according to studies [William and Ghanadan (2006); Jamasb (2006); Reddy (2001)] very few of them have shown positive results. Majority of the nations stalled in some stage of corporatisation. According to Yi-chong (2006), the World Bank sold its reform template without taking into account the different economic, social and developmental stages of the different countries. Many studies [Wamukonya (2006); among others] also suggest that privatisation of the electricity sector might not be a necessary approach.



Source: Self.

#### **4. METHODOLOGY**

Purposeful and criterion based selection was used for sampling. The informants who were targeted through these methods were the people who had served or were still serving in the key positions/departments that were directly related to the process of restructuring of WAPDA into autonomous utilities. 18 informants were identified who belonged to the government offices: PPIB (Public Private Infrastructure Board), Planning Commission of Pakistan, NTDC (National Transmission and Dispatch Company), IESCO (Islamabad Electric Supply Company), PESCO (Peshawar Electric Supply Company), NEPRA and USAID. Semi structured interviews were the prime source of data collection. Open ended questions were designed in simple language and elaborated in some cases to obtain the relevant information. The questions were carefully designed to not lead the informants. The interviewees were given the autonomy to disclose any information which at times led to a new dimension of discussion. The interviews were conducted till a point of saturation and similar information was coming from the informants. An observation diary was kept during the data collection in which important notes and personal observations were noted.

#### **5. RESULT AND DISCUSSION**

##### **5.1. Inclination Towards Restructuring**

For 33 years (1958-1992) the power sector of Pakistan (generation, transmission, and distribution) worked under the 'vertically integrated' utility WAPDA which was termed "The White Elephant" because of the variables such as centralisation, corruption, dissatisfied customers, low performance and inability to meet the growing demands of electricity throughout the country. The decision of restructuring was taken to put an end to the above mentioned problems. The public owned utility was not only unable to meet the demand of energy but also it was unable to generate the revenues despite government's continuous investment. Wamukonya (2003) stated that many developing countries adopted the restructuring with a notion that it would be efficient and effective way to help a country meet its goals of sustainable development. The informants pointed out that the huge system of WAPDA was unorganised and poorly managed in. The power generated by the WAPDA was sold to the consumers but within the system, the loopholes were proving to be the hindrance in its efficiency. Even though WAPDA did see the time of surplus energy but many factors contributed to that including low economic growth and less demand along with the newly constructed hydel facilities that were generating enough rather surplus energy for the country. The increased budget did not help the situation because it was not the monetary problem that the utility was facing rather a managerial problem. The mismanaged utility was unable to allocate the funds properly to the distribution, generation and transmission sections thus resulting in heavy load shedding. The provincial autonomy of Punjab cannot be neglected here as Punjab, from beginning was the most powerful province and had a strong hold on national bureaucracy and politics. All the orders concerning electricity were released from WAPDA headquarter Lahore. All the information regarding energy sector from all over Pakistan was accumulated in Lahore. It was the centralised system. For a huge country like Pakistan having a lot of assets, this centralised system accounted for decreased speed of

the work, less efficiency and low performance of the organisation. One WAPDA office to deal with the diverse energy resources, the work load was exceptional on the staff and the top management which resulted in arbitrary decisions due to lack of time, thus compromising on the growth of the country. The process was slow, time consuming, ill managed and had created a lot of room for factors like corruption, nepotism, favouritism and negligence. These factors resulted in inept performance of WAPDA which was evident in shape of load shedding and ultimately customer dissatisfaction. The situation got worse in the mid 1980s. WAPDA became a weighted inconvenience burden on already financially weakened government. The government of Pakistan under Nawaz Sharif's rule in 1992 decided on the advice of loan lending agencies like IMF and World Bank which was to follow the new world order based on neoliberal theory of decentralisation and distribution of power for easy access and speedy outcomes. William and Ghanadan (2006) mentioned that the reforms were presented to the developing economies with the extensive references from the developed economies like US, Norway, England and Wales without matching them with the expectations and capabilities of the reforming countries. The government went ahead with decentralisation, breaking up the monolithic structure into 14 entities including Generation and Distribution Companies and one Transmission Company. According to the informants, the major players from Pakistan's side were the Energy wing of Planning Commission of Pakistan, Ministry of Water and Power and WAPDA authorities along with international donors (IMF, ADB, and WB). The involvement of foreign donors evoked a lot of resistance from within the system. There were people within the system who looked at the idea of corporatising WAPDA as a foreign idea and thought that Pakistan was pressurised into taking this decision by the money lenders. Pakistan wasn't prepared to handle the process of corporatisation and there were no solid grounds prepared for corporatisation.

Within WAPDA there are people who still consider WAPDA the ultimate organisation that has the potential to run the energy sector smoothly. They opposed this decision because in their personal capacity, they called WAPDA 'the backbone of the nation's economy' and the unbundling strategy 'a conspiracy'. They believed that in WAPDA, people got polished as they moved up the hierarchy unlike in the decentralisation where outsiders are hired directly on high posts as CEO, CFO or board of governors.

The people who oppose the restructuring of WAPDA also argue that the donor agencies had hidden agendas on which they work and lend financial assistance to the developing and undeveloped nations. In popular public opinion, the donor agencies like IMF, WB and ADB lend money to the developing countries put sanctions on them and control their policies and economic growth. World Bank (1994) stated that the purpose for reforms was to seek better performance in the power sector along with financial performance and supply—demand side performance.

In 1992 when the donor agencies approved the financial grant to Pakistan their agenda was to invest in sectors that could generate revenues and unfortunately WAPDA wasn't meeting the criteria. Due to its monolithic structure and mismanagement WAPDA was unable to provide satisfactory customer service and also had high losses and corruption. These factors also contributed in donor agencies' lack of investment in this public utility.

If the situation is analysed holistically it reveals that decentralisation and distribution of power to the grass root level is the ultimate way to success as the discourses of bottom up approaches are more sustainable. It also gives the employees a sense of ownership. As one unit WAPDA may be assembled as of numerous assets but the matter at hand was that how to use of those assets and skills effectively. The top management was overburdened with so much work that it was humanly impossible for the 4 members and one chairman to deal with any one of the problem or resource with undivided attention. They were required to do a lot of work in a lesser time; consequently they squeezed everything hastily in their schedule, compromising on the quality of the work and productivity of the decisions taken. Having all the authority under one command as in case of WAPDA would mean that the bureaucratic procedures would prevail, the authorities would be doctorial, they would sit in Lahore and the management would not have real and unfiltered information. The management would be overloaded as only 4 members are there to take all decisions and it would be politically very lucrative to get hold of WAPDA. The developed nations like USA, England, Korea, Malaysia, and Chile have successfully followed the new world but Pakistan is a developing nation unlike many of the mentioned countries which has created a difference in circumstances. William and Ghanadan (2006) mentioned that the reforms were presented to the developing economies with the extensive references from the developed economies like US, Norway, England and Wales without matching them with the expectations and capabilities of the reforming countries. Holistic analysis show that the Neoliberal theory is not applicable on the emerging capitalist states like Pakistan 100 percent because a vial portion of people live below the poverty line and it is government's duty to safeguard the interests of those people. Kotz (2000) stated that the theory of neoliberal negatively affects the macroeconomics of a country, shrinking its welfare programmes. To cater this arising issue, the Strategic Plan 1992 includes a section based on the subsidies for the poor population.

The situation analysis reveals that the national bureaucracy who was in charge of smooth unbundling of government utility sensed the incompetency of the political leaders and acted against the national benefits, earning themselves benefits in the unlikely situation.

According to the informants, the decision of restructuring may be a foreign dictation but it was also a very good decision which was well suited with Pakistan's conditions. According to Jamasb (2006), the developing and transitional economies adopted the new reforms when the international experiences with these reforms were limited; therefore, the decision of restructuring taken by many developing countries met with varied difficulties and problems. The results of a successful restructuring would have taken Pakistan from being an under developed to a developed nation. A separate board of governors for distribution companies is working to improve the efficiency of the companies. Although, it is impossible to remove T&D losses completely but unbundling has helped isolate the affected areas where T & D losses are highest. This has made it easier to establish an action plan for loss minimisation.

## **5.2. The Need for Change**

In 1970s, the theory of neoliberalism was revived and with that restructuring of public utilities became a common practice when many countries like Korea, US, UK, Japan, Malaysia adopted the theory of neoliberalism and ran it across the electricity

utilities [APEC (2000)]. Wamukonya (2003) mentioned that in 1970s only a handful and later in 1990s many countries adopted the new power sector reforms including approximately 30 countries in the last 15 years. Experts carry a difference of opinion about the time when the decision of 'corporatisation' of the electricity sector of Pakistan was taken i.e., 1992. Some informants<sup>2</sup> say that the right moment had come as the culture of corruption and failure trended in, demand was on the rise and to keep pace with the growing demand, WAPDA had to increase efficiency which was not happening. Any further delay in this regard would have been disastrous. Contrary to this, another set of informants are of opinion that this decision was a hasty decision taken by government under the pressure of donor agencies. Their point of argument is that the Government of Pakistan (GOP) should have considered capacity building<sup>3</sup> prior to restructuring. Wamukonya (2003) mentioned in his study that there are evidences that while the power sector reforms considered financial and economic growth, it did not give due attention towards social and environmental concerns. The best way to proceed with the strategic plan would have been to take into confidence the different level of employees regarding the corporatisation plan. In Pakistan during 1980-90s, there was a 'myth' about the private jobs. People preferred government jobs over private jobs because in their opinions government job provided security while the private jobs do not yield any kind of security. With this mass mindset there was no corporate culture in Pakistan to begin with. The government should have established a corporate culture and worked to nullify the myth regarding the private sector jobs before proceeding with the Strategic plan, 1992.

According to the studies of the World Bank (1995); Bacon (1995a); Bouille, *et al.* 2001, the greater involvement of the private sector would result in the better performance of the utility. For the first time, the facilities of generation, transmission and distribution were operated separately; there should have been staff trainings and briefings. The unprecedented amount of resistance induced by the defensive employees of WAPDA made a smooth start, impossible. Had there been a campaign to familiarise the process of corporatisation with the corporation of WAPDA and its employees, the result could have been a lot finer. Although, the 'Strategic plan of WAPDA's privatisation 1992' did include capacity building, but ill execution cost Pakistan two decades of delay to start this process.

A small group of informants also believed that the timing of the decision to restructure WAPDA was late as the idea had emerged years earlier. The interviewees have passed on a small amount of blame to the political turmoil in the country the major reason remains the unwillingness of authorities within WAPDA and other government offices, vested interests of people who held important positions in the energy sector and internal resistance and political interference that sabotaged the process of corporatisation. The study conducted by Wamukonya (2003) show that the reform template issued by the World Bank ignored the political, social and developmental stage of the country adopting the reforms.

Analyses show that the strategic plan formulated in 1992 to split WAPDA lacked social sector involvement. Marking the unbundling time period to 3-4 years was an

<sup>2</sup>Board Member PESCO, Senior Project Manager PPIB, Engineer NTDC.

<sup>3</sup>Capacity building refers to the development of skill in the technical and non-technical staff of an organisation.

overestimation of the situation. Although, according to Chang (2007) with the deregulation of the vertically integrated utility, competition would have been encouraged but Stern (2000) stated that the electricity reforms in developing countries proved to be more complicated than they were initially anticipated. Along with that, many developing countries lacked necessary regulatory framework, experience and human resource to compliment the reforms undertaken by the countries. With WAPDA being the sole owner of all the assets of energy sector, the length of bureaucratic and political interference in the affairs of the utility and the clear opposition of WAPDA officials towards the unbundling, the strategic plan should have been more realistic. Analyses also reveal that the time of the decision was not the issue. The process wasn't properly propagated. Even though the WAPDA authorities weren't in favour of this decision, it was not in their power to stop the decision of restructuring. The main reason of opposition was that WAPDA had enjoyed being all in all and was inclined towards personal benefits rather than national stability and growth. After the decision had been made the government should have disseminated the information to the lower staff and prepared the employees for the change in the nature of their jobs. The employees had many concerns regarding the reforms and many of them arose because they didnot have proper information.

The employees should also have been given job security during the process of corporatisation, protecting employee interests along with merit based selection. Also the labour unions, which are one of the major blocks of the system, should have been taken into confidence. Government should have got in touch with the labour unions before restricting to win their confidence and support. These measures would have speed up the process.

### **5.3. Privatisation: The Ultimate Solution? Arguments and Explanations**

The theory of neoliberalism supports privatisation which liberates the government from every responsibility. The strategic plan of disintegrating WAPDA 1992, talks about the privatisation of the corporatised entities. The questions that arises here is whether privatisation is the ultimate solution of Pakistan's energy crisis? 100 percent informants agreed that the energy sector of Pakistan should further move towards privatisation after the system has been corporatised. The private sector investment is not only secure but also they would bring in new technological advancement which would boost the competition among the distribution, generation and transmission companies. The competitive open market would solve Pakistan's energy crisis. An ex-employee of Planning Commission, though discarded the current system as being corporatised, he favoured privatisation. In his view, private sector would bring in business and their serious attitude towards business and profit making would also help Pakistan overcome its current managerial problems like non recovery of revenues, theft, corruption, vested interest etc, in the energy sector. The concept of 'free market economy' does not cater to the needs of unprivileged class as per Kotz (2000). However, according to an informant:

If privatisation of the utilities takes place, there will not be any need of subsidy. The culture of privatisation would bring competition in the market which would lower the prices by itself hence demolishing the need of subsidy in an economy.

In the current system, the government is subsidising the corruption. The cost of production according to NEPRA is 9 Rs/ KW and according to WAPDA its 11Rs/ KW. The difference of 2 Rs is being subsidised by the government. The private sector entry and removal of government intervention will eradicate any need of subsidy. However, the study of the strategic plan of unbundling of WAPDA 1992 shows that the objectives set by the government included subsidy to the unprivileged class of the economy. *“Rationalise Prices and Social Subsidies, while maintaining certain socially desirable policies such as rural electrification and low income lifeline rates.”* Kotz (2000) criticizes on the neoliberalism theory that it creates instability in the macroeconomic scenario by relinquishing the state taxation policies, compromising on the social welfare programs and loosing the government control on financial sector.

Like any other empirical research this study also suffers some caveats. First the sample selected is relatively small that can be enlarged if time and money permits. Second, open ended questions though bring more detailed information yet are biased and non objective. Finally people have their political affiliations and as the same government, who initiated this process, is again ruling the country the results may be positively biased in favour of the decision. Therefore, government should empower a body to conduct a comprehensive survey with specific objectives to find out the reason that are responsible for the energy crises in Pakistan.

## 6. CONCLUSION

The main objective of this study was to find out myth and realities attached to restructuring decision of a public utility i.e WAPDA. Revamping was initiated in 1992 in the energy sector of Pakistan based on the information provided by the people who were directly or indirectly involved in this process. It is found that corruption, nepotism, centralised system and bad governance led to the inefficiency of the WAPDA, which forced the government to deregulate it to enhance its efficiency. Though the process of unbundling was beneficial for the electricity sector of Pakistan, yet it has been unable to achieve its stated objectives. Extensive study of the literature available on the neoliberal theory, which acted as a base for the decision of corporatisation of WAPDA in 1992, coupled with semi structured interviews with energy experts (on job and retired) show that the government of Pakistan underwent the decision of corporatisation due to the policy of the loan lending agencies who associated the reforms with loan. The reform template given by the World Bank was adopted, as it is without making necessary changes with respect to the ground realities of the country, which resulted in various problems especially related to the social sector. The government could not properly propagate its agenda of unbundling WAPDA, which faced resistance within the different sectors and among the masses that ultimately slowed this process and decreased its importance. Analysis shows that the strategic plan formulated in 1992 to split WAPDA lacked social sector involvement. Marking the unbundling time period to 3-4 years reveals over confidence of the government. To some extent the political turmoil in the country remains major reason of the unwillingness of authorities within WAPDA and other government offices, vested interests of people who held important positions in the energy sector, internal resistance and political interference that sabotaged the process of corporatisation. Bureaucracy that was in charge of smooth unbundling of government

utility sensed the incompetency of the political leaders, and acted against the national benefits, earning themselves benefits in the unlikely situation.

Expert opinion reflects that the partial privatisation of state-led public utility would help bring in the competition in market, and would free the government to focus on the matters of governance, despite the literature which shows that theory of neoliberal doesn't work well in the capitalist states as it compromises on the welfare programmes and promotes 'free market economy' which doesn't cater to the unprivileged class. Further, the upcoming energy policies would make a serious impact in shaping the future of the power sector of Pakistan, which may look gullible at the moment. The example of Chile with very successful power reforms is a source of inspiration for all the developing countries to proceed with the reforms. It is to be duly noted that the electricity reforms of Chile were the longest in the history. In concluding remarks, it can be stated that the restructuring of WAPDA in 1992 was an ambitious and forced decision on the part of government due to which it could not achieve its objective, however, in its nature it was a right decision and need to be continued as will check the financial haemorrhaging and supposedly improve efficiencies and competitiveness in the sector and in the economy which will raise the service delivery a much needed goal of the government. However, there are enough reasons to be less sanguine that privatisation of WAPDA will provide affordable electricity to all Pakistanis.

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## Importance of Judicial Efficiency in Capital Structure Decisions of Small Firms: Evidence from Pakistan

ATTAULLAH SHAH and ZAHOOR KHAN

Empirical evidence to identify factors that are responsible for the sluggish development of bond and capital markets in Pakistan remains scanty. This paper is a step forward in this direction. Specifically, this paper draws on the recent developments in the area of law and finance to formulate several propositions on how judicial efficiency can have a differential impact on corporate capital structures of small and large firms. These propositions are tested using data of 370 firms listed at the Karachi Stock Exchange (KSE) and 27 districts high courts of Pakistan. The results indicate that leverage ratio decreases, when judicial efficiency decreases; however, this relationship is not statistically significant. This is due to the composition effect. Allowing judicial efficiency to interact with the included explanatory variables, the results show that worsening judicial efficiency increases leverage ratios of large firms and decreases leverage ratios of small firms, which is an indication of the fact that creditors shift credit away from small firms to large firms in the presence of inefficient judicial system. Results also indicate that the effect of inefficient courts is greater on leverage ratios of firms that have fewer tangible assets as percentage of total assets than on leverage ratios of firms that have more tangible assets. The results indicate that under inefficient judicial system creditors reduce their lending to small firms and firms with little collateral and redistribute the credit to large firms. This is why judicial inefficiency does not change volume of credit, but changes distribution of the credit. These results highlight the importance of judicial efficiency for small firms in the determination of their capital structures.

*JEL Classification:* G10, G21, G32

*Keywords:* Judicial Efficiency, Leverage, KSE, Capital Market Development, Law and Finance.

### 1. INTRODUCTION

In making their lending decisions, rational creditors will attempt to ascertain not just the quality of the borrower, but also the legal protection available to them should the borrower default. When the enforcement of lenders' rights is poor or costly in terms of administrative costs and time consumed in legal proceedings, lenders try to protect themselves through alternative mechanisms. For example, lenders might ask for the security of fixed assets, require personal guarantees, choose borrowers with presumably lower default risk such as wealthy individuals or large sized firms, and prefer to extend only short-term loans. A specific claim on fixed assets reduces chances of greater loss in

Attaullah Shah <attaullah.shah@imsciences.edu.pk> is Assistant Professor of Finance, and Zahoor Khan is affiliated with Institute of Management Sciences, Peshawar, Pakistan

case of default of the borrower. Short-term debt makes it easier for lenders to monitor their borrowers and reduce their misbehaviour by threatening not to renew the loan [Demirguc-Kunt and Maksimovic (1999)]. Under an inefficient judicial system, borrowers without a personal guarantee or collateral of fixed assets may be denied financing. This could result in less lending in the economy. Similarly, the financial structure of many firms could tilt toward short-term financing as lenders would prefer to extend loans only of short maturity.

Recent advancement in the literature of law and finance has highlighted the importance of institutional development and creditor rights protection for the development of capital markets. Various research studies have focused on cross-country differences in the quality of law, regulations, protection available to creditors, minority shareholders and the effects of all these on the development of financial system, corporate governance, and financing patterns [Shleifer and Vishny (1997); La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1996, 1997, 1998, 2000); Dehesa, Druck, and Plekhanov (2007); Djankov, McLiesh, and Shleifer (2007)]. Despite these developments in the area of law and finance, within-country judicial efficiency and its impact on the decisions of leverage and debt-maturity structure used by listed firms have attracted much less attention as observed by Sherwood, Shepherd and De Souza (1994: p.4)

*“Self-evident though it may seem, the proposition that a strong judicial process enhances economic performance is far from proven”.*

Moreover, the literature does not isolate the effect of legal and judicial efficiency on the pattern of financing. Empirical literature must still enrich itself with regard to identifying the specific impact of judicial efficiency on lenders willingness to increase the flow of credit to firms. A few known studies that provide evidence on within-country judicial efficiency and corporate financial decisions include Magri (2006), Jappelli, Pagano and Bianco (2005) and Pinheiro and Cabral (1999). These studies relate judicial efficiency to the overall level of credit in an economy. But no study exists that measures the impact of within-country judicial efficiency on capital structure of listed firms. The scanty empirical evidence warrants further investigation into the relationship of judicial efficiency and financing decisions. The objective of this paper is to go a step forward in this direction to fill the empirical gap by providing evidence on impact of the efficiency of district high courts on the capital structure of listed firms in Pakistan.

The presence of large number of firms with negative equity and few cases of forced bankruptcies in Pakistan motivates us to investigate the impact of judicial efficiency on leverage. If a firm has negative equity, the firm is considered to be technically bankrupt. The presence of a large number of firms with negative shareholders' equities in Pakistan naturally provokes the question as “why do creditors of the bankrupted firms shy away from going to court against such firms?” It is likely that the judicial efficiency is low in Pakistan in terms of time and cost, which makes the recovery of loans uneconomical for creditors. In fact, Claessens, Djankov and Klapper (2003) provide empirical support to this argument from 1472 listed firms in five East Asian countries. They report that efficiency of a judicial system serves as a critical in determining the creditors' choice to recover their funds through judicial systems or through other mechanisms.

Given that resource endowments and demand for judicial services vary across different districts, it is reasonable to expect that judicial efficiency will vary across different districts. Therefore, Pakistan is a good candidate to study the impact of within-country judicial efficiency on capital structure decisions of firms. Therefore, this study exploits variations in judicial efficiency across different districts of Pakistan and relates these variations to corporate leverage. Additionally, this paper also explores the possibility that worsening judicial efficiency has differential impact on leverage ratio of small and large firms. Small firms are more susceptible to information asymmetry problems and external macroeconomic shocks. These two features make small firms more sensitive to variations in judicial efficiency. Hence, it is expected that deterioration in judicial efficiency will have greater negative impact on leverage ratios of small firms compared to that of the large firms.

The rest of the paper is organised as follows. The next section reviews the law and finance literature to draw testable hypotheses. Section 3 discusses data, the model specifications, and variables. Section 4 reports and discusses results of regression analysis, while Section 5 presents the conclusion and policy implications.

## 2. RELATED LITERATURE

### 2.1. Judicial Efficiency and Leverage

Legal protection to creditors and enforcement of the same by judicial system play a major role in credit contracts. Legal protection alone may not be sufficient to prevent parties to the credit contract from engaging in opportunistic behaviour. As remarked by Galindo (2001, p.16).

*“...If institutions are inadequate it is likely that the benefits that the other parties have to gain from reneging on the debt contract can be pronounced enough to prevent the contract’s realisation. Hence, the ability of these institutions to align the players’ incentives with the clauses of the debt contract can become an engine of promotion of financial breadth...”*

Efficient judicial system reduces the chances of opportunistic behaviour of borrowers. In an inefficient judicial system borrowers would face lower costs of default. When borrowers know that they can gain more by defaulting on the loan, they will choose to default even if they are solvent [Eaton and Gersovitz (1981); Jappelli, Pagano, and Bianco (2005)]. In situation like this where borrowers have lower incentives to repay the loan, lenders will be very cautious and selective in making loans. As a result, the equilibrium amount of credit available in the credit market will be smaller. Bae and Goyal (2009) argue that an inefficient judicial system increases uncertainty about the repayment of loan by the borrower. As the credit risk increases, lenders will charge higher interest rates. And in some cases lenders will ration borrowers instead of charging higher interest rates [Stiglitz and Weiss (1981)]. In either case, volume of lending is expected to decline.

Empirically, several studies have found a positive relationship between creditors’ rights protection and lending volume, such as Gropp, *et al.* (1997), Freixas (1991), and Fabbri and Padula (2004). Gropp, *et al.* (1997) used U.S. cross-state data to determine

the impact of personal bankruptcy laws in various U.S. states on lending to low-assets households; they found a positive relationship between creditor rights protection and lending volume. Freixas (1991) confirmed that in Europe both the cost and the duration of the judicial process to repossess collateral were negatively related to the size of lending to firms and house acquisitions.

Fabbri and Padula (2004) examined the relationship between judicial efficiency and the distribution of credit to households. They used data on Italian households and the performance of judicial districts the proxy for which was the backlog of trials pending in a given district. They found both statistically and economically significant findings that districts where judiciary is inefficient, credit availability to poor households declines but to wealthy households increases. The authors hint that this phenomenon might be due to the fact that poor legal system redistributes credit towards borrowers with more assets.

Several studies have used cross-country data to establish the relationship between law and finance. In two seminal papers, La Porta, *et al.* (1997, 1998) empirically analysed a large cross-section of data from forty-nine countries to show how the origin of the legal system, the protection available to investors and the efficiency of judicial system influence the development of credit markets and lending volumes. One important finding of their studies is that countries with more efficient judicial systems have wider capital markets and enjoy higher lending volumes.

Laevena and Giovann (2003) studied the effect of judicial efficiency on banks' lending spreads for a large cross section of countries. They used two different set of data to measure bank interest rate spreads. In one data set, they measured the interest rate spread in 106 countries at an aggregate level, and in another set they did the same for 32 countries at the level of individual banks. After controlling for a number of other country-specific features, the authors found that judicial efficiency, in addition to inflation, is the main driver of interest rate spreads across countries. The implication of their findings is that in addition to making the overall macroeconomic conditions better in a country, judicial reforms are vital to lowering the cost of finance for households and firms. Resultantly, a lower cost of credit will lead to an increased level of borrowing. Similarly on the relationship between interest rates and judicial efficiency, Meador (1982) and Jaffee (1985) found evidence that interest rates charged on mortgage were higher in U.S. states where the judicial process to repossess the collateral was lengthy and costly.

Following the above line of arguments and keeping everything else constant, it is expected that leverage ratios of firms will be higher in districts where courts are more efficient.

## **2.2. Judicial Efficiency and Firm Attributes**

Ex-ante, lenders lend only to borrowers that have the ability to pay back the loan amount and the rate of interest on it. If complete information about the borrower and his investment project is available, lenders can easily distinguish between borrowers that have good credit risk and those that have bad credit risk. In such a case, the problem of an inefficient judicial system may not be severe since lenders themselves can reduce the chances of default by denying credit to borrowers with bad credit risk. However, the problem of asymmetric information does exist in the real world and is exacerbated by judicial inefficiency. When judicial efficiency worsens, lenders react more to asymmetric

information problems as the cost of choosing an undesirable borrower increases with the inefficiency of the judicial system. Consequently, lenders would not lend to opaque and risky borrowers or borrowers with low-quality projects under an inefficient judicial system.

The literature suggests that certain firm attributes convey information about a firm and the quality of the projects that the firm undertakes. Size of the firm, returns volatility and collateral offered against a loan are such attributes that can serve as proxies for information availability about the firm, the firm riskiness and the quality of its investment projects. The former suggests information availability about the firm and the latter two convey information about the riskiness of the firm and the quality of its investment projects.

The following firm attributes have widely been used in capital structure research. These features not only have direct impact on a firm's capital structure, but also their interaction with judicial efficiency can have additional effect on the firm's capital structure.

### **2.2.1. Firm Size**

The information asymmetry problem is severe with small firms, as they find it costly to produce and distribute information about themselves [Pettit and Singer (1985)]. This is why small firms are considered more opaque than large firms. The inadequate supply of information creates problem for lenders to distinguish between high quality and low quality borrowers. This increases the risk of adverse selection. Under poor enforcement of lenders' right by judiciary, lenders will not be able to recover the full amount of their loan from low-quality borrowers. Consequently, borrowers could shy away from lending to small firms.

Moreover, a firm's size can be a proxy for the riskiness of the firm. Large firms are considered to be more diversified and have greater capacity for absorbing negative external shocks due to their significant resource base as compared to small firms [Titman and Wessels (1988)]. The most commonly used term to refer to this phenomenon is "too big to fail" which suggests that large firms have a lower probability of falling into financial distress and bankruptcy, the opposite of which is true for small firms. Since poor judicial enforcement makes it difficult for lenders to recover their loan from firms in financial distress, lenders would either impose higher costs on lending to small firms or in some cases simply refuse credit to small firms.

Both of the above arguments about firm size imply that judicial efficiency will matter more for small firms. As the judicial efficiency worsens, credit flow to small firms declines.

### **2.2.2. Collateral**

Collateral can solve several problems associated with information asymmetries. Coco (2000) discusses that collateral can solve various problems engendered by asymmetric information in credit contracts, such as issues related to project valuation, uncertainty about quality of the project, riskiness of the borrower, and moral hazards.

Chan and Kanatas (1985) argue that collateral can help lenders and borrowers who disagree about the value of the project due to information asymmetry. As collateral has a more stable value than a project whose cash flows will accrue in the future, lenders feel more confident lending against collateral than they would lending against an uncertain project.

Collateral can also solve problems related to riskiness of the project or the borrower. Opportunistic borrowers will not like to pledge valuable assets as collateral against loans, especially borrowers with risky projects. Studies like Bester (1985), Besanko and Thakor (1987), and Chan and Thakor (1987) show that the value of the collateral and average riskiness of the projects are inversely related; hence, valuable collateral suggests low project risk. By resolving this information asymmetry problem, collateral increases the efficiency of the credit market. Following a similar line of argument, Bester (1985, 1987) argues that collateral reveals information about different borrowers and counteracts adverse selection problems. Also, when borrowers know that their misbehaviour can result in loss of the valuable collateral, they will preferably not engage in moral hazard activities [Barro (1976)].

In all of the above arguments, collateral either eliminates or at least mitigates problems related to information asymmetries, hence it can be expected that judicial inefficiency would not affect all borrowers alike. Borrowers with valuable collaterals would not face severe information asymmetry problems, and would less be affected as judicial efficiency worsens.

Contrary to the above prediction about collateral, judicial efficiency and leverage, as discussed in Galindo (2001), collateral may lose its significance if lenders feel that they cannot recover it through judicial process. However, Magri (2006) argues that in case of bankruptcy of the borrowers, lenders will face smaller losses if the borrowers have more tangible assets because these assets can serve as collateral. Since growth options become worthless when the borrower faces bankruptcy and only the value of tangible assets can be realised in the market, creditors will prefer to lend to borrowers with more tangible assets. It will be interesting to know which of the above competing arguments stand up in the empirical investigation of judicial efficiency and leverage used by listed firms in Pakistan.

Mixed empirical evidence exists on the relationship of tangible assets and leverage when the former is interacted with a proxy for efficiency of legal system or its judiciary. Fan, Titman, and Twite (2008) use two proxies for tangibility of assets and interact them with an index of corruption which measures how inefficient a legal system of given country is in protecting investors' rights. Their first proxy for tangibility, measured by market-to-book ratio, has significant influence on capital structure of firms in more corrupt countries and weaker legal systems. However, their second proxy, measured by total tangible assets to total assets, is not statistically significant.

An indication of the fact that inefficient judicial system will redistribute credit towards borrowers with more assets is found in the empirical results of Fabbri and Padula (2004). They found that districts where judiciary is inefficient, credit availability to poor households declines but to wealthy households increases. Their results purport that it might be due to the fact that poor legal system redistributes credit towards borrowers with more assets.

### **2.2.3. Earnings Volatility**

Earnings volatility emanates from business risk in the operations of a firm or from poor management practices. In either case earnings volatility is proxy for the probability of financial distress. All else constant, Bradley, Jarrell, and Kim (1984) argue that firms

with more volatile cash flows should have lower leverage. Combined with an inefficient judicial system, earning volatility should decrease the amount of leverage further.

#### **2.2.4. Profitability**

Myers (1984) argues that firms prefer internally generated funds to external funds and debt finance to equity finance. He calls this preference of firms as pecking order. This is because of asymmetric information; the cost of external funds is higher than internal funds and the cost of raising equity is higher than the cost of debt. Profitable firms are, thus, expected to have lower percentage of debt-financing. A negative relation is also expected between profitability and leverage from the view of double taxation. Auerbach (1979) says that firms have incentives to retain earnings to avoid dividend taxes. Since information asymmetry is more of an issue where judicial efficiency is poor [Magri (2006)], it is expected that firms will find it difficult to raise external finance and will distribute less profit where courts are inefficient. Empirically, two studies have found evidence to support the above arguments. The first study by Fan, *et al.* (2008) uses both aggregate and firm level data from 39 countries to examine the influence of institutions on leverage and leverage. Fan, *et al.* (2008) use corruption index as a proxy for efficiency of justice and find that in legal systems that protect investors more, profitability has less of an influence on leverage. The second study by La Porta, *et al.* (2000) reports that the firms in civil law countries, where legal protection to investors is higher, pay higher percentage of dividends.

#### **2.2.5. Growth**

Jensen and Meckling (1976) argue that agency costs of debt are higher for growing firms as managers in these firms have the incentive to invest sub-optimally and appropriate wealth from bondholders to shareholders. As growing firms have more options to invest in risky projects, lenders fear that such firms may create moral hazards for them. As a result, lenders will either hesitate to lend to growing firms or charge higher interest on lending to growing firms. Titman and Wessels (1988) also predict inverse relationship between growth opportunities and leverage, but from different angle. They note that since growth opportunities cannot be offered as collateral and do not generate current income, firms that have more capital assets in form of growth opportunities are expected to have lower leverage ratio. Myers (1977) developed a model of determinants of capital structure wherein he treated growth opportunities as call options. Myers (1977) suggests that growth opportunities are discretionary; hence they should not be financed with costly leverage. On the other hand, fixed assets are sunk costs and they can best be financed with leverage.

In support of the above arguments, several empirical studies found a negative relationship between growth opportunities and firms' leverage ratios. These studies include Titman and Wessels (1988), Barclay and Smith (1995) and Rajan and Zingales (1995).

The future growth opportunities under the framework of Myers (1977) and Jensen and Meckling (1976) can best be proxied by the ratio of market-to-book value of a firm. However, there is an alternative proxy which tracks the annual percentage increase in total assets. The latter is a more stable measure in case of Pakistan because the Karachi

Stock Exchange experienced abnormal growth from 2002 and onwards. This overall increase in market values of firms was not necessarily a reflection of their growth opportunities. Since growth opportunities have lower values as collateral against loans and that they are regarded as proxy for agency costs, it is expected that leverage ratios of growing firms will be lower.

### 2.2.6. *Non-Debt Tax Shields (NDTS)*

DeAngelo and Maussulis (1980) showed in a theoretical model that depreciation expense, depletion allowance, and investment tax credits serve as substitutes to debt tax shields and lower the firm's optimal debt level. If their model holds, then the observed differences in the debt ratios of different industries can be attributed to some extent to the level of NDTS that each industry bears. To test this hypothesis, Bowen, *et al.* (1982) used cross-sectional industries data and found that the existence of NDTS significantly lowered the debt ratios at industry level. However, Boquist and Moore (1984) did not find any evidence that supported the NDTS hypothesis. To test the hypothesis they used firm-level data and used a measure of leverage that included only long-term liabilities. The reason for getting different results against the previous studies was due to the use of a different proxy for leverage and the use firm-level data instead of industry-level data.

### 2.3. Testable Hypotheses

- H<sub>1</sub> Firms will have lower leverage ratios in districts where judicial efficiency is low
- H<sub>2</sub> Judicial inefficiency reduces the leverage ratios of small firms more than leverage ratios large firms
- H<sub>3</sub> In districts where judicial efficiency is low, firms with little collaterals have lower leverage ratios than firms with more collateral
- H<sub>4</sub> Growing firms have lower leverage ratios in districts where judicial efficiency is low than non-growing firms
- H<sub>5</sub> In efficient judicial districts, firms leverage ratio will be more sensitive to coefficient of income volatility.
- H<sub>6</sub> In the presence of judicial inefficiency, more profitable firms will have lower leverage ratios than less profitable firms
- H<sub>7</sub> Leverage ratio increases with the size of the firm
- H<sub>8</sub> Firms with more collaterals have higher leverage ratios
- H<sub>9</sub> Leverage ratio decreases with the profitability of the firm
- H<sub>10</sub> Growth opportunities decreases leverage ratio
- H<sub>11</sub> Volatility of a firm's cash flows will negatively affect leverage ratio of the firm.

## 3. METHODOLOGY

### 3.1. Data Sources and Sample

The four provincial high courts (Peshawar, Lahore, Sindh, and Baluchistan) restarted publication of their annual reports in the year 2001 after many years. Therefore, we have chosen the year 2001 as a starting point of our data collection of the judicial

statistics. For selection of judicial districts, we used the criteria of the location of head office of the listed firms. We found that listed firms are head-quartered in a total of 27 districts out of the total of 104 judicial districts. It is expected that efficiency of a judicial district does not change in short period of time. Therefore, we calculated a time series average for each district.

We obtained the firms' financial data from "Balance Sheet Analysis of Stock Exchange Listed Firms" a publication of the State Bank of Pakistan (SBP). The sample is collected from years 2000 to 2006. We started with the inclusion of all non-financial firms in the analysis. However, we removed outlier observations that were below 1 percentile or above 99 percentile. We also excluded firms with negative equity figures as these firms do not show normal behaviour. Finally, we were left with an unbalanced panel of 370 firms.

### 3.2. Measurement of Variables

#### 3.2.1. The Measure of Leverage

The basic notion of leverage implies long-term debt. Short-term debt is often provided to firms by their suppliers for convenience, not as a source of financing. The commonly used term for such type of debt is spontaneous financing that does not involve active decision making of the financial manager with regard to the firm's optimal debt-equity ratio. Earlier studies like Ferri and Jones (1979), Marsh (1982), Castanias (1983), Bradley, *et al.* (1984) and Kim and Sorensen (1986) used only long-term debt as a proxy for leverage with the exception of Titman and Wessels (1988) who also included short-term debt as a proxy for leverage.

However, most of the studies on comparisons and determinants of capital structure using cross-countries data employed a proxy for leverage that included both short-term and long-term debt e.g. [Rajan and Zingales (1995); Booth, Aivazian, and Demirguc-Kunt (2001); and Fan, *et al.* (2008)]. One reason why these studies included short-term debt in leverage ratio might be, as found by Booth, *et al.* (2001), that firms in developing economies mostly rely on bank financing which is usually short-term in nature. Given that, all of the short-term debt cannot be regarded as spontaneous financing especially in developing economies. Since Pakistan is a developing economy where banks remain the major financiers of the corporate sector, short-term financing cannot be ignored in the capital structure research. The measures of leverage used in this study are motivated by these considerations. The first proxy for leverage (*LEVI*) is the ratio of long-term debt to total assets whereas the second proxy (*LEV2*) is the ratio of long-term debt plus short-term debt to total assets. A third measure used in many empirical studies is a measure of leverage based on the market value instead of book value of equity. The study cannot use this measure due to the bias in the market values of equity in the sample period. The Karachi Stock Exchange experienced several-folds rise from the year 2002 and onwards. If the study uses market-based measure of leverage instead of a measure based on the book values, the persistent yearly increase in share prices would show inflated values of equity which in turn would lower the ratio of debt-to-equity each year, which would increase the chances of heteroscedasticity. On the other hand, measures of leverage based on book values are free from such abrupt fluctuations.

### 3.2.2. *The Measure of Judicial Efficiency*

Extant literature suggests different types of proxies to measure judicial efficiency. In majority of the international studies, [see, Modigliani and Perotti (1997); Giannetti (2003); Kumar, *et al.* (1999); Giannetti (2001)], a subjective index of judicial efficiency is used. Such an index was either developed by the researchers themselves or was borrowed from other organisations such as the Business International Corporations (BIC). Other studies have used more objective measures of judicial efficiency. For example, Fabbri (2002) and Fabbri, and Padula (2004) have used the fraction of pending cases to total settled cases or the fraction of pending cases to case started during a year. Shah and Shah (2016) have used three different measures of judicial efficiency which are (a) inverse of time in days that a judicial court takes in resolving a case (b) number of procedures involved in registering a case till the final decision implemented by a court, and (c) costs incurred on a judicial case as a percentage of the recovery amount. Due to data availability issues, we use the proxy of judicial efficiency where pending cases are scaled by some base figure such as judicial cases decided in a year, total cases started in a year, or population of a district. Therefore, we use the following measures of judicial efficiency:

$$JE1 = \frac{\text{Number of cases pending in a given district at the end of the year}}{\text{Number of cases initiated during that year}}$$

Other possible proxies for judicial efficiency may include:

$$JE2 = \frac{\text{Number of cases pending in a given district at the end of a year}}{\text{Number of cases disposed - off during that year}}$$

$$JE3 = \frac{\text{Number of cases pending in a given district at the end of the year}}{\text{Population of the district measured in thousands}}$$

$$JE4 = \frac{\text{Number of cases pending in banking court (where such courts are present)}}{\text{Population of the district measured in thousands}}$$

Higher value of *JE* shows inefficiency of a judicial court because larger number of pending cases as percentage of disposed-off cases shows that the court takes a longer time in deciding cases or is not capable of meeting the demand faced by it in comparison to other courts.

For simplicity, the *JE1* is simply represented by *JE* in the rest of the paper. *JE1* is found to be highly correlated with *JE2*, *JE3*, and *JE4*. This implies that all these measures of judicial efficiency are good alternatives. We use *JE1* as a primary proxy for judicial efficiency throughout this paper.

### 3.2.3. *Measurement of the Intendent Variables*

We include all important determinants of the corporate leverage as control variables. These variables include size, collateral, profitability, net income volatility, growth, dividends, and non-debt tax shield benefits. Names, symbols, and measures of these variables are reported in Table 1A.

Table 1A

*Names and Measurement of the Variables*

| Name of Variable | Denoted by    | Measured by                               |
|------------------|---------------|---|
| Leverage         | <i>LEV1</i>   | Long-term debt to total assets            |
| Leverage 2       | <i>LEV2</i>   | Total debts to total assets               |
| SIZE             | <i>SZ</i>     | log of assets                             |
| Tangibility      | <i>TG</i>     | Net fixed assets divided by assets        |
| Growth1          | <i>GROWTH</i> | Average percentage change in assets       |
| Growth2          | <i>MVBV</i>   | Market-to-book ratio                      |
| Volatility       | <i>VOL</i>    | Coefficient of variation of profitability |
| Profitability    | <i>PROF</i>   | Net income / total assets                 |
| Dividends        | <i>DIV</i>    | Amount of dividends / net income          |
| NDTS             | <i>NDTS</i>   | Depreciation for the year / total assets  |

**3.3. Model Specification**

We use a panel data framework to study the relationship between corporate leverage and judicial efficiency. The basic form of a panel regression is given in Equation (1).

$$y_{it} = \beta x'_{it} + \alpha z_i + \varepsilon_{it} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where  $y_{it}$  is the leverage ratio of firm  $i$  at time  $t$ .  $x'_{it}$  is the vector of the independent variables.  $\alpha z_i$  represent idiosyncratic effects and  $z_i$  represent a constant term that absorbs all observable and unobservable heterogeneity. If  $z_i$  does not vary across panel units, then OLS will yield consistent estimates. However, firms might vary from one another due to industry differences or managers aptitude towards risk. Therefore, it is rather a strict assumption that systematic difference across firms do not exist. Panel data models provide a wide array of options to deal with unobserved heterogeneity. The most common of these models is the fixed effects model, which is given below.

$$y_{it} = \beta x_{it} + a_i + \varepsilon_{it} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

The term  $a_i$  in Equation (2) is equal  $\alpha z_i$  in Equation (1). This term absorbs firm-specific effects that do not vary across time for a given firm. One common disadvantage of fixed-effects models is that we lose many degrees of freedom in defining dummy variables for each firm. On other hand, another commonly used model is the random effects model. This model yield efficient estimates when the firm-specific effects have low or no correlation with the independent variables. Random effects model can be written in the following form [Greene (2006)].

$$y_{it} = \beta x_{it} + [a z_i] + \{a z_i - E[a z_i]\} + \varepsilon_{it} \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

A simplified version of the above equation is given below.

$$y_{it} = \beta x'_{it} + a + u_i + \varepsilon_{it} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

Equation (4) treats the term  $u_i$  to be random element for each specific panel unit.

The question of selecting a better model that fits the data is both empirical and theoretical. Hausman (1978) proposed a test that identifies systematic differences in the estimates of fixed and random effects. If systematic differences exist, then the use of fixed effects model is preferred.

Using panel data framework, we estimate two types of regression equations. First, we assume that judicial efficiency uniformly influences firms in their capital structure decision. We call it a restricted model. Second, we assume that firm-specific factors moderate the impact of judicial efficiency on firm capital structure decisions. We call this model as a less-restricted model. For the less-restricted model, we estimate differential panel data models by including interaction terms between *JE* and the independent variables. To avoid the problem of simultaneity, all explanatory variables are lagged one period back excluding volatility and *GROWTH*.

### 3.3.1. Baseline Estimation

As mentioned previously, we estimated a restricted and less-restricted model. Assuming that judicial efficiency has an equal influence on all types of firms, the following restricted model is estimated.

$$Y_{it} = a + \beta_1 SZ_{i,t-1} + \beta_2 TG_{i,t-1} + \beta_3 PROF_{i,t-1} + \beta_4 MVBV_{i,t-1} + \beta_5 VOL_i + \beta_6 NDT S_{i,t-1} + \beta_7 DVD_{i,t-1} + \beta_8 JE_i + \eta_{1-5} YRS_i + \lambda_{1-27} IND_i + \varepsilon_{it} \quad \dots \quad (5)$$

Where  $Y_{it}$  is the leverage ratio for firm  $i$  at time  $t$  and *SZ*, *TG*, *PROF*, *MVBV*, *NTDS*, and *DVD*, are lagged independent variables whereas. *JE* measures efficiency of a judicial district. *YRS* represent year dummies. Industry dummies are represent by the variable *IND*. A total of 28 industries are included in the sample. Wald-joint significance test is used for testing the joint significance of the dummy variables.

### 3.3.2. Differential Impact of Judicial Efficiency

Assuming that firm-specific factors might moderate the impact of judicial efficiency on leverage, we introduce interaction terms between the measures of judicial efficiency and dummy variables that are based on the quartiles of selected explanatory variables. We define three dummy variables and one base category for the selected explanatory variables. For example, to interact judicial efficiency with firm size, we define four dummies for firm size as follows:

$$S1 = \begin{cases} 1 & \text{if } SZ \text{ value is in the 1st quartile} \\ 0 & \text{otherwise} \end{cases}$$

$$S2 = \begin{cases} 1 & \text{if } SZ \text{ value is in the 2nd quartile} \\ 0 & \text{otherwise} \end{cases}$$

$$S4 = \begin{cases} 1 & \text{if } SZ \text{ value is in the 4th quartile} \\ 0 & \text{otherwise} \end{cases}$$

If we include all interaction terms between judicial efficiency and the dummies, it might create the problem of high multicollinearity. To avoid it, we estimate separate regressions that include interaction terms between dummies of a single explanatory variable and the *JE*. All specifications include full set of dummy variables for years and industries. Since we are interested in investigating the impact of judicial efficiency on the leverage decision of small and large firms, it will be better that the referent category is one of the middle quartiles dummy variables against which the interactive effects of the 1<sup>st</sup> and the 4<sup>th</sup> quartiles can be compared. This is why the 3<sup>rd</sup> quartile is selected to be referent category in all regression models.

## 4. RESULTS AND DISCUSSION

### 4.1. Descriptive Statistics

Table 1B reports the descriptive statistics of the variables used in this study. The mean values of *LEV1* and *LEV2* are 0.1297 and 0.5686 across all firms and time periods. The mean value of *LEV1*, which represents long-term debt to book value of total assets, is not a complete departure from what was found in other empirical studies. Rajan and Zingales (1995) report mean *LEV1* of .0980 for Germany, 0.1210 for Italy, 0.1240 for U.K., 0.1570 for France, 0.1890 for Japan, 0.2330 for U.S.A., and 0.2810 for Canada (see Table II of Rajan and Zingales). The mean value of total debt to book value of assets ratio (*LEV2*) seems to be lower by about 5-10 percentage points as compared to what Rajan and Zingales (1995) found for a sample of firms in G7 countries. However, Booth, *et al.* (2001), who studied the capital structure choices in 10 developing countries, report much higher ratios for both *LEV1* (0.260) and *LEV2* (0.656) for a sample of 96 Pakistani listed firms. One possible explanation for this might be that their sample contained only 96 firms that were included in the Karachi Stock Exchange 100 Index. Firms included in KSE-100 Index are the largest firms either in their respective sectors or in the whole lot of listed firms. This is why the sample of firms included in the study of Booth, *et al.* (2001) was predominantly large firms. It is thus expected that those firms had higher leverage ratios just like the information asymmetry and trade-off theories suggest. On the other hand, the sample used in this study is larger and includes firms of all sizes.

The descriptive statistics for several other variables warrant attention. For example, the maximum value for tangibility (*TANG*) is 0.9876 which means that the firm has only 1.24 percent current assets. It seems quite odd. This value is for Pakistan Cement Ltd. which was previously known as Chakwal Cement Company Ltd. It is important to mention that the firm had no production during the period under review. Hence, current assets were negligible. To remove all such outliers, all corresponding rows where *TANG* was above 0.95 were dropped. This exercise resulted in eliminating 18 observations. However, this dropout had no significant impact on the results.

The variable *PROF* (profitability) has a minimum of  $-0.758$  and a maximum of  $0.864$ . After a pooled OLS regression with *LEV1* and *LEV2* as dependent variables and *PROF* explanatory variable, residuals plot against *PROF* showed that there were only 3 values of *PROF* which were less than  $-0.5$  and were outlier in the plot and 3 values

greater than 0.70 which were also outliers. After removing these values, the new mean value for *PROF* did not change. However, the minimum and maximum values were  $-0.4865$  and  $0.5678$  respectively. Similar procedure was repeated for other variables to remove outliers and influential observations from the data set. This exercise resulted in losing 126 observations. All regressions were estimated after all outliers were purged out.

Table 1B

*Descriptive Statistics of Variables*

| Variables     | Median | Mean   | Std. Dev. | Minimum   | Maximum |
|---------------|--------|--------|-----------|-----------|---------|
| <i>LEVI</i>   | 0.097  | 0.1297 | 0.1459    | 0         | 0.845   |
| <i>LEV2</i>   | 0.596  | 0.5686 | 0.2062    | 0.0029    | 0.9489  |
| <i>SZ</i>     | 6.874  | 6.9734 | 1.4832    | 2.3609    | 11.9228 |
| <i>PROF</i>   | 0.0312 | 0.0419 | 0.1058    | $-1.1463$ | 0.7701  |
| <i>TANG</i>   | 0.503  | 0.499  | 0.2227    | 0.0024    | 0.9876  |
| <i>VOL</i>    | 0.705  | 1.1893 | 1.1637    | 0.0225    | 4.9265  |
| <i>GROWTH</i> | 0.13   | 0.1538 | 0.1517    | $-0.2673$ | 1.3545  |
| <i>NDTS</i>   | 0.046  | 0.0509 | 0.0451    | 0         | 0.7256  |
| <i>MVBV</i>   | 0.74   | 1.3067 | 1.7167    | 0.0009    | 11.5    |
| <i>DIV</i>    | 0.00   | 0.2527 | 0.3576    | 0         | 2.4474  |

Table 1B reports descriptive statistics of variables using panel data capabilities for a sample of 370 firms listed on KSE. *LEVI* is the ratio of long-term debt to total assets whereas *LEV2* is the ratio of total debt to total assets. *SZ* is the natural logarithm of total assets. *PROF* is the ratio of net income to total assets. *TANG* is the value of net fixed assets over total assets. *VOL* is the coefficient of variation of *PROF*. *GROWTH* is the average of annual percentage change in total assets. *MVBV* is the ratio of market value per share to book value per share. *NDTS* represents non-debt tax shields and is measured as the ratio of depreciation for the year over total assets.

In Table 1C, the matrix of correlations among the variables used in the regressions indicates that there is no serious issue of multicollinearity among the explanatory variables. *LEVI* and *LEV2* are negatively correlated with *PROF*, *GROWTH*, *NDTS* and *DIV* whereas they are positively correlated with *SZ*, *TANG*, and *VOL*. These relationships are in line with the expectations, except the proxy for volatility of net income i.e. *VOL* which according to trade-off theory should be negatively associated with leverage. It is not possible to isolate unobserved fixed effects in simple correlation; the study will be able to check the robustness and the significance of this positive relationship between *VOL* and leverage under various specifications of regression models in the next section. Relationships between explanatory variables show that large firms have more tangible assets, are more profitable, comparatively grow more than small firms, have higher market-to-book ratios, pay more dividends and have less volatile net incomes.

Table 1C

*Matrix of Correlation among the Variables*

|        | LEV1    | LEV2    | SZ      | TANG    | PROF   | MVBV    | GROWTH  | VOL     | NDTS   | DIV |
|--------|---------|---------|---------|---------|--------|---------|---------|---------|--------|-----|
| LEV1   | 1       |         |         |         |        |         |         |         |        |     |
| LEV2   | 0.521   | 1       |         |         |        |         |         |         |        |     |
| SZ     | 0.1923  | 0.1373  | 1       |         |        |         |         |         |        |     |
| TANG   | 0.5157  | 0.1908  | 0.0614  | 1       |        |         |         |         |        |     |
| PROF   | -0.255  | -0.3656 | 0.2109  | -0.2751 | 1      |         |         |         |        |     |
| MVBV   | -0.0807 | 0.0001  | 0.1791  | -0.1614 | 0.3057 | 1       |         |         |        |     |
| GROWTH | -0.0113 | 0.0271  | 0.1941  | -0.0336 | 0.274  | 0.1132  | 1       |         |        |     |
| VOL    | 0.0687  | 0.0356  | -0.2714 | 0.1763  | -0.342 | -0.1138 | -0.3173 | 1       |        |     |
| NDTS   | -0.1911 | -0.057  | 0.1333  | -0.2613 | 0.2265 | 0.2237  | 0.2377  | -0.1381 | 1      |     |
| DIV    | -0.2273 | -0.2343 | 0.1483  | -0.2626 | 0.2892 | 0.1765  | 0.059   | -0.2303 | 0.1812 | 1   |

**4.1.2. Descriptive Statistics of the Judicial Efficiency**

Table 1D provides descriptive statistics for alternative measures of judicial efficiency while Table 1E reports the matrix of correlation among these measures. Judicial efficiency in different districts as measured by the ratio of pending cases at the end of the year to cases instituted during the year (*JE1*) had a mean value of 0.794 and standard deviation of 0.326. The minimum value of this measure was 0.29 (for the Lasbella district) while the maximum value was 1.309 (for the Gujranwala district). The second measure of judicial efficiency—the ratio of pending cases at the end of the year to cases disposed of during the year (*JE2*)—demonstrate similar statistics, with a minimum value of 0.28 and a maximum of 1.43 for the same districts (i.e., Lasbella and Gujranwala, respectively). These statistics suggest that, as Lasbella is a less developed district in Baluchistan and has a smaller population, has a much smaller demand for judicial resources in comparison to other developed cities; moreover, when judicial efficiency is measured as a ratio of pending cases per thousand persons (*JE3*), Lasbella still has the lowest ratio.

While *JE4* is similar to *JE2*, the only difference is that it replaces the high courts' statistics data with Special Banking Courts data in districts where such courts are operational.

The standard deviations of all the proxies of judicial efficiency show that there are reasonable variations in the efficiency of justice across the sample districts. The matrix of correlation between *JE1*, *JE2* and *JE4* in Table 1E shows that these measures are well correlated. Such a higher correlation indicates that it will matter less to replace one measure with others. Similarly, such a property also satisfies the conditions for instrumental variables i.e. one variable can be instrumented with the others.

Table 1D

*Descriptive Statistics of the Alternative Measures of Judicial Efficiency*

| Variable   | Median | Mean  | Std. Dev. | Min   | Max   |
|------------|--------|-------|-----------|-------|-------|
| <i>JE1</i> | 0.673  | 0.794 | 0.326     | 0.291 | 1.309 |
| <i>JE2</i> | 0.727  | 0.835 | 0.341     | 0.287 | 1.438 |
| <i>JE3</i> | .019   | 0.023 | 0.021     | 0.003 | 0.05  |
| <i>JE4</i> | 0.813  | 1.004 | 0.645     | 0.159 | 2.755 |

Table 1E

*Matrix of Correlation among the Measures of Judicial Efficiency*

|            | <i>JE1</i> | <i>JE2</i> | <i>JE3</i> | <i>JE4</i> |
|------------|------------|------------|------------|------------|
| <i>JE1</i> | 1          |            |            |            |
| <i>JE2</i> | 0.969      | 1          |            |            |
| <i>JE3</i> | 0.416      | 0.352      | 1          |            |
| <i>JE4</i> | 0.457      | 0.492      | 0.112      | 1          |

Table 1D and Table 1E, show descriptive statistics, and matrix of correlation of alternative measures of the judicial efficiency. These statistics are based on time series averages of 3 years judicial data of 27 districts. *JE1* is the ratio of all pending cases to cases instituted during a year. *JE2* is the ratio of pending cases to disposed-off cases during a year. *JE3* is the ratio of pending cases at the end of a year in a judicial district high court normalised by the district population which is measured in thousands. While *JE4* is similar to *JE2*, the only difference is that it replaces the high courts' statistics data with Special Banking Courts data in districts where such courts are operational.

#### 4.2. Results of the Main Effects Model

Results of baseline regression model are reported in Table 2. This model tests the hypothesis that worsening judicial efficiency affects leverage ratios of all firms alike. The table reports regression results of both fixed effects model and random effects. The first column of Table 2 shows names of the explanatory variables. The 2nd and the 3rd columns reports coefficients of the explanatory variables from fixed and random effects models where the dependent variable is *LEV1*. Similarly, the fourth and the fifth columns show coefficients of the explanatory variables from fixed effects and random effects models where the dependent variable is *LEV2*. Standard errors (robust) are reported inside the parentheses. In both *LEV1* and *LEV2* regressions, the Hausman test rejects the null hypothesis of no systematic differences in the estimators of fixed and random effects. To know the relative significance of each variable, the study ran another set of regressions on standardised values of the explained and explanatory variables and calculated beta coefficients of the explanatory variables. These beta coefficients from fixed-effects models are reported in Table 3.

Consistent with the information asymmetry and the trade-off theories, the firm size is positively correlated with leverage in all specifications. The coefficients of the variable  $SZ_{i,t-1}$  are significant at the 1 percent level in all regressions, irrespective of whether leverage is measured as a ratio of long-term debt-to-total-assets (*LEV1*) or total debt to total assets (*LEV2*). In addition to its statistical significance, the size of a firm also has the largest economic significance. As shown in Table 3 (column *LEV1*), the beta coefficient estimated by the fixed effects model indicates that one standard deviation increase in  $SZ_{i,t-1}$  will increase *LEV1* by approximately 0.796 standard deviations. In the second regression in which the dependent variable is *LEV2*, the size of a firm still has the largest economic significance i.e., one standard deviation increase in  $SZ_{i,t-1}$  increases *LEV2* by 0.516 standard deviations.

The coefficient for  $TG_{i,t-1}$  is positive and statistically significant in three regressions. However, it is insignificant in the fixed-effects model in which the dependent variable is  $LEV2$ . The results suggest that the tangibility of assets matters only in the case of long-term financing. Since  $LEV2$  is a ratio of total-debt-to-assets, it includes all types of short-term and long-term liabilities. Short-term liabilities also include spontaneous financing such as wages payable, utilities and overhead expenses payable, and other accounts payable. The persons and/or organisations to whom these accounts are payable usually do not ask for collateral or see how many fixed assets the firm have. This may be one reason why  $TG_{i,t-1}$  is not significantly related to  $LEV2$ .

Table 2

*Results of the Main Effects Model*

| Variables                    | <i>LEV1</i>    |                 | <i>LEV2</i>     |                |
|------------------------------|----------------|-----------------|-----------------|----------------|
|                              | Fixed-effects  | Random-effects  | Fixed-effects   | Random-effects |
| $SZ_{i,t-1}$                 | 0.075(0.012)*  | 0.028(0.004)*   | 0.071(0.015)*   | 0.028(0.007)*  |
| $TANG_{i,t-1}$               | 0.09(0.042)**  | 0.175(0.025)*   | 0.059(0.049)    | 0.103(0.034)*  |
| $PROF_{i,t-1}$               | -0.039(0.04)   | -0.1(0.035)*    | -0.165(0.061)*  | -0.261(0.06)*  |
| $MVBV_{i,t-1}$               | 0.014(0.004)*  | 0.008(0.003)**  | 0.017(0.005)*   | 0.015(0.004)*  |
| $VOL_j$                      | -0.063(0.017)* | -0.002(0.005)   | 0.03(0.014)**   | 0.009(0.008)   |
| $NDTS_{i,t-1}$               | -0.196(0.207)  | -0.396(0.175)** | -0.181(0.263)   | -0.272(0.229)  |
| $DIV_{i,t-1}$                | -0.029(0.009)* | -0.039(0.009)*  | -0.023(0.012)** | -0.043(0.011)* |
| $JE_i$                       | -0.123(0.155)  | -0.001(0.028)   | -0.182(0.121)   | 0.046(0.045)   |
| Constant                     | -0.169(0.182)  | -0.029(0.089)   | 0.125(0.188)    | 0.269(0.125)** |
| $R^2$ – Within               | 0.075          | 0.052           | 0.067           | 0.054          |
| - Between                    | 0.087          | 0.424           | 0.027           | 0.343          |
| - Overall                    | 0.078          | 0.345           | 0.041           | 0.314          |
| F-Statistics / Wald $\chi^2$ | 5.930 (0.00)   | 367 (0.00)      | 5.97 (0.000)    | 254 (0.00)     |
| Hausman - $\chi^2$           | 25.66 (0.00)   |                 | 61.91 (0.00)    |                |

The second and the third columns show coefficients of these variables from fixed and random effects models where the dependent variable is  $LEV1$ . Similarly, the fourth and the fifth columns show coefficients of the explanatory variables from fixed effects and random effects models where the dependent variable is  $LEV2$ . Standard errors (robust) are reported inside the parentheses. Symbols \*, \*\*, and \*\*\* indicate significance level at 1 percent level, 5 percent level, and 10 percent level respectively.  $LEV1$  is the ratio of long-term debt to total assets whereas  $LEV2$  is the ratio of total debt to total assets.  $SZ$  is the natural logarithm of total assets.  $PROF$  is the ratio of net income to total assets.  $TG$  is the value of net fixed assets over total assets.  $VOL$  is the coefficient of variation of  $PROF$ .  $MVBV$  is the ratio of market value per share to book value per share.  $NDTS$  represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets.  $DIV$  is the ratio of dividends divided by net income.

The economic significance of the relationship between  $TG_{i,t-1}$  and  $LEV2$  is also negligible. For example, one standard deviation increase in  $TG_{i,t-1}$  will lead to a mere 0.064 deviations increase in  $LEV2$ .

The results of Table 2 lend mixed support to the pecking order theory. The variable  $PROF_{i,t-1}$  is significantly related to  $LEV1$  and  $LEV2$  in three regressions at 1 percent level of significance whereas its coefficient is not significant in the fixed effects model where the dependent variable is  $LEV1$ . The sign of  $PROF_{i,t-1}$  in all regression

models is negative which is line with the prediction of the pecking-order theory. However, the variable itself has the lowest economic significance among all explanatory variables. One standard deviation increase the profitability of a firm relative to total assets will reduce *LEV1* and *LEV2* by only 0.025 and 0.073 standard deviations respectively.

Table 3  
*Regression Results of Standardised Variables*

| Variables      | <i>LEV1</i>       | <i>LEV2</i>       |
|----------------|-------------------|-------------------|
|                | Beta Coefficients | Beta Coefficients |
| $SZ_{i,t-1}$   | 0.796             | 0.516             |
| $TG_{i,t-1}$   | 0.141             | 0.064             |
| $PROF_{i,t-1}$ | -0.025            | -0.073            |
| $MVBV_{i,t-1}$ | 0.105             | 0.084             |
| $VOL_i$        | -0.507            | 0.164             |
| $NDTS_{i,t-1}$ | -0.028            | -0.018            |
| $DIV_{i,t-1}$  | -0.067            | -0.037            |
| $JE_i$         | -0.185            | -0.187            |

Table 3 presents regression results of standardised variables of 370 KSE listed firms, regressing leverage ratios on measure of judicial efficiency and other control variables. The second and the third columns show coefficients of these variables from fixed effects model where the dependent variables are *LEV1* and *LEV2* respectively. *LEV1* is the ratio of long-term debt to total assets whereas *LEV2* is the ratio of total debt to total assets. *SZ* is the natural logarithm of total assets. *PROF* is the ratio of net income to total assets. *TG* is the value of net fixed assets over total assets. *VOL* is the coefficient of variation of *PROF*. *GROWTH* is the average of annual percentage change in total assets. *MVBV* is the ratio of market value per share to book value per share. *NDTS* represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets. *DIV* is the ratio of dividends divided by net income.

The variable  $MVBV_{i,t-1}$  is positively correlated with *LEV1* and *LEV2* in all fixed-effects and random-effects models. However, the direction of the relationship becomes negative when growth opportunities are measured as the average percentage increase in total assets (denoted by the variable *GROWTH*). This shows that the relationship between growth opportunities and leverage is not robust to the alternative proxies of growth opportunities. The beta coefficient of  $MVBV_{i,t-1}$  indicates that a positive change of one standard deviation will increase *LEV1* by 0.105 standard deviations and *LEV2* by 0.084 standard deviations.

The results of Table 3 indicate that firms with more volatile incomes have lower long-term leverage ratios. The coefficient of  $VOL_i$  is negative in *LEV1* regressions and positive in *LEV2* regressions and the statistical and economic significance of  $VOL_i$  is greater for *LEV1* than for *LEV2*. The results suggest that the volatility of net income-to-total-assets will negatively influence only long-term leverage, possibly because long-term debt has greater default risk than short-term debt, and because return volatility, as one of the key sources of default risk, is more a matter of concern for the providers of long-term

financing. The positive coefficient of the proxy for return volatility in *LEV2* regression contradicts the prediction of trade-off theory.  $VOL_i$  is statistically significant at the 1 percent level of significance in the regression when the dependent variable is *LEV1* and at the 5 percent level in the regression when the dependent variable is *LEV2*. Likewise its statistical significance, the economic significance of  $VOL_i$  is also dramatic for *LEV1*; for example, an increase of one standard deviation in  $VOL_i$  will reduce *LEV1* by 0.507 standard deviations. As far as the variable non-debt tax shields (*NDTS*) is concerned, it is almost insignificant in all models.

Results indicate that firms that pay more in dividends and retain less of their net profits have lower leverage ratios. Theoretically, if a firm distributes a higher percentage of its net profit in dividends, it will require more outside financing, which according to pecking order theory, should be first debt-financing and then equity financing. This way, the proxy for dividends ( $DIV_{i,t-1}$ ) and leverage should be positively correlated. In contrast to this line of argument, however, one interesting aspect of the relationship between dividends and leverage is highlighted here. Firms that pay dividends are *presumably* profitable firms, while those that do not pay dividends are either less profitable or not profitable at all. A firm that is more profitable and distributes less than 100 percent of its net income will retain more in rupee terms than a firm that is less profitable or not profitable whatsoever. If so, it will need less outside financing than the one that retains nothing because of its lower or zero net profit. Resultantly, the relationship between dividends and leverage is negative. In the regressions, such a possibility cannot be completely ruled out because analysis of the data reveals that there are approximately 30 percent observations of the total sample where the *PROF* has value closer to zero or below zero. Moreover, out of total sample, dividend is zero in more than 50 percent of observations. The average profitability in all these observations is -0.3 percent. Testing a relationship between dividends and leverage ratio like the one discussed above requires the development of proper interaction terms between profitability and dividends. However, since the focus of the present study is on testing the relationship between judicial efficiency and leverage, the study leaves testing the above hypothesis to future research.

Finally the influence of judicial inefficiency on leverage ratios of firms included in the sample is negative; however, the relationship is statistically insignificant at any conventional level. The negative sign of the coefficient of the variable  $JE_i$  is in accordance with the theoretical predictions of this study, but its statistical insignificance suggests that its standard error is larger than the acceptable threshold level. This might be due to the composition effect i.e. firms in different quartiles of *SZ*, *TG*, *PROF*, *MVBV*, *VOL* and *DIV* are not uniformly influenced by the worsening judicial efficiency. To explore this possibility, the study partitions the effect of inefficiency of courts on the leverage ratios of firms belonging to the four quartiles of the explanatory variables in the following set of regressions.

#### 4.3. Results of Regressions with Interaction Terms

This section discusses the results of regression models that interacted with dummy variables based on the quartiles of selected firm attributes with the measure of judicial efficiency. The results are reported in Table 4 and Table 5. Table 4 presents results of

regression models where the dependent variable is long-term debt-to-total-assets (*LEV1*) and Table 5 presents regression results of regression models where the dependent variable is total debt-to-total-assets (*LEV2*). The heads of the tables display names of the explanatory variables for which interaction terms were included to test the differential impact of judicial efficiency on the leverage ratios of firms belonging to the four quartiles of these variables. The differential impact of each selected variable in the leverage equation is estimated with both fixed effects and random effects models. For instance, second column of Table 4 shows results obtained interacting *SZ* quartiles with *JE* from fixed effects model whereas third column shows results of the same interactions from random effects model. Standard errors are reported inside the parentheses. Wald-test is also applied to the interaction terms in each regression to test the joint significance of these interactions. In all regressions, results of the Hausman test indicate that the null hypothesis of no systematic differences in the estimators of fixed and random effects models can safely be rejected. Therefore, preferred models would be fixed-effects models in this section.

Since the third quartiles of each variable were dropped, the coefficient of *JE* shows how judicial efficiency affects the leverage decision of firms that are in the 3<sup>rd</sup> quartile of a selected explanatory variable. For example, coefficient of *JE* in Table 4: Panel A under the head of column *SZ* is actually the slope of the judicial efficiency for firms belonging to the third quartile of *SZ*. Coefficients of the interaction terms like *S1\*JE*, *S2\*JE* and *S4\*JE* are the incremental slopes of judicial efficiency above (if coefficient of the interaction term is positive) or below (if coefficient of the interaction term is negative) the slope of *JE* (comprehensive discussion on testing and interpreting interaction terms is given in the seminal book by Cohen, Cohen, West, and Aiken (2003)). Normal t-test can be used to find the statistical significance of these interaction terms. Details of the variables and tests reported in Panel B are given under Panel A of Table 4. Panel B reports the regression results where *JE* was interacted with the dummy variables based on *PROF* and *DIV*.

Results reported in the second and third columns of Table 4: Panel A suggest that the coefficients of *S1\*JE*, *S2\*JE* and *S4\*JE* are significantly different from the reference category. The Wald-test shows that these interactions terms are jointly significant. Specifically, coefficients of the first and the second interacted variables are negative while coefficient of the fourth variable is positive indicating that, other things remaining constant, leverage ratios of firms belonging to the first and second quartiles of *SZ* will significantly be lower than firms belonging to the third quartile when judicial efficiency worsens and, at the same time, leverage ratios of firms belonging to the fourth quartile of *SZ* will significantly be higher than firms in the third quartile. For example, the estimated coefficient of *JE* indicate that with one hundred percentage points increase in *JE*, leverage ratio (*LEV1*) of a firm belonging to the third quartile of *SZ* will decrease by 2.9 percent, whereas the decrease in *LEV1* will be 9.4 percent (i.e. (-2.9 percent) + (-6.5 percent)) and 5.4 percent (i.e. (-2.9 percent) +(-2.5 percent)), for firms in the first quartile and the second quartiles respectively [a quick review on obtaining and interpreting normal and differential coefficients of interactions terms between dummy variables and continuous variables is given in Yip and Tsang (2007)]<sup>1</sup>

<sup>1</sup>Detailed discussion on the alternative methods of using and interpreting interaction terms is given in Cohen, Cohen, West, and Aiken (2003).

Table 4

## Panel A - Regression Results with Interaction Effects

| Variables                  | SIZE            |                 | TANG            |                |
|----------------------------|-----------------|-----------------|-----------------|----------------|
|                            | Fixed           | Random          | Fixed           | Random         |
| $SZ_{i,t-1}$               | 0.056(0.012)*   | 0.008(0.005)    | 0.072(0.012)*   | 0.027(0.004)*  |
| $TANG_{i,t-1}$             | 0.078(0.041)*** | 0.17(0.025)*    | 0.07(0.042)***  | 0.112(0.03)*   |
| $PROF_{i,t-1}$             | -0.056(0.039)   | -0.114(0.035)*  | -0.03(0.039)    | -0.094(0.034)* |
| $MVBV_{i,t-1}$             | 0.013(0.004)*   | 0.008(0.003)**  | 0.014(0.004)*   | 0.009(0.003)*  |
| $VOL_i$                    | -0.069(0.017)*  | 0.00(0.005)     | -0.068(0.017)*  | -0.003(.005)   |
| $NDTS_{i,t-1}$             | -0.211(0.2)     | -0.4(0.171)**   | -0.172(0.203)   | -0.365(.174)** |
| $DIV_{i,t-1}$              | -0.029(0.009)*  | -0.037(0.008)*  | -0.029(0.009)*  | -0.038(0.008)* |
| $JE_i$                     | -0.029(0.158)   | 0.015(0.029)    | -0.155(0.155)   | -0.002(0.029)  |
| $S1 \times JE$             | -0.065(0.019)*  | -0.046(0.014)*  |                 |                |
| $S2 \times JE$             | -0.025(0.01)*   | -0.018(0.008)** |                 |                |
| $S4 \times JE$             | 0.04(0.012)*    | 0.045(0.01)*    |                 |                |
| $T1 \times JE$             |                 |                 | -0.021(.013)*** | -0.026(.011)** |
| $T2 \times JE$             |                 |                 | -0.012(0.008)   | -0.017(.007)** |
| $T4 \times JE$             |                 |                 | 0.034(0.009)*   | 0.033(0.008)*  |
| Constant                   | -0.087(0.182)   | 0.088(0.089)    | -0.05(0.18)     | -0.024(0.092)  |
| R <sup>2</sup> - Within    | 0.0948          | 0.0684          | 0.0928          | 0.0739         |
| - Between                  | 0.0854          | 0.4346          | 0.1232          | 0.4237         |
| - Overall                  | 0.0786          | 0.3567          | 0.1107          | 0.3534         |
| F-Statistics/              | 5.79(0.00)      | -               | 5.19(0.00)      | -              |
| Wald Chi <sup>2</sup>      | -               | 405(0.00)       | -               | 383.2(0.00)    |
| Wald (Joint)               | 5.04(0.00)      | 25.1(0.00)      | 4.36(0.00)      | 23.82(0.00)    |
| Hausman - Chi <sup>2</sup> | 39.0(0.00)      |                 | 26.38(0.00)     |                |

Table 4: Panel A, Panel B and Panel C presents results of regression models with interaction effects where leverage ratio ( $LEV1$ ) of 370 KSE listed firms is regressed on a measure of judicial efficiency as well as on the interaction terms of  $JE$  quartiles of explanatory variables. The second and the third columns show coefficients of these variables from fixed effects and random effects models where the dependent variable is  $LEV1$ . Similarly, the fourth and the fifth columns show coefficients of the explanatory variables from fixed effects and random effects models where the dependent variable is  $LEV2$ . Standard errors (robust) are reported inside the parentheses. Symbols \*, \*\*, and \*\*\* indicate significance level at 1 percent level, 5 percent level, and 10 percent level respectively. We include year and industry dummies in each regression.  $LEV1$  is the ratio of long-term debt to total assets whereas  $LEV2$  is the ratio of total debt to total assets.  $SZ$  is the natural logarithm of total assets.  $PROF$  is the ratio of net income to total assets.  $TG$  is the value of net fixed assets over total assets.  $VOL$  is the coefficient of variation of  $PROF$ .  $NDTS$  represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets.  $DIV$  is the ratio of dividends divided by net income.

Table 4

## Panel B - Regression Results with Interaction Effects

| Variables                  | PROF            |                | DIV            |                 |
|----------------------------|-----------------|----------------|----------------|-----------------|
|                            | Fixed           | Random         | Fixed          | Random          |
| $SZ_{i,t-1}$               | 0.073(0.012)*   | 0.028(0.004)*  | 0.074(0.012)*  | 0.029(0.004)*   |
| $TG_{i,t-1}$               | 0.083(0.042)**  | 0.167(0.025)*  | 0.088(0.041)** | 0.169(0.025)*   |
| $PROF_{i,t-1}$             | -0.028(0.04)    | -0.069(.036)** | -0.032(0.039)  | -0.087(0.035)*  |
| $MVBV_{i,t-1}$             | 0.015(0.004)*   | 0.01(0.003)*   | 0.014(0.004)*  | 0.009(0.003)*   |
| $VOL_i$                    | -0.065(0.016)*  | -0.004(.005)   | -0.063(0.017)* | -0.003(0.005)   |
| $NDTS_{i,t-1}$             | -0.201(0.207)   | -0.383(.174)** | -0.197(0.209)  | -0.385(0.175)** |
| $DIV_{i,t-1}$              | -0.028(0.009)*  | -0.036(0.008)* | -0.029(0.009)* | -0.037(0.008)*  |
| $JE_i$                     | -0.12(0.15)     | -0.003(0.028)  | -0.124(0.153)  | 0.006(0.028)    |
| $P1 \times JE$             | 0.007(0.008)    | 0.016(0.008)** |                |                 |
| $P2 \times JE$             | 0.009(0.008)    | 0.015(0.007)** |                |                 |
| $P4 \times JE$             | -0.017(0.007)** | -0.021(0.006)* |                |                 |
| $D1 \times JE$             |                 |                | -0.016(0.006)* | -0.018(0.005)*  |
| Constant                   | -0.116(0.178)   | -0.023(0.091)  | -0.163(0.181)  | -0.027(0.09)    |
| R <sup>2</sup> - Within    | 0.0827          | 0.0621         | 0.081          | 0.0595          |
| - Between                  | 0.1012          | 0.4404         | 0.0967         | 0.4251          |
| - Overall                  | 0.0913          | 0.3581         | 0.0865         | 0.3465          |
| F-Statistics/              | 5.34(0.00)      | -              | 5.73(0.00)     | -               |
| Wald Chi <sup>2</sup>      | -               | 395(0.00)      | -              | 372(0.00)       |
| Wald (Joint)               | 2.17(0.07)      | 21.77(0.00)    | 3.57(0.03)     | 9.6(0.00)       |
| Hausman - Chi <sup>2</sup> | 47.43(0.00)     |                | 40.39(0.00)    |                 |

Details of the variables and tests reported in Panel B are given under Panel A of Table 4. Panel B reports the regression results where  $JE$  was interacted with the dummy variables based on  $VOL$  and  $MVBV$ .

Interestingly, worsening judicial efficiency has positive impact on the leverage ratios of firms belonging to the fourth quartile of  $SZ$ . For example, the slope of  $S4*JE$  is .04 which indicate that one hundred percentage points increase in  $JE$  will lead to 1.1 percent (i.e. -2.9 percent + 4 percent) increase in the leverage ratio of firms belonging to the fourth quartile of  $SZ$ . This is an indication that lenders reduce credit to small firms and redistribute the same to large firms when judicial efficiency deteriorates. This finding has some resemblance to the findings of Gropp, *et al.* (1997) who used U.S. cross-state data to determine the impact of personal bankruptcy laws in various U.S. states in relation to lending to low-assets households. They found that lending to households with low-assets intensity was lower in states with more exemptions than to households with high-assets intensity.

These results have also similarity with the findings of Fabbri and Padula (2004) who found that inefficient enforcement of credit contracts redistributes credit from poor households to wealthy households. These results are robust to whether leverage is measured by the ratio of long-term-debt-to-total-assets ( $LEVI$ ) or the ratio of total-debt-to-total-assets ( $LEV2$ ). Results of the regressions where the dependent variable is  $LEV2$  are reported in Table 5.

Table 4: Panel C

## Regression Results with Interaction Effects

| Variables                  | VOL            |                 | MVBV           |                |
|----------------------------|----------------|-----------------|----------------|----------------|
|                            | Fixed          | Random          | Fixed          | Random         |
| $SZ_{i,t-1}$               | 0.075(0.012)*  | 0.026(0.004)*   | 0.075(0.012)*  | 0.027(0.004)*  |
| $TG_{i,t-1}$               | 0.09(0.042)**  | 0.179(0.025)*   | 0.09(0.041)**  | 0.173(0.025)*  |
| $PROF_{i,t-1}$             | -0.039(0.04)   | -0.1(0.034)*    | -0.051(0.039)  | -0.111(0.034)* |
| $MVBV_{i,t-1}$             | 0.014(0.004)*  | 0.008(0.003)**  | 0.012(0.004)*  | 0.004(0.003)   |
| $VOL_i$                    | -0.008(0.016)  | 0.01(0.009)     | -0.07(0.018)*  | -0.001(0.005)  |
| $NDTS_{i,t-1}$             | -0.196(0.207)  | -0.416(0.174)** | -0.214(0.208)  | -0.42(0.177)** |
| $DIV_{i,t-1}$              | -0.029(0.009)* | -0.04(0.009)*   | -0.03(0.009)*  | -0.041(0.009)* |
| $JE_i$                     | 0.207(0.087)** | -0.013(0.029)   | -0.107(0.162)  | 0.013(0.029)   |
| $V1 \times JE$             | -0.061(0.046)  | 0.046(0.016)*   |                |                |
| $V2 \times JE$             | -0.398(0.138)* | 0.025(0.015)*** |                |                |
| $V4 \times JE$             | -0.261(0.067)* | -0.012(0.024)   |                |                |
| $M1 \times JE$             |                |                 | -0.042(0.01)*  | -0.036(0.008)* |
| $M2 \times JE$             |                |                 | -0.021(0.008)* | -0.02(0.007)*  |
| $M4 \times JE$             |                |                 | 0(0.007)       | 0(0.007)       |
| Constant                   | -0.495(0.22)** | -0.081(0.071)   | -0.156(.184)   | -0.027(0.029)  |
| R <sup>2</sup> - Within    | 0.0754         | 0.0537          | 0.0927         | 0.0677         |
| - Between                  | 0.0876         | 0.3526          | 0.0765         | 0.4255         |
| - Overall                  | 0.0783         | 0.3263          | 0.0701         | 0.3518         |
| F-Statistics/              | 5.93(0.00)     | -               | 5.51(0.00)     | -              |
| Wald Chi <sup>2</sup>      | -              | 261.3(0.00)     | -              | 380.88(0.00)   |
| Wald (joint)               | 16.86(0.00)    | 8.3(0.08)       | 4.42(0.00)     | 17.85(0.00)    |
| Hausman - Chi <sup>2</sup> | 55.1(0.00)     |                 | 42.1(0.00)     |                |

As far as the relevance of tangible assets in the leverage equation is concerned, there is some evidence in support of the hypothesis of this study. Results of the fixed-effects model in Table 4 (Panel A) demonstrate that in the presence of inefficient courts, firms in the first quartile of  $TG$  will have lower leverage ratios ( $LEV1$ ) than firms in the third quartile, and firms in the fourth quartile of  $TG$  will have higher leverage ratios than firms in the third quartile. The differential slope of  $T1*JE$  and  $T4*JE$  are significant at 10 percent and 1 percent whereas  $T2*JE$  is insignificant. Similar to the results of the main effects model, Table 5 (Panel A) shows that there is no clear indication that tangibility matters in total-debts-to-total-assets ( $LEV2$ ) ratio. In all fixed-effects models of the Table 5 (Panel A), the coefficients of  $TG$  are insignificant at conventional levels which implies that tangibility does not influence total-debt-to-total-assets ratio when  $JE$  is zero.

Past profitability has explanatory power only in  $LEV2$  regressions as shown in Table 5: Panel B. Results of the fixed-effects models in Table 4: Panel B reveal that neither the coefficient of  $PROF_{i,t-1}$  nor its interaction terms is significantly different from zero. This confirms the results of the main effects model where profitability had a poor explanatory power in  $LEV1$  regression. The interaction terms between  $PROF$  and  $JE$  in Panel B of Table 5 imply that one hundred percentage increases in  $JE$  will reduce the

leverage ratio of a firm in the third quartile of profitability by 5.8 percentage points. Similarly, at the same time, firm in the fourth quartile of profitability will have 3.9 percentage points lower leverage ratio than a firm in the third quartile. These results are consistent with the hypothesis that in the presence of poor enforcement of creditors' rights, the problem of information asymmetry and the adverse selection could be severe and pecking order theory would strictly hold. However, it is not clear why profitability matters in total-debt-to-assets ratio and not in long-term-debt-to-assets ratio.

To test the relevance of pecking-order theory in less efficient judicial system from another angle, the next proxy is  $DIV_{i,t-1}$ . According to pecking-order theory, a firm that pays higher percentage of its profit in dividends will use more debt-financing. This way the relationship between dividends and leverage should be positive. It is important to mention that out of the total of 1850 observations in the sample,  $DIV_{i,t-1}$  has a value of zero in 928 observations. The average profitability is  $-0.3$  percent in all observations where  $DIV_{i,t-1}$  is zero. These results lend support to the earlier postulation that a negative relationship may be expected between dividends and leverage if some firms do not pay dividends due to losses or zero operating profits while others distribute less than 100 percent of their net incomes in dividends. Since the values of  $DIV_{i,t-1}$  are zero up to the second quartile, all firms were distributed only in two groups: one that pays out dividends and the other that does not.  $DI$  in the interaction term represents dummy variable for firms that pay dividends whereas the missing category is represented by the coefficient of  $JE$ .

Results from both  $LEV1$  and  $LEV2$  (Table 4: Panel B and Table 5: Panel B) regressions indicate that in the presence of judicial inefficiency, dividends paying firms have lower leverage ratios than those that do not pay dividends. Seemingly odd, but the results are line with the pecking-order theory as par the explanation given above.

As far as volatility of net income is concerned, its sign and significance are not stable under different specifications. In  $LEV1$  regressions (Table 4: Panel C), the coefficient of  $VOL_i$  is not statistically significant in the fixed effects model whereas result of the Wald-test demonstrate that its interaction terms are jointly insignificant in both fixed-effects and random-effects models. In  $LEV2$  regressions, its coefficient and interaction terms are insignificant yet again in the random-effects model. Only in the fixed effects models of  $LEV2$ , results indicate that under poor enforcement of contracts firms in the fourth quartile of  $VOL$  have lower leverage ratios as compared to the ones in the third quartile; and firms in the first quartile of  $VOL$  have higher leverage ratios than firms in the third quartile.

The proxy for growth opportunities,  $MVBV$ , exhibits very interesting phenomenon. Its positive coefficient throughout all specifications contradicts the predictions of the agency model developed by Jensen and Meckling (1976). The results are also inconsistent with the argument of Titman and Wessels (1988) who say that growth opportunities should not increase leverage because they cannot serve as collateral to debts. In fact, the positive coefficient of  $MVBV_{i,t-1}$  suggests that in the absence of judicial inefficiency, growth opportunities increase leverage. However, when dummy variables based on the quartiles of  $MVBV$  are interacted with  $JE$ , the results show that when faced with inefficient judicial system, more growing firms will have lower leverage ratio than less growing firms.

Table 5: Panel A  
 Regression Results with Interaction Effects  
 (Using Long-term Debt/Assets as Dependent Variable)

| Variables                  | SZ              |                 | TG               |                |
|----------------------------|-----------------|-----------------|------------------|----------------|
|                            | Fixed           | Random          | Fixed            | Random         |
| $SZ_{i,t-1}$               | 0.048(0.016)*   | 0.007(0.009)    | 0.077(0.015)*    | 0.029(0.007)*  |
| $TG_{i,t-1}$               | 0.041(0.048)    | 0.096(0.034)*   | 0.09(0.048)***   | 0.16(0.038)*   |
| $PROF_{i,t-1}$             | -0.186(0.06)*   | -0.276(0.059)*  | -0.167(0.06)*    | -0.261(0.059)* |
| $MVBV_{i,t-1}$             | 0.015(0.005)*   | 0.014(0.004)*   | 0.017(0.005)*    | 0.015(0.004)*  |
| $VOL_i$                    | 0.022(0.014)    | 0.011(0.008)    | 0.029(0.014)**   | 0.01(0.008)    |
| $NDTS_{i,t-1}$             | -0.214(0.256)   | -0.298(0.226)   | -0.171(0.254)    | -0.277(0.225)  |
| $DIV_{i,t-1}$              | -0.023(0.012)** | -0.042(0.011)*  | -0.023(0.012)*** | -0.043(0.011)* |
| $JE_i$                     | -0.057(0.125)   | 0.081(0.046)*** | -0.188(0.123)    | 0.028(0.045)   |
| $S1 \times JE$             | -0.09(0.024)*   | -0.063(0.02)*   |                  |                |
| $S2 \times JE$             | -0.056(0.014)*  | -0.044(0.012)*  |                  |                |
| $S4 \times JE$             | 0.037(0.016)**  | 0.03(0.013)**   |                  |                |
| $T1 \times JE$             |                 |                 | 0.073(0.016)*    | 0.057(0.015)*  |
| $T2 \times JE$             |                 |                 | 0.04(0.01)*      | 0.03(0.009)*   |
| $T4 \times JE$             |                 |                 | -0.006(0.012)    | -0.004(0.011)  |
| Constant                   | 0.231(0.186)    | 0.395(0.127)*   | 0.071(0.182)     | 0.258(0.14)*** |
| R <sup>2</sup> -Within     | 0.0908          | 0.0737          | 0.0885           | 0.0704         |
| - Between                  | 0.0207          | 0.3327          | 0.0136           | 0.339          |
| - Overall                  | 0.038           | 0.3117          | 0.0294           | 0.3146         |
| F-Statistics/              | 6.38(0.00)      | -               | 6.47(0.00)       | -              |
| Wald Chi <sup>2</sup>      | -               | 280.95(0.00)    | -                | 269.6(0.00)    |
| Wald (joint)               | 2.17(0.07)      | 21.77(0.00)     | 3.57(0.03)       | 9.6(0.00)      |
| Hausman - Chi <sup>2</sup> | 65.31(0.00)     |                 | 100.6(0.00)      |                |

Tables 5: Panel A, Panel and B present results of regression models with interaction effects where leverage ratio ( $LEV2$ ) of 370 KSE listed firms is regressed on a measure of judicial efficiency, as well as on the interaction terms of  $JE$  quartiles of explanatory variables. The second and the third columns show coefficients of these variables from fixed effects and random effects models where the dependent variable is  $LEV1$ . Similarly, the fourth and the fifth columns show coefficients of the explanatory variables from fixed effects and random effects models where the dependent variable is  $LEV2$ . Standard errors (robust) are reported inside the parentheses. Symbols \*, \*\*, and \*\*\* indicate significance level at 1 percent level, 5 percent level, and 10 percent level respectively. We include year and industry dummies in each regression.  $LEV1$  is the ratio of long-term debt to total assets whereas  $LEV2$  is the ratio of total debt to total assets.  $SZ$  is the natural logarithm of total assets.  $PROF$  is the ratio of net income to total assets.  $TG$  is the value of net fixed assets over total assets.  $VOL$  is the coefficient of variation of  $PROF$ .  $NDTS$  represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets.  $DIV$  is the ratio of dividends divided by net income.

Table 5: Panel B

*Regression Results with Interaction Effects*  
(Using Long-term Debt/Assets as Dependent Variable)

| Variables                  | PROF            |                | DIV            |                |
|----------------------------|-----------------|----------------|----------------|----------------|
|                            | Fixed           | Random         | Fixed          | Random         |
| $SZ_{i,t-1}$               | 0.061(0.015)*   | 0.028(0.007)*  | 0.07(0.015)*   | 0.029(0.007)*  |
| $TG_{i,t-1}$               | 0.033(0.047)    | 0.077(0.034)** | 0.055(0.048)   | 0.093(0.034)*  |
| $PROF_{i,t-1}$             | -0.128(0.059)** | -0.188(0.056)* | -0.153(0.06)*  | -0.24(0.059)*  |
| $MVBV_{i,t-1}$             | 0.021(0.005)*   | 0.021(0.005)*  | 0.017(0.005)*  | 0.015(0.004)*  |
| $VOL_i$                    | 0.025(0.013)**  | 0(0.008)       | 0.03(0.014)**  | 0.005(0.008)   |
| $NDTS_{i,t-1}$             | -0.213(0.251)   | -0.255(0.22)   | -0.183(0.263)  | -0.258(0.228)  |
| $DIV_{i,t-1}$              | -0.02(0.012)*** | -0.035(0.011)* | -0.023(.012)** | -0.04(0.011)*  |
| $JE_i$                     | -0.192(0.099)** | 0.029(0.043)   | -0.185(0.118)  | 0.063(0.045)   |
| $P1 \times JE$             | 0.058(0.01)*    | 0.071(0.01)*   |                |                |
| $P2 \times JE$             | 0.046(0.008)*   | 0.055(0.008)*  |                |                |
| $P4 \times JE$             | -0.039(0.011)*  | -0.046(0.01)*  |                |                |
| $D1 \times JE$             |                 |                | -0.028(0.008)* | -0.035(0.007)* |
| Constant                   | 0.297(0.181)*** | 0.133(2.4)*    | 0.136(0.187)   | 0.257(0.126)** |
| R <sup>2</sup> - Within    | 0.1292          | 0.1212         | 0.0783         | 0.0664         |
| - Between                  | 0.1053          | 0.4161         | 0.0391         | 0.3577         |
| - Overall                  | 0.1288          | 0.3838         | 0.0548         | 0.3283         |
| F-Statistics/              | 10.27(0.00)     | -              | 6.46(0.00)     | -              |
| Wald Chi <sup>2</sup>      | -               | 422.1(0.00)    | -              | 290.42(0.00)   |
| Wald (Joint)               | 2.17(0.07)      | 23.47(0.00)    | 4.21(.03)      | 8.7(0.014)     |
| Hausman - Chi <sup>2</sup> | 27.02 (.001)    |                | 18.16(.052)    |                |

Details of the variables and tests reported in Panel B are given under Panel A of Table 5. Panel B reports the regression results where  $JE$  was interacted with the dummy variables based on  $PROF$  and  $DIV$ .

#### 4.4. Robustness Checks

To check robustness of the results, several alternative methods are employed next.

##### 4.4.1. Results of Regression Involving $JE$ Dummies

First of these checks is to divide the sample of judicial districts into two groups. Group one includes districts where the  $JEI$  is above the 50th percentile while group two has districts where  $JEI$  is below the 50th percentile. Using a dummy variable scheme of  $g-1$ , a dummy variable  $JED$  is defined for the first group. This  $JED$  variable is interacted with the included explanatory variables. The interaction terms will highlight the significance of a variable of interest for leverage ratios in districts where judicial efficiency is below the 50th percentile. Based on the discussion in the theoretical framework section, it is expected that interaction terms involving  $TG$ ,  $SZ$ , and  $DIV$  will have positive differential slopes whereas  $PROF$ ,  $VOL$ , and  $MVBV$  will have negative differential slopes. Moreover, the coefficient of the dummy variable  $JE$  is expected to be negative. Since, almost in all previous regressions, the Hausman test favoured the use of fixed-effects models, this section reports only the results of fixed-effects regressions, where the dependent variable is  $LEVI$ . The results are shown in Table 6.

In Table 6, the results indicate that the interaction terms of *SZ* and *TG* are significant and, as expected, positive. Interaction terms of other variables are either insignificant or unexplainable.

Table 6

| <i>Regression with JE Dummies and Interaction Terms</i> |                 |                  |                 |                |
|---|-----------------|------------------|-----------------|----------------|
| Variables   | <i>SZ</i>       | <i>TG</i>        | <i>PROF</i>     | <i>VOL</i>     |
| <i>SZ</i> <sub><i>i,t-1</i></sub>                       | 0.065(0.013)*   | 0.074(0.012)*    | 0.073(0.012)*   | 0.075(0.012)*  |
| <i>TG</i> <sub><i>i,t-1</i></sub>                       | 0.095(0.041)**  | 0.074(0.042)***  | 0.084(0.042)**  | 0.09(0.042)**  |
| <i>PROF</i> <sub><i>i,t-1</i></sub>                     | -0.05(0.04)     | -0.031(0.04)     | -0.042(0.04)    | -0.039(0.04)   |
| <i>MVBV</i> <sub><i>i,t-1</i></sub>                     | 0.013(0.004)*   | 0.014(0.004)*    | 0.015(0.004)*   | 0.014(0.004)*  |
| <i>VOL</i> <sub><i>i</i></sub>                          | -0.03(0.009)*   | -0.028(0.009)*   | -0.029(0.009)*  | -0.029(0.009)* |
| <i>NDTS</i> <sub><i>i,t-1</i></sub>                     | -0.012(0.004)*  | -0.013(0.005)*   | -0.009(0.004)** | -0.174(0.024)* |
| <i>DIV</i> <sub><i>i,t-1</i></sub>                      | -0.202(0.202)   | -0.203(0.203)    | -0.199(0.208)   | -0.196(0.207)  |
| <i>JED</i>  | -0.184(0.082)** | -0.064(0.039)*** | 0.012(0.013)    | -0.736(0.099)* |
| <i>SZ</i> × <i>JED</i>                                  | 0.031(0.013)**  |                  |                 |                |
| <i>TG</i> × <i>JED</i>                                  |                 | 0.119(0.056)**   |                 |                |
| <i>PROF</i> × <i>JED</i>                                |                 |                  | -0.101(0.066)   |                |
| <i>VOL</i> × <i>JED</i>                                 |                 |                  |                 | 0.175(0.017)*  |
| Constant  | -0.59(0.155)*   | -0.503(.161)*    | -.537(0.159)*   | .140(0.08)***  |
| R <sup>2</sup> – Within                                 | 0.0813          | 0.0802           | 0.0782          | 0.0754         |
| - Between   | 0.0611          | 0.1106           | 0.093           | 0.0876         |
| - Overall   | 0.0534          | 0.0973           | 0.083           | 0.0783         |
| F-Statistics  | 6.42(0.00)      | -                | 5.74(0.00)      | -              |
| Wald Chi <sup>2</sup>                                   | -               | 5.89(0.00)       | -               | 5.93(0.00)     |
| Wald(Joint)   | 3.17(.04)       | 2.88(.05)        | 1.71(.18)       | 55(0.00)       |

Table 6 presents results of regression models with interaction effects where total leverage/assets ratios (*LEVI*) of 370 listed firms are regressed on *JE* which is a dummy variable that assumes value of 1 if a given firm has its office in a district where *JE* value is above the 50<sup>th</sup> percentile. Robust standard errors are given in parentheses. The \*, \*\*, and \*\*\* show statistical significance at 1 percent level, 5 percent level, and 10 percent level respectively. We include year and industry dummies in each regression. *LEVI* is the ratio of long-term debt to total assets whereas. *SZ* is the natural logarithm of total assets. *PROF* is the ratio of net income to total assets. *TG* is the value of net fixed assets over total assets. *VOL* is the coefficient of variation of *PROF*. *MVBV* is the ratio of market value per share to book value per share. *NDTS* represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets.

In Table 6, the second column presents result of regression where *SZ* was interacted with *JED*. The coefficient of the variable *SZ* shows that under efficient judicial system (where *JEI* is below the 50th percentile) one unit change in *SZ* will cause the *LEVI* ratio of firms to change by 0.065 in the same direction. But under an inefficient judicial system (where *JEI* is above the 50th percentile) one unit increase in *SZ* increases the *LEVI* ratio by 0.095. This is evident from the coefficient of the interaction term *JED*\**SZ*. The interaction term has a coefficient of 0.031 which indicates that *SZ* increases *LEVI* ratio of firms by an additional 3.1 percent in an inefficient judicial system. The

coefficient of  $TG$ , which is a proxy for firm fixed-assets-to-total-assets, shows similar results. The coefficient of the variable  $TG$  demonstrates that under efficient judicial system (where  $JEI$  is below the 50<sup>th</sup> percentile) one unit change in  $TG$  will cause the  $LEVI$  to change by 0.074 positively. However, when the firm is faced with an inefficient judicial system (where the  $JEI$  is above the 50th percentile) one unit increase in  $TG$  increases the  $LEVI$  ratio by a value of 0.193. This 0.193 value is the sum of the coefficients of the interaction term  $TG*JED$  and  $TG$ . The interaction term has a coefficient of 0.119 and is significant at 5 percent level of significance. The coefficient of the interaction term indicates that  $TG$  increases  $LEVI$  ratio of firms by an additional 11.9 percent in an inefficient judicial system.

The interaction terms for other variables are either insignificant or show inconsistent results.

#### **4.4.2. Banking Courts**

To resolve the issue of non-performing loans of commercial banks, many policy measures were taken by the government of Pakistan in the recent past. Among these measures, one was to promulgate a new law titled “The Financial Institutions (Recovery of Finance) Ordinance 2001”. This law chalked out many ways to expedite the recovery of non-performing loans. It enabled the financial institutions to foreclose and sale collateral property without having to go to court and obtain orders from there. The law also allowed the federal government to establish as many banking courts as may be required for early and quick resolution of cases related to recovery of loans.

Presently, there are 29 banking courts in 14 cities. These banking courts handle cases related to default on loans by banks’ customers or breach of any terms of the loan contract. Where such banks are not existent, the city high court handles cases related to recovery of banks’ loans. Since these banks are dedicated solely to handling loans recovery cases and other matters related to banks’ loans, it is reasonable to expect that creditors (banks) will feel confident that their loan amount would be recovered quickly and hence at lower cost. This confidence should increase their willingness to extend lending to even smaller firms and firms with little collaterals. Other things being equal, this confidence should increase leverage ratios of firms in areas where these courts are functional. However, the efficiency of these courts will influence the leverage decisions in similar fashion as other courts do. To check for these possibilities, the next section discusses results from a set of regression models that follow similar methodology as was applied in the preceding section, the only difference being the data set used. In these regression models, the study uses a judicial efficiency proxy which is based on the pending cases of banking courts ( $JE4$ ). If a banking court is not present in a given city, then judicial statistics for that city are derived from the high court data files. It is important to mention that the banking courts data have some limitations. For example, data on pending cases, total cases instituted, and cases resolved are available only for the year 2006. Such a short period exposes the analysis to the possibility of biasness. Second, since most of the companies have their head offices in Karachi, such a single big city can potentially reduce variability in data and hence can create huge biasness in the results. In previous Section, the study divided the Karachi city in four regions where a high court was present in each region. That classification helped in increasing variation in data. But

such classification was not possible in the case of banking courts. With all these limitations, the study performs this robustness check and hope that it can at least give an idea of whether the estimates drawn from the analysis based on data of banking courts deviate substantially from earlier results. Results of regression models using banking courts data are presented in Panel A and B of Table 7.

Regression outputs reported in panel A and B of Table 7 show that results drawn from banking courts data are almost in line with the main findings of the study. For example, the variable *SZ* and *TG* have positive coefficients and their interactions terms exhibit similar behaviour as their counterparts did in the preceding analysis.

Table 7: Panel A

*Regression Results Interacting Firm Variables with JE based on Data of Banking Courts*

| Variables                  | <i>SZ</i>      |                | <i>TG</i>        |                 |
|----------------------------|----------------|----------------|------------------|-----------------|
|                            | Fixed          | Random         | Fixed            | Random          |
| $SZ_{i,t-1}$               | 0.052(0.011)*  | 0.012(0.005)** | 0.061(0.011)*    | 0.027(0.004)*   |
| $TG_{i,t-1}$               | 0.081(0.036)** | 0.152(0.022)*  | 0.064(0.038)***  | 0.092(0.027)*   |
| $PROF_{i,t-1}$             | -0.018(0.023)  | -0.078(0.024)* | -0.004(0.023)    | -0.07(0.024)*   |
| $MVBV_{i,t-1}$             | 0.01(0.002)*   | 0.005(0.002)** | 0.011(0.002)*    | 0.006(0.002)*   |
| $VOL_i$                    | -0.083(0.007)* | -0.003(0.005)  | .059(.014)*      | -0.004(0.005)   |
| $NDTS_{i,t-1}$             | -0.051(0.043)  | -0.058(0.045)  | -0.045(0.044)    | -0.051(0.045)   |
| $DIV_{i,t-1}$              | -0.024(0.008)* | -0.032(0.007)* | -0.024(0.007)*   | -0.031(0.007)*  |
| $JE_i$                     | 0.015(0.013)   | 0.007(0.009)   | 0.004(0.013)     | 0.005(0.01)     |
| $S1 \times JE$             | -0.038(0.011)* | -0.028(0.009)* |                  |                 |
| $S2 \times JE$             | -.011(.006)*** | -0.006(0.005)  |                  |                 |
| $S4 \times JE$             | 0.018(0.008)** | 0.02(0.006)*   |                  |                 |
| $T1 \times JE$             |                |                | -0.01(0.008)     | -0.014(0.006)** |
| $T2 \times JE$             |                |                | -0.009(0.004)*** | -0.012(0.004)*  |
| $T4 \times JE$             |                |                | 0.027(0.006)*    | 0.025(0.005)*   |
| Constant                   | -0.016(0.094)  | 0.046(0.084)   | -0.28(0.107)*    | -0.033(0.091)   |
| R <sup>2</sup> - Within    | 0.0816         | 0.0572         | 0.089            | 0.0719          |
| - Between                  | 0.0957         | 0.4194         | 0.1237           | 0.4093          |
| - Overall                  | 0.0913         | 0.3453         | 0.1206           | 0.3428          |
| F-Statistics               | 5.27(0.00)     | -              | 6.37(0.00)       | -               |
| Wald Chi <sup>2</sup>      | -              | 386(0.00)      | -                | 385.94(0.00)    |
| Hausman - Chi <sup>2</sup> | 16.25(0.234)   | -              | 81.75(0.00)      | -               |

Table 7 presents results of regression models with interaction effects where leverage ratios (*LEVI*) of 370 listed firms is regressed on, *JE* which is based on banking courts data, firm-specific variables and the interaction terms between *JE* and quartile dummies of firm-specific variables. Standard errors are reported inside the parentheses. We include year and industry dummies in each regression. *LEVI* is the ratio of long-term debt to total assets whereas. *SZ* is the natural logarithm of total assets. *PROF* is the ratio of net income to total assets. *TG* is the value of net fixed assets over total assets. *VOL* is the coefficient of variation of *PROF*. *MVBV* is the ratio of market value per share to book value per share. *NDTS* represents non-debt tax shields and is measured as a ratio of depreciation for the year over total assets.

Table 7: Panel B

*Regression Results Interacting Firm Variables with JE based on Data of Banking Courts*

| Variables                  | PROF           |                | DIV            |                |
|----------------------------|----------------|----------------|----------------|----------------|
|                            | Fixed          | Random         | Fixed          | Random         |
| $SZ_{i,t-1}$               | 0.061(0.011)*  | 0.026(0.003)*  | 0.066(0.011)*  | 0.029(0.004)*  |
| $TG_{i,t-1}$               | 0.081(0.037)** | 0.141(0.022)*  | 0.091(0.036)*  | 0.15(0.022)*   |
| $PROF_{i,t-1}$             | 0(0.024)       | -0.04(.023)*** | -0.003(0.023)  | -0.063(0.024)* |
| $MVBV_{i,t-1}$             | 0.011(0.002)*  | 0.007(0.002)*  | 0.01(0.002)*   | 0.005(0.002)** |
| $VOL_i$                    | 0.179(0.066)*  | 0.001(0.038)   | 0.067(0.054)   | -0.005(0.039)  |
| $NDTS_{i,t-1}$             | -0.065(0.007)* | -0.006(0.005)  | 0.063(0.015)*  | -0.004(0.005)  |
| $DIV_{i,t-1}$              | -0.05(0.045)   | -0.053(0.044)  | -0.05(0.043)   | -0.056(0.045)  |
| $JE_i$                     | -0.022(0.008)* | -0.028(0.006)* | -0.026(0.008)* | -0.032(0.007)* |
| $SZ_{i,t-1}$               | 0.005(0.013)   | 0(0.009)       | 0.002(0.013)   | -0.003(0.009)  |
| $P1 \times JE$             | 0.009(0.005)** | 0.017(0.004)*  |                |                |
| $P2 \times JE$             | 0.009(0.004)** | 0.013(0.004)*  |                |                |
| $P4 \times JE$             | -0.016(0.004)* | -0.02(0.004)*  |                |                |
| $D1 \times JE$             |                |                | 0.01(0.004)**  | 0.012(0.004)*  |
| Constant                   | -0.035(0.095)  | -0.071(0.086)  | -0.338(0.112)* | -0.049(0.084)  |
| R <sup>2</sup> - Within    | 0.0797         | 0.0627         | 0.074          | 0.0538         |
| - Between                  | 0.1329         | 0.4456         | 0.1064         | 0.412          |
| - Overall                  | 0.1222         | 0.3632         | 0.0982         | 0.3374         |
| F-Statistics               | 5.9(0.00)      | -              | 4.99(0.00)     | -              |
| Wald Chi <sup>2</sup>      | -              | 431(0.00)      | -              | 374(0.00)      |
| Hausman - Chi <sup>2</sup> | 157(0.00)      | -              | 280.42(0.00)   | -              |

Details of the variables and tests reported in Panel B are given under Panel A of Table 7. Panel B reports the regression results where *JE* was interacted with the dummy variables based on *PROF* and *DIV*.

## 5. CONCLUSION

In this paper, we have investigated both the direct and indirect effects of judicial efficiency of district high courts in Pakistan on leverage ratios of 370 KSE-listed firms. In the baseline estimation, all important firm-specific determinants of leverage ratios are included with the measure of judicial efficiency. The baseline results indicate that leverage ratios increase with the size of the firm, ratio of fixed-assets-to-total assets, and decreases with profitability, net income volatility, dividends payments and growth opportunities. The largest economic effect on leverage ratio is that of the size of a firm. The trade-off theory and the information asymmetry theory appear to be best explaining leverage ratios. Interestingly, the judicial inefficiency does not have any statistically significant association with leverage ratios. This might be due to the composition effect which means that judicial efficiency does not influence all firms alike. To check for such a possibility, differential slopes were estimated by interacting the measure of judicial efficiency with dummy variables that were based on the quartiles of the included explanatory variables. Results of these regressions show that worsening judicial efficiency increases leverage ratios of large firms and decrease leverage ratios of small firms which is an indication that creditors shift credit away from small firms to large

firms in the presence of inefficient judicial system. Results also indicate that the effect of inefficient courts is greater on leverage ratios of firms that have fewer tangible assets as a percentage of total assets than on leverage ratios of firms that have more tangible assets. And finally there is some evidence that firms with more volatile net incomes are affected more than firms with less volatile net incomes when judicial efficiency decreases.

### **Policy Implications**

Findings of this study have important policy implications concerning the development of the capital market in Pakistan. Results indicate that overall level of leverage in the economy is not affected by inefficiency of the judicial system. However, this does not mean that judicial efficiency has no impact on leverage ratios. The results indicate that under inefficient judicial system creditors reduce their lending to small firms and firms with little collateral and redistribute the credit to large firms. This is why judicial inefficiency does not change volume of credit, but changes distribution of the credit. These findings show the importance of judicial efficiency for small firms in determining their optimal capital structures. Being unable to borrow and achieve optimum capital structure, small firms lose an important and inexpensive source of capital. Small firms play a pivotal role in the development of a country. If these firms face difficulty in obtaining cheaper source of financing, their growth opportunities remain limited, this in turn may negatively influence economic development of the country.

These results also have implications for the diversification of loan portfolios of the banking sector. Under inefficient judicial system the banks' loan portfolios will have greater percentage of investment held in large firms. This engenders two main issues regarding diversification of loan portfolios. First, the banks' loan portfolios will remain undiversified across different sizes of firms and across firms with different collateral ratios. Second, and the most important one, is that lending to large firms will concentrate large amounts in fewer loans. This will violate the golden principle of banks in diversification "small loans to large number of borrowers".

The poor state of judicial efficiency warrants quick resolution of pending cases at all levels of the high courts. However, given the dynamics of the institutional settings and resource endowments, it is not likely to happen soon or easily. Alternatively, the government can focus specifically on improving the efficiency of banking courts. This alternative is comparatively less resource-intensive as banking is limited in number. The government can also increase the number of banking courts and extend this facility to cities where such courts are non-existent. This will not only lighten the burden on the existing courts, but will also send a positive signal to fund suppliers that they can easily recover their funds through these courts should the borrower default.

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## **The Current Account Deficit Sustainability: An Empirical Investigation for Pakistan**

TAHIR MUKHTAR and ALIYA H. KHAN

The existence of large and persistent current account deficit is always viewed with great concerns, as it usually leads an economy to a state of insolvency due to building up excessive net foreign debt. As the current account deficit is a persistent feature of Pakistan's economy, therefore, it becomes essential to empirically investigate, whether this deficit is sustainable or not. To this end, the present study has applied two alternative approaches, namely, the intertemporal approach to the current account and the intertemporal solvency approach, in order to get more convincing evidence on the sustainability issue in Pakistan using the time series data over the period 1960 to 2012. From the perspective of both the approaches, Pakistan's current account deficit is on a sustainable path and the macroeconomic policies of the country remained effective in securing it from any external sector crisis.

*JEL Classification:* C32, F32, F41

*Keywords:* Current Account Deficit, Intertemporal Budget Constraint, VAR Model, Cointegration

### **1. INTRODUCTION**

Large and persistent current account deficits are detrimental to economic welfare, and hence there arises the issue of sustainability of these deficits. A country that continually runs a current account deficit will become ever more indebted to foreigners. The sustainability of the current account deficits depends on certain characteristics such as measures of determining, when a deficit is a large deficit, the financing of a deficit, and whether the deficits are used for investment or for consumption [Edwards (2001)]. If for long, these borrowings are invested wisely, the deficits need not be a problem, since future economic growth should allow the debt to be serviced. On the other hand, if the foreign resources are not employed properly, or if the current account deficit grows too fast, a country may not be able to meet its obligations to foreign creditors. Hence, a large current account deficit that fuels consumption or a property price bubble may become a problem.

Tahir Mukhtar <tahir.mukhtar@fjwu.edu.pk> is Associate Professor at the Department of Economics, Fatima Jinnah Women University, Rawalpindi. Aliya H. Khan <ahkhan@qau.edu.pk> is Professor and Dean of Social Sciences, Quaid-i-Azam University, Islamabad.

Table 1  
*Historical Trends in Exports, Imports, Trade Deficit and Current  
 Account Deficit in Pakistan (As Percent of GDP)*

| Years   | Exports | Imports | Trade Deficit | Current Account Deficit |
|---------|---------|---------|---------------|-------------------------|
| 1960s   | 8.96    | 12.88   | 5.71          | 2.37                    |
| 1970s   | 10.47   | 15.86   | 6.35          | 4.75                    |
| 1980s   | 12.07   | 21.27   | 7.79          | 3.93                    |
| 1990s   | 16.39   | 19.68   | 3.98          | 4.52                    |
| 2000-01 | 13.42   | 14.74   | 2.16          | 0.11                    |
| 2001-02 | 14.73   | 15.77   | 1.70          | +1.90                   |
| 2002-03 | 15.27   | 15.31   | 1.33          | +3.83                   |
| 2003-04 | 16.72   | 16.13   | 3.36          | +1.34                   |
| 2004-05 | 15.75   | 14.68   | 5.50          | 0.83                    |
| 2005-06 | 15.74   | 19.54   | 9.53          | 3.29                    |
| 2006-07 | 15.22   | 20.57   | 9.42          | 5.30                    |
| 2007-08 | 14.17   | 18.12   | 12.84         | 5.81                    |
| 2008-09 | 12.16   | 18.26   | 10.61         | 4.98                    |
| 2009-10 | 11.84   | 19.61   | 8.72          | 2.13                    |
| 2010-11 | 11.6    | 18.9    | 7.3           | +0.1                    |
| 2011-12 | 10.5    | 20.0    | 9.5           | 2.1                     |
| 2012-13 | 10.5    | 19.3    | 8.8           | 1.1                     |

*Source:* Pakistan Economic Survey (various issues) and World Development Indicators (WDIs), 2013.

*Note:* Values are averaged over each decade up to figures for 1999.

The economy of Pakistan has been facing persistent external sector deficits since 1960s with few exceptions.<sup>1</sup> Low domestic saving rates, persistent budget and trade deficits bear major responsibility for deterioration in the external accounts. Recurring current account deficit coupled with the evolution of external debt and fluctuating private consumption have generated interest in examining the dynamics of Pakistan's current account balance. This interest is partly due to the fact that the economic theory suggests that nations should use the current account as a tool to smooth consumption [Sachs (1981)].

Pakistan has experienced chronic balance of payments (BOP) problems as its trade and current account balances remained in deficit almost throughout its history. Trade balance delivered surplus twice, first time just after independence when due to Korean War Pakistan's exports increased and its trade balance went into surplus. Trade balance turned into surplus second time in 1972 when Pakistan devalued its currency by 131 percent. In 1973, however, there was an oil price shock and worldwide inflationary pressures caused deterioration in Pakistan's terms of trade. Accordingly, the increase in imports far outstripped the increase in exports and trade deficit persisted throughout the rest of the decade. Even after liberalisation episodes of late 1980s imports increased more than exports, thereby leaving trade balance in deficit. In early 2000s oil prices surged world-wide, therefore, trade deficit further increased. The deficit in current account

<sup>1</sup>For the fiscal years 1960-61, 1983-84, 2001-02, 2002-03, 2003-04 and 2010-11 Pakistan experienced the current account surplus.

remained less than the deficit in trade account for most of the periods mainly due to massive inflow of unilateral transfers in terms of workers' remittance particularly after the 1980s when a number of Pakistanis migrated to Middle East. After the event of 9/11 current account went into surplus for the three consecutive years (FY2001-02, FY2002-03 and FY2003-04) due to a high influx of workers' remittances but it again showed deficits due to the increase in world oil prices. The current account deficit to GDP ratio ranged from 0.83 to 5.8 percent for the fiscal years 2004-05 to 2008-09, however, it stood at 2.13 percent during 2009-10. However, the current account became surplus in 2010-11 and onward 2010-11 it again turned into deficit (see Table 1).

The above discussion points towards investigating whether or not the current account deficit of Pakistan is sustainable. Hence, the present study aims to examine the current account deficit sustainability issue using alternative approaches, namely, the intertemporal to the current account (ICA) and the intertemporal solvency approach. The use of alternative approaches provides an opportunity to have relatively more conclusive evidence with regard to the current account deficit sustainability issue.

This study is divided into five sections. Following this introduction to the study the next section presents a review of the empirical literature related to the issue of the current account deficit sustainability. Section 3 deals with theoretical models that will be tested empirically in the subsequent section, the construction of variables, data sources and estimation procedures. Section 4 provides empirical results for the models presented in Section 3 along with their interpretations. Finally, concluding remarks along with policy recommendations are summarised in Section 5.

## **2. LITERATURE REVIEW**

The economic literature on the current account sustainability is of a recent origin in the aftermath of the financial and currency crises during the 1990s in different parts of the world. Milesi-Ferretti and Razin (1996) formulate the current account sustainability as the possibility of continuation of the current policy stance and/or present private behaviour without entailing the need for a drastic policy shift (such as, for example, a sudden policy tightening causing a large recession), or without leading to a crisis (such as, for example, an exchange rate collapse leading to inability to service external obligations). Zanghieri (2004) also analyses the sustainability of current accounts explaining that current account position is sustainable as long as foreign investors are willing to finance it. The instruments of financing also matter as the foreign direct investment (FDI) is the most appropriate instrument of external financing in comparison, for instance, to short-term debt instruments. Zanghieri also points out that a deficit created by a reduction of savings is much more worrying than a deficit caused by an increase of investments. Another similar assumption of current account sustainability is that the current account balance is said to be sustainable if it stabilises the stock of external debt at the current level.

Unfortunately, there is no simple answer to the question of the sustainable level of the current account balance. According to Milesi-Ferretti and Razin (1996) "...current account deficits above 5 percent of GDP flash a red light..." However, they conclude that a specific threshold is not a sufficient informative indicator of sustainability. Similarly, Summers (1996) contends that current account deficit in excess of 5 percent of GDP

should be seen as uncomfortable. He further maintains that it is even more critical if this deficit is particularly financed in a way that leads to rapid reversals or through a Ponzi-type of game. This even becomes more prominent when empirical studies after the Asian crisis conclude that countries affected severely were those with large deficit/GDP ratios throughout the 1990s [Corseti, *et al.* (1999) and Radelet and Sachs (2000)]. According to Roubini and Wachtel (1998), “there is no simple rule that can help us determine when current account deficit is sustainable or not”. They are of the view that what is sustainable for one country it is not for other because current account sustainability depends on a country’s specifics. In addition, the Benhima and Haveylchik (2006) analysis reminds us that the deficit of the current account in Mexico has been 7 percent in 1994 and in Thailand it has been 8 percent in 1996, just before the sudden stop of capital flows and the beginning of the crisis.

The literature on the sustainability of the current account revolves around two approaches. On the one hand, there is an intertemporal solvency approach pioneered by Husted (1992) where a time series perspective is employed to investigate the long run relationship between exports and imports such that the slope coefficients obtained from the equations derived from these series should be statistically equal to unity. The rationale of this approach is straightforward. If such a long run relationship exists, the time series of imports and exports will tend to move closely together over time, i.e., they will not permanently diverge from each other, implying that the current account imbalance is sustainable. Using this approach Husted (1992), Bahmani-Oskooee and Rhee (1997), Fountas and Wu (1999), Arize (2002), Tang (2002), Baharumshah, *et al.* (2003), Irandoust and Ericsson (2004), Keong, *et al.* (2004), Kalyoncu (2005), Narayan and Narayan (2005), Tang and Mohammad (2005), Hollauer and Mendonça (2006), Cunado, *et al.* (2008), Erbaykal and Karaca (2008), Verma and Perera (2008), Kalyoncu and Ozturk (2010), Pattichis (2010), Greenidge, *et al.* (2011) and Holmes, *et al.* (2011) have reported mixed evidence across countries on the issue of the current account imbalance sustainability.

But the intertemporal solvency approach is beset with two main limitations. Firstly, this approach fails to give a rational explanation for the current account behaviour. Secondly, Roubini and Wachtel (1998) note that the IBC of a country imposes very mild restrictions on the evolution of a country’s current account and foreign debt. They conclude that according to this approach one country can run very large current account deficits for a long time and remain solvent as long as there are surpluses at some time in the future.

The second approach that dominates the literature on the current account sustainability is based upon the ICA. Thus, we do find the extensive use of the present value model of current account (PVMCA) and other small open economy models in the literature for investigating the issue of the external balance sustainability both in the developed and developing economies. This approach, in principle, is able to provide a benchmark for defining “excessive” current account deficits in the context of models that yield predictions about the equilibrium path of external imbalances [Milesi-Ferretti and Razin (1996)]. The intertemporal approach to assessing the current account sustainability allows us to compute the optimal or benchmark current account and compare the actual with the optimal current account. If the actual current account deficit is significantly

higher than the optimal it implies unsustainability of the current account deficit. Since the optimal current account gives an indication of what a country's current account position ought to be, policy makers must seek to implement measures to narrow the gap between optimal and actual current account balances. This approach has been implemented by Cashin and McDermott (1998) for Australia, Makrydakis (1999) for Greece, Hudson and Robert (2003) for Jamaica, Ogus and Niloufer (2006) for Turkey, Goh (2007) for Malaysia, Khundrakpam and Rajiv (2008) for India, Kim, *et al.* (2009) for Indonesia, Malaysia, South Korea, the Philippines and Thailand and Karunaratne (2010) for Australia in order to assess the current account deficit sustainability.

Empirical research pertaining to the current account deficit sustainability is very limited in the context of Pakistan. Moreover, the findings of the available literature do not provide decisive evidence whether the current account deficit of Pakistan is sustainable or not. For instance, Naqvi and Kimio (2005) and Mukhtar and Sarwat (2010), using quarterly data covering the period 1972:1 to 2004:4 and 1972:1 to 2006:4 respectively, find that both exports and imports are cointegrated and the slope coefficient on export is significant and close to unity. Hence, they conclude that Pakistan is not in violation of its IBC, implying thereby that the current account imbalances of the country are sustainable in the long run. On the other hand, applying the recently developed unit root tests with unknown level shift [Saikkonen and Lutkepohl (2002)] and the cointegration test with structural break [Gregory and Hansen (1996)], Tang (2006) reinvestigates the cointegration relationship between imports and exports for the Organisation of the Islamic Conference (OIC) member countries including Pakistan. The findings of the study show that not only the current account series is non-stationary but also there is a lack of any long run equilibrium relationship between exports and imports of Pakistan. Consequently, unsustainability of the current account deficit of the country is established. Azgun and Ozdemir (2008) also reach the same conclusion. They consider the period 1980:1–2004:2 to demonstrate whether the foreign debt arising from deficit current accounts policies has sustainability in the current economic policies of Pakistan. The results obtained using Husted's (1992) model reveal that current account deficit is not sustainable.

All the four above studies on Pakistan have applied simple export-import cointegration model developed by Husted (1992) which has its own defects as discussed above in this section. Therefore, methodological aspects of the existing studies on Pakistan require some refinement to reach at a more plausible explanation regarding the external imbalance sustainability for the country. Thus, to address the limited and conflicting evidence from the existing literature as well as the related methodological issues there is a need to revisit the topic of current account deficit sustainability in Pakistan. In this regard, the present study aims to apply the ICA along with the intertemporal solvency approach to investigate the current account deficit sustainability issue in the country.

### 3. ANALYTICAL FRAMEWORK

#### 3.1. The Intertemporal Solvency Approach

A simple framework is provided by the intertemporal solvency approach to assess sustainability issue through examining a long run relationship between exports and imports

of a country. This approach, primarily developed by Husted (1992), assumes a small open economy without government sector where an optimising representative household is free to borrow and lend in international financial markets at a given world rate of interest for achieving maximum utility. Endowments or output and redistributed profits from firms constitute the agent’s resources which are used for consumption and saving purposes. The representative household faces the following budget constraint for each time period:

$$C_0 = Y_0 + A_0 + I_0 - (1 + r_0)A_{-1} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

where  $C_0, Y_0, A_0$  and  $I_0$  refer to current consumption, output, net foreign assets or international borrowing (which could be positive or negative) and investment respectively,  $r_0$  is the one period world interest rate and  $(1 + r_0)A_{-1}$  is the initial external debt of the country.

Since the budget constraint (1) must hold in every time period, we can obtain the IBC by combining all individuals’ budget constraints given in (1) in the economy. Iterating (1) forward the IBC becomes:

$$A_0 = \sum_{t=1}^{\infty} \mu_t TB_t + \lim_{n \rightarrow \infty} \mu_n A_n \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

where  $TB_t = X_t - M_t = (Y_t - C_t - I_t)$  is the trade balance in period  $t$  (income minus absorption),  $X_t$  and  $M_t$  represent exports and imports for period  $t$  and  $\mu_t = \prod_{s=1}^t \left( \frac{1}{1 + r_s} \right)$  is

the product of the first  $t$  discount factors. An important element in (2) is the limit term as if it is equal to zero, the amount of international borrowing (lending) is exactly the same as the sum of present discounted value of future trade surpluses (deficits). If this is not the case (i.e., the limit term is nonzero) and  $A_0$  is positive, then the current stock of external debt exceeds the present value of future trade balances and the country is said to be “bubble-financing” its external debt, meaning that the economy needs new debt and its current account is not sustainable. On the other hand, a nonzero limit term and negative  $A_0$  means that the country is making Pareto inferior decisions [Husted (1992)]. Thus, from a theoretical perspective we need to investigate whether the limit term in (2) is equal to zero.

After making several assumptions Husted (1992) reaches a testable model which is of the following form:

$$X_t = a + bM_t^* + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

where  $M_t^*$  indicates imports of goods and services plus net interest payments. If  $b = 1$  and  $e_t$  is a stationary process i.e.,  $I(0)$ , the economy is not violating its IBC. In other words, if these conditions hold, on average the current account balance will be equal to zero, which implies that it is sustainable. If  $b < 1$  while  $e_t$  remains stationary,  $X_t$  and  $M_t^*$  will be on the long run equilibrium path while the economy will violate its IBC because in such a situation the current account balance will be continuously deteriorating. Lastly, if  $e_t$  is a non-stationary process, it implies a lack of cointegration between  $X_t$  and  $M_t^*$

which means that both the variables do not tend to move towards long run equilibrium and thus the sustainability is ruled out. It should be remembered that  $b = 1$  is considered a relatively strong condition for the current account sustainability.

### 3.2. The PVMCA and Derivation of Optimal Current Account

The theoretical model adopted here is based on Sachs (1981), Sheffrin and Woo (1990), Otto (1992), and Ghosh (1995). The PVMCA considers an infinitely lived representative household in a small open economy. This economy consumes a single good and has access to the world capital markets at an exogenously given world real interest rate. The intertemporal model is similar to the PIH [Friedman (1957) and Hall (1978)] where the representative agent chooses an optimal consumption path to maximise the present-value of lifetime utility subject to a budget constraint. The representative agent is assumed to have rational expectations. The infinitely lived household has the expected lifetime utility function given as:

$$E_t U = E_t [u(C_t) + \beta u(C_{t+1}) + \beta^2 u(C_{t+2}) + \dots] = E_t \left[ \sum_{s=t}^{\infty} \beta^{s-t} \{u(C_s)\} \right], \quad \dots \quad (4)$$

where  $E_t U$  is the expected utility,  $E_t$  is the conditional expectations operator based on the information set of the representative agent at period  $t$ ,  $\beta$  is the subjective discount factor with  $0 < \beta < 1$ , and  $C$  represents private consumption of the single good. The period utility function  $u(C)$  is continuously differentiable and it is also strictly increasing in consumption and strictly concave:  $u'(C) > 0$  and  $u''(C) < 0$ .

In the ICA, the current account acts as a mean of smoothing consumption amidst shocks faced by the economy e.g., shocks to national output, investment and government spending. The current account expresses the evolution of the country's net foreign assets with the rest of the world and is given by:

$$CA_s = A_{s+1} - A_s = Y_s + rA_s - C_s - I_s - G_s, \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

Where  $CA_s$  is the current account balance in periods,  $A_s$  represents the country's net foreign assets,  $r$  denotes the world real interest rate (assumed constant),  $Y_s$  is the gross domestic product,  $C_s$ ,  $I_s$  and  $G_s$  capture aggregate consumption, government expenditures and total investment respectively.

Constraint (5) holds as an equality based on the assumption of non-satiation. By taking the expectation of (5) and by imposing the standard no-Ponzi game condition to rule out the possibility of bubbles, iterating the dynamic budget constraint in (5) gives the intertemporal budget constraint facing the representative agent as:

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} Y_s + (1+r)A_t = \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (C_s + I_s + G_s) \quad \dots \quad \dots \quad (6)$$

Deriving and substituting the optimal consumption level in Equation (5), it can be shown that the present value relationship between the current account balance and future changes in net output ( $\Delta NO$ ) is given by:

$$CA_t = - \sum_{s=t+1}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} E_t(\Delta NO_s) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (7)^2$$

We define net output (*NO*) as gross domestic output less gross investment and government expenditures i.e.,

$$NO \equiv Y - I - G \quad \dots \quad (8)$$

According to Equation (7), the optimal current account balance is equal to minus the present value of the expected changes in net output. For example, the representative agent will increase its current account, accumulating foreign assets, if a future decrease in income is expected and vice versa.

But problem is that Equation (7) is not empirically operational because the expression requires the researcher to be knowledgeable of the full information set of consumers' expectations. Campbell and Shiller (1987) explain that information on consumers' expectations is not required since the current account contains consumers' expectations of shocks to national cash flow. We begin therefore by estimating a first-order vector autoregressive (VAR)<sup>3</sup> model in the changes in net output and the current account as:

$$\begin{bmatrix} \Delta NO_s \\ CA_s \end{bmatrix} = \begin{bmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{bmatrix} \begin{bmatrix} \Delta NO_{s-1} \\ CA_{s-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1s} \\ \varepsilon_{2s} \end{bmatrix} \quad \dots \quad \dots \quad \dots \quad \dots \quad (9)$$

where  $\varepsilon_{1s}$  and  $\varepsilon_{2s}$  are errors with conditional means of zero,  $\Delta NO_s$  and  $CA_s$  are now expressed as deviations from unconditional means so that only the dynamic restrictions of the present value model of the current account are tested [see Otto (1992); Ghosh (1995); Adler (2002); Goh (2007); and Adedeji and Jagdish (2008)]. The main interest in (9) concerns the regression in which  $\Delta NO_s$  is a dependent variable. It is the discounted value of all dates forecasts of this variable conditional on the agent's full set of information that will determine the optimal current account at time  $t$ . That is, according to (9), future expected changes in net output are reflected in today's current account. Then intuitively, not only will  $\Delta NO_{s-1}$  be important in determining  $\Delta NO_s$  but also  $CA_{s-1}$  is helpful in predicting  $\Delta NO_s$ , since it may contain additional information. So, Granger causality should run from the current account to changes in net output.

Taking expectation of Equation (9) we get

$$E_t \begin{bmatrix} \Delta NO_s \\ CA_s \end{bmatrix} = \begin{bmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{bmatrix}^{s-t} \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} \quad \dots \quad \dots \quad \dots \quad \dots \quad (10)$$

In equation (10) we use the condition that  $E_t(X_{t+j}) = \Omega^j X$  which is derived considering that expectations are formed rationally in the underlying theoretical model [Makrydakis

<sup>2</sup>See Sheffrin and Woo (1990), Milbourne and Otto (1992), Otto (1992), Ghosh and Ostry (1995) and Makrydakis (1999) for derivation details.

<sup>3</sup>The generalisation to higher order VARs is straightforward. Given that the present study will use annual data and that the sample is relatively small, the first order VAR is sufficient to capture the time series properties.

(1999)].  $\Omega$  is the  $2 \times 2$  matrix of coefficients  $\phi_{ij}$ . We can get forecast of  $\Delta NO_s$  by pre-multiplying right hand side of Equation (10) by vector  $[1 \quad 0]$  as:

$$E_t \Delta NO_s = [1 \quad 0] \begin{bmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{bmatrix}^{s-t} \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} \dots \dots \dots (11)$$

Or

$$E_t \Delta NO_s = [1 \quad 0] \Omega^{s-t} \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} \dots \dots \dots (12)$$

Let  $I$  be a  $2 \times 2$  identity matrix. Substituting Equation (12) into Equation (7) and simplifying gives:

$$\begin{aligned} \widehat{CA}_t &= -[1 \quad 0] \left( \frac{1}{1+r} \Omega \right) \left( I - \frac{1}{1+r} \Omega \right)^{-1} \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} \\ &= [\Phi_{\Delta NO} \quad \Phi_{CA}] \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} = k \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} \dots \dots \dots (13) \end{aligned}$$

Equation (13) has the advantage that the optimal current account series  $\widehat{CA}_t$  can be compared to the actual series  $CA_t$ . If the model is true, the two series should be identical. So, if the model is true, it follows that

$$\widehat{CA}_t = [0 \quad 1] \begin{bmatrix} \Delta NO_t \\ CA_t \end{bmatrix} = CA_t \dots \dots \dots (14)$$

There are a few testable implications of the present value relationship indicated in Equation (4) noted by Otto (1992), Ghosh and Ostry (1995), Makrydakis (1999), Adedeji (2001) and others which we conduct as well. In brief they are: (i) the optimal current account ( $\widehat{CA}_t$ ) variable is stationary in level; (ii) the current account Granger causes changes in net output ;(iii) there is equality between the optimal and actual current account balances; (iv) there is equality of variances of the optimal and current account series; and (v) the stationarity of the optimal current account implies the stationarity of the actual current account.

### 3.3. Data Sources and Construction of Variables

The present study aims to conduct a time series analysis for Pakistan, which requires a large data set to obtain robust results. While quarterly data would be the right choice for this empirical exercise, however, due to non-availability of quarterly data for some variables we use annual data for the period 1960 to 2012. Data sources for the present study include *International Financial Statistics* (IFS) and *Pakistan Economic Survey* (various issues).

Consistent with the theoretical framework, exports include exports of goods and services, while imports comprise of imports of goods and services plus net interest

payments. The nominal exports and imports are converted into corresponding real variables by deflating them by export and import price indices and expressed in natural logarithms. With regard to the construction of variables used the ICA, we have collected the data on private consumption, government consumption, investment (which consists of gross fixed capital formation and change in inventories) and gross domestic product (GDP). All variables are used in real per capita terms by dividing the nominal variables by the GDP deflator (2005=100) and the level of total population. Following Ghosh (1995), Bergin and Sheffrin (2000) and Adler (2002) along with many others, we construct current account series by subtracting private and government consumption expenditures and investment from the gross national product (GNP). The net output series (*NO*) is computed by subtracting government and investment expenditures from GDP. Similarly, we construct the net output inclusive of interest payment (*NOR*) by subtracting government and investment expenditures from GNP. All the models of the ICA express net output and the current account in per capita terms with the aim to link the data of these variables to the assumption of a representative agent.

### 3.4. Econometric Methodology

To diagnose stationarity of the variables a number of tests have been proposed in the literature. Among them the Augmented Dickey-Fuller (ADF) test of Dickey and Fuller (1979, 1981), and the Phillips-Perron (PP) test of Phillips and Perron (1988) are frequently used. However, because of their poor size and power properties these tests are not reliable for small sample data sets [Dejong, *et al.* (1992) and Harris and Sollis (2003)].<sup>4</sup> In such a situation, we prefer to apply a more efficient and powerful univariate Dickey-Fuller Generalised Least Square (DF-GLS) test developed by Elliot, *et al.* (1996) which is basically a modified version of the ADF test in which data are detrended before the unit root test is conducted.<sup>5</sup>

For testing the current account sustainability applying intertemporal solvency approach the econometric framework used in the study is the Johansen (1988) and Johansen and Juselius (1990) maximum likelihood cointegration approach, which tests both the existence and the number of cointegration vectors. Individual variables need not be identified as endogenous/exogenous as this approach treats all variables in the system as endogenous. As we have derived the testable implications of the basic PVMCA within the framework of an unrestricted VAR model which is indicative of the use of this technique for examining the validity of the ICA in Pakistan.

## 4. RESULTS AND DISCUSSION

The intertemporal solvency approach is based on a testing procedure developed by Husted (1992). In this method, an estimation of a long run relationship between exports and imports provides an empirical measure to investigate the current account sustainability. Keeping in view the importance of peculiar characteristics of the time series, we examine the order of integration of both real exports ( $rx_t$ ) and real imports ( $rm_t^*$ )<sup>6</sup> before conducting the

<sup>4</sup>Both these studies conclude that the ADF and the PP tests have the tendency to over-reject the null hypothesis when it is true and under-reject it when it is false.

<sup>5</sup>For detailed discussion on different unit root tests see Maddala and Kim (1998).

<sup>6</sup>The lower case letters denote that the underlying variables are logarithmic.

cointegration test. The results for the DF-GLS test are given in Table 2. It is evident from the table that both the series are non-stationary at levels as the null hypothesis of the non-stationarity cannot be rejected at any reasonable level of significance. However, the underlying variables are first difference stationary. Hence both the time series are  $I(1)$ .

Table 2

The DF-GLS Test for Exports and Imports

| Variables | Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root |                  |        |        |        | Decision   | Order of Integration |
|-----------|--|------------------|--------|--------|--------|--|----------------------|
|           | Level  | First Difference | 1 %    | 5 %    | 10 %   |  |                      |
| $rx_t$    | 1.152  | -7.354           | -2.613 | -1.947 | -1.612 | Non-stationary at level but stationary at first difference | $I(1)$               |
| $Rm_t^*$  | 0.210  | -7.164           | -2.613 | -1.947 | -1.612 | Non-stationary at level but stationary at first difference | $I(1)$               |

Having established that both the time series are integrated of the same order, we step forward to investigate the long run relationship between exports and imports using the Johansen and Juselius co-integration test for probing the current account balance sustainability. Before undertaking the cointegration test, the optimal lag length to be used in the analysis is determined. On the basis of the AIC and the SBC the lag length is selected at 1. As regard to the co-integration test Table 3 reports the results. Starting with the null hypothesis of no cointegration ( $r = 0$ ) between the exports and the imports, the trace statistic is 24.538 which is above the 95 percent critical value of 20.261. Thus, the null hypothesis  $r = 0$  is rejected in favour of the general alternative  $r = 1$ . But we fail to reject the null hypothesis  $r = 1$  at 5 percent level of significance. Consequently, it is concluded that there exists one co-integrating relationship between  $rx_t$  and  $rm_t$ . Furthermore, the maximum eigenvalue test also corroborates the result of the trace test. As the exports and the imports are co-integrated, so, the intertemporal budget constraint is satisfied in the context of Pakistan during the period under investigation.

Table 3

Results of Cointegration Test

| Null Hypothesis<br>$\lambda_{trace}$ rank tests | Alternative Hypothesis | Eigen Values | $\lambda_{trace}$ Rank Value          | Critical Values |            |
|---|------------------------|--------------|---------------------------------------|-----------------|------------|
|   |                        |              |                                       | 95 %            | P-values** |
| $H_0 : r = 0$                                   | $H_1 : r = 1$          | 0.256        | 24.539**                              | 20.262          | 0.024      |
| $H_0 : r = 1$                                   | $H_1 : r = 2$          | 0.083        | 6.346                                 | 9.165           | 0.147      |
| $\lambda_{max}$ rank tests                      |                        |              | $\lambda_{max}$ rank value            |                 |            |
| $H_0 : r = 0$                                   | $H_1 : r > 0$          | 0.256        | 17.924**                              | 15.294          | 0.049      |
| $H_0 : r \leq 1$                                | $H_1 : r > 1$          | 0.083        | 6.346                                 | 9.165           | 0.147      |
| <b>Normalised Cointegrating Coefficient</b>     |                        |              | <b>Test of Restriction</b>            |                 |            |
| $rx_t = -7.854 + 0.914 * rm_t^*$                |                        |              | $H_0 : b = 1$                         |                 |            |
| $(-4.661)*** (3.734)***$                        |                        |              | $\chi^2 = 1.142 p\text{-value}=0.273$ |                 |            |

Note: Figures in the parentheses are t values.\*\*\* and \*\* denote rejection of the null hypothesis at 1 percent and 5 percent significance levels respectively.  
\*\*MacKinnon-Haug-Michelis (1999) p-values.

However, just looking at the long run relationship between exports and imports we cannot decisively state that the external deficit is sustainable. To reach an absolute conclusion about the issue, it is also necessary that there exists a co-integrating relationship between the two series such that the slope coefficient obtained from the equation derived from the cointegration test should be statistically equal to unity. To this end, an equation normalised on  $rx_t$  is given in table 3 from which it can be seen that  $rx_t$  and  $rm_t^*$  are positively and significantly related to each other in the long run. The estimated coefficient of  $rm_t^*$  i.e., slope coefficient is 0.914, which is close to unity, and it indicates Pakistan's adherence to the international budget constraint. In order to validate this finding, we proceed with the restricted cointegration test to check the one-to-one relationship between  $rx_t$  and  $rm_t^*$ . From Table 3 it is obvious that on the basis of likelihood ratio test we fail to reject the null hypothesis that the coefficient of  $rm_t^*$  is not statistically different from unity. It implies that the macroeconomic policies of Pakistan remained quite effective in directing exports and imports of the country into a long run steady-state equilibrium relationship. Our finding is in line with the results obtained by Naqvi and Kimio (2005) and Mukhtar and Sarwat (2010) for Pakistan employing the same approach. Nonetheless, the result of the present study is in total contrast with those of Tang (2006) and Azgun and Ozdemir (2008) for Pakistan. Our result is statistically more reliable than all these studies in that we have supplemented the estimation procedure with the restricted cointegration test, whereas none of the above studies on Pakistan have applied this test.

After it has been established that both the variables in the model are cointegrated, as a next logical step a VECM with one cointegrating relation and one lag in each equation is estimated for examining the stability of the model. From the estimated VECM it becomes easy to gauge the speed of adjustment of the endogenous variables to converge to their long run equilibrium relationship while allowing a wide range of short run dynamics. Table 4 presents the summary results from VECM. The coefficient of the

Table 4

*Summary Results from VECM and Diagnostic Tests*

|                                 | $\Delta rx_t$                                 | $\Delta rx_t^*$    |
|---------------------------------|---|--------------------|
| Constant                        | -0.143<br>(-2.168)**                          | 0.067<br>(1.77)*   |
| <i>ECT</i> (-1)                 | -0.266<br>(-2.746)**                          | 0.134<br>(3.081)** |
| $R^2$                           | 0.708   | 0.597              |
| Adjusted $R^2$                  | 0.676   | 0.562              |
| F-Stat                          | 17.634  | 10.842             |
|                                 | $\chi^2$ ( $p$ values are in the parentheses) |                    |
| Serial Correlation              | 1.22  | 0.814              |
| (Breusch-Godfrey serial LM)     | (0.442)                                       | (0.541)            |
| Heteroscedasticity              | 0.086   | 0.412              |
| (White Heteroskedasticity Test) | (0.886)                                       | (0.643)            |
| Normality                       | 0.526   | 0.775              |
| (Jorjue-Bera)                   | (0.392)                                       | (0.363)            |
| AR.Cond.Heteroscedasticity      | 0.005   | 1.241              |
| (ARCH LM Test)                  | (0.961)                                       | (0.292)            |

Note: t-values given in parentheses with \*\* and \* indicate rejection of the null hypothesis at 5 percent and 10 percent significance levels respectively.

lagged error correction term (ECT) of export variable carries the correct sign i.e., negative and it is statistically significant at 5 percent level, with 26.6 percent speed of adjustment. Hence, every year exports are adjusted by almost 27 percent of the past year's deviation from equilibrium and the overall restoration to equilibrium will take place in nearly 4 years. This result implies the stability of the system. The coefficient of the lagged ECT of imports has positive sign and it is statistically significant at 10 percent level. It shows that due to any disturbance in the system, a continuous divergence from long run equilibrium will occur and the system will be unstable. Finally, the results of the diagnostic tests are also reported in Table 4 which clearly reveal that in both the equations the residuals are Gaussian as the Johansen cointegration technique assumes.

Now we come to empirically analyse the current account deficit sustainability issue of Pakistan within the framework of the ICA employing the PVMCA. As a first step in estimating the PVMCA, stationarity of the time series used in the model is checked. Applying the DF-GLS unit root test we find that change in net output ( $\Delta NO_t$ ), actual current account ( $CA_t$ ) and the model's predicted or optimal current account ( $\widehat{CA}_t$ ) are stationary at levels while net output inclusive of interest payments ( $NOR_t$ ) and private consumption ( $C_t$ ) are non-stationary at levels but they become stationary at their first differences (see Table 5). Hence the time series  $\Delta NO_t$ ,  $CA_t$  and  $\widehat{CA}_t$  are integrated of order zero i.e.,  $I(0)$ , while  $NOR_t$  and  $C_t$  are integrated of order one i.e.,  $I(1)$ . The inclusion of  $NOR_t$  and  $C_t$  in the analysis is to verify the stationarity of the actual current account series from the perspective of a long run relationship between these two time series. If both  $NOR_t$  and  $C_t$  are  $I(1)$  and make a co-integrating relationship then the residual series which is the actual current series will be  $I(0)$ .

Table 5

*Unit Root Test*

| Variables        | Level | First Difference | Mackinnon Critical for Rejection of Hypothesis of a Unit Root |       |       | Decision  | Order of Integration |
|------------------|-------|------------------|---|-------|-------|---|----------------------|
|                  |       |                  | 1 %   | 5 %   | 10 %  |   |                      |
| $\Delta NO_t$    | -4.94 | -                | -3.76   | -3.18 | -2.88 | Stationary at level                                       | $I(0)$               |
| $CA_t$           | -3.77 | -                | -3.76   | -3.18 | -2.88 | Stationary at level                                       | $I(0)$               |
| $\widehat{CA}_t$ | -3.79 | -                | -3.76   | -3.18 | -2.88 | Stationary at level                                       | $I(0)$               |
| $NOR_t$          | 1.44  | -5.22            | -3.76   | -3.18 | -2.88 | Nonstationary at level but stationary at first difference | $I(1)$               |
| $C_t$            | 1.66  | -4.37            | -3.76   | -3.18 | -2.88 | Nonstationary at level but stationary at first difference | $I(1)$               |

Co-integration between  $NOR_t$  and  $C_t$  is investigated using Johansen's maximum likelihood method<sup>7</sup> and the results are reported in Table 6. Both trace statistics ( $\lambda_{trace}$ ) and maximal eigenvalue ( $\lambda_{max}$ ) statistics indicate that there is at least one co-integrating vector between the two time series. We can reject the null hypothesis of no co-integrating

<sup>7</sup>See Johansen (1988) and Johansen and Juselius (1990).

Table 6

## Cointegration Test Results

| Null Hypothesis              | Alternative Hypothesis           | Critical Values |                              |        |       |
|------------------------------|----------------------------------|-----------------|------------------------------|--------|-------|
|                              |                                  | 95 %            | P-values**                   |        |       |
| $\lambda_{trace}$ Rank Tests |                                  | Eigen Values    | $\lambda_{trace}$ Rank Value |        |       |
| $H_0 : r = 0$                | $H_1 : r = 1$                    | 0.335           | 23.172**                     | 21.514 | 0.024 |
| $H_0 : r = 1$                | $H_1 : r = 2$                    | 0.074           | 3.961                        | 8.993  | 0.504 |
| $\lambda_{max}$ rank tests   |                                  |                 | $\lambda_{max}$ rank value   |        |       |
| $H_0 : r = 0$                | $H_1 : r > 0$                    | 0.335           | 20.311**                     | 16.477 | 0.037 |
| $H_0 : r \leq 1$             | $H_1 : r > 1$                    | 0.074           | 3.961                        | 8.993  | 0.504 |
| $H_0 : a = 1, b = -1$        | $\chi^2 = 0.966$ p-value = 0.313 |                 |                              |        |       |

\*\* denotes rejection of the null hypothesis at the 5 percent significance level.

\*\*MacKinnon-Haug-Michelis (1999) p-values.

vector in favour of one co-integrating vector under both test statistics at 5 percent level of significance. We also cannot reject the null hypothesis of at most one co-integrating vector against the alternative hypothesis of two co-integrating vectors, both for the trace and max-eigen test statistics. Consequently, we can conclude that there is only one co-integrating relationship between the variables under investigation. Thus, a long run equilibrium relationship exists between net output inclusive of interest payments and private consumption in Pakistan. At the bottom of Table 6 we present the likelihood ratio test result of the hypothesis that the vector  $[a, b] = [1, -1]$  belongs to the co-integrating space such that  $[1, -1][NOR_t, C_t]' = CA_t$  is  $I(0)$ . It is evident that we fail to reject the null hypothesis and hence it is confirmed that  $NOR_t$  and  $C_t$  are both not only  $I(1)$  but they are also co-integrated such that  $CA_t$  is  $I(0)$ .

For the validity of the PVMCA, the expression (14) must hold. In this case both the actual and the optimal current account series are identical which implies that if the actual current account balance is  $I(0)$  then the optimal current account series will also be  $I(0)$ . This is confirmed from the unit root test results of Table 5 where both the series are  $I(0)$ . As this finding is in accordance with one of the implications of the basic PVMCA, therefore, it provides evidence in favour of the model.

The applicability of the basic PVMCA to Pakistan's data is evaluated by testing some of the important implications of the model. In this regard we proceed by conducting some formal and informal tests using VAR model where we have estimated equations for  $\Delta NO_t$  and  $CA_t$  by applying OLS technique. Following the standard practice both the variables are expressed as deviations from their means since we are interested in testing the dynamic restrictions of the model [see Ghosh (1995); Manteu (1997); Makrydakis (1999); Adedeji (2001); Adler (2002); and Darku (2008)]. On the basis of the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criteria (SBC), a one lag VAR model is chosen which is not surprising for annual data. Table 7 lists the estimated coefficients, the associated standard errors and the residual diagnostic tests from the VAR model along with the computed values of the formal and informal tests of the basic PVMCA obtained for the period 1960 to 2012. First of all the null hypothesis that  $CA_t$

Table 7

VAR Estimation and Tests of Restriction of the Basic PVMCA

| Dependent Variable  | Regressors                                 |                          | Diagnostic Tests: $\chi^2$ ( <i>p</i> values are in the parentheses) |                  |                    |                  |
|---|--|--------------------------|--|------------------|--------------------|------------------|
|   | $\Delta NO_{t-1}$                          | $CA_{t-1}$               | S.Corr   | ARCH             | Heteroscedasticity | Normality        |
| $\Delta NO_t$   | 0.315<br>s.e.(0.217)                       | -0.456<br>s.e.(0.081)*** | 1.161<br>(0.292)   | 0.003<br>(0.989) | 0.077<br>(0.921)   | 0.747<br>(0.345) |
| $CA_t$  | 0.085<br>s.e.(0.074)                       | 0.922<br>s.e.(0.204)***  | 0.766<br>(0.334)   | 1.164<br>(0.291) | 1.477<br>(0.234)   | 0.454<br>(0.793) |
| Granger Causality Test: F statistic ( <i>p</i> values are in the parentheses) |  |                          |  |                  |                    |                  |
| CA does not Granger Cause $\Delta NO$   |  |                          |  |                  | 7.925<br>(0.006)   |                  |
| ΔNO does not Granger Cause CA   |  |                          |  |                  | 1.084<br>(0.429)   |                  |
| Tests of Restrictions   |  |                          |  |                  |                    |                  |
| $\Delta NO_t$   | -0.107<br>s.e.(0.111)                      |                          | $\frac{\text{var}(\widehat{CA})}{\text{var}(CA)} = 0.738$            |                  |                    |                  |
| $CA_t$  | 0.805<br>s.e.(0.197)***                    |                          |  |                  |                    |                  |
|   | $\chi^2=37.915$ ;<br><i>p</i> -value=0.000 |                          | $\text{Corr}(CA, \widehat{CA}) = 0.686$                              |                  |                    |                  |

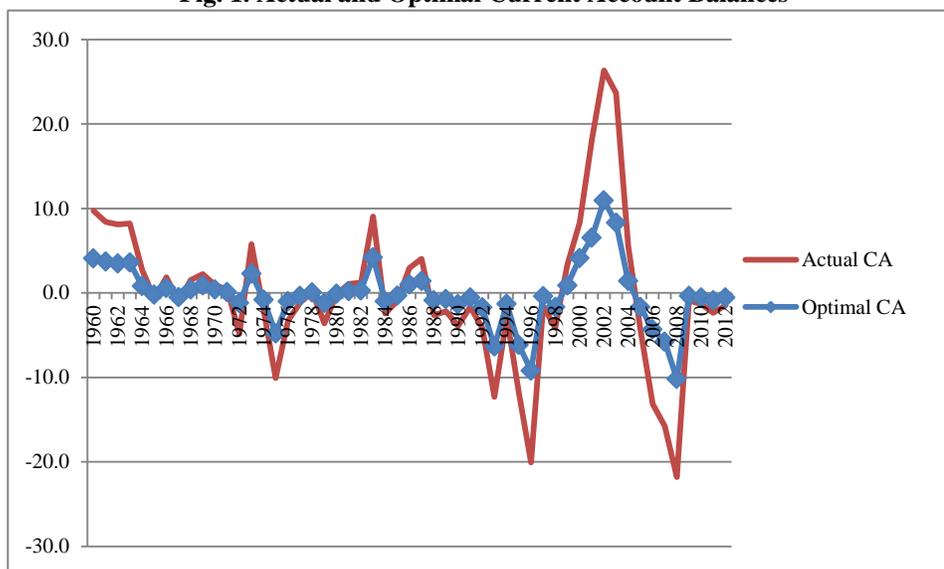
Notes:

- As both the variables entering the model are expressed as deviations from their means, so, the VAR model is estimated without a constant term.
- s.e. stands for standard errors.
- \*\*\* indicate rejection of null hypothesis at 1 percent level.

does not Granger cause  $\Delta NO_t$ , is rejected which suggests that the representative agent has superior information. It means that the fluctuations in Pakistan’s current account provide a signal about how this agent is expecting net output to change in the future. As a whole this finding constitutes weak evidence in favour of the PVMCA. However, we fail to reject the hypothesis that  $\Delta NO_t$  does not Granger cause  $CA_t$ .

For further evidence on the relevance of the PVMCA to Pakistan’s data we turn to figure 1 that reflects the time series graphs of the actual current account series and its optimal counterpart. Following Sheffrin and Woo (1990); Otto (1992); Obstfeld and Rogoff (1995); Makrydakis (1999); and Adler (2002) we have used an annual real world interest rate of 4 percent for discounting purposes while calculating the optimal current account series.<sup>8</sup> We know that if the PVMCA holds in Pakistan then graphically both the actual and the optimal current account series should differ only by the sampling error. In case there are significant differences in the time series plots of both the variables it will be considered as evidence against the consumption smoothing behaviour of the current account. Despite the fact that basic PVMCA is quite restrictive and simple in structure, the visual inspection of the two series in figure 1 represents a reasonably good capability of the optimal (or VAR model predicted) current account series to follow the year-to-year trends of Pakistan’s actual current account balance during almost the entire period of study. Nevertheless, the actual current account series exhibits relatively more volatility as compared to its optimal counterpart, which is a very common outcome when consumption smoothing model is applied to small open economies [Adler (2002)].

<sup>8</sup>Most of the empirical computations have been carried out using 2,4,6 and 8 percent real world interest rate but they have almost the same quantitative results [Makrydakis (1999)].

**Fig. 1. Actual and Optimal Current Account Balances**

Another testable implication of the model is the equality between the variances of the actual and the optimal current account series. If the variance ratio of optimal to actual current account series is equal to unity then it validates the assumption of high degree of capital mobility and the intertemporal model of current account [Ghosh (1995); Agenor, *et al.* (1999)]. In Table 7 this ratio is 0.738, which is different from unity, and thus indicative of some degree of excessively volatile international capital flows to Pakistan in the sense of Ghosh (1995). It implies that in case of some shocks, Pakistan's consumption smoothing current account flows have been more volatile than justified by expected changes in economic fundamentals i.e., net output.<sup>9</sup> The problem with excessive volatility is that it raises the possibility of inappropriate utilisation of foreign capital for domestic consumption [Ismail and Ahmad (2008)]. As the variance of the actual current account balance is larger than its optimal counterpart, therefore, in Figure 1 the time series plot of the former has larger amplitude than that of the latter. With regard to the correlation coefficient between the two current account series it is found to be moderate i.e., 0.686. The graphs of the two series in figure 1 are clearly consistent with this modest relationship between them, hence the model's predicted current account series succeeds in explaining a reasonable portion of the fluctuations in the actual current account of Pakistan.

Now we come to examine the result of the formal and most stringent test of parameter restrictions imposed on estimated coefficients of  $\Delta NO_t$  and  $CA_t$ . Considering that if the basic PVMCA gives a convincing representation of the actual current account fluctuations then equation 5.1 will hold; it implies that in the context of first order VAR the estimated values of  $\Phi_{\Delta NO}$  and  $\Phi_{CA}$  should be zero and unity respectively. Table 3 reports the result for this statistical test. The estimated values for both the variables are -0.107 and 0.805 respectively. From the perspective of individual testing we find that  $\Delta NO_t$  is found not to be significantly different from its theoretical value of zero but  $CA_t$  is

<sup>9</sup>It means that capital movements are mainly dominated by speculative capital flows.

quite different from its theoretical value of unity. For overall testing of the model, our computed value of Wald test statistic (which is distributed as a  $\chi^2$  with two degrees of freedom) is 37.915 with  $p$ -value of zero, which indicates the rejection of the restrictions of the basic PVMCA on the VAR model even at 1 percent significance level. It suggests that Pakistan lacked the ability to smooth consumption through external borrowing and lending in the face of exogenous shocks during the sample period of the study.

Finally Table 7 also presents results for some diagnostic tests, which involve  $\chi^2$  tests for the hypothesis that there is no serial correlation; that the residual follow the normal distribution; that there is no heteroscedasticity; and lastly that there is no autoregressive conditional heteroscedasticity. In all equations the diagnostics suggest that the residuals are Gaussian.

Thus, while the basic intertemporal model is a bit capable of tracing the peaks and troughs of the Pakistan's current account series for the period 1960 to 2012, it remains unsuccessful in capturing the full magnitude of the cyclical fluctuations of the said series. Similarly, while the informal evidence reveals adequacy of the model in Pakistan's case, the formal restrictions of the model are strongly rejected by the country's data. This outcome is supported by a number of empirical studies for other developing countries including Manteu (1997) for Portugal, Adedeji (2001) for Nigeria, Landeau (2002) for Chile, Ogus and Niloufer (2006) for Turkey, Goh (2007) for Malaysia and Lau, *et al.* (2007) for the Philippines and Singapore. However, our findings are in contrast with those obtained by Ghosh and Ostry (1995) for majority of developing countries in their sample, Callen and Cashin (1999) for India, Lau, *et al.* (2007) for Indonesia, Malaysia and Thailand and Khundrakpam and Rajiv (2008) for India. In all these cases the formal and informal tests have provided evidence in favour of the model.

Ghosh and Ostry (1995) are pioneers in testing the validity of the PVMCA for a number of developing countries including Pakistan. Nonetheless, their study does not address the issue of the excessiveness and sustainability of current account deficits in its empirical endeavour using the framework of the intertemporal approach. Studies aimed at examining the sustainability of the current account deficit in Pakistan have not applied the intertemporal model. Hence, the present study is distinguished from others in that it uses the PVMCA to analyse the issue of the excessiveness and sustainability of current account deficits in the country. From the perspective of the intertemporal model, the actual and the optimal current account series are compared to judge the extent of deviations between them and whether or not these deviations follow a systemic pattern for scrutinising the sustainability issue. For the sustainability of the current account imbalances to occur, it is essential that there must be consistency between these imbalances and the optimal current account path generated by the intertemporal model.

One of the features of the intertemporal approach is that it also provides an opportunity to test the stationarity of the current account series in order to investigate the sustainability issue. This is an easy way to examine whether the current account imbalances of a country are sustainable or not. Stationarity of current account is considered to be in line with a fixed external debt to GNP ratio which in any manner does not encourage a country to default on its external debts [Wu (2000)]. Thus, in the literature, several studies have used different unit root tests for exploring the current account sustainability of various countries [see, for example, Trehan and Walsh (1991);

Gundlach and Sinn (1992); Wickens and Uctum (1993); Wu (2000); Dulger and Ozdemir (2005); Tang (2006, 2007) and Lau, *et al.* (2007)]. When this yardstick is applied in the context of Pakistan, it turns out on the basis of the DF-GLS unit root test that the current account series is stationary at level [see Table 5.1]. It implies that Pakistan is invulnerable to unsustainability problem despite facing persistent current account deficits.

With regard to the findings based on the intertemporal methodology, we find that the basic PVMCA is rejected strongly by the data of the country which categorically suggests that the actual and the optimal current account balances are not identical statistically. A graphical examination demonstrates the persistent excessiveness of the actual current account series vis-à-vis the optimal series which points towards a careful inspection of the pattern of this excessiveness so that it can be decided whether there is some problem of unsustainability or not. From figure 1 it can be seen that during the sample period of the study on the whole the gap between the two current account series does not follow any systematic pattern. However, in between 1999 and 2003 the degree of the excessiveness of the actual current account series increases but it falls later on. Thus, from the perspective of the basic PVMCA the current account deficits are sustainable in the case of Pakistan.

The above analysis of the current account imbalance sustainability depicts an encouraging picture for Pakistan. Both the approaches applied in the study provide a consensus that the country's current account deficits are sustainable and the macroeconomic policies of the country remained effective in securing it from any external sector crisis.

## 5. CONCLUSION AND POLICY IMPLICATION

The current account deficit is a persistent feature of Pakistan's economy, so, it becomes natural to empirically investigate, whether this deficit is sustainable or not. The existence of large and persistent current account deficit is always viewed with great concerns as it usually leads an economy to a state of insolvency due to building up excessive net foreign debt. Consequently, there are increasing prospects of default on foreign payments or a sharp reversal in capital flows, which may force an abrupt and costly adjustment. The countries facing the situation of large current account deficit, and rising indebtedness are always more vulnerable to adverse external shocks, including a change in the foreign creditors' sentiment. Therefore, for a country such as Pakistan which is constantly facing the external imbalances, it is always recommended that the current account deficit sustainability issue should be evaluated effectively. To this end, the present study has applied two alternative approaches in order to get more convincing evidence on the sustainability issue in Pakistan.

The first approach is the intertemporal solvency approach pioneered by Husted (1992) which provides a simple and direct testing procedure for examining the sustainability of the current account balance. The fundamental nature of this approach stresses that to declare the current account deficit sustainable it is essential that exports and imports of a country have a long run relationship such that the coefficient obtained from the equation derived from the cointegration test should be statistically equal to unity. The results from the Johansen cointegration test reveal that exports and imports share long run equilibrium. Furthermore, from the restricted cointegration test it appears

that the coefficient of imports is statistically not different from unity, hence, Pakistan satisfies its intertemporal budget constraint. Thus, the time series of imports and exports will never move too far apart from each other over time which implies that the current account balance is sustainable in the long run in Pakistan.

While the findings of the second approach i.e., the ICA clearly indicate that the actual current account series is relatively more volatile as compared to its optimal counterpart. So, the excessiveness of the actual current account balance is established during the period under study. However, absence of a systemic pattern of divergence of the optimal current account from the actual one is suggestive of the fact that Pakistan's current account deficits remained sustainable over the period of this study. The main limitation of this approach is that it fails to address the issue of current account deficit sustainability directly. The ICA actually shows excessiveness of the current account balance and the issue of sustainability is decided on the basis of this excessiveness.

Thus, from the perspective of both the approaches, Pakistan's current account deficit is on a sustainable path and the macroeconomic policies of the country remained effective in securing it from any external sector crisis. The policy implication of the study is straight forward. Since Pakistan's current account imbalances has not been appeared to be unsustainable, so, the application of coherent, consistent and well-coordinated exchange rate, trade and macroeconomic policies aimed at the floating exchange rate, reduction in fiscal deficits, increased savings rate and export volumes, increased growth rate of the economy and efficient debt management strategy should remain in operation effectively to keep the current account deficit on the sustainable path.

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## **Spatial Disparities in Socioeconomic Development: The Case of Pakistan**

HAROON JAMAL

Rising spatial disparities in socioeconomic development is a major concern in developing economies. Regional inequality is a dimension of overall inequality, but it has added significance when spatial and regional divisions align with political and ethnic tensions to undermine social and political stability.

This paper is an attempt to document the extent and nature of regional inequality in the level of socioeconomic development. Seventeen indicators related to human resources and standards of living are developed from the district representative household data of Pakistan Social and Living-Standard Measurement (PSLM) survey for the year 2012-13. Development Indicators, for the first time in Pakistan are also aggregated at sub-district level to incorporate the intra-district inequalities in the analysis of spatial disparities.

The study provides provincial multidimensional Gini coefficients and district development ranking to evaluate inter and intra provincial disparities respectively in the selected dimensions of socioeconomic development with the help of Inequality-adjusted Socioeconomic Development Index (ISDI).

*JEL Classification:* D63, I31

*Keywords:* Multidimensional Inequality, Inequality Adjusted Socioeconomic Development Index, Development Ranking, Pakistan

### **1. INTRODUCTION**

Earlier research on spatial disparities in the context of Pakistan demonstrated the existence of significant differences in the quality of life of people living in different regions and parts of the country. Pasha and Hasan (1982) analysed the data at the district level for the early 1970s. They concluded that not only do levels of development significantly vary among the four provinces of the country, but there are large regional disparities within the province as well. Attempts have also been made to observe inter-temporal changes of development levels. Pasha, *et al.* (1990) identified significant changes in the development rank ordering of districts of Pakistan from the early 1970s to the early 1980s, especially among districts at the intermediate level of development.<sup>1</sup> More recently, Jamal and Khan (2003) provided changing scenarios of multi-dimensional inter-temporal spatial inequality and regional levels of development in Pakistan during

Haron Jamal <haroonjamal@hotmail.com> is Visiting Research Fellow, Institute of Business Administration (IBA), Karachi.

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<sup>1</sup>Jamal and Malik (1988) also analysed the changing patterns of regional development in Sindh province of Pakistan during the period 1971-72 and 1980-81.

early 1980s and the late 1990s.<sup>2</sup> Their study indicated that over time inequality has increased in three provinces, namely, Sindh, the NWFP (now KPK) and the Balochistan. They also noted that “So far as the province of Balochistan is concerned, there is evidence that it has continued to fall behind the rest of the country during the last 20 years”. Regarding NWFP province it was concluded that “the situation in the NWFP is not so disturbing, and it seems that the province is acquiring the characteristics of an emerging economy”.<sup>3</sup>

The data used in all above studies were obtained from diverse sources of supply-side information. Moreover, various proxies are used to develop indicators due to unavailability of actual data. For instance, district’s income is estimated with two components; agricultural and manufacturing value added instead of direct income or GDP data. Thus the income component was underestimated due to non-representation of service sector which is a major source of income in some parts of the country. Likewise, district wealth is represented with number of cars registered instead of car ownership in district and number of bank branches instead of bank deposits. Similar problems may be identified in the construction of social indicators. The supply-side data on school enrollments (numerator) are obtained from provincial statistics to estimate enrollment rates at various levels, while the data on the relevant age group (denominator) are obtained from another source (Population Census). More importantly, previous studies for Pakistan did not consider intra-district inequality in constructing development indicators due to the non-availability of relevant information at sub-district level.

Consequently, this study for the first time incorporates intra-district inequality for the analysis of spatial disparities and inequalities in the context of Pakistan. Further, the study develops socioeconomic indicators from the demand-side single source of information by using large household survey. Pakistan Social and Living-standard Measurement (PSLM) survey for the year 2012-13 is used in this study to develop multidimensional development indicators. PSLM is a district representative survey, covers more than 75,000 households across four provinces of Pakistan and is statistically comparable with the Census data, with some margin of sampling error.

The research is presented as follows. The next section discusses the dimensions and attributes of socioeconomic development included in the analysis of spatial disparities. Section 3 briefly describes the methodology of aggregating dimensions of socioeconomic development, while empirical findings related to multidimensional inequality and districts’ development levels are furnished in the subsequent section. The last section is reserved for some concluding remarks.

## 2. DIMENSIONS OF SOCIOECONOMIC DEVELOPMENT

No single attribute can be expected to provide a complete representation of welfare. As Kolm (1977) suggests, the greater the number of attributes considered the

<sup>2</sup>Wasti and Siddiqui (2008) updated the rank orders of districts of Pakistan with the published information in the late 1990s. Surprisingly, they did not mention and compare results with the study of Jamal and Khan (2003) which also uses the data of late 1990s. Nonetheless, their findings are not different with that of Jamal and Khan (2003).

<sup>3</sup>This is not the exhausting list of articles which furnish the extent of spatial disparities in Pakistan. The research studies referred here are nationwide studies and provide development ranking of districts of Pakistan; which is also one of the main objectives of this study.

better is the assumption of ‘anonymity’ and ‘impartiality’ in welfare analysis. However, empirically the selection of indicators is based entirely on the availability of consistent data.

Development indicators that have been included in this research to analyse disparities and inequality relate to human resources and standards of living.<sup>4</sup> Seventeen indicators are developed from the district representative household data of Pakistan Social and Living-Standard Measurement (PSLM) Survey for the year 2012-13. A brief description of the selected welfare attributes is given below, while the national averages of and inequality in these indicators are furnished in Table 2.1.

Both stock and flow measures are included in the study to represent the educational status of population. The stock measure is the adult literacy rate, whereas enrolment rates with respect to population of age cohort 5-24 years represent a flow in the educational attainment. Both of these measures are developed separately for gender.

Table 2.1

*Development Indicators Selected for the Analysis of Disparities*

| Development Indicators |  | National Average | Coefficient of Variation | Gini Coefficient |
|------------------------|--|------------------|--------------------------|------------------|
| <b>Human Resources</b> |  |                  |                          |                  |
| Education              | Adult Literacy Rate – Male                 | 68.72            | 31.35                    | 0.1758           |
|                        | Adult Literacy Rate – Female               | 41.13            | 70.16                    | 0.4031           |
|                        | Enrollments in 5-24 Years Age Cohort—Boys  | 60.66            | 33.33                    | 0.1861           |
|                        | Enrollments in 5-24 Years Age Cohort—Girls | 47.75            | 52.12                    | 0.2982           |
| Child Health           | Immunisation – Polio                       | 51.01            | 74.06                    | 0.4221           |
|                        | Child Delivery at Hospitals/Nursing Homes  | 51.13            | 68.48                    | 0.4014           |
| Maternal Health        | Prenatal Care                              | 68.64            | 50.60                    | 0.2841           |
|                        | Postnatal Care                             | 30.62            | 110.66                   | 0.6013           |
|                        | Had Tetanus Injection                      | 57.66            | 63.66                    | 0.3694           |
| <b>Living Standard</b> |  |                  |                          |                  |
| Income                 | Average Income Per Capita                  | 36300            | 185.32                   | 0.3726           |
| Housing Quality        | Adequate Roof Structure                    | 27.11            | 130.96                   | 0.6700           |
|                        | Adequate Wall Structure                    | 69.53            | 51.25                    | 0.2728           |
| Housing Services       | Access to Safe Drinking Water              | 83.83            | 36.21                    | 0.1540           |
|                        | Flush Toilet Facility                      | 67.93            | 55.01                    | 0.2928           |
|                        | Use of Adequate Fuel                       | 40.69            | 108.51                   | 0.5761           |
|                        | Electricity Connection                     | 91.90            | 23.12                    | 0.0766           |
|                        | Telephone Connection (Landline or Mobile)  | 82.24            | 27.13                    | 0.1288           |

*Data Source:* PSLM, 2012-13.

*Note:* Development Indicators are aggregated at the level of Primary Sampling Unit (PSUs) and thus the magnitudes would be different with the district figures which are usually mentioned in the published PSLM reports.

<sup>4</sup>Supply-side input indicators; such as mechanisation of agriculture, roads and other infrastructure, number of medical personnel etc. have also been included in the earlier research on district ranking in terms of socioeconomic development. However, this research is purely based on demand-side household information and thus attention is restricted to output indicators in terms of quality of life.

Welfare and inequality, in the health sector, may best be evaluated with the help of ultimate output indicators such as life expectancy at birth, infant and maternal mortality rates etc. However, non-availability of data has restricted the choice and the dimension of health is represented by some proxies of health status of mother and children. Polio vaccination of children under the age of five according to vaccination card or through polio campaign and the child delivery at hospitals are used to represent child health status, while three indicators are developed to assess the maternal health status; prenatal and postnatal care and the proportion of mothers who had tetanus toxoid injections during the previous pregnancy.

Income or consumption is the appropriate indicator to evaluate the standard of living of person, family or region.<sup>5</sup> Due to the relatively high non-response rate for income based measures as well as under reporting typically found in standard of living household surveys in developing countries, income data is often not preferred as a proxy for living standard over consumption data. Nonetheless in the absence of district-wise consumption<sup>6</sup> data, household income is used in this study as a relative measure of economic status. Regional income at the level of PSU or district is computed from the PSLM employment module which reports monthly or annual income of each family member of household aged 10 years and above.<sup>7</sup>

Housing conditions and access to basic social services are one of the key determinants of the quality of life. It is often argued that publicly provided services must have more equal distribution. Therefore it is of interest to include inequality in means and standards of living directly provided by government and those that are acquired by the household. To observe the inequality in housing facilities, five indicators are used, viz., access to safe drinking water (piped, hand-pump, motorised pump or tube well and covered well), flush toilet facility, use of adequate fuel (cooking gas or kerosene oil), access to electricity and telephone (landline or mobile) facility. The quality of housing stock is represented by the proportion of houses with cemented outer walls (burned bricks) and reinforced cement concrete (RCC) or reinforced brick concrete (RBC) roofing.

### 3. METHODOLOGY FOR AGGREGATING DIMENSIONS OF DEVELOPMENT

Inequality-adjusted Socioeconomic Development Indices (ISDIs) are developed to estimate the extent of disparities among provinces and districts of Pakistan in socioeconomic development. Multidimensional measures that capture the association

<sup>5</sup>One of the non-monetary indicators of household welfare is the asset-based index which has been introduced and developed as an alternative tool for classifying household socio-economic status. This method employs data of household's assets such as durable and semi-durable goods to describe household welfare instead of using household's income or expenditure data. However, this approach is not applicable for this research as welfare indicators are aggregated here at regional level instead of classifying household economic status. For detail methodology of developing asset-based index, see Filmer and Pritchett (2001).

<sup>6</sup>Household Integrated Economic Survey (HIES) which collects information on household consumption does not provide district representative information on household consumption.

<sup>7</sup>However, it is worth to mention that the reported income might be biased downward due to the fact that the majority of the economically active population is not in a salaried remuneration but is either self-employed or work in farms or other family business. In addition, about 16 percent sample households refused to give response regarding employment activities and household income.

between various attributes can generally be derived from a two-stage aggregation approach. The approach which originally proposed by Maasoumi (1986, 1989, 1999) uses a common utility-like function (measure of well-being) to aggregate the attributes for each individual in the first stage, and a uni-variate inequality measure to aggregate the utility-like values across individuals in the second stage. As an alternate to Maasoumi's method, individuals' achievements on each attribute are aggregated first and then the resulting attribute-specific indicators are summarised over the given dimensions. The later approach forms the basis of the Inequality-adjusted Human Development Index (IHDI) of United Nations Development Programme (UNDP).<sup>8</sup>

IHDI is based on a distribution-sensitive class of composite indices proposed by Foster, Lopez-Calva, and Szekely (2005), which draws on the Atkinson (1970) family of inequality measures. It is computed as a geometric mean of geometric means, calculated across the population for each dimension separately. The IHDI accounts for inequalities in HDI dimensions by "discounting" each dimension's average value according to its level of inequality. The IHDI equals the HDI (Human Developed Index) when there is no inequality across people or across regions but falls further below the HDI as inequality rises. In this sense, the IHDI is the actual level of human development (taking into account inequality), while the HDI can be viewed as an index of the "potential" human development that could be achieved if there was no inequality. The "loss" in potential human development due to inequality is the difference between the HDI and the IHDI (UNDP-HDR, Technical Notes).<sup>9</sup>

This study follows the IHDI methodology to develop the Inequality-adjusted Socioeconomic Development Index (ISDI) for districts of Pakistan. Specific steps to estimate the ISDI are narrated below.

At step one; indicators are developed by aggregating information at the sub-district level (Primary Sampling Unit (PSU)–Villages and Urban Circles). Except income, all chosen indicators are proportions or percentages and thus have natural goalposts (minimum and maximum) in order to transform the indicators expressed in different units into indices between 0 and 1. As described in the UNDP-HDR technical notes, these goalposts act as the 'natural zones' and 'aspirational goal' respectively. However, dimension of income is adjusted with the observed minimum and maximum values of per capita income across all PSUs.

Inequality in the underlying distribution for each indicator is estimated using the Atkinson (1970) inequality measure  $A$  with the aversion parameter equal to one. Accordingly,  $A = 1 - g/\mu$ , where  $g$  is the geometric mean,  $\mu$  is the arithmetic mean of the distribution in the variable of interest ( $X$ ). Symbolically,

$$A_x = 1 - \frac{\sqrt[n]{X_1 \dots X_n}}{\bar{X}} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

where  $\{X_1, \dots, X_n\}$  denotes the underlying distribution in the indicator  $X$  and  $n$  refers to the number of geographical units (here PSUs).  $A$  is computed for each development indicator ( $X$ ) aggregated at PSU (sub-district) level.

<sup>8</sup>For computational detail see Alkire and Foster (2010).

<sup>9</sup>The Technical Notes of UNDP may be downloaded using the URL [http://hdr.undp.org/sites/default/files/hdr14\\_technical\\_notes.pdf](http://hdr.undp.org/sites/default/files/hdr14_technical_notes.pdf)

At the second stage, indicators are first developed by aggregating information at district level and then are adjusted for inequality in the distribution across the intra-district population. Thus, district-wise inequality adjusted indicators ( $I_x^*$ ) are obtained by multiplying district development indicators ( $I_x$ ) with  $(1-A_x)$ , where  $A_x$  is estimated through Equation 1. Accordingly,  $I_x^*$  estimates the value of indicators after adjusting potential loss due to the underlying distribution and is defined as;

$$I_x^* = (1 - A_x) * I_x \quad \dots \quad (2)$$

Besides income, other dimensions of socioeconomic development have more than one indicator. Therefore, dimensional composite indices for education, health and housing sectors are developed at the third stage by applying the following formula of geometric mean.<sup>10</sup> Here  $k$  denotes the dimension (sector) of development, while  $n$  refers to the number of indicators in each dimension.

$$\bar{I}_k = \sqrt[n]{\prod_{i=1}^n I_{xi}^*} \quad \dots \quad (3)$$

Thus  $\bar{I}_k$  is the  $k^{\text{th}}$  dimension composite index which represents the geometric mean of the relevant inequality-adjusted development indicators ( $I_x^*$ ).

Finally, ISDI for each district is developed by taking the geometric mean of three composite dimension ( $\bar{I}_k$ ) indices and income ( $I_{income}^*$ ) component.

$$ISDI_{(district)} = \sqrt[4]{I_{income}^* + \bar{I}_{Education} + \bar{I}_{Health} + \bar{I}_{Housing}} \quad \dots \quad \dots \quad (4)$$

District-wise ISIDs are estimated using PSLM data for the year 2012-13 to rank districts according to the level of development. Development scores represented by districts' ISDI are also used to estimate the *Gini* index (Equation 5) which is the well-known inequality index.

$$Gini = 1 - \frac{1}{N} \sum_{i=1}^N (ISID_d - ISID_{d-1}) \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

The *Gini* is obtained from a rank-dependent social evaluation function which attaches welfare-weights to individuals that depends on their position in the total distribution.

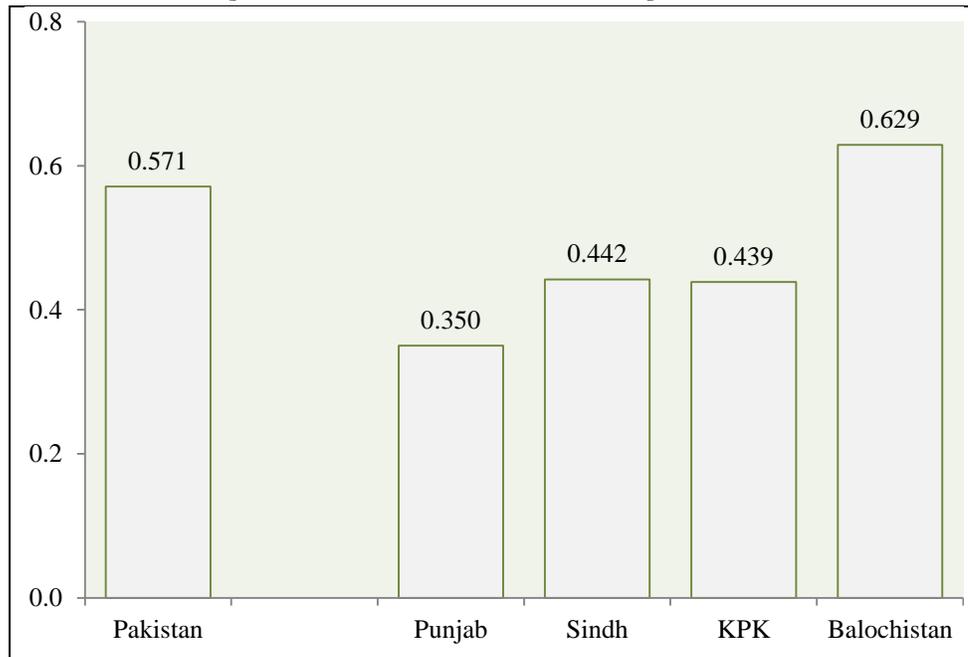
#### 4. ESTIMATES OF SPATIAL DISPARITIES IN SOCIOECONOMIC DEVELOPMENT

The estimated districts' ISIDs provide multi-dimensional development scores which represent the level of socioeconomic development in the district. These scores are used to develop rank orders and inequality levels to furnish intra and inter provincial disparities respectively in terms of development indicators considered for this analysis.

<sup>10</sup>One of the issues in the context of composite indexing is the substitutability among component indicators. However, the substitutability issue may be resolved by taking geometric mean instead of combining indicators using simple average. Although use of the geometric mean has been relatively rare in computing social statistics, starting from 2010 the UNDP Human Development Index did switch to this mode of calculation for combining component indicators of HDI and IHDI. It is argued that geometric mean better reflects the non-substitutable nature of the statistics being compiled and compared.

Figure 4.1 portrays the provincial *Gini* coefficients which reflect multidimensional provincial disparities in overall socioeconomic development. The magnitude of estimated *Gini* for overall level of development is 0.57 which is quite high and indicates severe disparities among districts of Pakistan. In terms of provinces, highest and lowest magnitudes of multidimensional *Gini* coefficients are estimated for Balochistan and Punjab provinces respectively. The estimated *Gini* for Balochistan is 0.63, while for Punjab it is 0.35, almost half of that of Balochistan. Interestingly, inequality levels in Sindh and KPK provinces as measured by *Gini* are almost equal. The high level of inequality in Sindh province indicates sharp urban-rural divide in the level of development.

**Fig. 4.1. Provincial Inequalities in Socioeconomic Development**  
[Multi-Dimensional *Gini* Coefficients]



Source: Estimated from PSLM, 2012-13 data.

The levels of provincial inequality in the dimensions of ISDI are furnished in Table 4.1. The table reveals that inequality magnitude with respect to districts' per capita income is 0.34 which is relatively low as compared with other components of ISDI. Highest income inequality is observed in KPK province, while Balochistan province has relatively more equal distribution in terms of district per capita income. The phenomenon of multi-dimensional inequality with respect to other sectors is however quite different. The table indicates that districts are significantly unequal in terms of health and housing indicators included in this analysis. The estimated *Gini* coefficients are 0.76 and 0.67 for housing and health dimensions respectively. Comparatively, level of inequality is low in the education sector, however the coefficient for Balochistan here also is quite high (0.66).

Table 4.1

*Inequalities in the Dimensions of Development*  
*[Multi-Dimensional Gini Coefficients]*

|             | Overall | Income | Education | Health | Housing |
|-------------|---------|--------|-----------|--------|---------|
| Pakistan    | 0.57    | 0.34   | 0.44      | 0.67   | 0.76    |
| Punjab      | 0.35    | 0.28   | 0.17      | 0.48   | 0.63    |
| Sindh       | 0.44    | 0.31   | 0.39      | 0.57   | 0.80    |
| KPK         | 0.44    | 0.35   | 0.33      | 0.59   | 0.62    |
| Balochistan | 0.63    | 0.22   | 0.66      | 0.73   | 0.94    |

*Source:* Estimated from the data of PSLM, 2012-13.

Besides the level of provincial disparities which are depicted in the Table 4.1, the analysis of intra-provincial inequalities is also important for resource allocation and regional planning. To facilitate provincial planners and policy makers, this study provides rank order of districts according to the level of socioeconomic development as estimated by Inequality-Adjusted Socioeconomic Development Indices. The national and provincial rank orders of districts are furnished in the appendix (Tables A1 through Table A4 for districts of Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan provinces respectively), while Table 4.2 is developed to show distribution of provincial population according to the level of development. For this exercise, quintiles are developed for each province after ranking of districts in terms of the magnitude of ISDI.

Table 4.2

*Population Distribution According to the Level of Development - Quintiles of ISDI*

|             | Provincial Population Residing in<br>Development Quintiles |        |       |      |         |
|-------------|--|--------|-------|------|---------|
|             | Lowest   | —————▶ |       |      | Highest |
|             | One  | Two    | Three | Four | Five    |
| Punjab      | 0  | 2      | 15    | 33   | 50      |
| Sindh       | 3  | 35     | 22    | 5    | 35      |
| KPK         | 4  | 14     | 20    | 40   | 22      |
| Balochistan | 57   | 29     | 14    | 0    | 0       |

*Source:* Estimated from the data of PSLM, 2012-13.

As expected, about 57 percent of the population of Balochistan resides in districts which fall in the lowest development quintile. Incidentally, no district of the province including the capital city has succeeded to have a place in the upper two quintiles. In contrast, more than 80 percent of the population of Punjab resides in top two (fourth and fifth quintiles) and only 2 percent resided in the lowest two quintiles. The population of KPK is distributed in quintiles with 4, 14, 20, 40 and 22 percentages and thus the province reflects relatively less lopsided nature of socioeconomic development. Conversely, the Sindh province reflects the case of extreme division of population; where about 35 percent population resides in the second and fifth quintiles each.

As this study is the first attempt in the context of Pakistan which uses the parameters of intra-districts inequality to adjust the development indicators of districts, it would be interesting to investigate how this inequality adjustment affects the development rank order? Tables 4.3 and 4.4 are developed to show the changes in rank order due to intra-district inequality. These tables furnish adjusted and unadjusted ranking of top and bottom 25 districts of Pakistan respectively.

Due to the intra-district inequality, the significant decline in rank order among the top districts is observed in Karachi, Jehlum, Chakwal and Quetta districts, while improvement in ranks are evident for districts Hafizabad, Sheikupura, Malalkand and Okara. According to earlier research on development ranking, Karachi always dominated with the first or second position on the top. Table 4.3 also confirms its top position after Islamabad according to the unadjusted ranking. However after adjusting inequality in the district; its rank position deteriorated by pushing it 15 ranks behind. Similarly, inequality in Quetta district affected its rank order and pushed it 25 ranks behind. The position of Islamabad however remained the same in both scenarios mainly due to large difference in the magnitude of development score between Islamabad and succeeding districts (Table A1, Appendix).

Table 4.3

*Effect of Intra-District Inequality on Development Ranking*  
*[Top 25 Districts according to Unadjusted Development Ranking]*

| Province    | Districts       | Development Rank Order                 |                                      | Change in Ranks |
|-------------|-----------------|--|--------------------------------------|-----------------|
|             |                 | Intra-District Inequality [Unadjusted] | Intra-District Inequality [Adjusted] |                 |
| Punjab      | Hafizabad       | 90                                     | 105                                  | 15              |
| Punjab      | Chiniot         | 91                                     | 92                                   | 1               |
| Punjab      | T.T Singh       | 92                                     | 99                                   | 7               |
| Balochistan | Quetta          | 93                                     | 68                                   | -25             |
| Punjab      | Okara           | 94                                     | 102                                  | 8               |
| KPK         | Malakand        | 95                                     | 104                                  | 9               |
| KPK         | peshawar        | 96                                     | 96                                   | 0               |
| Punjab      | Nankana Sahib   | 97                                     | 100                                  | 3               |
| Punjab      | Sheikhupura     | 98                                     | 106                                  | 8               |
| Punjab      | Sahiwal         | 99                                     | 95                                   | -4              |
| KPK         | Abbottabad      | 100                                    | 97                                   | -3              |
| KPK         | Haripur         | 101                                    | 108                                  | 7               |
| Sindh       | Hyderabad       | 102                                    | 94                                   | -8              |
| Punjab      | Sialkot         | 103                                    | 107                                  | 4               |
| Punjab      | Attock          | 104                                    | 103                                  | -1              |
| Punjab      | Chakwal         | 105                                    | 83                                   | -22             |
| Punjab      | Faisalabad      | 106                                    | 101                                  | -5              |
| Punjab      | Mandi Bahauddin | 107                                    | 109                                  | 2               |
| Punjab      | Gujranwala      | 108                                    | 112                                  | 4               |
| Punjab      | Jehlum          | 109                                    | 93                                   | -16             |
| Punjab      | Gujrat          | 110                                    | 113                                  | 3               |
| Punjab      | Rawalpindi      | 111                                    | 110                                  | -1              |
| Punjab      | Lahore          | 112                                    | 111                                  | -1              |
| Sindh       | Karachi         | 113                                    | 98                                   | -15             |
| Punjab      | Islamabad       | 114                                    | 114                                  | 0               |

Source: Estimated from the data of PSLM, 2012-13.

Table 4.4

*Effect of Intra-District Inequality on Development Ranking*  
*[Bottom 25 Districts according to Unadjusted Development Ranking]*

| Province    | Districts       | Development Rank Order                 |                                      | Change in Ranks |
|-------------|-----------------|--|--------------------------------------|-----------------|
|             |                 | Intra-District Inequality [Unadjusted] | Intra-District Inequality [Adjusted] |                 |
| Balochistan | Musa Khel       | 1                                      | 1                                    | 0               |
| Balochistan | Washuk          | 2                                      | 9                                    | 7               |
| KPK         | Torgarh         | 3                                      | 4                                    | 1               |
| Balochistan | Awaran          | 4                                      | 15                                   | 11              |
| Balochistan | Kohlu           | 5                                      | 2                                    | -3              |
| Balochistan | Dera Bugti      | 6                                      | 3                                    | -3              |
| KPK         | Kohistan        | 7                                      | 5                                    | -2              |
| Balochistan | Sheani          | 8                                      | 12                                   | 4               |
| KPK         | Tank            | 9                                      | 26                                   | 17              |
| Balochistan | Qilla Abdullah  | 10                                     | 21                                   | 11              |
| KPK         | D.I.Khan        | 11                                     | 34                                   | 23              |
| KPK         | Shangla         | 12                                     | 32                                   | 20              |
| Sindh       | Tharparkar      | 13                                     | 27                                   | 14              |
| Balochistan | Loralai         | 14                                     | 19                                   | 5               |
| Balochistan | Jhal Magsi      | 15                                     | 25                                   | 10              |
| Balochistan | Chaghi          | 16                                     | 11                                   | -5              |
| Balochistan | Zhob            | 17                                     | 8                                    | -9              |
| Sindh       | Kashmore        | 18                                     | 45                                   | 27              |
| Sindh       | Ümer Kot        | 19                                     | 31                                   | 12              |
| Balochistan | Qilla Saifullah | 20                                     | 7                                    | -13             |
| Balochistan | Bolan/Kachhi    | 21                                     | 6                                    | -15             |
| KPK         | Upper Dir       | 22                                     | 28                                   | 6               |
| Balochistan | Barkhan         | 23                                     | 14                                   | -9              |
| Balochistan | Harnai          | 24                                     | 13                                   | -11             |
| Balochistan | Jaffarabad      | 25                                     | 30                                   | 5               |

*Source:* Estimated from the data of PSLM, 2012-13.

## 5. CONCLUDING REMARKS

This research facilitates policy makers, regional planners and politicians by providing a single composite index from household survey data to evaluate relative position of districts of Pakistan in terms of socioeconomic development. Provincial multidimensional *Gini* coefficients and district development rank orders are presented to enlighten the nature and extent of inter and intra provincial disparities in Pakistan.

Besides income, various development indicators in the dimensions of education, health and housing are developed from the district representative household data of Pakistan Social and Living-Standard Measurement Survey for the year 2012-13. These indicators are used to develop Inequality-adjusted Socioeconomic Development Index (ISDI) for districts of Pakistan using the methodology of Inequality-adjusted Human Development Index of UNDP.

The study finds quite a high magnitude of estimated multidimensional *Gini* for overall level of development which reflects severe disparities among districts of Pakistan. In terms of provinces, highest and lowest magnitudes of *Gini* coefficients are estimated for Balochistan and Punjab provinces respectively. The high level of inequality in Sindh province indicates sharp urban-rural divide in the level of development.

Provincial population is distributed in development quintiles which are classified according to the level of development of districts. The exercise reveals that more than half of the population of Balochistan resides in districts which fall in the lowest development quintile. Incidentally, no district of the province including the capital city has succeeded to have a place in the upper two quintiles. In contrast, more than 80 percent of the population of Punjab resides in top two (fourth and fifth quintiles) and only 2 percent resided in the lowest two quintiles. The distribution of population of KPK reflects relatively less lopsided nature of socioeconomic development, while extreme division of population is found in case of Sindh province.

This study is the first attempt in the context of Pakistan which uses the parameters of intra-districts inequality to adjust the district development indicators. This adjustment significantly affects the development rank orders of districts. According to earlier research on development ranking in Pakistan, Karachi always dominated with the first or second position on the top. However after adjusting inequality in the district; its rank position deteriorated by pushing it 14 ranks behind. Similarly, inequality in Quetta district affected its rank order and pushed it 30 ranks behind.

The findings of this research would facilitate policy makers and development experts by identifying regions and areas which are lagging behind; making decisions on regional and sectoral priorities, facilitating targeted public interventions; and helping federal and provincial governments in determining financial awards.

## APPENDIX

Table A1

*Intra-Provincial Disparities in Socioeconomic Development – Punjab Province*  
*[Lowest to Highest Development Rank Order]*

| Districts       | Development Score<br>[ISDI] | Development<br>Index | Rank Order           |                     |
|-----------------|-----------------------------|----------------------|----------------------|---------------------|
|                 |                             |                      | Provincial<br>[1-37] | National<br>[1-114] |
| Rajapur         | 1.570                       | 3.92                 | 1                    | 36                  |
| D.G Khan        | 2.811                       | 7.03                 | 2                    | 48                  |
| Rahim Yar Khan  | 3.957                       | 9.89                 | 3                    | 55                  |
| Muzaffar Garh   | 5.524                       | 13.82                | 4                    | 62                  |
| Bhakar          | 5.561                       | 13.91                | 5                    | 64                  |
| Lodhrean        | 6.050                       | 15.13                | 6                    | 66                  |
| Layyah          | 6.083                       | 15.22                | 7                    | 67                  |
| Jhang           | 6.622                       | 16.57                | 8                    | 69                  |
| Khushab         | 6.723                       | 16.82                | 9                    | 70                  |
| Bahawalpur      | 7.093                       | 17.75                | 10                   | 71                  |
| Bhawanagar      | 7.730                       | 19.34                | 11                   | 76                  |
| Narowal         | 8.259                       | 20.66                | 12                   | 78                  |
| Khanewal        | 8.361                       | 20.92                | 13                   | 80                  |
| Chakwal         | 9.270                       | 23.19                | 14                   | 83                  |
| Multan          | 9.781                       | 24.47                | 15                   | 84                  |
| Vehari          | 9.867                       | 24.69                | 16                   | 85                  |
| Mianwali        | 10.092                      | 25.25                | 17                   | 87                  |
| Kasur           | 11.039                      | 27.62                | 18                   | 88                  |
| Sargodha        | 11.166                      | 27.94                | 19                   | 89                  |
| Pakpattan       | 11.291                      | 28.25                | 20                   | 90                  |
| Chiniot         | 11.556                      | 28.91                | 21                   | 92                  |
| Jhelum          | 12.365                      | 30.94                | 22                   | 93                  |
| Sahiwal         | 13.096                      | 32.77                | 23                   | 95                  |
| T.T Singh       | 14.923                      | 37.34                | 24                   | 99                  |
| Nankana Sahib   | 15.168                      | 37.95                | 25                   | 100                 |
| Faisalabad      | 15.190                      | 38.01                | 26                   | 101                 |
| Okara           | 15.363                      | 38.44                | 27                   | 102                 |
| Attock          | 16.422                      | 41.09                | 28                   | 103                 |
| Hafizabad       | 18.046                      | 45.16                | 29                   | 105                 |
| Sheikhupura     | 19.475                      | 48.73                | 30                   | 106                 |
| Sialkot         | 20.722                      | 51.85                | 31                   | 107                 |
| Mandi Bahauddin | 26.627                      | 66.63                | 32                   | 109                 |
| Rawalpindi      | 26.815                      | 67.10                | 33                   | 110                 |
| Lahore          | 30.258                      | 75.72                | 34                   | 111                 |
| Gujranwala      | 31.229                      | 78.15                | 35                   | 112                 |
| Gujrat          | 33.569                      | 84.01                | 36                   | 113                 |
| Islamabad       | 39.959                      | 100.00               | 37                   | 114                 |

Source: Estimated from the data of PSLM, 2012-13.

Table A2  
*Intra-Provincial Disparities in Socioeconomic Development – Sindh Province*  
*[Lowest to Highest Development Rank Order]*

| Districts       | Development Score<br>[ISDI] | Development<br>Index | Rank Order           |                     |
|-----------------|-----------------------------|----------------------|----------------------|---------------------|
|                 |                             |                      | Provincial<br>[1-37] | National<br>[1-114] |
| Thatta          | 0.437                       | 1.09                 | 1                    | 22                  |
| Tharparkar      | 0.661                       | 1.65                 | 2                    | 27                  |
| Ümer Kot        | 1.061                       | 2.65                 | 3                    | 31                  |
| Mir pur khas    | 1.511                       | 3.77                 | 4                    | 35                  |
| Shahdadkot      | 1.645                       | 4.11                 | 5                    | 37                  |
| Khairpur        | 1.859                       | 4.64                 | 6                    | 39                  |
| Ghotki          | 1.975                       | 4.94                 | 7                    | 40                  |
| Shiokarpur      | 2.044                       | 5.11                 | 8                    | 41                  |
| Jacobabad       | 2.102                       | 5.25                 | 9                    | 42                  |
| Baddin          | 2.206                       | 5.51                 | 10                   | 43                  |
| Kashmore        | 2.426                       | 6.07                 | 11                   | 45                  |
| Nawabsha        | 2.463                       | 6.16                 | 12                   | 46                  |
| Dadu            | 2.496                       | 6.24                 | 13                   | 47                  |
| Nowshero Feroze | 3.057                       | 7.64                 | 14                   | 50                  |
| Sanghar         | 3.238                       | 8.10                 | 15                   | 51                  |
| Jamshoro        | 3.822                       | 9.56                 | 16                   | 53                  |
| Tando Mohd Khan | 3.966                       | 9.92                 | 17                   | 56                  |
| Tando Allah Yar | 4.504                       | 11.27                | 18                   | 58                  |
| Sukkur          | 5.542                       | 13.86                | 19                   | 63                  |
| Larkana         | 7.605                       | 19.03                | 20                   | 75                  |
| Mitiari         | 8.462                       | 21.17                | 21                   | 81                  |
| Hyderabad       | 13.026                      | 32.59                | 22                   | 94                  |
| Karachi         | 14.783                      | 36.99                | 23                   | 98                  |

Source: Estimated from the data of PSLM, 2012-13

Table A3  
*Intra-Provincial Disparities in Socioeconomic Development – Khyber Pakhtunkhwa*  
*Province [Lowest to Highest Development Rank Order]*

| Districts    | Development Score<br>[ISDI] | Development<br>Index | Rank Order           |                     |
|--------------|-----------------------------|----------------------|----------------------|---------------------|
|              |                             |                      | Provincial<br>[1-37] | National<br>[1-114] |
| Torgarh      | 0.036                       | 0.08                 | 1                    | 4                   |
| Kohistan     | 0.039                       | 0.09                 | 2                    | 5                   |
| Tank         | 0.621                       | 1.55                 | 3                    | 26                  |
| Upper Dir    | 0.738                       | 1.84                 | 4                    | 28                  |
| Shangla      | 1.305                       | 3.26                 | 5                    | 32                  |
| D.I.Khan     | 1.322                       | 3.30                 | 6                    | 34                  |
| Chitral      | 3.040                       | 7.60                 | 7                    | 49                  |
| Lakki Marwat | 3.908                       | 9.77                 | 8                    | 54                  |
| bannu        | 4.452                       | 11.14                | 9                    | 57                  |
| Karak        | 4.592                       | 11.49                | 10                   | 59                  |
| Hangu        | 5.050                       | 12.63                | 11                   | 60                  |
| Swabi        | 5.375                       | 13.45                | 12                   | 61                  |
| Bonair       | 5.705                       | 14.27                | 13                   | 65                  |
| Mardan       | 7.226                       | 18.08                | 14                   | 72                  |
| Kohat        | 7.239                       | 18.11                | 15                   | 73                  |
| Lower Dir    | 7.518                       | 18.81                | 16                   | 74                  |
| Charsada     | 7.815                       | 19.55                | 17                   | 77                  |
| Manshera     | 8.338                       | 20.86                | 18                   | 79                  |
| Batagram     | 8.623                       | 21.57                | 19                   | 82                  |
| Swat         | 9.949                       | 24.89                | 20                   | 86                  |
| Nowsehra     | 11.384                      | 28.48                | 21                   | 91                  |
| Peshawar     | 13.462                      | 33.69                | 22                   | 96                  |
| Abbottabad   | 13.888                      | 34.75                | 23                   | 97                  |
| Malakand     | 17.472                      | 43.72                | 24                   | 104                 |
| Haripur      | 23.629                      | 59.13                | 25                   | 108                 |

Source: Estimated from the data of PSLM, 2012-13.

Table A4

*Intra-Provincial Disparities in Socioeconomic Development – Balochistan Province*  
*[Lowest to Highest Development Rank Order]*

| Districts       | Development Score<br>[ISDI] | Development<br>Index | Rank Order           |                     |
|-----------------|-----------------------------|----------------------|----------------------|---------------------|
|                 |                             |                      | Provincial<br>[1-37] | National<br>[1-114] |
| Musa Khel       | 0.003                       | 0.00                 | 1                    | 1                   |
| Kohlu           | 0.008                       | 0.01                 | 2                    | 2                   |
| Dera Bugti      | 0.008                       | 0.01                 | 3                    | 3                   |
| Bolan/Kachhi    | 0.078                       | 0.19                 | 4                    | 6                   |
| Qilla Saifullah | 0.155                       | 0.38                 | 5                    | 7                   |
| Zhob            | 0.158                       | 0.39                 | 6                    | 8                   |
| Washuk          | 0.198                       | 0.49                 | 7                    | 9                   |
| Kharan          | 0.223                       | 0.55                 | 8                    | 10                  |
| Chaghi          | 0.231                       | 0.57                 | 9                    | 11                  |
| Sheani          | 0.239                       | 0.59                 | 10                   | 12                  |
| Harnai          | 0.253                       | 0.63                 | 11                   | 13                  |
| Barkhan         | 0.296                       | 0.73                 | 12                   | 14                  |
| Awaran          | 0.298                       | 0.74                 | 13                   | 15                  |
| Nasirabad       | 0.311                       | 0.77                 | 14                   | 16                  |
| Keych/Turbat    | 0.331                       | 0.82                 | 15                   | 17                  |
| Khuzdar         | 0.360                       | 0.89                 | 16                   | 18                  |
| Loralai         | 0.371                       | 0.92                 | 17                   | 19                  |
| Nauski          | 0.401                       | 1.00                 | 18                   | 20                  |
| Qilla Abdullah  | 0.409                       | 1.01                 | 19                   | 21                  |
| Lasbella        | 0.499                       | 1.24                 | 20                   | 23                  |
| Ziarat          | 0.539                       | 1.34                 | 21                   | 24                  |
| Jhal Magsi      | 0.614                       | 1.53                 | 22                   | 25                  |
| Kalat           | 0.863                       | 2.15                 | 23                   | 29                  |
| Jaffarabad      | 0.940                       | 2.35                 | 24                   | 30                  |
| Pashin          | 1.308                       | 3.27                 | 25                   | 33                  |
| Sibbi           | 1.673                       | 4.18                 | 26                   | 38                  |
| Gawadar         | 2.363                       | 5.91                 | 27                   | 44                  |
| Mastung         | 3.421                       | 8.55                 | 28                   | 52                  |
| Quetta          | 6.127                       | 15.33                | 29                   | 68                  |

Source: Estimated from the data of PSLM, 2012-13.

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## Financial Sector, Democracy and Economic Growth: A Panel Data Analysis

MUHAMMAD ISHTIAQ, MUHAMMAD TARIQ MAJEED, and MUHAMMAD SOHAIL

Economic growth depends on many factors like the traditional factors of capital, labour and technological advancement and the somewhat novel factors of financial development and the nature of political regime. The relationship between the nature of political structure and economic growth is quite complicated. There may be direct and indirect impacts of the nature of political set up on economic growth. However, these channels remain un-explored to larger extent. The present study is conducted to analyse economic growth under democracy and dictatorship for a considerably larger set of countries from 1974 to 2013. The indirect impact of democracy on economic growth is analysed through an unexplored channel of financial sector performance, which is expected to be sensitive to regime type. The direct impact of democracy is found to be positively significant on economic growth. Likewise, direct impact of financial sector performance on economic growth is also found to be positive and significant. However, democracy had negative indirect impact on economic growth through financial sector but the magnitude of this indirect negative impact is minute enough to be ignored as compared to large individual direct effects of democracy and financial sector.

*JEL Classification:* O40, O43, O16

*Keywords:* Economic Growth, Democracy, Dictatorship, Financial Sector Performance

### 1. INTRODUCTION

Economic growth is of great concern in today's modern world as it is the main yard stick to measure the development and progress of any nation. Economic growth depends on various variables leading from socio cultural values to political scenarios. Different studies are conducted which relates the economic growth to different variables like education, investment, remittances, law and order, infrastructure, corruption and financial sector. Similarly, there are various studies relating the economic growth to the political regime where both direct and indirect impacts of democracy upon economic growth can be seen.

Financial sector and political regime both have impact on economic growth. Therefore, it is of no surprise that any alteration in one can alter the impact of other. Main variables of financial sector like money supply, market capitalisation and credit provision can increase economic growth as evident from literature. However, the question is how financial sector and democracy together act to foster economic growth?

Muhammad Ishtiaq <ishtiaq.iiiie@gmail.com> is Assistant Director, Employees' Old-Age Benefits Institution, Government of Pakistan. Muhammad Tariq Majeed <m.tariq.majeed@gmail.com> is Assistant Professor, Quaid-i-Azam University, Islamabad. Muhammad Sohail <m.iiui60@gmail.com> is Lecturer, National University of Modern Languages, Islamabad.

Theoretical debate regarding the possible net impact of democracy on economic growth is very interesting. Many political scientists are of the view that democracy has no direct net impact but it influences economic growth indirectly. This indirect impact is seen through channels of human capital, physical capital, corruption, technological innovations, investment, education, governance, state strength and many others.

Critics of democracy argue that democratic regimes are connected to the pressures from median voters to increase consumption which reduces investment funds and hence retards economic growth. Huntington and Dominguez (1975) argued that democratic government remains under huge pressure from the public to increase current consumption. This increase in personal consumption of public causes shrinkage investment funds in productive venues which retards the rate of economic growth. Becker (1983) pointed out that rent seeking behaviour of interest groups who try to maximise their benefits by pressurising government under a democratic form of government creates a dead weight loss in economy.

Dictatorship is considered to be more favourable than democracy by some studies on the bases that dictatorship has control over unfavourable actor like labour unions and hence accelerates growth through the channel of investment and saving as suggested by Knutsen (2010). Olson (1982) also argued against democracy on the basis of its vulnerability to particular pressure blocks. He argued that government in democratic regime can be pressurised by interest groups and vote blocks which will lead to policies against majority of populace by protecting the interests of small pressure groups. Wade (1990) stated that under autocracy politicians and bureaucrats will be free from pressures of interest groups. Another argument against democracy is the presence of veto-players as discussed by Tsebelis (2002). These veto-players will block the reforms introduced by democratic government in order to protect their potential political loss or defeat.

Advocates of democracy argue that it is democracy which protects the property rights and hence increases economic growth. Olson (2003) argued that the negative impact of violation of property rights will be less in democracies as they redistribute less to itself than an autocrat. Halperin, *et al.* (2005) claimed a superior developmental role of democracies over dictatorships as they are more adoptive to technological innovations because of high education and human capital. Gerring, *et al.* (2005) stipulated that a long time prevalence of democracy can accelerate economic growth through four channels which can be considered as different types of capital. These channels are human capital, physical capital, social capital and political capital. Baghwati (1995) also argued in democracy's favour by stating that less military conflicts are there between democratic nations which supports world peace and played a positive role in economic growth.

## 2. LITERATURE REVIEW

There are number of empirical studies as well interlinking the democracy and economic growth. Barro (1996) investigated the relationship between democracy and economic growth for the panel of 100 countries from 1960 to 1990. A weak negative and non-linear relationship was suggested in this study.

Franciso (2002) studied the long run growth effect of democracy through channel of quality of governance for a panel of 59 countries over the period 1960-90. The results indicated that democracy has a significant impact on economic growth as it is one of the

main components of total factor productivity. It also influences growth through the channel of governance quality which gives scope to technology and reduces corruption.

Persson and Tabellini (2006) conducted a study for a panel of 150 countries for time span 1960-90. Among the sample 120 countries experienced a regime change during the study period. The results show that both democratisation and economic liberalisation are associated with some reforms which, in turn, enhance economic growth during the transition phase of the economy (i.e., regime switching into democracy).

Cervellati and Sunde (2014) investigated the inter connections between democratisation, growth and violent conflicts for a panel of 166 countries for time period 1960-2003. The main focus of the study was on the third wave of democratisation which took place after 1970. Results indicated that civil conflicts weaken the growth impact of democratisation. A non-violent democracy or transition to democracy is more fruitful for growth.

Drury, *et al.* (2006) discussed the impact of corruption on growth in two different political regimes, democracies and non-democracies for a panel of 100 countries with time span 1982-97. They found only an indirect growth enhancing impact of democracy through the channel of corruption. Corruption's negative impact on growth tends to be reduced in democracies as compared to dictatorships.

Zouhaier, *et al.* (2006) investigated the linkages between democracy, investment and country's economic performance for 11 countries from MENA region for time period 2000-09. Democracy's impact on investment was seen to be positive hence suggesting its role in growth through the channel of investment in the sample countries. Political rights and investment interaction was also observed to be positive.

Papaioannou, *et al.* (2008) investigated the with-in country effects of democratisation by studying the growth performance before and after the transition phase towards democracy. Results of this study showed 1 percent increase in the growth of real GDP per capita as result of democratisation. It was also revealed that growth declines during transition year/years but as time passes growth rate comes again on stable path. Transition on reverse path (Democracy to Autocracy) was found to have negative growth impact.

Helliwell (1994) studied the two-way linkages between democracy and economic growth for a data panel of 125 countries for 25 years (1960-85). Income was found to have a significant positive impact on democracy while the counter relation was found to be complex in nature. Democracy direct impact was observed to be negative but insignificant but its indirect impact through channel of investment and education was positive which offset the direct negative impact indicating an overall weak positive net impact of democracy on economic growth.

Rodrick, *et al.* (2005) studied the post democratisation growth patterns of developing countries. Transition towards democracy was seen fruitful while state failure was seen damaging for growth. This study as whole suggested democracy beneficial for growth both in long run and short run.

Baum, *et al.* (2003) tried to explore the indirect effect of democracy on growth through the channels of education and life expectancy. Two recursive equations were used to capture direct and indirect impact of democracy for a panel of 128 countries spanning from 1967 to 1997. Direct impact of democracy was found to be insignificant.

However, democracy was found to influence growth positively through channel of life expectancy in poor and through secondary education in non-poor countries.

Doucouliaagos and Ulubasoglu (2008) conducted a meta-analysis based on 483 estimates derived from 84 studies from the literature. The studies' results were widely spread between positive and negative impacts of democracy over growth. 15 percent showed a positive and significant impact of democracy on growth, 21 percent show positive but insignificant impact, 37 percent results were negative but statistically insignificant while proportion of significant results was 27 percent.

### **Impact of Financial Sector on Economic Growth**

Growth literature nowadays incorporates several things related to material world (Physical Capital, Investment, institutions) and immaterial world (social values, ethical values, human capital, law and order) but still financial sector development is a hot issue to discuss. Financial sector is believed to have a key role in shaping the growth and developmental path of an economy. It is evident from existing studies in growth literature that financial liberalisation and financial reforms play key role in growth of an economy by bringing in foreign investment or improved industrialisation. Among important studies discussing financial development and economic growth relationship, Walter Bagehot (1873) and Joseph Schumpeter (1911) are considered to be pioneers. These scholars termed financial sector development as the major component of economic growth. Other studies like Robinson (1952), Beck, *et al.* (2003) and Levine, *et al.* (1998) also indicated a positive impact of financial development over economic growth.

On other hand, Keynes (1936) oppose the positive growth impact of financial development by arguing that stock markets inherently possess speculative activities which increase with the degree of development of financial systems and hence put negative and destabilising impact on economy's growth. Several Empirical Studies like Gregorio, *et al.* (1995) and Andersen, *et al.* (2003) supported Keynes argument.

Bagehot (1873) held responsible the established financial system of England in mid-1800s as the main reason of its success and wealth which put it in distinguished position in comparison to other poor countries in that era. He also pointed out that financial systems are responsible to generate savings as aggregate saving is composed of both private and national savings.

Levine, *et al.* (1998) investigated the effect of stock market performance and financial intermediaries on economic growth for a cross sectional averaged data of time period 1976-93. This study found a positive and significant impact of both stock market and financial sector intermediaries on economic growth.

Beck, *et al.* (2003) examine the role of stock market in growth structure of an economy by bringing in concern the time variable nature of stock market data for a panel of 40 countries for time period 1976-98 Results from the estimation concluded that both stock market and bank development show a joint significant impact on the development of economy and foster economic growth.

In opposite, there are several other studies indicating negative impact of financial sector development on growth. Ram (1999) investigated the relation between growth of real GDP per capita and financial development by using data panel consisting of 95 countries spanning from 1960 to 1989. This study indicated a weakly negative or even negligible impact of financial development on growth of real GDP per capita.

There are several other studies suggesting positive impact of financial development on growth of an economy like Goldsmith (1969), Levine (1991) and Saint-Paul (1992). Other shows insignificant or no impact of financial development on growth as Lucas (1988) termed the role of financial sector development in growth structure of an economy to be minor and negligible. Stern (1989) also suggested no role of financial development in the growth process. A negative impact of financial development is also found in literature as suggested by Keynes (1936) and is empirically supported by Gregorio (1995) and Andersen (2003) and Ram (1999).

### Impact of Democracy on Financial Institutions

Similar to economic growth financial sector has also number of components in its development strategy. Several important components are discussed by many which can bring financial development like financial reforms, political stability [Roe, *et al.* (2013)], trade openness [Rajan, *et al.* (2003)] and legal system structure [Porta, *et al.* (1998)]. Among all determinants of financial developments, regime type and democratic structure of country's institutions are of vital importance.

Wittman (1989) argued that under democratic institutions the efficiency of financial markets improves and transaction cost is reduced. Similarly, a visit to the literature by Malmendier (2009) concluded that politics and political regimes' role can't be ignored in the discussion of financial sector development. Numerous other studies are there in literature linking other studies linking political regimes and financial sector development included Huang (2010), Rajan, *et al.* (2003) and Clague, *et al.* (1996).

Clague, *et al.* (1996) investigated the relationship between democracy and financial sector development. They argued that as democracy better protect individual and property rights which will give incentives for investment to private investors hence bring improvement in financial sector. Huang (2010) linked the political institutions with financial development. Study suggested a positive and significant impact of institutions' improvement on financial sector development. This study also concluded that democratic transformation brings a boom in financial sector growth in the short run.

### 3. MODEL AND METHODOLOGY

Econometric model is constructed by modifying the famous Cobb-Douglas production function. Cobb-Douglas production function states that output is the function of inputs and total factor productivity. Further, total factor productivity depends on several economic, political, social and technological factors. We have introduced the role of political regime and financial sector into the growth of an economy through total factor productivity. Our model is given below which is modified with different proxies for financial sector and also combine term whenever required for the statistical purposes [Griliches (1979 and 2000)] For the linearity of model and growth inertia we have adopted the precedence from the literature. [For details see, Barro (1996), Mankiw (2002)].

$$Y_{i,t} = \alpha_0 + \beta_1 \cdot Y_{i,t-1} + \beta_2 \cdot Pol_{i,t} + \beta_3 \cdot FS_{i,t} + \beta_4 \cdot K_{i,t} + \beta_5 \cdot L_{i,t} + \varepsilon_{i,t} \dots \quad (1)$$

$Y_{i,t}$  = natural log of real GDP per capita

i = 1, 2, 3 ..... n. (representing cross section)

$t = 1, 2, 3 \dots \dots T$ . (representing time in years)

$\varepsilon$  = error term

FS = Financial sector (M2, credit availability and market capitalisation ratio to GDP)

Pol= Polity Scale IV

By introducing an interactive term of polity (regime time) and different financial sector variables, we are intended to capture indirect impact of polity through financial sector. This can be seen in Equation (2).

$$Y_{i,t} = \alpha_0 + \beta_1 \cdot Y_{i,t-1} + \beta_2 \cdot \text{Pol}_{i,t} + \beta_3 \cdot \text{FS}_{i,t} + \beta_4 \cdot \text{Pol}_{i,t} * \text{FS}_{i,t} + \beta_5 \cdot K_{i,t} + \beta_6 \cdot L_{i,t} + \varepsilon_{i,t} \quad (2)$$

We will also split our model into democratic and autocratic regimes on the basis of polity index where positive values are taken as democracy and negative values are taken as autocracy. Polity index has value between -10 and +10). [see Drury, *et al.* (2006)].

#### 4. DATA COLLECTION AND DESCRIPTIVE STATISTICS

Data is collected from various standard databases used widely in literature. Data on economic growth is taken as log of GDP per capita from World Development Indicators of World Bank WDI (2014).

For democracy we have extracted data from Polity IV index which is a 21-point scale ranging from -10 to +10, where -10 shows the extreme value for dictatorship while +10 indicates maximum of democracy.

Data of financial sector proxies which are Money supply ratio to GDP, market capitalisation ratio to GDP and Private credit to GDP is taken from the WDI (2014).

Data on various control variables which are investments (used as proxy for capital), labour, government expenditure, inflation, population growth, trade openness, life expectancy and education is taken from WDI (2014). A table with definitions of different variables and sources is presented in the Appendix.

Table 1

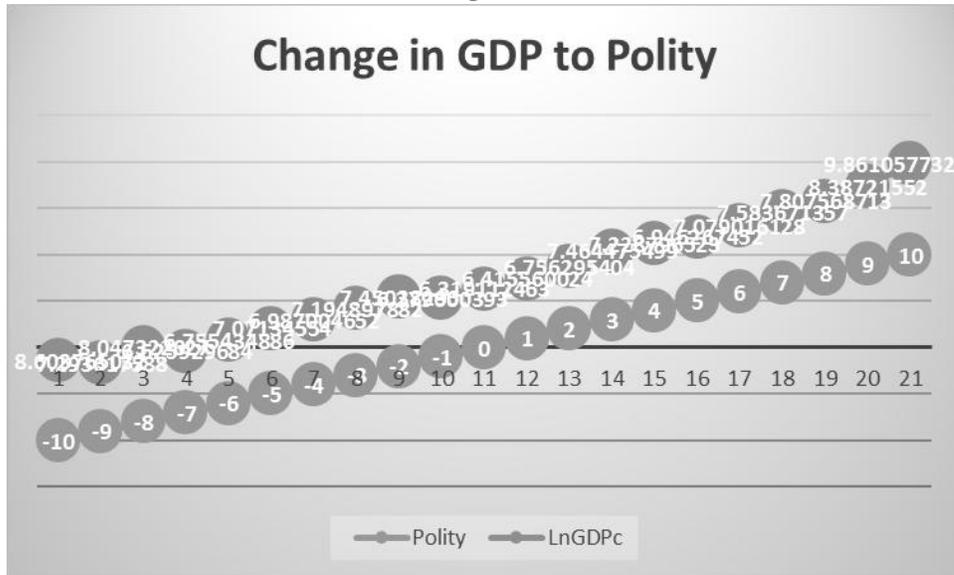
##### *Summary Statistics of Main Variables*

| Variable              | Total        |         |                    |         |         |
|-----------------------|--------------|---------|--------------------|---------|---------|
|                       | Observations | Mean    | Standard Deviation | Minimum | Maximum |
| Ln GDPc               | 1112         | 7.8192  | 1.6131             | 4.2596  | 11.3277 |
| Investment            | 1083         | 3.029   | 0.3713             | 0.7333  | 5.1399  |
| Labour                | 795          | 15.1529 | 1.6151             | 11.0015 | 20.4735 |
| Money Supply          | 1056         | 3.6696  | 0.7052             | 1.4784  | 8.8445  |
| Market Capitalisation | 530          | 3.05372 | 1.3776             | -3.4071 | 6.1733  |
| Credit Availability   | 1090         | 3.0537  | 1.3776             | -3.4071 | 6.1733  |
| Polity                | 1173         | 1.4146  | 7.2087             | -10     | 10      |

Figure (a) relating the change in GDP to change in points on polity scale shows positive relationship between regime type and development of an economy. The GDP shows a parallel continuous increase with every point movement from autocratic form of government towards the democratic. Polity scale starting from -10 being most autocratic

to +10 being most democratic shows a constant increase in real GDP per capita with every point improvement towards the most democratic.

Fig. (a)



Financial sector also shows a positive linear relationship with polity variables which shows that financial sector also derives benefits from democracy (Figure b). Similarly, Figure (c) relating polity IV scale and financial sector ratings [WDI (2014)] also show a positive relationship between financial sector and democracy’s variables.

Fig. (b)

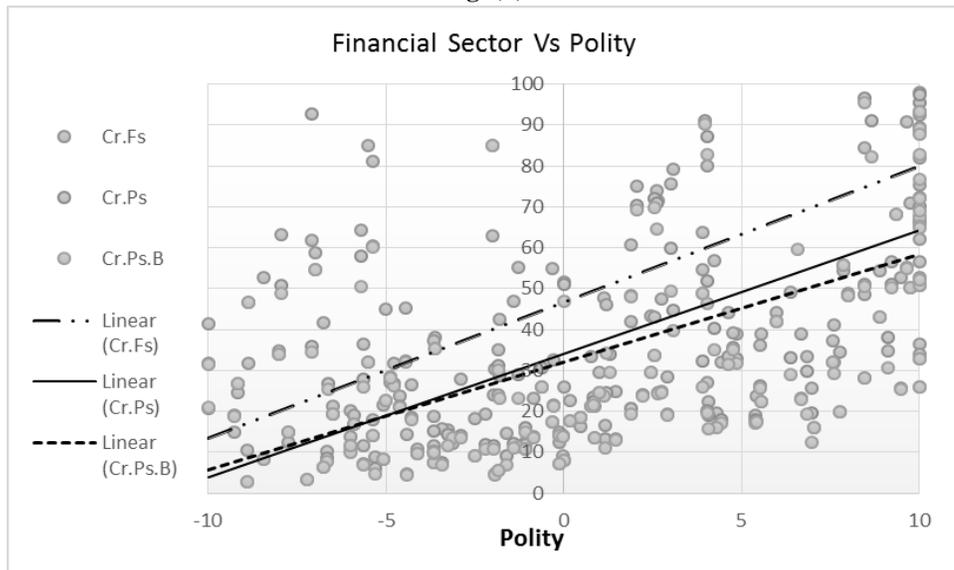
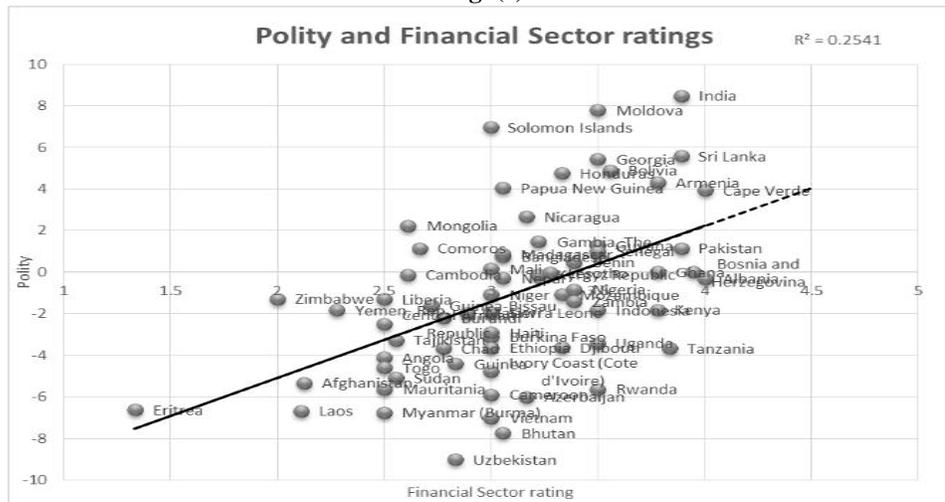


Fig. (c)



## 5. EMPIRICAL RESULTS AND DISCUSSION

We apply various econometrics tests to check the statistical problems like normality issues, heteroskedasticity, auto correlation, multicollinearity and endogeneity. We are using a larger data panel having issues of endogeneity which makes the OLS estimator biased and inefficient. We attempt to overcome the issue of endogeneity by estimating system Generalised Method of Moments with exogenous instruments as well as lags of independent variables as instruments. Exogenous instruments used in system GMM estimation are legal origin, regional dummies, time dummy, war count and religious fractionalisation.

### 5.1. Diagnostic Tests

Our basic data diagnostic tests reported below are shows no problem of multicollinearity which is check through variance inflated factor reported in Table 2. VIF value is far below the critical value of 10 suggested no relationship between the dependent variables. Linearity of the model is also confirmed through Ramsey Reset Test (Table 2) hence showing no misspecification of model form. Null hypothesis of no misspecification or correct functional form is accepted. In addition to that, results of Breusch Pagan test of heteroskedasticity confirm that the data panel is heterogeneous in nature as cross-section is enormously greater than time series.

Dependents variables don't have any explicit relationships hence there is no problem of multicollinearity. However, the problem of omitted variables and endogeneity in the model are the issue which make the OLS results bias and less efficient. No formal test of endogeneity has been conducted. But as evident from previous growth studies investment and growth inertia is always endogenous to growth. So, we also assume a default endogeneity in our model as well and use the lag of independent variables as the instruments in growth equation [Arellano and Bond (1991)]. Therefore, for final and robust results GMM with lags as instrument to control for endogeneity as well as hetero problem in the panel is estimated with hetero adjusted robust errors.

Table 2

*Variance Inflated Factor results*

| Model Type | Variables                        | Money<br>Supply | Market<br>Capitalisation | Credit<br>Availability |
|------------|----------------------------------|-----------------|--------------------------|------------------------|
|            |                                  | VIF value       | VIF Value                | VIF Value              |
|            | Log of GDPpc                     | 2.55            | 2.99                     | 2.36                   |
|            | Log of Financial Sector Variable | 1.62            | 1.90                     | 1.74                   |
|            | Polity/ Democracy                | 2.05            | 2.11                     | 2.54                   |
|            | Investment                       | 1.15            | 1.09                     | 1.21                   |
|            | Labour                           | 1.81            | 1.63                     | 1.74                   |
|            | <b>Mean VIF</b>                  | <b>1.59</b>     | <b>1.88</b>              | <b>1.74</b>            |

Table 3

*Different Normality Tests*

| Model Test   |         | Money<br>Supply | Market<br>Capitalisation | Credit<br>Availability |
|--------------|---------|-----------------|--------------------------|------------------------|
| Shapiro-Wilk | Z-score | 9.145           | 9.229                    | 10.582                 |
|              | P-value | 0.0000          | 0.0000                   | 0.0000                 |
| Jarque-Bera  | P-value | 0.0000          | 0.0000                   | 0.0000                 |
| Skewness     | P-value | 0.0000          | 0.0000                   | 0.0000                 |
| Kurtosis     | P-value | 0.0000          | 0.0000                   | 0.0000                 |

Table 4

*Model Specification and Linearity Tests*

| Model Test                         |                         | Money<br>Supply | Market<br>Capitalisation | Credit<br>Availability |
|------------------------------------|-------------------------|-----------------|--------------------------|------------------------|
| Ramsey Reset (Omitted<br>Variable) | F-stat                  | 10.005          | 12.358                   | 11.302                 |
|                                    | P-value                 | 0.0000          | 0.0000                   | 0.0000                 |
| Ramsey Reset<br>(Linearity)        | Chi-square              | 3.81            | 4.22                     | 3.57                   |
|                                    | P-value                 | 0.0926          | 0.05532                  | 0.1081                 |
| Link Test                          | Hat (P-value)           | 0.0000          | 0.0000                   | 0.0000                 |
|                                    | Hat-square<br>(P-value) | 0.1283          | 0.119                    | 0.1030                 |

Table 5

*Breusch-Pagan/Cook-Weisberg test for Heteroskedasticity*

|            | Money<br>Supply | Market<br>Capitalisation | Credit<br>Availability |
|------------|-----------------|--------------------------|------------------------|
| Chi-Square | 58.33           | 57.29                    | 62.19                  |
| P-value    | 0.0000          | 0.0000                   | 0.0000                 |

## 5.2. Estimation Techniques

As evident from the literature that panel data have twin problems of autocorrelation and heteroskedasticity of time and space. Therefore, our main focus will be on the results of system GMM which is used to tackle these issues along with endogeneity arising from the endogenous nature of polity and investment variables.

Results of OLS show that polity has positive impact on economic growth under democracy and negative impact under dictatorship. Likewise, the impact of financial sector also fluctuates as we change the proxy variable which shows the inconsistency of OLS in an endogenous growth and democracy relationship. OLS is based on arithmetic mean formula where the estimated line passes through the average of data set. It is based on the minimisation of sum of squared errors criteria. OLS is assumed to be unbiased and best under certain set of assumptions like normality, no auto and no hetero problem. But our data panel doesn't fulfil the conditions of OLS which induces us to move to GMM estimations in order to control the problem of endogeneity as well as get rid of hetero and auto problems.

For this reason, we have estimated system GMM with lags as an instruments along with some exogenous instruments. GMM is based on the moment's conditions where the criterion for best parameter estimate is to minimise the sum of squared moments. Dynamic panel data is mostly estimated through system and different GMM technique by using some instruments of own lag value for dependent variable or some exogenous instrumental variables. [Arellano and Bover (1995) and Blundell and Bond (1998)].

Table 6

### *Financial Sector, Democracy and Economic Growth—OLS results*

|                              | Combine               | Democracy              | Dictatorship          | Combine                 | Democracy              | Dictatorship          | Combine               | Democracy              | Dictatorship          |
|------------------------------|-----------------------|------------------------|-----------------------|-------------------------|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Lag of GDPpc Growth          | 0.981***<br>(0.00536) | 0.975***<br>(0.00647)  | 0.981***<br>(0.0125)  | 0.973***<br>(0.00510)   | 0.973***<br>(0.00642)  | 0.949***<br>(0.0157)  | 0.975***<br>(0.00568) | 0.971***<br>(0.00659)  | 0.974***<br>(0.0131)  |
| Investment                   | 0.207***<br>(0.0173)  | 0.149***<br>(0.0223)   | 0.246***<br>(0.0301)  | 0.239***<br>(0.0227)    | 0.245***<br>(0.0286)   | 0.216***<br>(0.0437)  | 0.201***<br>(0.0170)  | 0.144***<br>(0.0217)   | 0.243***<br>(0.0300)  |
| Polity                       | -0.00633<br>(0.00543) | 0.00826**<br>(0.00337) | -0.00422<br>(0.00594) | 0.00495**<br>(0.00235)  | 0.00806**<br>(0.00369) | -0.00859<br>(0.00622) | -0.00261<br>(0.00359) | 0.00653**<br>(0.00332) | -0.00390<br>(0.00593) |
| Labour force                 | 0.00535<br>(0.00398)  | 0.000389<br>(0.00395)  | 0.0195*<br>(0.0101)   | -0.000354<br>(0.00390)  | -0.00582<br>(0.00417)  | 0.0156<br>(0.0104)    | 0.00274<br>(0.00393)  | -0.00170<br>(0.00384)  | 0.0150<br>(0.0102)    |
| Money Supply                 | 0.00700<br>(0.0118)   | 0.0320**<br>(0.0130)   | -0.0172<br>(0.0230)   |                         |                        |                       |                       |                        |                       |
| Money Supply*Polity          | 0.00225<br>(0.00142)  |                        |                       |                         |                        |                       |                       |                        |                       |
| Market Capitalisation        |                       |                        |                       | 0.0219***<br>(0.00583)  | 0.0158***<br>(0.00594) | 0.0448***<br>(0.0125) |                       |                        |                       |
| Market Capitalisation*Polity |                       |                        |                       | -0.000590<br>(0.000686) |                        |                       |                       |                        |                       |
| Private Credit               |                       |                        |                       |                         |                        |                       | 0.0224**<br>(0.00920) | 0.0366***<br>(0.0101)  | 0.00811<br>(0.0181)   |
| Private Credit*Polity        |                       |                        |                       |                         |                        |                       | 0.00128<br>(0.00104)  |                        |                       |
| Constant                     | -0.505***<br>(0.0828) | -0.342***<br>(0.0877)  | -0.785***<br>(0.193)  | -0.478***<br>(0.103)    | -0.433***<br>(0.122)   | -0.603***<br>(0.227)  | -0.449***<br>(0.0836) | -0.252***<br>(0.0881)  | -0.737***<br>(0.201)  |
| Observations                 | 658                   | 448                    | 203                   | 453                     | 358                    | 93                    | 673                   | 463                    | 203                   |
| R-squared                    | 0.990                 | 0.993                  | 0.980                 | 0.993                   | 0.994                  | 0.991                 | 0.991                 | 0.994                  | 0.980                 |

Standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

### 5.3. Financial Sector, Democracy and Growth- System-GMM results

The direct impact of polity variable is found to be positive and significant in the presence of different indicators of financial sector which are money supply, market capitalisation and credit availability to private sector. The coefficient sizes of polity are 0.024, 0.012, 0.020 in the models of money supply, market capitalisation and private credit, respectively (Table 6.7). These results indicate that democracies put direct effect on economic growth of about 2 percent on average with a point increase on polity scale. Our results are consistent with earlier studies showing direct positive growth impact of democracy because in democracies business activities increase [Baghwati (1995); Halperin, *et al.* (2005)].

All the interactive terms of money supply, market capitalisation and private credit with polity have negative and significant sign. This shows that although democracies accelerate growth by providing better economic conditions but in financial sector its role is different. Although supply of money affects growth positively in its individual capacity (0.0267) implying that whenever money supply is increased by 1 percent, it will increase economic growth by approximately 2.6 percent. But in democracies the combine impact is negative with a negligible co-efficient of interactive term (-0.005). This can be due to the fact that in democracies some part of increased money supply is used in non-productive activities. These non-productive activities can be advertisement and vote bank extension by ruling party, or taking pressure of public to fulfill current consumption demands by subsidising different consumable products [Huntington (1992)].

Market capitalisation shows positive direct impact of (0.162) implying that 1 percent increase in market capitalisation will accelerate economic growth by 1.62 percent. Like money supply here as well indirect impact of democracy is -0.3 percent through market capitalisation which can be ignored in the presence of 1.16 percent direct impact of democracy. The indirect negative impact of democracy through market capitalisation can be linked with the non-liberalisation of capital markets even in presence of democracies.

As suggested by Thomas Apolte (2011) that institutional structure matters for implications of democracy on growth. Likewise, financial sector can lead to high growth in democracies only when democratisation is followed by financial liberalisation as well. Baghwati (1995) in his theoretical discussion asserted that democracies enhance growth where capital markets are liberalised. Therefore, we can say that market capitalisation and democracy will not have combine positive and favourable growth impact because financial sectors are not necessarily liberalised with democracies. Mostly the financial liberalisation occurred in the economies years after they have evolved into democracies. [Baert, *et al.* (2005)]. In case of third variable private credit availability ratio to GDP, the direct impact is positive but insignificant due to sensitivity to polity variable. The sensitivity of credit availability to polity variable is in line with earlier literature showing that whenever we bring the democracy variable into growth equation, it draws out the impact of credit availability making it insignificant [Baert, *et al.* (2006)].

The combine effect of credit and polity shows negative effect of credit on growth when it is democratic form of government. However, the co-efficient size is very small of about -0.05 percent. In democracies the credit is extended on political bases to widen the vote bank of ruling party or credit schemes are devised which are not pro-growth but pro-vote.

In second step, we split sample into democracies and dictatorships. For democracies we have applied the data where the polity variables show a value in positive and for dictatorships a value in negative, respectively. The control variables show stable and significant signs to the changing proxies of financial sector. Investment as the main control variable for growth shows stable and significantly positive impacts on growth in both combine and split samples. We found that investment enhanced economic growth in democracies and is consistent with studies of Zouhaier, *et al.* (2006) and Persson, *et al.* (2006).

Labour force is seen to have negative growth impact in case of democracies but positive for dictatorships. It is due to the fact that democracies mostly faced enormous pressure from public to bring an immediate increase in their current consumptions shift funds from production sector to subsidies [Helliwell (1994)].

The direct impact of polity/democracy is positive in all cases of combine sample which is indication that democracy does have a favourable role in growth economics. This favourable role can be in form of conducive growth environment [Diebolt, *et al.* (2013)], protection of property rights [Przeworski, *et al.* (2002), liberalisation of other institutions [Thomas (2011)] and improved human capital [Baum, *et al.* (2003)]. In split sample analysis the polity variable keeps its positive and significant sign in case of money supply and credit models.

Table 7

*Financial Sector, Democracy and Growth—System GMM Results*

|                              | Dictator-ship           |                         |                        | Dictator-ship           |                       |                        | Dictator-ship           |                         |                        |
|------------------------------|-------------------------|-------------------------|------------------------|-------------------------|-----------------------|------------------------|-------------------------|-------------------------|------------------------|
|                              | Combine                 | Democracy               | Dictator-ship          | Combine                 | Democracy             | Dictator-ship          | Combine                 | Democracy               | Dictator-ship          |
| Lag of GDPpc Growth          | 0.990***<br>(0.00519)   | 0.982***<br>(0.00584)   | 0.989***<br>(0.0113)   | 0.983***<br>(0.00564)   | 0.983***<br>(0.00525) | 0.997***<br>(0.0144)   | 1.002***<br>(0.00819)   | 0.980***<br>(0.00690)   | 0.978***<br>(0.0125)   |
| Investment                   | 0.282***<br>(0.0322)    | 0.310***<br>(0.0357)    | 0.128***<br>(0.0359)   | 0.313***<br>(0.0267)    | 0.315***<br>(0.0362)  | 0.215***<br>(0.0440)   | 0.296***<br>(0.0356)    | 0.300***<br>(0.0380)    | 0.155***<br>(0.0347)   |
| Labour Force                 | 0.00347<br>(0.00329)    | -0.000738<br>(0.00298)  | 0.0331***<br>(0.00513) | 0.00454<br>(0.00369)    | -0.00260<br>(0.00337) | 0.0451***<br>(0.00630) | 0.00407<br>(0.00398)    | -0.00226<br>(0.00274)   | 0.0293***<br>(0.00456) |
| Polity                       | 0.0243***<br>(0.00802)  | 0.00664***<br>(0.00217) | 0.00356**<br>(0.00160) | 0.0116***<br>(0.00420)  | 0.00136<br>(0.00277)  | 0.00214<br>(0.00224)   | 0.0200***<br>(0.00628)  | 0.00771***<br>(0.00222) | 0.00392**<br>(0.00179) |
| Money Supply                 | 0.0267*<br>(0.0146)     | 0.0159<br>(0.0149)      | 0.0816***<br>(0.00914) |                         |                       |                        |                         |                         |                        |
| Money Supply*Polity          | 0.00553***<br>(0.00207) |                         |                        |                         |                       |                        |                         |                         |                        |
| Market Capitalisation        |                         |                         |                        | 0.0162**<br>(0.00802)   | 0.00423<br>(0.00740)  | 0.0389***<br>(0.00798) |                         |                         |                        |
| Market Capitalisation*Polity |                         |                         |                        | -0.00302**<br>(0.00125) |                       |                        |                         |                         |                        |
| Private Credit               |                         |                         |                        |                         |                       |                        | 0.00853<br>(0.0139)     | 0.00936<br>(0.0141)     | 0.0703***<br>(0.00746) |
| Private Credit*Polity        |                         |                         |                        |                         |                       |                        | 0.00503***<br>(0.00182) |                         |                        |
| Constant                     | -0.848***<br>(0.0937)   | -0.797***<br>(0.103)    | -1.028***<br>(0.121)   | -0.835***<br>(0.116)    | -0.686***<br>(0.145)  | -1.361***<br>(0.130)   | -0.899***<br>(0.117)    | -0.707***<br>(0.115)    | -0.887***<br>(0.133)   |
| Number of Instruments        |                         | 77                      | 68                     | 26                      | 79                    | 68                     | 20                      | 71                      | 63                     |
| AR (1)                       |                         | 0.042                   | 0.066                  | 0.122                   | 0.033                 | 0.078                  | 0.171                   | 0.071                   | 0.199                  |
| AR(2)                        |                         | 0.086                   | 0.166                  | 0.202                   | 0.097                 | 0.113                  | 0.264                   | 0.082                   | 0.119                  |
| Hansen J. Test               |                         | 0.273                   | 0.515                  | 0.492                   | 0.551                 | 0.388                  | 0.814                   | 0.263                   | 0.411                  |
| Observations                 | 500                     | 377                     | 139                    | 319                     | 316                   | 64                     | 499                     | 392                     | 139                    |
| Countries                    | 114                     | 93                      | 44                     | 83                      | 76                    | 21                     | 113                     | 93                      | 44                     |

Standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The impact of money supply is positive in split sample analysis and confirms the result of combined sample. Here we can see in second column of Table 7 that under democratic regime the impact of money supply turns insignificant although positive. Which means that democracies do not perform well when it comes to achieve growth targets through use of money supply tool.

In split sample analysis the impact of market capitalisation is seen to be insignificant in case of democracies but in dictatorships it turns to be positive and significant. But it should be seen that the results in split sample is not negative for democracies which is the indication that democracies don't derive extra growth benefits from financial sector but it is not harming the current growth as well.

Impact of credit availability is insignificant for combine and in split sample of democracies. While in dictatorships a positive significant impact is seen which is similar to our other two variables from financial sector, money supply and market capitalisation. Insignificant impact of credit in combine sample and its negative interactive impact with polity indicate that credit itself has no impact on growth when we bring the democracy in picture. China can be a bright example of positive impact under dictatorships where home scale production industries were developed by extending credit to the skilful labour which gives boost to production on low cost.

## 6. CONCLUSION

From the results we conclude that all the variables used as proxies for financial sector are directly affecting the economic growth positively and significantly. Likewise, direct impact of democracy on growth is also found to be positive and significant. However interactive term of financial sector and democracy insert negative impact on economic growth. This indicates that financial sector does not behave efficiently under democracy. The reason maybe that it is not necessary that financial markets are liberalised under democracy to gain maximum benefits in terms of growth. While it has been observed that financial markets are liberalised years after democratisation. The results provided by combined sample are supported by split sample analysis as well. The co-efficient of financial sector variables are significantly positive in dictatorship's models and insignificant in democracies' showing that democracies do not outperform dictatorships in financial sector performance. It is because democracies are more vulnerable to political violent activities which influence the financial sector performance in worse manner.

We conclude our study here by answering the question about direct impact of democracy on economic growth and also its indirect impact through financial sector variables. The answer is that democracies positively influence economic growth directly as it ensures property rights and improves business environment through advanced technological innovation and improved human capital. But its indirect impact through channels of money supply, market capitalisation and credit availability to private sector is negative.

## APPENDIX

## A1. Data Variables Definitions and Sources

| Variable                     | Description  | Source  |
|------------------------------|--|---|
| Growth                       | Natural log of annual percentage growth of GDP.  | WDI (2014)  |
| Democracy                    | Two measures are used for democracy  | Freedom House (2014) and Polity (2014)                          |
| Polity IV                    | Measure of democracy based on several indicators from free and fair election to the constraints on executive.  | Polity IV index (2014)  |
| Financial Sector Performance | Measure by three different variables.<br>i) M2/GDP ratio<br>Total money supply as a percent of GDP<br>ii) Market Capitalisation to GDP ratio<br>Total share of market capitalisation as a percent of GDP<br>iii) Private Credit to GDP ratio<br>Volume of credit to private sector as a percent of GDP | World Bank's Global Financial Development Database (GFDD), 2014 |
| Investment                   | Gross domestic investment as percentage of GDP.  | World Bank Database (2014)                                      |
| Labour Force                 | Growth in labour force over a year   | World Bank Database (2014)                                      |

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## Measurement and Determinants of Inclusive Growth: A Case Study of Pakistan (1990-2012)

AZRA KHAN, GULZAR KHAN, SADIA SAFDAR, SEHAR MUNIR,  
and ZUBARIA ANDLEEB

Equality of opportunity is the core of inclusive growth, and the inclusive growth emphasises to create employment and other development opportunities through rapid and sustained economic growth, and to promote social justice and the equality of sharing of growth results by reducing and eliminating inequality of opportunity. The main objective of the study is to measure the inclusive growth first and then empirically examine its determinants. To measure the inclusive growth, we use the methodology developed by Asian Development Bank using weights and scores of different indicators. We develop a unified measure of inclusive growth, which integrates growth, inequality, accessibility and governance into one single measure. Results show that Pakistan is at satisfactory performance level with respect to its performance in growth inclusiveness. Further results of ARDL show that macroeconomic stability and social financial deepening are important determinants to enhance the inclusiveness, and reduce poverty and inequality, while reforms in trade sector are required to increase their efficiency in terms of inclusiveness.

*JEL Classification:* O4

*Keywords:* Inclusive Growth, Poverty Reduction, Income Inequality, Equity, Accessibility, Social Protection

### INTRODUCTION AND LITERATURE REVIEW

In most of the developing nations policy makers are diverting their attention towards the inclusive growth because of increasing inequality levels. According to Osmani, 2008, “the concept of inclusive growth demands for widespread expansion of opportunities so that all segments of the society can benefit from economic expansion”. The idea of inclusive growth has been commonly explained through the employment, poverty and inequality nexus. As for as Pakistan is concerned, there is a decrease in extreme poverty that is about 60 percent, but still many people are living below the poverty line. The official poverty estimates show a persistent decline since 2001-2002 (see Table). Poverty increased during from 1992-1993 to 2001-02, with the exception of 1996-1997, and then declined sharply by 10.6 percentage points after 2001-2002 through 2004-2005—from 34.5 percent in 2001-2002 to 23.9 percent in 2004-2005. In 2005-2006, a further decline of overall poverty in Pakistan by 1.6 percentage points was officially observed. These rapidly declining estimates became highly controversial and

Azra Khan<azraphd@gnmail.com> is PhD scholar and Lecturer at Federal Urdu University of Arts, Science and Technology, Islamabad. Gulzar Khan <gulzarakpk@gmail.com> is PhD scholar at Federal Urdu University of Arts, Science and Technology, Islamabad. Sadia Safdar <sadiasafdar81@gmail.com> is Assistant Professor at Federal Urdu University of Arts, Science and Technology, Islamabad. Sehar Munir <ssaharmunir@gmail.com> is Lecturer at National Defence University, Islamabad. Zubaria Andleeb <economist243@gmail.com> is PhD scholar and Lecturer at Federal Urdu University of Arts, Science and Technology, Islamabad.

the Government of Pakistan stopped formally reporting official estimates after 2006. However, the economic survey of 2013-14 reported estimates of poverty headcount for 2007-2008 and 2010-2011 of 17.2 percent in 2007-08, which meant that the proportion of poor had declined a further 5.1 percent between 2005-06 and 2007- 08. A further decline of 4.8 percentage points is observed in the official numbers in 2010-11; when the poverty headcount declined further to 12.4 percent [Pakistan (2014)].

| Years   | Poverty Headcount |
|---------|-------------------|
| 1992-93 | 25.5              |
| 1993-94 | 28.2              |
| 1996-97 | 25.8              |
| 1998-99 | 30.6              |
| 2001-02 | 34.5              |
| 2004-05 | 23.9              |
| 2005-06 | 22.3              |
| 2007-08 | 17.2              |
| 2010-11 | 12.4              |

Source: Government of Pakistan 2014.

The prevailing inequalities in Pakistan have resulted in 31.5 percent loss in human development which could have been improved otherwise. The economic indicators show that the most of the poor population have not benefitted from growth. Almost all the developing countries which have the interest in inclusive growth are trying to reduce the inequalities. According to Ali and Son (2007) “Inclusive growth ensures fair and equal access to all stratum of society, including disadvantaged and marginalised, to opportunities created”. Any economy is unable to achieve the sustainable development until all the fruits of the growth are not provided to all segments of the society. In the recent years Pakistan has emphasised on improving education and health sectors for productive labour force.

This paper makes two contributions to the inclusive growth debate. First, the paper develops a unified measure of inclusive growth, which integrates growth, inequality, accessibility and social protection into one single measure, followed by the methodology of Asian Development Bank. To the best of our knowledge, this is the first unified measure of inclusive growth applied in Pakistan. Second, the measure is used to study the determinants of inclusive growth in Pakistan.

In many developing countries Inclusive growth has become an important development policy. In literature there are different definitions and measurement concepts of inclusive growth.

Anand, *et al.* (2013) found that macroeconomic stability, human capital, and structural modification are providing basis for obtaining inclusive growth of emerging markets over three decades. While, Tripathi (2013) study shows that the 54 populated cities of India have lower inclusive growth and poverty but it is attached with rise in inequality from 2004-05 to 2009-10. Ali and Ahmad (2013) co-integration analysis shows inverse influence of growth on income inequality whereas foreign aid, foreign direct investment and labour force participation rate have positive influence on inequality. A vector error correction model result confirms long run causality for Pakistan from 1972–2007, as the coefficient of error correction term is significantly negative.

Asghar and Javed (2012) found that larger education and employment opportunities are inclusive but distributed inequitably over the time period of 1998 to 2008 for Pakistan. While, Thorat and Dubey (2012) explore that few communities are getting more advantages from poverty reduction strategies and inequality negatively influence poverty reduction in urban areas of India.

Rauniyar and Kanbur (2009) found that by improving infrastructure qualities, social benefits for deserving people, advance agriculture technologies for rural population, making business environment feasible for more fruitful investment to endorse equity and inclusiveness. Habito (2009) explores the significant influence of governance, public expenditures in social services, sectoral composition of GDP growth, and contribution of agriculture to GDP growth on the inclusiveness of economic growth. Lanchovichina and Lundstrom (2009) found that poor education and health, access to capital and credit, infrastructure and government failure are the hurdles to inclusive growth in Zambia. Afterwards, Meschi and Vivarelli (2007) suggest that aggregate trade flows are weakly related with income inequality in a sample of 70 developing countries from 1980 to 1999. Study also supports technological differentials between trading partners are important in shaping the distributive effects of trade openness.

### Measurement of Inclusive Growth

Following the methodology developed by Asian Development Bank [Terry McKinley (2010)] building of inclusive growth index has the following steps:

*First*, select the dimensions and indicators.

Assume the evaluation dimension collection of inclusive growth index is  $U = \{u_1, u_2, u_3, \dots, u_n\}$  evaluation area collection is  $U = \{u_{j1}, u_{j2}, u_{j3}, \dots, u_{jn}\}$  and evaluation index collection is  $U = \{u_{j11}, u_{j21}, u_{j31}, \dots, u_{jim}\}$  where  $j$  refers to evaluation dimension,  $i$  is evaluation area and  $m$  is evaluation indicator.

*Second*, set target weight.

Weight is the proportion of each indicator in the collection, reflecting the importance of each indicator. Assume the weight is  $W$ ,  $W = \{w_1, w_2, w_3, \dots, w_i\}$

*Third*, conduct univariate standardisation.

After building the evaluation indicators, conduct quantitative evaluation of indicators one by one. After that, we have a matrix  $R$ .

$$U_R = \{r_{111}, r_{112}, \dots, r_{11m}\}$$

*Fourth*, weighted sum to have inclusive growth index (IGI)

$$IGI = \sum_{i=1}^m \left( \sum_{j=1}^n U_R * w_j \right) * W_i$$

Where

$U_R$  Standardised single index score

$w_i$  weight of single indicator at this level

$W_i$  Dimensional layer weight

The overall goal of inclusive growth index is set as 100. The closer to 100 the result is, the higher the degree of inclusiveness of economic growth is.

This indicator system includes both positive indicators and reverse indicators, as well as range indicators. The specific methods for dimensionless vary, shown as follows:

### Method of Positive Indicators

$$V_{y,j} = (X_{y,j}/Z_{y,j}) * 100$$

Where  $V_{y,j}$  is the score of  $j$  index in  $y$  year,  $Z_{y,j}$  is the target value of  $j$  index,  $X_{y,j}$  is the actual value of the  $j$  index.

Reverse will hold for negative indicator.

### Weighting and Scoring

A composite index that is based on a scoring methodology and a weighting scheme implicitly involves value judgments. The composite index is constructed on a weighted average score of 0–10, based on country performance on each of its four components. Each of the four components is, in turn, a weighted average of its subcomponents. In general, a score of 1–3 will be regarded as unsatisfactory progress on inclusive growth, a score of 4–7 as satisfactory progress, and a score of 8–10 as superior progress.

### Weight of Inclusive Growth Index

There are four pillars of inclusive growth (1)Economic Growth, Employment, and Infrastructure (2) Inequality, Poverty and General Equity (3) Accessibility (4) Social Protection and Governance. Weight is the proportion of each indicator in the collection, reflecting the importance of each indicator.

| Dimension Index   |        | Area index                                     |        | Indicators   |        |
|---|--------|--|--------|--|--------|
| Indicators  | Weight | Indicators                                     | Weight | Indicators   | Weight |
| Economic Growth, Employment, and Infrastructure (U <sub>1</sub> ) | 0.30   | Economic growth (U <sub>11</sub> )             | 0.15   | GDP per capita growth rate (U <sub>111</sub> )                             | 0.15   |
|   |        | Employment (U <sub>12</sub> )                  | 0.1    | Employment in industrial sector (U <sub>121</sub> )                        | 0.05   |
|   |        |  |        | Employment in services sector (U <sub>122</sub> )                          | 0.05   |
|   |        | Infrastructure (U <sub>13</sub> )              | .05    | Energy use (U <sub>131</sub> )   | 0.05   |
| Inequality, Poverty and General Equity (U <sub>2</sub> )          | 0.30   | Income inequality (U <sub>21</sub> )           | 0.1    | Gini index (U <sub>211</sub> )   | 0.1    |
|   |        | Poverty (U <sub>22</sub> )                     | 0.1    | Poverty headcount ratio at \$2 a day (PPP) (U <sub>221</sub> )             | 0.1    |
|   |        |  |        | Ratio of female to male labourforce participation rate (U <sub>231</sub> ) | 0.1    |
|   |        | Gender equity (U <sub>23</sub> )               | 0.1    | Primary school enrollment rate (U <sub>311</sub> )                         | 0.07   |
| Accessibility (U <sub>3</sub> )                                   | 0.25   | Education (U <sub>31</sub> )                   | .09    | Mortality rate, under-5 (U <sub>321</sub> )                                | 0.07   |
|   |        | Health (U <sub>32</sub> )                      | .09    | Improved water source (U <sub>331</sub> )                                  | 0.03   |
|   |        | Access to water, sanitation (U <sub>33</sub> ) | .07    | Improved sanitation facilities(U <sub>332</sub> )                          | 0.03   |
| Governance (U <sub>4</sub> )                                      | 0.15   | Governance (U <sub>42</sub> )                  | .15    | Government Effectiveness(U <sub>421</sub> )                                | 0.08   |
|   |        |  |        | Corruption perception index (U <sub>422</sub> )                            | 0.07   |

**Data Sources and Description**

| Dimension Index Indicators                      | Area index Indicators | Indicators                       | Unit  | Source                          |     |
|---|-----------------------|----------------------------------|---|---------------------------------|-----|
| Economic Growth, Employment, and Infrastructure | Economic growth       | GDP per capita growth rate       | Annual %  | WDI                             |     |
|   |                       | Employment in industrial sector. | % of total employment                                   | WDI                             |     |
|   | Employment            | Employment in services sector    | % of total employment                                   | WDI                             |     |
|   |                       | Infrastructure                   | Energy use  | kg of oil equivalent per capita | WDI |
| Inequality, Poverty and General Equity          | Income inequality     | Gini index                       |   | WIID                            |     |
|   |                       | Poverty                          | Poverty headcount ratio at \$2 a day (PPP)              | % of population                 | WDI |
|   | Poverty               | Gender equity                    | Ratio of female to male labour force participation rate | %                               | WDI |
|   |                       | Education                        | Primary school enrolment rate                           | % of all eligible children      | GE  |
| Accessibility                                   | Health                | Mortality rate, under-5          | per 1,000 live births                                   | WDI                             |     |
|   |                       | Access to water, sanitation      | Improved water source                                   | % of population with access     | WDI |
|   |                       | Improved sanitation facilities   | % of population with access                             | WDI                             |     |
| Governance                                      | Governance            | Government Effectiveness         | score (-2.5-2.5)  | WDI                             |     |
|   |                       | Corruption perception index      | score (0-10)  | TI                              |     |

*WDI*: World Development Indicators.

*WIID*: World Income Inequality Database.

*GE*: The Global Economy.

*SBP*: State Bank of Pakistan.

*WGI*: World Governance Indicators.

*TI*: Transparency International.

In order to make the inclusive growth index we follow the above mentioned methodology and indicators. The estimated inclusive growth index is given below from the year of 1990 to 2012.

| Years | Inclusive Growth Index |
|-------|------------------------|
| 1990  | 41.99086607            |
| 1991  | 31.10589917            |
| 1992  | 38.93098023            |
| 1993  | 31.95072188            |
| 1994  | 46.79391174            |
| 1995  | 48.14598354            |
| 1996  | 48.27021251            |
| 1997  | 34.38311549            |
| 1998  | 35.33617878            |
| 1999  | 50.33384011            |
| 2000  | 50.73424768            |
| 2001  | 36.12871625            |
| 2002  | 43.12325203            |
| 2003  | 51.67598125            |
| 2004  | 52.39837594            |
| 2005  | 53.51583759            |
| 2006  | 54.57861248            |
| 2007  | 54.98029639            |
| 2008  | 40.38851806            |
| 2009  | 55.99545687            |
| 2010  | 41.63392123            |
| 2011  | 53.75695377            |
| 2012  | 52.64293172            |

### Determinants of Inclusive Growth

An analysis is conducted using annual time series data (1990-2012) to determine whether financial development, globalisation and macroeconomic stability have empirical significance in explaining growth inclusiveness. We thus estimate the following equation, Rahul, Saurabh, and Shanak (2013)

$$g_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 TO_t + \alpha_3 \Delta CPI_t + \varepsilon_t$$

The dependent variable measures inclusive growth. The set of independent variables includes the financial development (measured by credit to private sector), globalisation (measured by trade openness) and macroeconomic stability (measured by inflation rate).

### Description and Sources of Variables

| Variable     | Description  |
|--------------|--|
| g            | Measure of inclusive growth, which integrates growth, inequality, accessibility social protection and stability. |
| FD           | Financial development (measured by credit to private sector as a % of GDP)<br><i>Source:</i> The Global Economy  |
| TO           | Globalisation (measured by trade openness as a % of GDP)<br><i>Source:</i> World Development Indicators (WDI)    |
| $\Delta CPI$ | CPI based inflation (2010=100)<br><i>Source:</i> World Development Indicators (WDI)                              |

## METHODOLOGY

### Unit Root Test: Augmented Dickey Fuller Test

In order to check the stationarity we use augmented dickey fuller test which is the advanced version of dickey fuller test. If one can reject the null hypothesis that a series possesses a unit root, then the series is stationary at level, or integrated of order zero (I(0)). If one cannot reject the null of a unit root, then the series is difference stationary. We can write the general form of ADF au level and first difference as:

$$\Delta Y_t = a y_{t-1} + \sum_{i=1}^n \beta \Delta Y_{t-1} + \delta + Y_t + \xi_t$$

$$\Delta \Delta Y = a_1 \Delta Y_{t-1} + \sum_{i=1}^n \beta \Delta \Delta Y_{t-1} + \delta + \gamma_t + \xi_t$$

### ARDL Co-integration

The main advantage of bounds test is that it allows a mixture of I (1) and I (0) variables as regressors, that is, it is not necessary that the order of integration of variables should be same. Therefore, the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. We can also use this technique for small or finite sample size [Pesaran, *et al.* (2001)].

The null hypothesis of no co-integrations tested against the alternative by means of the F-test. Pesaran, *et al.* (1996) provides two sets of asymptotic critical values. One set assumes that all variables are I (0) and the other assumes they are all I (1). If the calculated F-statistic is above the upper bound critical value, then we reject the null hypothesis of no co-integration. If it is below the lower bound, then the null cannot be rejected. Finally, if it calculated value is inside the critical value band then the result would be inconclusive. If it is confirmed that there is co- integration then we can estimate long run coefficients and ARDL error correction.

### Descriptive Statistics

Descriptive statistics can be used for the better decision about data reliability. Two important measures are used to check data reliability. One is measure of central tendency and other is the measure of dispersion. Usually mean, median and mode are used as a measure of central tendency and standard deviation, quartile, range and mean deviation are used as a measure of dispersion. Our results show that the mean and median are almost same and there is no evidence of skewness and almost all the variables have low standard deviation which shows low variations and consistency in data.

| Variables | Mean     | Median   | Std. Dev. |
|-----------|----------|----------|-----------|
| FD        | 23.54783 | 23.38000 | 2.147351  |
| G         | 4.873075 | 4.814598 | 0.819452  |
| INF       | 8.760852 | 9.083693 | 3.790116  |
| TO        | 34.18412 | 34.01173 | 2.939877  |

### Results of Unit Root Test

Null Hypothesis: there is unit root

| Variables    | Level                     |                          | 1 <sup>st</sup> Difference |                           | Order of Integration |
|--------------|---------------------------|--------------------------|----------------------------|---------------------------|----------------------|
|              | Intercept                 | Trend and Intercept      | Intercept                  | Trend and Intercept       |                      |
| g            | -3.353121*<br>(-2.715892) | -4.847602*<br>(-3.32418) | -7.576314*<br>(-2.758434)  | -6.691587*<br>(-3.374224) | I(0)                 |
|              | Lag (0)                   | Lag (0)                  | Lag (0)                    | Lag (0)                   |                      |
| FD           | -2.637108<br>(-2.945842)  | -2.770642<br>(-3.54428)  | -2.994102*<br>(-2.948404)  | -3.831702*<br>(-3.544284) | I(1)                 |
|              | Lag (1)                   | Lag (1)                  | Lag (0)                    | Lag (0)                   |                      |
| TO           | -2.484238<br>(-2.945842)  | -2.601095<br>(-3.54428)  | -6.371947*<br>(-2.948404)  | -6.192645*<br>(-3.544284) | I(1)                 |
|              | Lag (0)                   | Lag (0)                  | Lag (0)                    | Lag (0)                   |                      |
| $\Delta$ CPI | -2.122297<br>(-2.945842)  | -2.095782<br>(-3.54428)  | -5.820432*<br>(-2.94840)   | -5.707053*<br>(-3.544284) | I(1)                 |
|              | Lag (0)                   | Lag (0)                  | Lag (0)                    | Lag (0)                   |                      |

Note: \*Denotes the rejection of hypothesis at 5 percent level of significance.

For further estimation we now consider the order of integration (or stationary) of each series using the Augmented Dickey Fuller (ADF) unit root tests. The results show that some variables are stationary at level while some are at first difference. So we apply ARDL model which deals with both I(0) and I(1).

**Results of ARDL Test:**

$$\Delta g_t = \beta_0 + \beta_1 g_{(t-1)} + \beta_2 FD_{(t-1)} + \beta_3 TO_{(t-1)} + \beta_4 \Delta CPI_{(t-1)} + \gamma_1 \sum_{i=1}^n \Delta g_{(t-i)} + \gamma_2 \sum_{i=0}^n \Delta FD_{(t-i)} + \gamma_3 \sum_{i=0}^n \Delta TO_{(t-i)} + \gamma_4 \sum_{i=0}^n \Delta \Delta CPI_{(t-i)} + u_t$$

In the above ARDL equation variables in level show the long run relationship whereas variables in differenced form show the short run relationship. For the estimation of the above equation in first step, we choose the lag length of first differenced variables. We take only two lags due to the problem of degree of freedom. We use ordinary least square method to estimate the above equation. On long run coefficients we apply bound test through S coefficient restriction test. We test the null hypothesis of no long run relationship against the alternative.

$$H_0 : \beta_1 = 0, \beta_2 = 0, \beta_3 = 0, \beta_4 = 0$$

$$H_1 : \beta_1 \neq 0, \beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0$$

**Wald Test:**

|                         |                 |            |          |
|-------------------------|-----------------|------------|----------|
| <b>Null Hypothesis:</b> | C(2)=0          |            |          |
|                         | C(3)=0          |            |          |
|                         | C(4)=0          |            |          |
|                         | C(5)=0          |            |          |
| <b>F-statistic</b>      | <b>3.536812</b> | Probabiliy | 0.022561 |
| <b>Chi-square</b>       | 23.42163        | Probabiliy | 0.004957 |

Tabulated value of F-statistics lower bond I(0)=2.62 and upper bond I(1)=3.79 at 5 percent level of significance.

As calculated value of f-statistics is greater than the upper bound critical value so we reject the null hypothesis of no long run relationship against the alternative.

**Estimated Long Run Coefficients**

ARDL(0,1,1,0,1) selected based on R-BAR Squared Criterion

| Variable | Coefficient | Std. Error | T-Ratio   |
|----------|-------------|------------|-----------|
| C        | 6.791486    | 2.087559   | 3.253314  |
| FD       | 0.625241    | 0.229625   | 2.722876  |
| TO       | 0.585101    | 0.248826   | 2.351448  |
| INF      | -0.216720   | 0.109458   | -1.979937 |

Note: \*shows the significance at S5 percent while \*\* shows significance at 10 percent.

Financial deepening, measured by the credit to private sector, has a positive and very significant impact on inclusiveness which shows the importance of financial deepening for the inclusive growth. Basically the improvements in the financial sector make easy access to loan for investment. In previous findings such as Levine (2005) financial development is positively linked to growth.

Globalisation or international integration, measured by trade openness, plays its role through positive externality. Trade facilitates the adaptation and movement of both workers and firms towards sectors with growing demand, and the incorporation of new technologies with the objective of promoting productivity and employment growth. Globalisation generates a virtuous circle between the reduction of structural differences and growth that improves the wellbeing of a majority and reduces inequality. Our results show that there is positive and significant relation between globalisation and inclusive growth.

Macroeconomic stability is represented by inflation. There is a negative link between inflation and inclusiveness, higher inflation is associated with less poverty reduction, through lower average welfare growth as well as with an adverse contribution to distributional effects. In particular, poor households are usually more affected by food price inflation as they need to spend disproportionately more on food, and substitution possibilities are limited. Therefore, they are generally more affected by inflation, Rahul, Saurabh, and Shanak (2012), Rahul, Saurabh, and Shanak (2013), Rahul, Saurabh, and Shanak (2014), Elena and Macro (2007).

#### Short Run Error Correction Model

$$\Delta g_t = \alpha + \beta_1 \sum_{i=1}^n \Delta g_{(t-i)} + \beta_2 \sum_{i=0}^n \Delta FD_{(t-i)} + \beta_3 \sum_{i=0}^n \Delta TO_{(t-i)} + \beta_4 \sum_{i=0}^n \Delta \Delta CPI_{(t-i)} + \lambda ECM_{t-1} + \varepsilon_t$$

In error correction model, variables in differenced form show the short run relationship and ECM is the error correction term which shows the adjustment from previous period to current period.

| Dependent Variable is dg |             |                |           |
|--------------------------|-------------|----------------|-----------|
| Regressor                | Coefficient | Standard Error | T-Ratio   |
| ecm(-1)                  | -0.212570   | .10253         | -2.07324* |

Note: \*shows the significance at 5 percent

The error correction term is negative and significant which means that any exogenous shock in one of the variables will lead to convergence towards the equilibrium. An exogenous shock in the inclusive growth will lead to 21 percent movement towards the original equilibrium every year, thus the equilibrium is stable.

#### CONCLUSION

As the eight development goals of the millennium is reduction in poverty to be achieved by 2015, and this can be achieved if everyone gets one's fair and equal income so that he/she may spend to fulfil their biological needs and improve its living standard.

Inclusive growth that focuses on both creating opportunities rapidly and making them accessible to all including the disadvantaged and the bypassed is a necessary but insufficient condition for reducing inequality outcomes. The main objective of the present study is the measurement of inclusive growth using the methodology developed by Asian Development Bank, which integrates growth, inequality, accessibility, and governance into one single measure. Other objective is to empirically examine the determinants of inclusive growth using annual time series data for Pakistan from 1990-2012. First of all we have measured the inclusive growth using weights and scores for each indicator of inclusive growth. The index shows that Pakistan shows a satisfactory progress in inclusive growth. Second, we use the index to examine the determinants of inclusive growth. We use financial development, globalisation and macroeconomic stability in explaining growth inclusiveness. Results of the ARDL show that financial development increases the inclusive growth and makes easy access to loan for investment. Here globalisation affect the inclusive growth through trade openness, results shows that more globalisation through technology leads to the economies of scale and ultimately increases the inclusive growth. Macroeconomic stability is represented by inflation rate; results show that lower level of inflation increases the purchasing power of the poor and their access to basic needs.

We concluded that better financial system ensuring equity, improvement in the skill level to take benefit from international trade, maintaining macroeconomic stability by stabilising the inflation leads to the inclusive growth.

### **Policy Implications**

Findings of the study lead to following policy implications:

Access to finance by the poor is a prerequisite for poverty reduction and sustainable economic development. This study has established that there is a strong need to strengthen policy approach for financing the priority sector in Pakistan as it has had a positive impact on inclusive growth. In view of the strong relationship between priority sector lending and inclusive growth, it is imperative on the policy makers in general and the governments in particular to make efforts to induce the banks and financial institutions in increasing priority sector lending beyond the stipulations laid down.

As trade positively affect the growth inclusiveness but significant at 10 percent so government should adopt the policy that enable poorer people to compete in a globalised world market by increasing their productivity ensuring that poor people, women and other disadvantaged groups can draw benefits from exports.

Stable macroeconomics is important for economic growth, thus indirectly affecting income inequality. Government need to prevent the occurrence of high inflation.

## **APPENDIX:**

### **Five Pillars of Inclusive Growth**

1. Economic Growth, Employment, and Infrastructure
  - **Growth**
  - GDP per capita growth rate

- **Employment**
  - Employment in industrial sector.
  - Employment in services sector
- **Infrastructure**
  - Energy use
- 2. Inequality, Poverty and General Equity
  - **Inequality**
    - Gini index
  - **Poverty**
    - Poverty headcount ratio at \$2 a day (PPP)
  - **General Equity**
    - Ratio of female to male labour force participation rate
- 3. Accessibility
  - **Education**
    - Primary school enrollment rate
  - **Health**
    - Mortality rate, under-5
  - **Access to water and sanitation**
    - Improved water source
    - Improved sanitation facilities
- 4. Governance
  - Government Effectiveness
  - Corruption perception index

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## **Social Capital Household Welfare and Poverty: Evidence from Pakistan**

NUZHAT AHMAD and MAHPARA SADAQAT

The research addresses the missing link between social capital and analyses of household welfare and poverty. First the relationship between social capital and household welfare is analysed using a social capital index and a heterogeneity index. The social capital index is calculated using different dimensions: density of membership, attendance at meetings, cash and kind contributions and decision making in local organisations/associations. Heterogeneity index is based on differences in incomes, ethnicity, education and political affiliations in the composition of organisations. Endogeneity of social capital with household expenditure is tested through an Instrumental Variable approach. The relationship between social capital and probability of being poor is analysed through a logit model. The analysis uses data collected from 1050 households in and around the cities of Karachi, Lahore and Quetta. The main results indicate that social capital (however measured) has a positive impact on the welfare of the household. The study concludes that social capital and human capital have the same returns. A powerful result of the research is that households with social capital at their disposal are likely to be less poor and that poverty is less when households share risks through building associations and through collective action. The research has some policy implications which can be useful in building up social capital in the country.

### **1. INTRODUCTION**

It has been increasingly recognised that social capital has a vital role to play in enhancing a nation's productivity and development. Recently, the subject has received attention in developing countries, as it has been realised that social capital is needed along with traditional inputs of land, labour and capital to realise the full benefits of investments in these countries. A number of authors have recognised these contributions in their work. For instance, Putman (1993) states that social contact between individuals and society increases the productivity of individuals in the same way as human and physical capital does. Knack and Keefer (1997) are of the view that trust and civic cooperation lead to economic prosperity and sustainable development. According to Narayan (1997) social capital brings prosperity and reduces poverty.

International agencies have also recognised the role that social capital can play in the development of countries, and have emphasised that countries should invest more in their social capital. The World Bank recognised the role of social capital in promoting welfare, wellbeing and happiness of individuals, households, communities and nations in

Nuzhat Ahmad <n.ahmad@cgiar.org> is Senior Research Fellow, International Food Policy Research Institution in its Development Strategies and Governance Division, Washington DC, USA. Mahpara Sadaqat <s.mah.para@hotmail.com> is Senior Research Economist, Applied Economics Research Centre, University of Karachi, Karachi.

it 'Social Capital Initiative' in 1996. Many empirical studies have also been undertaken by international institutions in Asia, South America and Africa, and elsewhere which have highlighted the role that social capital play in promoting household welfare in developing countries. This work has been the basis for policy formulation in some countries.

Although, there is agreement in the literature on what social capital can do there is no consensus as to what it means or an agreed definition of the term. So in order to better understand the issues, we begin by looking briefly at the theoretical underpinning and some of the definitions of social capital.

The theoretical basis for social capital stems from the idea that the institutions play a major role in the development of nations, and network or social relationships are formed in the process of these interactions that lead to commitment and trust and form social capital. The main reasons of people's engagement in these networks and continue to maintain links with others is that they can take benefit from it. Economic rational suggests that actors' goals are determined by utility-maximising pursuit of self-interest. Theoretical base for social capital can be better understood from the work of Bourdieu, Coleman and Putman and how they define social capital. Most of the empirical work that has subsequently followed is also based on these formulations. A central notion of Bourdieu's (1986) theory is the differential distribution of and control of social space and of resources. He describes social capital as 'the aggregate of the actual potential resources which are linked to possession of a durable network of institutionalised relationships of mutual acquaintance or recognition'. Putnam (1993) refers to social capital as "features of social organisations, such as networks, norms and trust that facilitate action and cooperation for mutual benefit". Coleman adopts a middle line between functionalist view of social action which is conditioned by social structure; and economic rational theory of utility maximisation. For Coleman (1988) social capital "consists of some aspect of social structure, and facilitates certain actions of actors-whether persons or corporate actors-within the structure". To him social capital is anything that facilitates individual and collective action generated by networks, reciprocity, trust and social norms. To all three authors, Bourdieu, Coleman and Putman social capital is a productive and collective resource which is used for achieving particular goals.

Social capital operates at the macro, meso and micro levels. At the macro level there are institutions like the government, rule of law and civil and political liberties. There is evidence that at the macro level social capital has a positive effect on the economic performance of nations. Knack and Keefer (1997) show a significant impact of social capital on aggregate economic activity. Grootaert (1998) shows that certain forms of social capital have strong positive effects on economic growth and contribute to sustainable development. Isham, *et al.* (2000) argues that communities with more social capital are in a better position to achieve economic growth. See Knack (1999) for a review of macro literature on social capital. At the meso and micro level social capital look at network of and interactions between individuals, households and communities which translates into formulation of local associations/organisations. Empirical studies at the micro level of social capital are still a relatively new area of research in the developing countries, mainly due to a lack of disaggregated data.

Social capital has not been the focus of much research in Pakistan and there is very little empirical evidence that investigates the issue at the micro and the household level. This paper is a study of social capital at the household micro level and defines it as a resource which is created by formal and informal relationships between individuals within a community. The definition that we adopt in this paper is based on the how people interact with each other as defined by Dekker and Uslaner (2001). "Social capital is about the value of social networks, bonding similar people and bridging between diverse people, with norms of reciprocity".<sup>1</sup> The research is based on household and community level data from around the cities of Karachi, Lahore and Quetta.

The remaining of the paper is organised in the following way. The next section gives a brief review of the relevant literature. Section 3 outlines the methodology and the sources of data and describes variables used in the analysis. Section 4 discusses the results and their interpretation. The last section concludes and describes the policy relevance of the research.

## 2. REVIEW OF LITERATURE

Recently the literature on social capital has grown especially in developing countries. Sociologists, economists and political scientists have written about it in abundance. It is beyond the scope of this paper to cover all the literature so we only present a brief review of the relevant studies here. Many studies in the literature investigate the effects of social capital on household welfare. The well-known study by Narayan and Pritchett (1997) demonstrates that ownership of social capital by households in rural Tanzania has a strong effect on household welfare and that social capital impacts household welfare more than human capital. Maluccio, *et al.* (2001) find a strong relationship between social capital and household welfare in their study for South Africa, while Grootaert, *et al.* (2001) demonstrates a significant effect of social capital on welfare in Bolivia. A recent study by Olawuyi and Oladele (2012) reveals that social capital makes a significant contribution to household welfare along with other characteristics such as age, age-squared and household size in Nigeria. Putman (2002) shows that more social capital is associated with lower levels of violent crimes, lower mortality rates and better education. Grootaert's (1998) research also shows that disaggregated measures of social capital such as memberships in local associations lead to higher incomes. In a recent study for Bhutan by the National Statistics Bureau (2013) both aggregate as well as disaggregated measures of social capital are found to significantly affect household welfare (happiness) in the country.

A body of literature includes trust an element in social capital in their analysis [see Cox and Caldwell (2000), Giddens (1990), Black and Hughes (2000)]. Trust is necessary

<sup>1</sup>There are several other definition of social capital found in the literature. The World Bank defined it as "institutions, relationships and norms that shape the quality and quantity of society's social interactions". [Adler and Kwon (2002)] focus on types of linkages. Exterior relations are described as binding by Woolcock 1998 and as communal by Oh, *et al.* (1999). Baker (1990) states that social capital is created by changes in the association among participants. Portes (1998) defines social capital 'as the ability of actors to secure benefits by virtue of memberships in social networks or other social structures'. OECD (2001) defined social capital as "networks together with shared norms, values and understandings which facilitate cooperation within or among groups" According to Stone (2001) "social capital consists of networks of social relations which are characterised by norms of trust and reciprocity".

for smooth running of civil society and facilitation of democracy according to Putman (1993, 1995) and Uslaner (2001). Wheatley and Zurcher (2009) analyse the determinants of social capital in Tajikistan, Kyrgyzstan and Uzbekistan and test whether networks, norms and trust are empirically related to factors like culture, regime type, perceptions of government responsiveness and development interventions.

The effects of social capital on poverty outcomes have been the subject of a number of studies in developing countries and have clear policy implications for improving the well-being of the poor. Goetz (2007) in his research emphasises that social capital is vital to poverty alleviation in developing countries and that efforts to increase education level of the poor and job creation will not be successful in reducing poverty unless accompanied by social capital. Grootaert (1999) explores relationship between poverty and social capital in Indonesia and finds that social capital reduces the probability of being poor. Grootaert Oh and Swamy (2002) find similar results for South Africa while Narayan and Grootaert (2004) find that presence of social capital reduces the probability of being poor in Bolivia. Diawara, *et al.* (2013) for Nigeria and Roslan, Nor, and Russyani (2010) for rural Malaysia also find a negative relationship between poverty and social capital in their research.

### 3. DATA AND METHODOLOGY

The model used to measure the effects of social capital on household welfare corresponds to the conventional model of household economic behaviour under constrained utility maximisation which relates household expenditure to asset endowments and other socio economic characteristics of the household. The methodology that is used is based on the assumption that social capital provides measurable returns to households. The methodology is well known and used by a number of studies in different developing countries [Grootaert (1999) and Narayan and Pritchett (1997) Diawara (2013) among others, where social capital is treated as any other forms of capital that is at the disposal of the household to generate income and increase its welfare. We estimate the following equation:

$$L^{\text{PExp}} = \alpha + SC + HC + AS + X + Z + u \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where:

- L<sup>PExp</sup> = Log of household per capita expenditure
- SC = household endowment of social capital
- HC = household endowment of human capital
- AS = household endowment of assets
- X = a vector of household demographic and other socioeconomic characteristics
- Z = regional characteristics (urban/rural)
- $\alpha$  = constant term
- $u$  = error term

The model uses per capita household expenditure as a measure of household welfare as it is difficult to measure household income accurately. This approach has been extensively used in the literature [see Grootaert (1999); Grootaert and Bastelaer (2002);

Okunmadewa, *et al.* (2005a); Okunmadewa, *et al.* (2007); Yusuf (2008); Narayan and Pritchett (1999)]. The exploratory variables in the analysis include social capital, human capital, demographic variables, location variables, and physical capital.

Two measures of social capital are used in the analysis, an index of social capital and a heterogeneity index following the approach used by Grootaert, *et al.* (2002). The social capital index is constructed using different dimensions of social capital including density of membership of local groups/associations, meeting attendance, cash contribution, time contribution in days and decision making. Membership density is measured by the summation of number of groups a household belongs to. Meeting attendance is measured by the summation of number of meetings attended by all members of the household in the 12 months prior to the survey. Attendance at more meetings is assumed to translate into greater participation and higher social capital. Cash contribution represents average monthly cash that a household contributed to different local organisations in the last 12 months. Work contribution is measured by the number of days of work that members of the household have collectively contributed to any group/association also in the last 12 months. Both cash and time contributions are assumed to represent greater interest and participation in the groups' activities. Decision making is measured by the member's participation in the group's decision making process. The respondents were asked if they thought they had actively participated in making decisions. All positive responses from the above dimensions of social capital are aggregated to create an index of social capital. A linear transformation is then applied to get a scale of 0–10. The effect of the social capital index is expected to be positive on household welfare.

A group's composition may have a bearing on its effectiveness for collective action. For instance, an internally homogenous group may find it easier to trust other members in the group, share common information and reach collective decisions easily. On the other hand, if the membership of the group is diversified meaning if its members have heterogeneous backgrounds, they may have access to different sources of information and knowledge which can be utilised to improve the effectiveness of the group. We develop a Heterogeneity Index based on ethnicity, education, income and political affiliation. The respondents were asked if the majority of the members in the group they belonged to were of the same, ethnic background, had the same level of education and income and had similar political affiliation as them. Their recorded responses were used to develop a heterogeneity index. The index is based on an aggregation of responses of each of the household to the questions for the 3 most important groups/associations. The index has a higher value when there is more diversity in the group with a maximum score of 12 for each household representing highest level of heterogeneity. Score of each household is divided by the maximum score and multiplied by 100. The effect of heterogeneity on household welfare can be positive or negative (as indicated in the literature). There is very little empirical evidence in Pakistan to suggest the sign of the estimated effect of heterogeneity on household welfare.

Two additional measures of social capital are included in the analysis of poverty. A variable related to risk sharing measured as receiving help from the group of which a household is a member in times of natural disasters, illnesses, loss of work etc.) and collective action to deal with adverse circumstances (load shedding, water crises, poor service provisions etc.) is defined.

Human capital is measured by education (number of years) of the head of household. Demographic variables in the analysis include household/family size, age of the head of household and its squared term (both are used to define the life cycle effects of the household). Physical capital is measured by asset endowment. An asset index is computed through factor analysis and based on ownership of durables (car, motorbike, refrigerator, sewing machine, television, air conditioner tractor, cart, computer and cell phone). Location dummy is used to take into account regional (urban/rural) differences in welfare levels. Another dummy variable is included to represent the households engaged in agriculture activities.

### Two Stage Least Square (2SLS)

Since, it costs time and money to acquire social capital households with higher incomes (measured through expenditures here) can have greater endowments of social capital. The causality between social capital and expenditures may be before run both ways and will cause the OLS estimates to be biased, so there is a need to test for endogeneity in the model where expenditure is a dependent and social capital is an independent variable. In order to address the endogeneity problem in the estimation, we use an instrumental variable (IV) approach which test for the extent of two way causality. The problem with this approach is the difficulty in finding a good instrument that is highly correlated with social capital, but uncorrelated with expenditures and does not belong in the expenditure equation. These problems have been highlighted in the literature [see Putman (2000)]. But a number of studies have tested for endogenous social capital and have used the instrumental variable approach. Different instrumental variables have been used in the literature for different countries. Adepoju and Oni (2012) uses length of household residence in the community, household donation, membership in a religious and ethnic group as instruments for the social capital variable. Diawara, *et al.* (2013) in their his work uses distances to closest market, closest primary school, closest secondary school and closest tele-centre as instruments for social capital. Trust in individual and government organisations is used by [Narayan and Prichett (1999)]. Grootaert, *et al.* (2002) uses traditional authority, organisation strength and associations created by the community as instrumental variables in their research. A two stage least square (2SLS) methodology is used in our analysis to test for endogeneity of social capital. Given the availability of data and past research, we use trust in individuals and government and other organisations as our instrumental variable for social capital.

In the second part of the paper, a logit model is estimated where the dependent variable is the probability of being poor and the independent variables include measures of social capital education of the head, age of the head and its squared term, household size, assets, location dummies, number of earners and a dummy to represent engagement in agriculture activity. The following logit model is estimated:

$$P(Y) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon_i)}} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where:

P(Y) = Probability of being poor

- $X_1$  = Measures of Social Capital  
 $X_2$  = Other individual and household characteristics  
 $\varepsilon_t$  = error term

Household level data is used for the analysis. Data was collected through a primary survey of 1050 households in and around the cities of Karachi, Lahore, and Quetta from clusters of households. These clusters were formed on the basis of housing characteristics and other measures of living standards. Data from the survey was collected through a structured questionnaire on the following modules (i) household composition and socioeconomic characteristics module (ii) groups and networks module (iii) trust and solidarity module (iv) collective action and cooperation module.<sup>2</sup>

The primary survey was conducted by Applied Economics Research Centre, University of Karachi in the year 2011. The survey was based on the household and community level information. A stratified random sampling approach was used to select the households in the survey. Clusters were identified on the basis of housing characteristics. Households within a cluster were identified for interview through the Monte Carlo method, where every 5th household was chosen for interview. Four hundred households each from around Karachi and Lahore and 250 households from around Quetta were selected for interview.<sup>3</sup>

#### 4. EFFECTS OF SOCIAL CAPITAL ON HOUSEHOLD WELFARE

##### Test for Endogeneity of Social Capital

This section of the paper presents results of the analysis of social capital on household welfare. The results of the estimations are presented in Table 1 below. Model 1 presents results for OLS estimates and includes a social capital index along with other exogenous variables, while Model 2 presents results where the heterogeneity index is also included as a separate measure of social capital. The study test for endogenous social capital and the corresponding Instrumental Variable (IV) results are presented in Model 3 and 4 of Table 1. The results show that using the instrument of trust for social capital leads to slightly higher  $R^2$  (0.355) than that obtained from the OLS estimates (0.347) in Models 1 and from 0.355 to 0.362 in Model 2. Additionally, instrumenting the social capital results in a higher coefficient for the social capital index than that estimated through the OLS regressions which imply an absence of reverse causality. The instrument test also indicates that the null hypothesis of exogeneity of the social capital variable is not rejected. This result is consistent with that found by Narayan and Prichett (1997), Grootaert (1999) and Okunmadewa, *et al.* (2005). Therefore our OLS estimates can be used to analyse the effects of social capital on household welfare.

The results of the OLS estimations indicate that social capital index has a consistently significant positive effect on household welfare in both the specification (see Table 1 Model 1 and 2) indicating that households with higher social capital have higher welfare levels. The effect however is small as indicated by the small coefficient of the variable. This is in contrast to the results of the studies for Indonesia by Grootaert (1999)

<sup>2</sup>Copy of the Questionnaire is available from the author's upon request.

<sup>3</sup>Both urban and rural households were included. As these households are located in and around major cities they do not adequately represent rural household. They are selected from a rural clusters only.

Table 1

*Social Capital and Household Welfare*

| Dependent Variables→<br>Independent Variables ↓<br>Equations | Log Per Capita Expenditure |                       |                       |                       |
|--|----------------------------|-----------------------|-----------------------|-----------------------|
|  | Model 1<br>OLS             | Model 2<br>OLS        | Model 3<br>IV         | Model 4<br>IV         |
| Social Capital Index   | 0.021<br>(2.31)**          | 0.032<br>(3.929)***   | 0.087<br>(2.33)**     | 0.090<br>(2.55)**     |
| Heterogeneity Index  |                            | 0.046<br>(3.177)***   |                       | 0.098<br>(2.52)**     |
| Education of Head  | 0.038<br>(14.218)***       | 0.038<br>(14.18)***   | 0.038<br>(13.13)***   | 0.038<br>(14.07)***   |
| Household Size   | -0.124<br>(-15.716)***     | -0.125<br>(-15.92)*** | -0.126<br>(-14.49)*** | -0.127<br>(-15.85)*** |
| Age  | 0.0004<br>(0.137)          | 0.00001<br>(0.04)     | 0.002<br>(0.56)       | 0.000098<br>(0.03)    |
| Age <sup>2</sup>   | 0.00007<br>(3.431)***      | .00008<br>(3.53)***   | 0.00006<br>(2.37)**   | 0.00007<br>(3.48)***  |
| No. of Earners   | 0.114<br>(7.142)***        | 0.114<br>(7.16)***    | 0.102<br>(5.56)***    | 0.111<br>(6.92)       |
| Asset Index  | 0.032<br>(1.67)            | 0.029<br>(1.65)       | 0.021<br>(0.95)       | 0.024<br>(1.19)       |
| Engaged in Agr.  | -0.042<br>(-1.113)         | -0.053<br>(-1.40)     | -0.124<br>(-2.51)**   | -0.082<br>(-1.92)*    |
| Urban  | 0.122<br>(3.776)***        | 0.11<br>(3.37)***     | 0.118<br>(3.33)***    | 0.094<br>(2.74)***    |
| Constant   | 7.340<br>(67.46)           | 6.916<br>(40.26)      | 6.73<br>(21.05)       | 6.29<br>(13.73)       |
| No. of Observations  | 1050                       | 1038                  | 1050                  | 1050                  |
| R <sup>2</sup>   | 0.347                      | 0.354                 | 0.355                 | 0.362                 |
| Instrument Test (p-level)                                    | -                          | -                     | 0.347                 | 0.323                 |

Source: Ahmad, N and Sadaqat, M., "An Aggregate model of Social Capital and Household Welfare" Pakistan *Journal of Applied Economics*, Forthcoming and Author's Calculations.

\* Significant at the 10 percent level of significance.

\*\* Significant at the 5 percent level of significance

\*\*\* Significant at the 1 percent level of significance.

where the effect is shown to be large. The other measure of social capital, the heterogeneity Index (Table 1 Model 2) also shows a significant impact on household welfare. This result indicates that more the heterogeneous the members of a group in terms of income, ethnicity, education and political affiliation the more they increase the welfare of the group by having access to a greater pool of knowledge and resources. In some of the literature the homogenous group of association is more beneficial. However, when we test for the effect of each of these characteristics on household welfare in a separate equation they do not have a significant impact on the welfare of households.<sup>4</sup>

The results of the analysis also show a strong effect of the head of household's characteristics and household's demographic and socioeconomic characteristics on household welfare. The education of the head of the household measuring human capital has a consistently significant and positive effect on household welfare in both specifications of the equation. The coefficient is around 0.038 and is highly significant at the 1 percent level of significance. Our results of similar returns to human and social capital is different

<sup>4</sup>The results of the estimations are not reported here but are available with the authors upon request.

than those for other countries like Tanzania and Indonesia where the social capital effect is shown to be more than 4 times that of human capital.

Larger households have lower welfare as indicated by the negative and significant coefficient of the household size variable (a coefficient of around  $-0.02$ ). This result as expected, and is consistent with a number of other studies which show negative effects of family size on household welfare. Narayan and Cassidy (2001), Grootaert (1999), Narayan and Pritchett (1997). The age and age squared of the head of the household are included to test the life cycle effects. The age squared variable of the head however, has a positive and strong significant impact on household welfare indicating increasing rather than diminishing life cycle effects. The effect is however very small as demonstrated by the small coefficient of the variable. Another variable included in the equations is the number of earners in the household. The effect is positive and highly significant indicating that the more income generating capacity of the household the higher is its per capita expenditure and its welfare, as expected.

An asset index calculated from the ownership of number of durables has also been included in the model. As expected the variable has a significant and positive effect on household welfare.

The results of the analysis also indicate that household's welfare is affected by its location. The urban/rural dummy is used to capture the effect and indicates that the welfare of households in the urban areas is much higher than in the rural areas with a highly significant positive coefficient. The variable has the largest coefficient in the equation showing that households in the urban areas have much higher expenditures and welfare. A dummy variable is included to represent engagement in agriculture activities. The results show an insignificant effect on household welfare indicating that there is essentially no difference between earning income from agricultural activities or from other sources on household welfare.

## 5. SOCIAL CAPITAL AND POVERTY

The results for the analysis of social capital and poverty are presented in this section of the paper. The estimated logit models for probability of being poor<sup>5</sup> are presented in Table 2 Models 1 and 2 while the corresponding average marginal effects for the two models are presented in columns 2 and 5 of Table 2. The results of the analysis show that households with more social capital at their disposal are less likely to be poor. The marginal effects of Model 1 indicate that these households are 7 percent less likely to be poor. When social capital is disaggregated into its individual components i.e. membership density, number of meetings attended, cash and days contributions to local organisations, the effects are mixed (see Model 2). Membership density and cash contributions are significantly and negatively related to the probability of being poor while meeting attendance and work days contributed do not have a significant relationship with the poverty status of the household. Households with higher membership density in local groups/ associations are less likely to be poor although the marginal effect of the variable shows a small impact. Households that make more cash

<sup>5</sup>The poverty status of the household is based on the official poverty line at the time of the survey. The expenditure levels of the household from the survey and an adult equivalent are used to determine the poverty status of the households in the sample. The data shows that 13 percent households were poor in the sample.

Table 2

*Social Capital and Poverty Outcomes*

| Dependent Variables →<br>Independent Variables ↓<br>Equations | Probability of Being Poor        |                         |                |                                  |                         |               |
|---|----------------------------------|-------------------------|----------------|----------------------------------|-------------------------|---------------|
|   | Model 1                          | Av. Marginal<br>Effects | Odds<br>Ratios | Model 2                          | Av. Marginal<br>Effects | Odds<br>Ratio |
| Social Capital Index  | -0.094<br>(-0.59) <sup>***</sup> | -0.070                  | 0.91           | -                                | -                       |               |
| Meetings  |                                  |                         |                | 0.158<br>(0.34)                  | 0.012                   | 0.95          |
| Memberships   |                                  |                         |                | -0.084<br>(-2.23) <sup>**</sup>  | -0.006                  | 0.91          |
| Money Contribution  |                                  |                         |                | -0.494<br>(-2.14) <sup>**</sup>  | -0.037                  | 0.609         |
| Days Contribution   |                                  |                         |                | .0006<br>(0.73)                  | 0.00005                 | 1.00          |
| Collective Action for<br>Benefits                             |                                  |                         |                | -0.234<br>(-2.39) <sup>***</sup> | -0.034                  |               |
| Risk sharing  |                                  |                         |                | -0.103<br>(-2.00) <sup>**</sup>  | -0.060                  |               |
| Education   | -0.009<br>(-.81) <sup>***</sup>  | -0.007                  | 0.05           | -0.102<br>(-3.93) <sup>***</sup> | -0.007                  | 0.903         |
| Household Size  | 0.439<br>(7.07) <sup>***</sup>   | 0.033                   | 1.55           | 0.497<br>(7.51) <sup>***</sup>   | 0.037                   | 1.64          |
| Age of Head   | -0.037<br>(-1.54)                | -0.003                  | 0.96           | -0.031<br>(-1.26)                | -0.002                  | 0.97          |
| Age <sup>2</sup>  | -0.00002<br>(-0.16) <sup>*</sup> | -2.26e-06               | 0.99           | -0.0001<br>(-0.56) <sup>*</sup>  | -7.85e-06               | 0.99          |
| # Earners   | -0.316<br>(-2.34) <sup>**</sup>  | -0.024                  | 0.73           | -0.380<br>(-2.75) <sup>***</sup> | -0.029                  | 0.68          |
| Assets  | -0.331<br>(-4.78)                | -0.025                  | 0.72           | -0.370<br>(-5.13) <sup>***</sup> | -0.028                  | 0.69          |
| Part in Ag Activity   | 1.014<br>(4.08) <sup>***</sup>   | 0.077                   | 2.76           | 1.117<br>(-4.44) <sup>***</sup>  | 0.084                   | 3.05          |
| Urban   | -0.053<br>(-0.22)                | -0.004                  | 0.95           | -0.065<br>(-0.27)                | -0.005                  | 0.94          |
| CONSTANT  | 0.530<br>(0.059)                 | -                       | 1.70           | -0.062<br>(-0.07)                |                         | 0.94          |
| No. of Observations   | 1049                             |                         |                | 1049                             |                         |               |
| Log Likelihood  | -274.71                          |                         |                | -269.38                          |                         |               |
| Pseudo R2   | 0.33                             |                         |                | 0.42                             |                         |               |
| Percentage Correct<br>Predictions                             | 89.68                            |                         |                | 90.16                            |                         |               |

Note: 1. Probability derivatives at the mean of each explanatory variable (or for 0 to 1 change for dummy variables) and z-scores in parenthesis based on robust standard errors.

contributions to organisations and groups are also less likely to be poor than those that do not. The marginal effects show that they are 3 percent less likely to be poor than other households in the sample. The contribution of volunteer days and meeting attendance however do not matter as indicated by an insignificant coefficient for the variable in the equations.

Two additional variables one measuring risks sharing and collective action to deal with adverse circumstances are included to see their impact on poverty. Both are significantly and negatively related to the probability of being poor. Therefore,

households with social capital, translated into receiving help in difficult times of need are less likely to be poor than those who do not have this networking at their disposal. The marginal effects show that households who receive help through collective action are likely to be 3 percent less poor than other households. Similarly the effect of social capital where households are aided through collective action by associations is highly significant. Such households are 6 percent less likely to be poor. This is a powerful result of our analysis and highlights the crucial role social capital can play in the fight against poverty in Pakistan and has policy implications for poverty alleviation strategies in the country.

A number of household and individual characteristics are also included in the logit model to test their association with the probability of being poor. Education of has a highly significant and negative coefficient indicating that households with educated heads are less likely to be poor. However, the marginal effects are small. The effect of the education variable is much smaller than that for the social capital index variable (Model1). This result is significant for Pakistan showing a much higher and powerful significant negative effect of social capital on the poverty status of households. Household size is positively and significantly related to the probability of being poor with a one unit increase in size leading to more than 3 percent increase in poverty. Age and squared term of age both representing life cycle do not show significant effects.

The number of earners in the household and the asset endowments both representing higher incomes in the households show that household with more earners and assets are less likely to be poor. The marginal effects show a negative effect of around 2 percent for both the variables representing and income generating capacity and wealth of the household, in both the models.

The dummy for participation in agriculture activities has a positive and significant effect on poverty indicating that such households are more likely to be poor. The urban dummy shows an insignificant effect on the probability of being poor.<sup>6</sup>

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

The paper presents a contribution to the literature on social capital in Pakistan by including it in the analysis of income and poverty and providing empirical evidence on the subject at the household level. The results of the analysis indicate that social capital is an exogenous variable in the expenditure equation and that there is no simultaneity or two way causality. The results further show that social capital and the human capital both have a significant and positive effect on household welfare and that the returns to both forms of capital are similar. Social capital as measured by heterogeneity of the groups also shows significant positive effect on household welfare indicating that more the diversity in composition of a local group or organisation the more group benefits collectively. Household welfare is also influenced strongly by the household's demographic characteristics. As expected larger households have less welfare. Households with older heads are better off and that their welfare does not diminish with age. Household's welfare also depends upon where the household is located and urban households are better off compared to rural households.

<sup>6</sup> Our sample of households is not representative and the results should be looked at in context only.

The results of poverty and social capital analysis indicate that households with social capital (measured in different ways) at their disposal are less likely to be poor. The social capital index has a significant negative impact on poverty of a household. Membership density and cash contributions, disaggregated measures of social capital are also associated with lower poverty levels. Social capital has a much larger impact on poverty than human capital. Social capital translated into risk sharing in time of disaster, job loss, and illnesses and collective actions to raise voices for common problems are likely to have a negative impact on household poverty. This is a powerful result of our analysis the issue needs to be investigated through research based on more representative data in the country.

The research presents some interesting results which are not sufficient to base policy recommendations on but they present some important considerations for policies in Pakistan. Many policy lessons can be learnt from these results and can facilitate more informed policy making. In developing countries like Pakistan social capital is important for development. Individuals are contributing by participating in networks and associations but the government needs to do more since market is not likely to create enough social capital. The results of the paper suggest that social capital may be the missing link in the analyses of poverty and welfare in the country. There is a need to promote social networks for raising the living standards of the poor and bring the social capital perspective into policies. The government should facilitate the development of regions by relying on social networks and improving the welfare of people by working through networks and organisation. If these associations and networks get the support of the local, regional and national governments and work through community leaders, collective social action can be instrumental in increasing the welfare of weaker sections of these communities. Since social capital has a significant impact on the welfare of the households and negative impact on poverty policies to improve the human capital in Pakistan have to be accompanied by policies to improve social capital as well. Investing in education only will not work to get development on track. More attention needs to be devoted to the development of social network in the rural areas of the country.

## APPENDIX

*A Summary Statistics*

| Variable Name           | Variable Description/Unit of Measurement   | N    | Mean      | Std. Deviation |
|-------------------------|--|------|-----------|----------------|
| Social Capital Index    | An additive social capital index based on density of membership, meeting attendance, cash and work contribution  | 1050 | 68.3924   | 2.751          |
| Heterogeneity Index     | An index measuring diversity of a group based on ethnicity, education, income and political affiliation  | 1050 | 6.3876    | 1.535          |
| Meetings                | # of meetings of group attended by any household member in last 12 months  | 1050 | 1.07      | 84.690         |
| Membership Density      | # Number of organisations/groups household members are members   | 1050 | 2.31      | 6.68           |
| Cash Contribution       | Cash contribution in rupees to group in last 12 months   | 1050 | 1891.4333 | 870.79932      |
| Days Contribution       | Days of work contribution by household members to the group in last 12 months  | 1050 | 112.35    | 136.27         |
| Education of Head Years | # of years of education of head of the household   | 1050 | 5.11      | 3.004          |
| Household Size          | # of family members in household   | 1050 | 5.90      | 2.022          |
| Age                     | Age of the head of household in years  | 1049 | 45.02     | 9.80           |
| Number of Earners       | # earners in household   | 1048 | 1.88      | 1.03           |
| Urban Dummy             | Dummy for Rural/Urban, Urban =1  | 1050 | .8790     | .32623         |
| Asset Index             | An asset index calculated through factor analysis based on ownership of durable assets (car motor bike, refrigerator, sewing machine, television, air conditioner, computer cell phone, tractor, cart) | 1050 | 1.56      | 0.3811         |
| Risk Sharing            | Dummy for risk sharing measured as receiving help from the group in times shocks or disaster =1  | 1050 | 0.423     | 2.30           |
| Collective Action       | Dummy for collective action measured as collective action taken by group =1  | 1050 | .3390     | .47361         |
| Trust                   | Dummy for trust measured as trust in government and other organisations =1   | 1050 | 0.53      | 4.499          |

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## Determinants of GDP Fluctuations in Selected South Asian Countries: A Macro-Panel Study

GHULAM MOHEY-UD-DIN and MUHAMMAD WASIF SIDDIQUI

Now a days, the issue of volatility in GDP is becoming a fundamental development concern due to the undeniable connections between volatility and lack of development. In addition, the recognition of the negative link between short-term fluctuations and long-term growth not only signifies the importance of exploring this link but also stresses the importance of studying the determinants of the GDP fluctuations so that the efforts to manage these fluctuations can be made. Therefore, keeping in view, the importance of studying the factor causing fluctuations in GDP, the present study aims at exploring the determinants of GDP fluctuations using macro panel approach in a panel of five selected South Asian countries (SSAC) including Bangladesh, India, Nepal, Pakistan and Sri Lanka over the period of 1980-2010. For this purpose, modern non-stationary panel techniques such as cross section dependence test, second generation unit root test under cross sectional dependence, panel cointegration and Group Mean Fully Modified OLS (GM-FMOLS) estimation are applied.

The results of the group mean FMOLS estimates show that aid dependence (AIDGDP), trade openness (OPEN), volatility in the price level (PRIVOL), reliance on agriculture (AGRGDP) and political stability (POLSTB) are the significant determinants of the GDP fluctuations. Thus, it is suggested that these determinants may be managed to reduce the volatility in GDP growth rate.

*JEL Classification:* E32, F44, N15

*Keywords:* Determinants of GDP Fluctuations, Determinants of GDP Volatility, South Asia, Group Mean FMOLS, Panel Cointegration, Macro Panel, Business Cycle Fluctuations

### 1. INTRODUCTION

GDP fluctuations and volatility has large welfare costs, particularly, in developing countries. According to World Bank (2007), the direct welfare costs of volatility are about 5 to 10 percent of annual consumption in some Latin American countries as compared to industrial countries where it is about less than one percent. Similarly, the fluctuation and volatility of GDP has an adverse impact on long-run output growth, especially in developing countries. This negative link between volatility and growth was found empirically in the seminal paper of Ramey and Ramey (1995) and then Fatás (2002), Acemoglu, *et al.* (2003), Hnatkowska and Loayza (2004) and many other studies further studied it and found similar results.

Ghulam Mohey-ud-din <dr.moheyuddin@gamil.com> is Sr. Assistant Professor, Department of Management Sciences Department, Bahria University Lahore Campus, Pakistan. Muhammad Wasif Siddiqi is Senior Visiting Professor, Department of Economics, GC University, Lahore.

Now the issue of volatility is becoming a fundamental development concern due to the undeniable connections between volatility and lack of development [World Bank (2007)]. In addition, the recognition of the negative link between short-term fluctuations and long-term growth not only signifies the importance of exploring this link, but also stresses the importance of studying the determinants of the GDP fluctuations, so that the efforts to manage these fluctuations can be made.

There are so many domestic and external factors such as fluctuating commodity prices (inflation volatility), level of financial development, trade openness, reliance on agriculture, political instability and reliance of foreign resources etc. that cause the fluctuations in GDP growth. Studying the determinants of GDP fluctuation being least explored topic has a lot of space and potential for further research in a special context of developing countries.

Most of existing literature on the determinants of GDP volatility is limited to large cross-sectional and micro-panel studies. There is a considerable space in existing literature for further time-series, macro-panel studies (with small N and large T), and country or region specific research on this topic. South Asian countries are also facing the issue of fluctuations in growth rate, such as, soon after a vibrant growth rate of 9.1 percent in 2010, South Asia's real GDP growth has decelerated to an projected growth rate of 6.6 percent in 2011 [World Bank (2012a)]. Consequently, there is a massive potential for research on analysing the underlying sources of GDP volatility in South Asia, so that an effective policy to manage these GDP fluctuations may be devised.

Therefore, the present study tries to identify the major determinants of GDP fluctuations using annual data of five SSAC for the period of 1980-2010. Thus, the present study applies modern macro-panel techniques for non-stationary data which also accounts for cross section dependence. The organisation of the rest of the paper is as follows. The next section reviews the existing available literature on the determinants of GDP fluctuations. Section 3 deals with the detailed description of econometric techniques and data description. Section 4 presents and discusses the estimated results. The last section concludes the paper by presenting a summary of findings and giving policy recommendations.

## 2. REVIEW OF LITERATURE

The history of literature on the study of causes of business cycle is very old, but the study of the causes and sources of volatility and fluctuations in GDP growth rate has been started in late nineties and early twenties. Bergman (1996) found that both demand and supply shocks are important causes of business cycle fluctuations. Easterly, Islam and Stiglitz (2000) found that trade openness and price volatility (nominal volatility) are positively related to growth volatility (real volatility). Moreover, the relationship between financial deepening and growth volatility has a non-linear form.

Hoffmaister and Roldós (2001) examined found that domestic shocks are the main source of GDP fluctuations, while external shocks explain a small part of changes in output. Acemoglu, *et al.* (2003) found that countries inheriting the "extractive" institutions from their colonial past have more chances of having high volatility and economic crises during the post-war period. Furthermore, the study found that the distortionary macroeconomic policies are the indicators of underlying institutional

problems rather than the main causes of economic volatility. The findings of the study also suggested that the weak institutions cause volatility through a number of microeconomic, as well as macroeconomic, channels.

Ndlela and Nkala (2003) confirmed macroeconomic theory postulations about the nature of the relationship between each of the variables (real domestic product, terms of trade, inflation, government consumption, money supply, real exchange rate, and the world interest rate) and macroeconomic fluctuations in South Africa. Arreaza and Dorta (2004) found that domestic shocks seem to explain around 70 percent of the non-oil, output growth volatility. Particularly, supply shocks seem to be the main source of non-oil, output growth volatility. On the other hand, nominal shocks seem to account for over half of inflation variability.

Mobarak (2004) found that democracy, income and diversification lower the volatility, while volatility itself has a negative impact on growth. The author concluded that the democracy-stability link is strong, robust and sharper than democracy-growth relationship.

Spiliopoulos (2005) study found that the relationship between volatility and financial sophistication is not clearly negative as explained by many studies. Similarly, the oft quoted negative relationship between real GDP per capita and volatility turns out to be positive while no stable significant relationship between inflation and volatility is found. Mehrra and Oskoui (2007) found that the oil price shocks are the main source of output fluctuations in Saudi Arabia and Iran, but not in Kuwait and Indonesia.

Kunieda (2008) found that financial development has a hump-shaped effect on growth volatility. In the very early stages of financial development growth rate is less volatile. An economy becomes highly volatile as the financial sector develops. However, as the financial sector becomes mature and financial markets become perfect, the growth rates become less volatile again.

Ahmed and Suardi (2009) found strong evidence that trade liberalisation is associated with higher output and consumption growth volatility. On the contrary, financial liberalisation was found to increase the effectiveness of consumption smoothing and stabilise income and consumption growth. Balcilar and Tuna (2009) found that supply-side shocks are the main determinant of output fluctuations in the long-run and it explains almost half the variance of domestic output. On the other hand, most of the short-run fluctuation in domestic output was affected by relative demand shocks. Aggregate demand shocks did not seem to play any significant role in output volatility in the long-run.

Jalil (2009) found that a higher level of financial development reduces the volatility of real per capita GDP in China for the period under study. Perry (2009) found that during 1970-2005 about 44 percent of excess volatility in developing countries is associated with higher exposure to external shocks, about 38 percent is associated with volatile macroeconomic policies and the rest of (18 percent) is associated with insufficient development of domestic capital markets, financial integration, and other factors. Özata and Özer (2010) found that the fluctuations in real output are mainly caused by the supply shocks both in the short- and long-runs. Furthermore, it was also found that the domestic supply shocks (defined as productivity shocks) are the most important factors in explaining output fluctuations.

The literature, reviewed above, highlights different factors causing volatility in GDP growth rates. Furthermore, most of existing literature on the determinants of GDP volatility is limited to large cross-sectional and micro-panel studies. Thus, signifying for a considerable space in existing literature for further time-series, macro-panel studies (with small N and large T), and country or region specific research on this topic. South Asia has never been studied in the literature. Consequently, this study focuses on analysing the underlying sources of GDP volatility in like South Asia.

### 3. DATA AND METHODOLOGY

#### 3.1. Data Description

The volatility in GDP is already measured using five-years moving standard deviation of per capita GDP from trend. This study, on the basis of literature review, have selected the price volatility, level of financial development, the share of foreign aid in GDP, share of agriculture in GDP, trade liberalisation (openness) and political stability as the significant sources (determinants) of GDP fluctuations. The data of the GDP per capita and all the determinants including reliance on foreign aid (AIDGDP), aid volatility (AIDVOL), financial development (FINDEV), price volatility (PRIVOL) except Political Stability (POLSTB) is taken from the world development indicators 2012 [World Bank (2012b)]. While the data of political stability, proxied by the Polity2 series, is taken from Polity IV project by Marshall and Jaggers (2011). Some missing values in data of inflation for Bangladesh are taken from Triami Media (2012).<sup>1</sup> Detailed variable description along with data sources is given in Table A.1 of Appendix.

#### 3.2. Econometric Methodology

The primary objective of this paper is to examine and explore the overall long-run relationship between GDP fluctuations and determinants in SSAC. Most of the existing studies have used micro-panels for studying GDP fluctuations. These studies calculated standard deviation of GDP per capita growth rate for time-period under study as a proxy of volatility. While, some of panel-data studies used the country-averages for the sub-periods (by dividing the time-period into decades or even smaller sub-periods). Since the present study is also interested in testing the consistency of relationship between GDP fluctuations, and its determinants over time and this method of country-averages is not suitable in case of this study due to small country-sample. Therefore, the current study uses five-years moving standard deviation of per capita GDP growth rate from trend.<sup>2</sup>

<sup>1</sup>The missing period of 1980-86 in the WDI dataset of inflation rate for Bangladesh is filled with the Triami Media (2012).

<sup>2</sup>The five-year moving standard deviation from trend (SDFT) is calculated through taking the five-years moving standard deviation of cyclical component of the GDP per capita growth. The series of GDP per capita growth rate of each country, individually, has been decomposed into trend and cyclical components using the Hodrick-Prescott (HP) filter [Hodrick and Prescott (1997)] with a smoothing parameter set at 6.25 [as suggested by Ravn and Uhlig (2002) for annual data]. Then the five years moving standard deviation of cyclical component has been calculated to get the SDFT. Hodrick and Prescott (1997) originally found that the value of smoothing parameter ( $\lambda$ ) as 1600 for US quarterly data. Rand and Tarp (2002) find that business cycles in developing countries are significantly shorter in duration than cycles in developed countries. Therefore, the present study uses the choice of  $\lambda=6.25$  suggested by Ravn and Uhlig (2002) for annual data.

In a panel data having a small sample of countries (N) with a longer time-series (T), like present study, the existence of non-stationarity is more likely. Furthermore, this study also likes to explore the consistency of past cross-sectional studies over time. Therefore, this study employs the panel cointegration framework to estimate the equation 4.1. But, before continuing to the cointegration analysis first to check the order of integration by applying the unit root tests is needed. Along with the unit root analysis another recently developed concept of the cross sectional dependence is also gaining lot of attraction in the current non-stationary panel literature. Therefore, the current study employs the Cross Sectional Dependence (CD) test by Pesaran (2004) before applying panel unit root test.

### 3.2.1. Cross Sectional Dependence Test

Pesaran (2004) suggests a simple test for testing cross-sectional dependence (CD) which can be applied to a variety of panel-data models including stationary and non-stationary dynamic heterogeneous panels. This CD test is based upon the average of pair-wise correlation coefficients of OLS residuals from the individual regressions in the panel rather than their squares like the Breusch–Pagan LM test [Baltagi (2005), p. 247]:

$$CD = \sqrt{\frac{2T}{N(N-1)} \left( \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right)} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

### 3.2.2. Panel Unit Root Tests

The first step in determining a potential cointegrated relationship is to test whether the variables of interest are stationary or non-stationary. There are many tests available for testing unit root in panel data like Breitung (2000), Hadri (2000), Levin, Lin and Chu (2002) test (known as LLC test) and Im, Pesaran and Shin (2003) test (known as *IPS* test) etc. but these all test assumes cross sectional independence. As mentioned earlier that it is more likely that our data may have cross-sectional dependence, therefore, none of these above-mentioned tests can be used. Accordingly, the current study employs the Breitung and Das (2005) panel unit root test. The main advantage of the Breitung and Das (2005) is that it can also be applied in the presence of cross-sectional dependence. In case of cross-sectional dependence the robust value of lambda is calculated to account for the cross-sectional dependence otherwise in case cross-sectional independence the simple value of lambda is calculated.

### 3.2.3. Panel Cointegration Tests

After confirmation about the order of integration of variables of interest, and if the variables are non-stationary, the next step is to check for cointegration because the use of traditional OLS may give the spurious results in the presence of a unit root. Although taking the first difference of the data is a useful transformation to prevent the spurious regression problem but it also causes to lose the long term information. Therefore, the current study uses the panel cointegration technique. For the panel cointegration test, the current study employs Pedroni (1997, 1999 and 2004a) panel cointegration tests. The main advantage of using Pedroni panel cointegration test is that it accounts for cross-section dependence if common

time dummies added as Banerjee and Lluís (2006) pointed out that most panel data tests (including Pedroni) assume cross-section independence, except for common time effects. Therefore, the addition of common time effects (common time dummies) may account for the problem of cross-sectional dependence.

*Pedroni Panel Cointegration Test:* Pedroni Panel cointegration test is a significant improvement over the conventional cointegration tests applied on a single series. The panel regression model to analyse the long-run co-integrating relationship between growth and GDP fluctuations, using Pedroni panel co-integration test, can be represented as under:

$$FLUC_{i,t} = \alpha_i + \delta_t + \sum_{m=1}^M \beta_{mi} X_{mi,t} + e_{i,t} \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where,

X = Set of Determinants of GDP Fluctuations (including volatility of the price level (PRIVOL), level of financial development (FINDEV), reliance on the foreign aid (AIDGDP), political stability (POLSTB), Share of Agriculture (AGR GDP) and Trade liberalisation / openness (OPEN)) FLUC = GDP fluctuations

Using the above equation, the null of no cointegration is tested through seven test statistics developed by Pedroni (1999). The first four statistics (Panel-v, Panel-rho and Panel-t (PP and ADF)) are based on pooling the residuals along the within dimension of the panel. The rest of three statistics (Group-rho and Group-t (PP and ADF)) are based on pooling the residuals along the between dimension of the panel. Under the alternative hypothesis, Panel-v statistic diverges to positive infinity. It is a one sided test therefore, where large positive values reject the null of no cointegration. The remaining statistics diverge to negative infinity, which means that large negative values reject the null of no cointegration.

### 3.2.4. Panel Estimation using FMOLS Approach

These panel cointegration tests, just give the information about the long-run equilibrium relationship among the variables, these tests don't estimate the co-integrating vectors. For this purpose, the present study uses Group Mean Fully Modified Ordinary Least Squares (GM-FMOLS) developed by Pedroni (2001a, 2001b, 2004b) which is an extension of time-series Fully Modified OLS (FMOLS) by Phillips and Hansen (1990). The main advantage of using GM-FMOLS estimator is that it not only gives consistent estimates of the  $\beta$  parameters in relatively small samples, but it also controls for the likely endogeneity of the regressors and serial correlation [Ramirez (2010); Al Yousef (2013)]. This technique also control for the likely cross-sectional dependence by including common time dummies in the model [Pedroni (2001a); Lee (2007)]. Another method which allow estimation in the presence of cross-sectional dependence is the Pesaran (2006) CCEMG estimator. But Pesaran (2006) is the extension of Pesaran and Smith (1995) MG and Pesaran, shin and Smith (1999) PMG estimator. Tsangarides, Saxegaard, and Roudet (2007) pointed out that GM-FMOLS estimators have satisfactory size and power properties even for small panels, as long as T is larger than N and in the presence of homogeneous co-integrating vector mean-group estimators have better small sample performance than within group estimators. Tsangarides, *et al.* (2007) further highlighted the PMG estimator imposes long-run homogeneity, it can also produce inconsistent estimates of the average values of the parameters if the assumption of homogeneity is

violated in practice. Therefore, the present study employs GM-FMOLS with common time dummies to estimate the long-run cointegrating vector.

For the estimation of GM-FMOLS estimation the following model is considered:

$$FLUC_{i,t} = \alpha_i + \beta_i X_{i,t} + \varepsilon_{i,t} \dots \dots \dots \dots \dots \dots \dots \quad (3)$$

Where,  $FLUC_{i,t}$  is the dependent variable of the country  $i$  at time  $t$ ,  $X_{i,t}$  is vector of determinants of GDP Fluctuations (of a country  $i$  at time  $t$ ) including volatility of the price level (PRIVOL), level of financial development (FINDEV), reliance on the foreign aid (AIDGDP), political stability (POLSTB), Share of Agriculture (AGR GDP) and Trade liberalisation/openness (OPEN). and  $\varepsilon_{i,t}$  is the error-term.  $X_{i,t}$  and  $FLUC_{i,t}$  are cointegrated with coefficient  $\beta_i$ , which may or may not be homogenous across  $i$ .

All the idiosyncratic (individual country) coefficients ( $\hat{\beta}_{FM,i}^*$ ) and associated  $t$ -statistic for each country ( $i$ ) are estimated using above Equation (3) and then the Group Mean (Between-Dimension) panel estimates ( $\hat{\beta}_{GFM}^*$ ) can be calculated using the following formula given by Pedroni (2004b).

$$\hat{\beta}_{GFM} = N^{-1} \sum_{i=1}^N \left( \sum_{t=1}^T (P_{it} - \bar{P}_i) \right)^{-1} \times \left( \sum_{t=1}^T (P_{it} - \bar{P}_i) S_{it}^* - T \hat{\gamma}_i \right) \dots \dots \quad (4)$$

Where,

$$S_{it}^* = (S_{it} - \bar{S}_i) - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} \Delta P_{it}$$

$$\hat{\gamma}_i = \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^\circ - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} (\hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^\circ)$$

In the above equation (4), the expression after the summation over  $i$  is similar to the conventional idiosyncratic time-series estimator ( $\hat{\beta}_{FM,i}^*$ ) therefore the between dimension panel estimator ( $\hat{\beta}_{GFM}^*$ ) can be constructed simply by,

$$\hat{\beta}_{GFM}^* = N^{-1} \sum_{i=1}^N \hat{\beta}_{FM,i}^* \dots \dots \dots \dots \dots \dots \dots \quad (5)$$

Where,  $\hat{\beta}_{FM,i}^*$  is the conventional time-series (individual country) FMOLS estimator of  $i$ th member of panel. Similarly, related  $t$ -statistic for the between dimension panel estimator can be measured by the following formula by Pedroni (2004b).

$$t_{\hat{\beta}_{GFM}^*} = N^{-1/2} \sum_{i=1}^N t_{\hat{\beta}_{FM,i}^*} \dots \dots \dots \dots \dots \dots \dots \quad (6)$$

Where,  $t_{\hat{\beta}_{FM,i}^*}$  is the conventional time-series (individual country,  $i$ )  $t$ -statistic, of  $i$ th member of panel, associated with related  $\hat{\beta}_{FM,i}^*$ . The formula of  $t_{\hat{\beta}_{FM,i}^*}$  is given as,

$$t_{\hat{\beta}_{FM,i}^*} = \left( \hat{\beta}_{FM,i}^* - \beta_o \left( \hat{\Omega}_{11i}^{-1} \sum_{t=1}^T (P_{it} - \bar{P}_i)^2 \right)^{1/2} \right) \dots \dots \dots \dots \quad (7)$$

## 4. RESULTS AND DISCUSSION

### 4.1. Cross Sectional Dependence Test

The results of CD Test by Pesaran (2004) are given in the Table 1 which shows that except GDP fluctuations (FLUC) and Price Volatility (PRIVOL) the null of no cross-sectional independence can be rejected i.e. all the variables except the FLUC and PRIVOL are found as cross-sectionally dependent variables.

Table 1

#### *Cross Sectional Dependence Test*

| Variable | CD-test | p-value | Corr  | abs(corr) |
|----------|---------|---------|-------|-----------|
| AGRIGDP  | 14.82   | 0.000   | 0.902 | 0.902     |
| FINDEV   | 9.86    | 0.000   | 0.600 | 0.600     |
| POLSTB   | 3.22    | 0.001   | 0.196 | 0.266     |
| AIDGDP   | 12.12   | 0.000   | 0.738 | 0.738     |
| OPEN     | 4.74    | 0.000   | 0.289 | 0.375     |
| FLUC     | 0.71    | 0.479   | 0.044 | 0.226     |
| PRIVOL   | 0.60    | 0.547   | 0.037 | 0.250     |

Source: Author's Own Calculation.

Notes: Under the null hypothesis of cross-section independence  $CD \sim N(0,1)$ .

While, GDP fluctuations (FLUC) and Price Volatility (PRIVOL) are found as cross-sectionally independent variables.

### 4.2. Panel Unit Root Testing under Cross Sectional Dependence

Table 2 depicts the results of Breitung and Das (2005) panel unit root test at level. The value of lambda ( $\lambda$ ) statistic shows that at level all the variables are non-stationary at 5 percent level of significance. The robust values of lambda ( $\lambda$ ) are given to account for cross-sectional dependence except the FLUC and PRIVOL which are the cross-sectionally independent variables.<sup>3</sup>

Table 2

#### *Breitung and Das (2005) Panel Unit Root Test (at Level)*

| Lambda Statistic (Probability in Parenthesis) |                     |                    |                     |                    |                    |                     |
|---|---------------------|--------------------|---------------------|--------------------|--------------------|---------------------|
| AIDGDP  | AGRIGDP             | FINDEV             | FLUC                | OPEN               | PRIVOL             | POLSTB              |
| With Intercept Only                           |                     |                    |                     |                    |                    |                     |
| -0.4234<br>(0.3660)                           | 2.5911<br>(0.9952)  | 3.2224<br>(0.9994) | -0.4644<br>(0.3212) | 1.3295<br>(0.9082) | -0.6573<br>(0.255) | -1.5266<br>(0.0634) |
| With Intercept and Trend                      |                     |                    |                     |                    |                    |                     |
| 1.5011<br>(0.0667)                            | -0.8978<br>(0.1846) | 3.0679<br>(0.9989) | -1.4907<br>(0.0680) | 1.7235<br>(0.9576) | 0.7886<br>(0.7848) | 0.7896<br>(0.7851)  |

\* and \*\* represent the rejection of null hypothesis of no unit root at 1 percent and 5 percent level of significance respectively.

<sup>3</sup>Pesaran (2004) CD Test implemented using XTCD Stata Module by Eberhardt (2011).

The results of Breitung and Das (2005) panel unit root test at first difference are given in Table 3. The table shows that all the variables become stationary at first difference. The results of Breitung and Das (2005) panel unit root test shows that all the variables are integrated of order one i.e. I(1).

Table 3

*Breitung and Das (2005) Panel Unit Root Test (at 1st Difference)*

| Lambda Statistic (Probability in Parenthesis) |          |           |          |          |          |          |
|---|----------|-----------|----------|----------|----------|----------|
| AIDGDP  | AGR GDP  | FINDEV    | FLUC     | OPEN     | PRIVOL   | POLSTB   |
| With Intercept Only                           |          |           |          |          |          |          |
| -7.3115*                                      | -5.2441* | -4.9692*  | -7.4447* | -4.1148* | -5.6063* | -8.0366* |
| (0.000)                                       | (0.000)  | (0.000)   | (0.000)  | (0.0000) | (0.000)  | (0.0000) |
| With Intercept and Trend                      |          |           |          |          |          |          |
| -8.6522*                                      | -4.7455* | -1.6883** | -6.7141* | -3.4999* | -4.0954* | -5.5024* |
| (0.000)                                       | (0.000)  | (0.0457)  | (0.000)  | (0.0002) | (0.000)  | (0.0000) |

\* and \*\* represent the rejection of null hypothesis of no unit root at 1 percent and 5 percent level of significance respectively.

#### 4.3. Panel Cointegration Test

After the conformation of the order of integration of the variables, the results of the Pedroni test are shown in Table 4. The Pedroni's seven panel test statistics are given in the table.

Table 4

*Pedroni Panel Cointegration Test Results (Determinants of GDP Fluctuations)*

| Test Statistics | With Intercept and<br>No Trend+ |             | With Intercept and<br>Trend+ |             |
|-----------------|---------------------------------|-------------|------------------------------|-------------|
|                 | Un-weighted                     | Weighted++  | Un-weighted                  | Weighted++  |
| panel v-stat    | 0.304925                        | -0.12296    | 0.021222                     | -0.58023    |
| panel rho-stat  | 0.564599                        | 0.923547    | 1.31596                      | 1.693967*** |
| panel pp-stat   | -2.7994*                        | -1.73298**  | -2.4967*                     | -1.36056*** |
| panel adf-stat  | -2.55554*                       | -1.35939*** | -1.58484***                  | -0.04979    |
| group rho-stat  | 1.695304                        | -           | 2.398424                     | -           |
| group pp-stat   | -1.95884**                      | -           | -1.33352**                   | -           |
| group adf-stat  | -1.93784**                      | -           | 0.28011                      | -           |

Null hypothesis: no cointegration, + common time dummy included to account for cross sectional dependence. ++ Panel stats are weighted by long run variances. \*, \*\* and \*\*\* represent the rejection of null hypothesis of no unit root at 1 percent, 5 percent & 10 percent level of significance respectively

The Group PP-Statistic and Group ADF-Statistic show the existence of long-run equilibrium relationship between GDP Fluctuations and its determinants (AIDGDP, AGR GDP, FINDEV, PRIVOL, OPEN, POLSTB) in both cases of Pedroni panel cointegration tests (i.e. model with intercept and no trend and model with intercept and trend). According to the panel statistics, Panel PP-Statistic and Panel ADF-Statistic also show the existence of a co-integrating relationship between GDP Fluctuations and its

determinants. Therefore, it may be concluded that the results of Pedroni cointegration test show the presence of long run equilibrium relationship among the variables.

#### 4.4. GM-FMOLS Results and Discussions

The long-run GM-FMOLS i.e. Pedroni Panel (Group-Mean) FMOLS estimates are presented in Table 5.<sup>4</sup> The results of the group mean (panel) FMOLS estimates show that aid dependence (AIDGDP), trade openness (OPEN), volatility in the price level (PRIVOL), reliance on agriculture (AGR GDP) and political stability (POLSTB) are the significant determinants of the GDP fluctuations while the coefficient for financial development (FINDEV) has positive sign but insignificant.

Table 5

| <i>Group Mean Fully Modified OLS (GM-FMOLS) Results</i> |                     |                      |                 |
|---|---------------------|----------------------|-----------------|
| <i>Dependent Variable: GDP Fluctuations (FLUC)</i>      |                     |                      |                 |
| Variable  | Coefficient         | t - Statistics       |                 |
| OPEN  | 0.008568            | 2.762835*            |                 |
| POLSTB  | -0.020820           | -1.7627***           |                 |
| AIDGDP  | -0.095600           | -5.57032*            |                 |
| AGR GDP   | 0.043102            | 2.303267**           |                 |
| FINDEV  | 0.004392            | -0.44504             |                 |
| PRIVOL  | 0.058576            | 2.001935**           |                 |
| Constant  | -0.132180           | 0.93368              |                 |
| <i>Diagnostic Testing</i>                               |                     |                      |                 |
| Residual Stationarity                                   | I(0)                | CD Test for Residual | 1.64<br>(0.110) |
| F Test  | 33.85434<br>(0.000) | RMSE                 | 0.55030         |

\*, \*\* and \*\*\* represents 1 percent, 5 percent and 10 percent significance level respectively.

The trade liberalisation (OPEN), volatility in the price level (PRIVOL) and reliance on agriculture (AGR GDP) have positive sign as expected showing a positive relationship of these variables with GDP fluctuations. Political stability is also found as a significant determinant of GDP fluctuations in the SSAC and have expected sign (i.e. negative). Political stability has a negative impact on the GDP fluctuations i.e. a stable political environment help in maintaining the stable growth rate of GDP (i.e. reducing fluctuations and volatility in GDP) on the other hand it may be said that political instability has positive relationship with GDP fluctuations. The reliance on foreign aid (AIDGDP) also has a negative relationship with GDP fluctuations, which shows that foreign aid helps in maintaining stability and smoothing out the volatility and instability.

The post estimation diagnostic tests are also shown in Table 4.6. These test shows that the F-test is significant and residuals are stationery. CD Test for residuals shows that the residuals are cross-sectionally independent which shows that the adding common time dummies resolve the issue of cross section dependence.

<sup>4</sup>The GM-FMOLS model is estimated using RATS code (*PANELFM*) by Doan (2012).

## 5. CONCLUSION AND RECOMMENDATIONS

The paper studies the determinants of GDP fluctuations in SSAC using macro panel approach in a panel of five selected South Asian countries (SSAC) including Bangladesh, India, Nepal, Pakistan and Sri Lanka over the period of 1980-2010. For this purpose, modern non-stationary panel techniques such as cross section dependence test, second generation unit root test under cross sectional dependence, panel cointegration and Group Mean Fully Modified OLS (GM-FMOLS) estimation are applied. Due to small sample size, study could not cover all of the determinants. Especially, non-economic factors like conflicts/ wars, atomic explosion, climatic condition/ natural disaster, floods and famine etc. may also be the determinants of the fluctuations/ volatility in GDP in South Asia. However, non-availability of reliable data, small sample size and degrees of freedom restrict the paper to the variables used in the study. However, impact of some non-economic aspects have been tried to be covered in the 'political stability' and impact of weather, natural disasters (floods etc.) have been proxied in dependence on agriculture. Despite these limitations, this study tries to contribute to limited literature on GDP fluctuations in South Asia.

The results of the current study show that the reliance on agriculture (AGR GDP) is a significant determinant of the GDP fluctuations in the SSAC and has a positive effect on GDP fluctuations (FLUC). This shows that the dependence on agriculture make a country more vulnerable because agricultural production is vulnerable and dependent upon the weather and climatic conditions. Similarly, price volatility (PRIVOL) is also found as a significant and positive determinant of the GDP fluctuations in the SSAC. Easterly, Islam and Stiglitz (2000) also find that nominal volatility (price volatility) is positively related to growth volatility (real volatility). The financial development (FINDEV) is also a positive but insignificant determinant of the GDP fluctuations. Kunieda (2008) also found that the financial development level, for the countries having fully developed financial markets and developed financial system, expected to have negative impact on GDP fluctuations. However, for less developed countries like the SSAC, where the financial system is not fully developed and in the middle stages of development, FINDEV has a positive impact on the GDP fluctuations. Similarly, Easterly, Islam and Stiglitz (2000) also find financial deepening (proxied by domestic credit to GDP ratio) and growth volatility has a non-linear form. Political stability (POLSTB) is also found as a significant determinant of GDP fluctuations in the SSAC and has expected negative sign. Political stability has a negative impact on the GDP fluctuations i.e. a stable political environment help in maintaining the stable growth rate of GDP and on the other hand political instability may result in increasing the volatility and fluctuations in growth rate of GDP. Mobarak (2004) also found that democracy has positive link with stability i.e. the democracy (political stability) lower the volatility.

The trade liberalisation or openness (OPEN) has positive and significant sign as expected showing a positive relationship of these variables with GDP fluctuations. Easterly, Islam and Stiglitz (2000) also find that trade openness is positively related to growth volatility. This shows when less developed countries become more open they become more vulnerable to external shocks resulting in more volatility. The reliance on foreign aid (AIDGDP) has a negative and significant relationship with GDP fluctuations, which shows that foreign aid helps in maintaining stability and smoothing out the volatility and instability.

The results, presented above, have the serious policy implications. These results suggest that the price volatility should be reduced and be controlled for reducing the GDP fluctuations and maintaining stability. Furthermore, financial development under less developed financial market and financial system is causing the fluctuation (volatility) in output (GDP) growth rates. Therefore, a developed financial system may help in maintaining economic stability. The political stability can also help in achieving the goal of economic stability. The study finds that the democracy and political stability helps in lowering the volatility in growth which suggests that a stable and democratic political environment may help in achieving the economic stability. The dependence on agriculture is also a major source of fluctuations in GDP growth rates, the structural transformation of economy by shifting the reliance from agriculture to other sectors (manufacturing etc.) may help in achieving stable growth rates. The study also suggests that the foreign aid in productive sectors can also be helpful in gaining economic stability and reducing growth volatility through supplementing the shortage of domestic resources (and by filling in the twin deficits i.e. current account deficit and fiscal deficit).

## APPENDIX

Table A.1

### *Definitions and Sources of Variables*

| Variable Acronym | Variable Description  | Source  |
|------------------|---|---|
| FLUC             | GDP Fluctuations, GDP fluctuations are measured by the five-years moving standard deviation (SD) of Per Capita GDP growth from trend (five-years moving SD of cyclical component, decomposed by HP filter). | Researcher Calculation based on WDI data on GDP per capita growth |
| FINDEV           | Financial Development, Financial Development is proxied by domestic private credit to GDP ratio (%).  | WDI 2012, Online  |
| PRIVOL           | Price volatility, measured by volatility index (GARCH Variance Series) generated by GARCH (1,1) model of CPI inflation.   | Researcher Calculation based on WDI data on CPI inflation         |
| POLSTB           | Political Stability, proxied by Polity2 series of Polity IV project.  | Polity IV Project by Marshall, and Jaggers. (2011).               |
| AGR GDP          | Reliance on Agriculture proxied by the share of Agricultural value added in GDP (as a percentage of GDP).   | WDI 2012, Online  |
| AIDGDP           | Reliance on Foreign Capital, proxied by Foreign Aid as percentage of GDP  | WDI 2012, Online  |
| OPEN             | Trade Liberalisation / Openness, proxied by the volume of exports + Imports as a share of GDP (%)   | WDI 2012, Online  |

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## **E-government, Economic Growth and Trade: A Simultaneous Equation Approach**

MUHAMMAD TARIQ MAJEED and AMNA MALIK

Does e-government promote trade and economic growth? This paper attempts to answer this question by employing simultaneous equation estimation approach and using a cross-section data of 147 countries. This is first study which has empirically estimated the bilateral relationships between economic growth and e-government, trade and e-government and trade and economic growth. The findings indicate that e-government is a stimulant of both economic growth and trade. The results predict the presence of a bilateral relationship between e-government and economic growth, trade and e-government, and unilateral causality exists from trade to growth.

*JEL Classification:* F14; H10; O40

*Keywords:* E-government; Economic Growth; Trade

### **1. INTRODUCTION**

The study on economic growth is dated back from Adam Smith (1776) discussed in his famous book “wealth of nation”. There are many theories of economic growth presented by different economists, according to the situation that have been prevailed during that time [Ricardo (1817); Harrod (1939); Domer (1946); Solow (1956)]. The pioneer of theoretical framework of economic growth is Solow (1956) and his model was employed by Barro (1991); Mankiw, Romer, and Weil (1992); and Quah (1993, 1997).

Trade is an important topic that has been captured the attention of policy makers since the start of previous century. The debate on trade has been dated back from many decades but yet there is no consensus about the positive consequences of trade on economic growth. The positive influence of trade on economic growth is empirically supported by [Edwards (1998); Wacziarg (2001); Greenaway, *et al.* (2002)] whereas [Rodriguez and Rodrik (1999)] doubted the robustness of positive relationship between trade and economic growth. In this study we empirically check the association of trade with economic growth by incorporating e-government. The trade and e-government have bilateral relationship. Trade promotes e-government by diffusion of technologies and on the other hand e-government promotes trade by overcoming non- tariff barriers and asymmetric information.

Muhammad Tariq Majeed <m.tariq.majeed@gmail.com, tariq@qau.edu.pk> is Assistant Professor, School of Economics, Quaid-i-Azam University, Islamabad. Amna Malik <amina.d786@gmail.com> is Officer Grade 1, State Bank of Pakistan, Karachi.

E-government is referred to online availability of government to provide quick and efficient services to masses of people. Von Haldenwang (2004) defined e-government as a practice of information and communication technology (ICT) in public administration. E-government facilitates government in efficient provision of services to citizen by employing ICT infrastructure [Tandon (2005); Chen, *et al.* (2009); and Krishnan and Teo (2012)].

The theoretical studies on e-government emphasise its role in enhancing the efficiency of public sector and public administration [Al Kibsi, *et al.* (2001); Von Haldenwang (2004); and West (2004)] and increasing the marginal productivity of labour by mitigating the disguised unemployment [Grimes, Ren, and Steven (2012)]. In spite of its importance the empirical research on e-government is on embryonic stages. After reading vast literature we got insights about empirically investigating its role in promoting trade and economic.

E-government contributes in economic growth through trade openness by providing online availability of government and web connections. Trade also significantly contributes in output growth by tapping full potential of world resources that will help to mitigate poverty, malnourishment, infant mortality rate, illiteracy, unemployment, and inequality. The consensus about the positive relationship between trade and economic growth is yet not achieved. The advocates of positive relationship between trade and economic growth are [Rivera-Batiz and Romer (1990); Grossman and Helpman (1991); Edwards (1998); Wacziarg (2001); and Greenaway, *et al.* (2002)] whereas [Rodriguez and Rodrik (1999)] questioned the robustness of positive association between trade liberalisation and economic growth. Most of the studies empirically confirm the positive association between trade and economic growth. Thus, to reap full potential of trade we have to mitigate tariff and non-tariff barriers. The hindrance in the way of trade openness is not only tariffs but also non-tariff barriers such as asymmetric information, transportation cost and low interaction between traders.

The non-tariff barriers in the way of liberalise economy can be overwhelmed by e-government through cheap access to refine information and interaction between traders. E-government can upsurge economic development of country by facilitating trade. There are few studies which have taken into account of internet role in facilitating trade liberalisation [Choi and Hoon Yi (2009); Clarke and Wallsten (2006); Freund and Weinhold (2004); Vemuri and Saddiqi (2009)]. These studies predicted internet as a trade stimulant.

The impact of e-government on trade in empirical literature is missing. We fill this gap by taking into account of bilateral relationships between trade, e-government and economic growth by employing simultaneous equation model. Our study empirically explores e-government-trade, trade-economic growth and e-government-trade nexus. By advocating the bilateral relationship between trade and economic growth we are able to find the direct and indirect impact of trade on economic growth through e-government.

The study is arranged as follows: Section 2 presents the literature on economic growth, e-government and trade. Section 3 discusses the empirical framework of our study. Section 4 describes data and its statistical analysis. Section 5 presents and interprets empirical findings of simultaneous equation model. Finally Section 6 concludes and suggests policies.

## 2. LITERATURE REVIEW

In this section we explore the literature on the relationships between economic growth, e-government and trade.

### 2.1. E-government and Economic Growth

E-government provides efficient services to masses of people that stimulate economic growth. The efficient provision of responsibilities towards nation facilitates trade by providing cheap access to information and efficient allocation of resources to those projects that reap high returns, and facilitate interaction among investors. The electronic government through information and communication infrastructure enhances productive potential of economy. E-government stimulates output growth of the country by disseminating information and spilling over the knowledge and cutting down transaction and transportation cost. Salvatore (1996) points out that East Asia “miracle” was based on strong government support for domestic industry while stimulating competition and efficiency among domestic firms.

Summer (1999) illustrated the importance of software development in setting up new information based modern economy. He demonstrated that information technology is contributing significantly in output growth of a country. Shamim (2007) empirically analysed the effect of telecommunication technologies on output growth by taking data of 61 countries over the year of 1990 to 2001. She proposed that telecommunication technologies provide refine information, mitigate the data processing cost and asymmetric information, and facilitate interaction between buyer and seller. The results indicated that positive impact of financial development is mediated by e-government or telecommunication technology.

Choi and Yi (2009) investigated empirically the effect of internet on output growth using the panel data for 217 countries from 1991 to 2000. The findings indicate that 1 percent increase in internet subscribers up surges growth about 0.05 percent. Krishnan, Teo, and Lim (2013) argued that impact of e-government on growth is mediated by control of corruption and environmental degradation. They use averaged data over the period 2004-2008. Their finding inferred that direct impact of e-government on economic prosperity is insignificant and its impact on growth is intermediated by control of corruption and environmental degradation.

According to Czernich, *et al.* (2011) broadband “fast speed internet” has positive effect on output growth. They have empirically investigated the impact of broadband on economic growth by taking data of OECD countries over the years of 1996 to 2007. Their results indicate that broadband upsurges growth up to 3.9 percent. Mahyideen, *et al.* (2012) proposed that ICT upsurge economic development by enhancing productivity and cutting down production cost. They empirically explored the relationship between economic prosperity and information and communication technologies (ICT) for ASEAN countries from 1976 to 2010. The results of granger causality supported long run relationship between ICT and economic growth.

### 2.2. Trade and Economic Growth

There is vast theoretical as well as empirical literature on the impacts of trade liberalisation on economic growth but debate is yet not settled. The contradiction in

consequences of trade on growth in not only lies between theoretical but also lies within empirical literature. The positive impacts of trade liberalisation on output growth are advocated by theoretical models of many economists [Grossman and Helpman (1991); Rivera-Batiz and Romer (1990); and Devereux and Lapham (1994)] and theoretical framework on negative implication of trade on economic growth is proposed by Redding (2002). Likewise, empirical studies have also polarised into positive and negative consequences of trade liberalisation on economic growth. The positive impact of trade on economic growth in empirical studies is advocated by [Edwards (1998); Wacziarg (2001); and Greenaway, *et al.* (2002)] whereas Rodriguez and Rodrik (1999) doubted the robustness of positive effect of trade on output growth. The negative relationship between trade-growth nexus is demonstrated by Clemens and Williamson (2000); and Vamvakidis (2002).

Winter (2004) doubted on robustness of positive impact of trade on economic growth. He demonstrated that relationship between economic growth and trade depends on omitted variables in regression. He proposed that consequences of trade on economic growth can vary in the case of inclusion of education, corruption, institutional strength, political stability, and level of development of a country. Using a panel data for 42 countries, Parikh (2006) estimates the effect of trade liberalisation on growth and growth on trade balance. The study finds out that trade liberalisation promotes growth in most countries, but the growth itself has a negative impact on trade balance.

Kneller, *et al.* (2008) empirically founded relationship between trade liberalisation and economic growth is heterogenous in different countries. He has taken panel data of 37 countries and introduced dummy variable that is one for the time period when it starts to liberalise. Their findings inferred that trade liberalisation has increased overall growth rate of post-liberalisation period about 2.4 percent per annum but out of 37, the growth rate of 20 countries has decrease in after liberalisation. Shachmurove and Spiegel (2010) analysed the welfare of nations in a globalised economy. They point out less welfare effects in a more globalised world.

### **2.3. E-government and Trade**

The impediments of trade are not only tariffs but also non-tariff barriers such as transaction cost and lack of information. Collier and Gunning (1999) alleged that particular obstacle in the way of economic growth in Africa is transaction cost. E-government through online availability and web connection can fill this gap in the way of open economy. E-government also accelerates trade by decreasing transaction cost, facilitating interaction between traders, providing refine and clear information on quality, demand and supply, markets, and prices of different products.

Mattoo, Rathindran, and Subrama (2001) empirically investigated the impact of liberalisation in service on economic growth of the country. He argued that consequences of service liberalisation are different from trade liberalisation. The empirically results of the study inferred that telecommunication services and financial services have positive and significant impact on output growth whereas impact of financial services is stronger than telecommunication services. They conclude that the economy having open telecom and financial services tends to grow 1.5 percent higher.

We cannot blame merely tariff as a resistance of trade liberalisation but various transactions, communication, and fixed entry costs also responsible for restricting smooth trade in the country. Majeed and Ahmad (2006) in their study of determinants of exports in developing countries enunciated the importance of communication technologies in encouraging exports. They proposed that communication technologies such as internet and mobile phones have significant impact on exports of developing countries.

Clarke and Wallsten (2006) scrutinised the impact of internet on trade for both developing and developed countries. The findings of their study suggested that internet has positive impact on trade only in developing countries. Meijers (2014) investigated growth-internet, internet-trade, and trade-growth nexus by taking archive data of 162 countries over the time period 1990-2008. The result of simultaneous equation model confirmed that the growth impact of internet is mediated by trade whereas direct effect of internet on growth is insignificant.

Kurihara and Fukushima (2013) examined how internet facilitates trade in 34 developed and 24 Asian countries for year 2005 and 2010 by employing gravity trade model. Their findings indicate that internet has stronger positive effect on trade in developing countries than developed countries in 2005. Yadav (2014) studied the impact of internet on exports and imports of 52 Asian and sub-Saharan African countries from 2006 to 2010. He proposed that internet has significant effect on export and import of firms in extensive and intensive margin in Asian and Sub-Saharan African countries. He mentioned that firm has to face fixed information cost to enter into international market but internet save firms from entry costs. Freund and Weinhold (2004) also supported that internet is a trade stimulant in a sample of 56 developing countries.

The above literature shows that trade-growth nexus is empirically investigated by economist, but the association of this nexus with e-government is ignored. Furthermore, the existing literature focuses different components of e-government such as internet to explain growth but does not incorporate a comprehensive measure of e-government. The present study fills these gaps in the literature.

### 3. SIMULTANEOUS EQUATION MODEL

E-government stimulates economic growth directly and also indirectly by stimulating trade. Trade regulates e-government by integrating different economies which facilitate diffusion and spillover of knowledge whereas e-government enhances trade by facilitating interaction between traders and foreign investors. The prevailing case of interrelationship among three endogenous variables calls for a need of simultaneous equations model. The empirical framework of our study is based on three simultaneous equations to estimate direct and indirect impacts of e-government on economic growth.

#### 3.1. Equation of Economic Growth

The model of economic growth employed in our study is stemmed from Solow (1956) which has CRS (constant returns to scale) and two inputs

$$y = f(A, K, L)$$

Mankiw, *et al.* (1992) extended the theoretical models of Solow (1956) and Koopmans (1969) by relaxing the convergence condition. According to absolute

convergence theory the poor countries will catch up the per-capita of rich countries due to high marginal productivity of capital. In order to fulfil the convergence condition we have introduced initial per-capita in our empirical growth model.

$$y_i = \beta_0 + \beta_1 y_{initial,i} + \beta_2 A_i + \beta_3 K_i + \beta_4 L_i + e_i \quad \dots \quad \dots \quad \dots \quad (1)$$

The advocates of endogenous growth model see divergence in per-capita income due to divergence on technological potential of country. The steady state growth rate of country varies due to differences in technological progress and innovations [Barro (1991) and Barro and Sala-i-Martin (1991)]. Technological progress has proxied by information and communication technology in different studies and intuition behind using ICT “as a proxy for technology” is high labour marginal productivity due to information and communication technology [Jorgenson, *et al.* (2007); van Ark, *et al.* (2008); Oliner, *et al.* (2008)]. Few studies emphasised on information technology (internet) in order to measure the divergence in per-capita due to gaps in technological potential [Clarke and Wallsten (2006); Meijers (2014)]. We measure technology by e-government. The equation 1 is modified as

$$y_i = \beta_0 + \beta_1 y_{initial,i} + \beta_2 EG_i + \beta_3 K_i + \beta_4 L_i + e_i \quad \dots \quad \dots \quad \dots \quad (2)$$

The technological diffusion across the world can be driven by economic integration of world. The economic integration will help in diffusion and spill over knowledge and information and excite innovation in the country. Acemoglu and Ventura (2002) proposed the model that describes convergence in per-capita in terms of international trade. We also address the impact of trade on economic growth following same rationale. The left side variable is economic growth, K is capital stock, and L is labour force. The error term of equation is shown by  $e_i$ .

$$y_i = \beta_0 + \beta_1 y_{initial,i} + \beta_2 EG_i + \beta_3 K_i + \beta_4 L_i + \beta_5 Trade_i + e_i \quad \dots \quad (3)$$

### 3.2. Equation of Trade

The economic integration of world can be stimulated by e-government through its information and telecommunication infrastructures, skilled labour, and web connectivity. Different studies have explored merely internet as a stimulant of trade liberalisation [Kurihara and Fukushima (2013); Meijers (2014); and Yadav (2014)].

We are interested to explore reverse relationship between trade liberalisation and economic growth. The equation three explains the impact of trade on economic growth but in equation 4 we have incorporated economic growth as a determinant of trade. E-government stimulates trade by delivering cheap information and facilitating interaction among traders.

$$Trade = \alpha_0 + \alpha_1 Trade_{initial,i} + \alpha_2 y_i + \alpha_3 EG_i + \alpha_4 Tariff_i + \alpha_5 Exchange\ rate_i + u_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

In order to determine the indirect impact of e-government on trade we have introduced interactive term of economic growth and e-government. The exchange rate is an important determinant of trade. Trade liberalisation depends on protection level in a country. The tariff rate is a measure of trade protection in a country and exerts a negative influence on trade liberalisation.

$$\begin{aligned} Trade_i = & \alpha_0 + \alpha_1 Trade_{initial,i} + \alpha_2 y_i + \alpha_3 EG_i + \alpha_4 Y * EG_i \\ & + \alpha_5 Exchange\ rate_i + \alpha_6 Tariff_i + u_i \quad \dots \quad \dots \quad \dots \quad (5) \end{aligned}$$

### 3.3. Equation of E-government

The adoption of ICT tools by government for efficient provision of its services depends on economic growth of the country. The installation of latest technology in public sectors is regulated by economic performance of the country. The latest technology is usually innovated and adopted by developed countries because they have sufficient budgets to shift public sector from primitive to modern public administration. According to Comin and Hobjin (2004) famous technologies are first embraced by most of the developed countries. Czernich, *et al.* (2011) proposed that there is reverse causal relationship between e-government and economic growth. The other possibility of impact of output growth on e-government is state intervention. The installation and penetration of ICT infrastructure in public sector is regulated by state intervention in economic decisions of country and state intervention is regulated by economic growth of the country [OECD (2009)].

$$EG_i = \varkappa_0 + \varkappa_1 EG_{initial,i} + \varkappa_2 y_i + z_i \quad \dots \quad \dots \quad \dots \quad (6)$$

The diffusion of technology is stirred by economic and social integration of countries. Here we are going to address only trade as a measure of economic integration, to find out that how it promotes e-government. The equation 6 can be written as

$$EG_i = \varkappa_0 + \varkappa_1 EG_{initial,i} + \varkappa_2 y_i + \varkappa_3 Trade_i + z_i \quad \dots \quad \dots \quad (7)$$

According to Czernich, *et al.* (2011) access to broadband usually comes from fixed telephones and TV-cables lines. The fixed telephone lines regulate online presence of government. Anderson (2008) proposed that according to UDT (urban density theory) internet subscription depends on urban population because cost of internet decreases as share of urban population increases because of knowledge spillover, availability of other substitutes of internet such as broadband. For these reasons we incorporated fixed-telephones line and share of urban population as determinants of e-government

$$\begin{aligned} EG_i = & \varkappa_0 + \varkappa_1 EG_{initial,i} + \varkappa_2 y_i + \varkappa_3 Trade_i + \varkappa_4 Fixed\ tele_i \\ & + \varkappa_5 Urban_i + z_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (8) \end{aligned}$$

## 4. DATA DESCRIPTION

The secondary data of 147 countries for the years of 2003 to 2012 is employed in this study. We have supported our study through cross sectional data by taking averages of dataset from 2003 to 2012. The main reason behind the choice of cross sectional data is missing data of e-government. The data on e-government is not continuous but have missing values. So the best alternate was to take the multiyear averages of data produce more efficient and robust results than single year data. The cross sectional data of multiyear averages give less sensitive results [Wiggins and Ruefli (2005)].

E-government index is weighted average of online service and web connection, telecommunication infrastructure, and human capital that can use the tools of information and communication technologies. All the components of e-government have equal weight of 0.33. The data lies in the range of 0 to 1: zero indicates worst e-government quality whereas one indicates best e-government quality.

The measure of economic growth is natural log of per capita GDP (at current U.S dollars) whereas 1990 is base year of initial per-capita income, measure of tariff is tariff rate of weighted mean, measure of physical capital is gross fixed capital formation (percentage of GDP), and measure of trade liberalisation is export plus import (percentage of GDP). The data source of these variables is WDI [World Development Indicators (2014)]. The data of fixed telephone lines is derived from ITU (International Communication Union).

Table 4.1  
*Dimensions of E-government*

| Description of E-government Dimensions  |  |
|---|--|
|  <p>Online Service and Web Connections</p> | <p>It measures the extent of online and web content availability and focused on growing web connection and online presence which improves the accessibility of information by utilisation of multimedia which facilitates online delivery of transactional services and communication between government and citizens.</p> |
|  <p>Telecommunication Infrastructure</p> | <p>The telecommunication infrastructure is founded on five indicators: internet users, personal computers, fix-telephones lines, mobile phone subscription, and broadband subscription (all the indicators are in per 100 inhabitants).</p>  |
|  <p>Human Capital</p>                    | <p>Human capital is based on four indicators that are adult literacy rate, gross secondary enrolment, gross secondary enrolment, and gross tertiary enrolment.</p>   |

Figures 1, 2 and 3 show a positive association of trade and e-government with economic growth and with each other. The bar charts (Figures 4 and 5) indicate that trade is high in countries having good quality e-government (see Appendix).

Table 4.2

*Summary Statistics of Data*

| Variable                 | Observation | Mean     | Min      | Max      |
|--------------------------|-------------|----------|----------|----------|
| Y                        | 147         | 11692.31 | 179.401  | 94654.22 |
| Y <sub>initial</sub>     | 145         | 5342.72  | 182.797  | 36337.09 |
| Capital                  | 147         | 23.4887  | 9.85652  | 68.78322 |
| Labour                   | 147         | 63.29    | 41.42    | 86.63    |
| E-government             | 147         | 0.44781  | 0.08738  | 0.87     |
| Exchange Rate            | 133         | 675.99   | 0.344    | 25000    |
| EG <sub>initial</sub>    | 145         | 0.40274  | 0.0000   | 0.92706  |
| Trade                    | 147         | 89.4306  | 27.0795  | 303.446  |
| Trade <sub>initial</sub> | 142         | 73.24068 | 14.56329 | 210.161  |
| Urban _population        | 147         | 1.39e+07 | 21606    | 3.00e+08 |
| Fix_Telephone            | 147         | 19.6930  | 0.04629  | 65.9294  |
| Tariff                   | 146         | 6.616705 | 4.839402 | 21.42    |

Table 4.2 presents the summary statistics of data. The minimum value of e-government is 0.087 that is the value for Niger. Niger has poorest e-government quality and Denmark has best e-government quality. United States has minimum trade to GDP ratio that is only 27 percent and Luxembourg has highest trade to GDP ratio and per capita income. Burundi has lowest per capita income. The country having lowest tariff rate is Macao (China) and country having highest tariff rate is Liberia.

In order to avoid biased result it is necessary to check the functional forms of specified equations. Linktest<sup>1</sup> serves to find that whether functional form of the equation is correct or not. Table 4 presents the results of linktest which indicate that coefficients of hat square are not significant in Equations 3 and 8 which is a signal of no concern of specification error in the equations. Hat square is the square of the independent variables in an auxiliary regression to check leverage. The insignificance of hat square illustrates that the variance in independent variables is not causing fluctuation in dependent variables.

<sup>1</sup>Specification error in model occurs when one or more irrelevant variables are incorporated or one or more relevant variables are omitted in the specified equation. When relevant variables are excluded from the model or irrelevant variables are included in the model, the common variance they share with excluded/included variables may be wrongly attributed to those variables. In the case of such specification errors, the error term tends to inflate and creates biased results. Specification error in any equation leads to biasness in all the results. Prior to estimate the model we have checked the specification of our model by employing the linktest. The test generates two variables, predicted independent variable (\_hat), square of predicted variable (\_hatsq). The model is then re-estimated using these two variables as predictors. If model is free from specification error then hatsq should not have much prediction power. Table 4.3 indicates that hatsq has not explanatory power and our all equations are free from specification error.

Table 4.3

*Linktest Results*

| Dependent Variable: Natural log of per-capita GDP |            |          |       |       |
|---|------------|----------|-------|-------|
| Variables   | Coef       | Std. Err | T     | P> t  |
| _hat  | 1.374505   | 0.316188 | 4.35  | 0.000 |
| _hatsq  | -0.022062  | 0.018553 | -1.19 | 0.236 |
| _cons   | -1.542248  | 1.318649 | -1.17 | 0.244 |
| Dependent Variable: Trade liberalisation          |            |          |       |       |
| _hat  | 1.318894   | 1.333089 | 0.99  | 0.324 |
| _hatsq  | -0.0367583 | 0.153453 | -0.24 | 0.811 |
| _cons   | -0.6875192 | 2.886441 | -0.24 | 0.812 |
| Dependent Variable: E-government                  |            |          |       |       |
| _hat  | 0.96947    | 0.091681 | 10.57 | 0.000 |
| _hatsq  | 0.031816   | 0.093483 | 0.34  | 0.734 |
| _cons   | .0062143   | 0.020458 | 0.30  | 0.762 |

**5. EMPIRICAL FINDINGS**

We have applied *Seemingly Unrelated Regressions (SUR)*, *Two Stage Least Squares (2SLS)*, and *Three Stage Least Squares (3SLS)*.<sup>2</sup> The *SUR* model takes into account correlation among error terms of all the equations. The empirical finding of *SUR* model indicates that there is a positive and significant relationship between economic growth and e-government. The coefficient of e-government in 1st column of Table 5.1 implies that 1 percent increase in e-government quality brings 3.67 percent increase in economic growth. The coefficient of trade in 1st column of Table 5.1 is also positive and significant which implies that 1 percent increase in trade causes 0.35 percent increment in economic growth. The coefficient of initial per capita income 1st column of Table 5.1 implies that 1 percent increase in initial income will upsurge growth about 0.52 percent.<sup>3</sup>

The 2nd column of Table 5.1 presents the empirical finding of equation 5. The results confirm that e-government is a trade stimulant. The coefficient of economic growth in 2nd column of Table 5.1 implies that 1 percent increase in economic growth will cause 0.10 percent increment in trade. The findings indicate the reverse causal relationship from economic growth to trade. The interactive impact of “e-government and

<sup>2</sup>There is significant systematic difference between *OLS* and *SUR* model, *OLS* and *2SLS*, *OLS* and *3SLS* according to Hausman Test. The variance-covariance matrix of error terms indicates correlation between the error terms of Equation 3, equation5, and equation8. The correlation between error terms of equation3 and equation5 is 0.13, equation3 and equation8 is 0.172, and equation 5 and equation 8 is 0.105 that is significant and greater than 10 percent. *3SLS* technique takes into account of both endogeneity and correlation among error terms, *2SLS* only takes into account of endogeneity, and *SUR* model takes merely into account of correlation between error terms. In order to check the robustness of results we have employed all the techniques of Simultaneous equation model. All equations in simultaneous equation model are identified according to order condition because the number of endogenous variables included in equation less one (M-1) is less than the number of exogenous variables excluded in equation [Gujrati (2003)]. The internal instruments are used to tackle endogeneity. The instruments are initial quality of e-government, physical capital, labour force, fixed telephone lines, initial urban population, initial per capita income, exchange rate, and tariffs.

<sup>3</sup>The sign of initial per-capita income can be positive in the case of poor or developing economies because they will likely to grow rapidly. The hypothesis of “catching per-capita of rich economies by poor economies is consistent with convergence theory that is supported by Solow (1956).

economic growth” on trade is negative and significant. The net effect of e-government on trade is 2.07 (2.33- 0.26) whereas net effect of economic growth on trade is -0.16 (0.10-0.26). It indicates that high per capita income is not strengthening the positive impact of e-government on trade, the likely reason of this effect may be self-sufficiency of a country after certain threshold level of high per capita income.

The high economic growth can make country self-sufficient that probably has negative impact on trade due to cutting down imports and exports (retaliation of foreign country due to decreasing theirs exports). Our data also indicates that United States has lowest trade to GDP ratio. Tokarick (2008) stated that rich countries use an array of protectionism policies in agriculture sector in order to protect their farm industry. They usually protect their agriculture sector by employing import quotas, tariff on imports, and subsidies. Stiglitz and Charleton (2005) also stated that the spending on agriculture subsidies in OECD countries is more than 300 billion US\$ per annum. Exchange rate has insignificant impact on trade liberalisation whereas initial trade value of trade has positive significant impact on trade liberalisation. The coefficient of tariff indicates that 1 percent increase in tariff rate will decrease trade about 1 percent.

The findings of equation 8 are reported in 3rd column of Table 5.1. The coefficients of trade and economic growth in 3rd column of Table 5.1 infer that 1 percent increase in trade and economic growth will improve quality of e-government about 0.038 percent and 0.032 percent. The initial urban population and fixed telephone lines have also positive influence on e-government. The findings of SUR indicate that there is bilateral relationship between per capita income and e-government, per capita income and trade liberalisation, and trade and e-government.

Columns (4-6) of Table 5.1 present the results of 2SLS model. The results show that there is a bilateral causality between “e-government and trade” and “per capita income and e-government”. There is unilateral causality between trade and per capita income from trade openness to per capita income. Initial urban population and fixed telephones lines is positively influencing the e-government quality. High per capita income is offsetting the positive impact of e-government on trade due to certain threshold level of per capita income when country adopts protection policy.

In 7th to 9th column of Table 5.1 the empirical findings of 3SLS are discussed. The results of 3SLS indicate that there is a bilateral relationship between e-government and per capita income and trade and per capita income. However, there is one way causality between e-government and trade that is from e-government to trade. The results of SUR model, 2SLS and 3SLS are almost consistent. All the simultaneous equation techniques confirm that e-government is a stimulant of trade but high per capita income offset its positive impact on trade because of protection in the form of subsidies to its sectors [Stiglitz and Charleton (2005)].

Simultaneous equation econometric techniques is ideal to estimate the simultaneous equation if all the equation are correctly specified. If one of the equations is miss specified then estimation with simultaneous equation approach will spread biasness in all the equation. In that case OLS is recommended. In order to evade from biasness and for sensitivity analysis we have applied Ordinary Least Square model. Table 5.2 presents the results of OLS which also infer that there is a two way causality between e-government and trade liberalisation and e-government and per capita income but unilateral causality

between trade liberalisation and per capita income that is from trade to per capita income. The coefficient of e-government in 1st and 2nd column of table 5.2 indicates that 1 percent increase in e-government quality will enhance per capita growth about 3.22 percent and trade about 2.188 percent, respectively. The coefficient of trade in 1st and 3rd column of Table 5.2 denotes that 1 percent increase in trade increase per capita growth about 0.247 percent and e-government quality about 0.034 percent, respectively.

Table 5.1

*Empirical Results of Simultaneous Equations Model*

| Independent Variables    | Empirical Findings of Simultaneous Equation Model |                      |                       |                    |                     |                       |                    |                      |                       |
|--------------------------|---|----------------------|-----------------------|--------------------|---------------------|-----------------------|--------------------|----------------------|-----------------------|
|                          | SUR Model   |                      | 2SLS                  |                    |                     | 3SLS                  |                    |                      |                       |
|                          | (1)<br>(Eq3)                                      | (2)<br>(Eq5)         | (3)<br>(Eq8)          | (4)<br>(Eq3)       | (5)<br>(Eq5)        | (6)<br>(Eq8)          | (7)<br>(Eq3)       | (8)<br>(Eq5)         | (9)<br>(Eq8)          |
| Trade <sub>initial</sub> |   | 0.55***<br>(0.045)   |                       |                    | 0.53***<br>(0.057)  |                       |                    | 0.51***<br>(0.055)   |                       |
| EG*Y                     |   | -0.26***<br>(0.0824) |                       |                    | -0.321*<br>(0.169)  |                       |                    | -0.209<br>(0.161)    |                       |
| Exchange Rate            |   | 0.00715<br>(0.0099)  |                       |                    | 0.00876<br>(0.0110) |                       |                    | 0.00778<br>(0.0099)  |                       |
| Tariff                   |   | -0.0101*<br>(0.0060) |                       |                    | -0.0108<br>(0.0068) |                       |                    | -0.0119*<br>(0.0061) |                       |
| ln(per capita)           |   | 0.101**<br>(0.0478)  | 0.032***<br>(0.00479) |                    | 0.159<br>(0.102)    | 0.046***<br>(0.00701) |                    | 0.175*<br>(0.0978)   | 0.062***<br>(0.00627) |
| E-gov                    | 3.67***<br>(0.416)                                | 2.33***<br>(0.815)   |                       | 3.67***<br>(0.451) | 2.601*<br>(1.526)   |                       | 5.08***<br>(0.411) | 1.140<br>(1.449)     |                       |
| Y <sub>initial</sub>     | 0.53***<br>(0.055)                                |                      |                       | 0.53***<br>(0.059) |                     |                       | 0.33***<br>(0.053) |                      |                       |
| Capital                  | 0.319**<br>(0.145)                                |                      |                       | 0.242<br>(0.158)   |                     |                       | 0.242*<br>(0.131)  |                      |                       |
| Labour                   | -0.281<br>(0.282)                                 |                      |                       | -0.311<br>(0.304)  |                     |                       | 0.0125<br>(0.259)  |                      |                       |
| Trade                    | 0.35***<br>(0.109)                                |                      | 0.038***<br>(0.00932) | 0.46***<br>(0.148) |                     | 0.0309**<br>(0.0151)  | 0.55***<br>(0.143) |                      | 0.0138<br>(0.0143)    |
| Urban pop                |   |                      | 0.010***<br>(0.00203) |                    |                     | 0.011***<br>(0.00248) |                    |                      | 0.010***<br>(0.00221) |
| E-gov <sub>initial</sub> |   |                      | 0.519***<br>(0.0349)  |                    |                     | 0.484***<br>(0.0411)  |                    |                      | 0.397***<br>(0.0365)  |
| Fix_Tele                 |   |                      | 0.002***<br>(0.00040) |                    |                     | 0.0012**<br>(0.00049) |                    |                      | 0.0010**<br>(0.00042) |
| Constant                 | 1.364<br>(1.427)                                  | 1.30***<br>(0.345)   | -0.376***<br>(0.0617) | 1.242<br>(1.591)   | 1.040<br>(0.645)    | -0.450***<br>(0.0857) | 0.344<br>(1.366)   | 1.190*<br>(0.619)    | -0.447***<br>(0.0785) |
| Observations             | 127   | 127                  | 127                   | 127                | 127                 | 127                   | 127                | 127                  | 127                   |
| R-squared                |   |                      |                       |                    |                     |                       |                    |                      |                       |
| Observation              | 0.880   | 0.622                | 0.956                 | 0.877              | 0.613               | 0.951                 | 0.854              | 0.592                | 0.937                 |
| F-stat                   | 127   | 127                  | 127                   | 127                | 127                 | 127                   | 127                | 127                  | 127                   |
| Chi-Square               | 959.11  | 217.22               | 2846.20               | 177.23             | 31.73               | 474.64                | 912.74             | 197.42               | 2468.93               |

Standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The positive sign of the coefficients of initial urban population and fixed telephones lines is consistent with urban density theory<sup>4</sup> and the study of Anderson (2008). Anderson proposed that online service and broadband are usually delivered from

<sup>4</sup>The increase in initial urban population decreases the cost of information and telecommunication technology due different substitutes of information technologies such as internet, broadband, and others.

fixed telephone lines and cable TV lines. We have also controlled our result by introducing the control of corruption (as a proxy of institution) in growth equation and our results remain consistent (see Table A3 in Appendix).

Table 5.2  
*Empirical Findings of Ordinary Least Squares*

| Variables                | Empirical Findings of OLS       |                       |                          |
|--------------------------|---------------------------------|-----------------------|--------------------------|
|                          | Ordinary Least Square Technique |                       |                          |
|                          | (Equation 3)                    | (Equation 5)          | (Equation 8)             |
|                          | Economic Growth                 | Trade                 | E-gov                    |
| Trade <sub>initial</sub> |                                 | 0.560***<br>(0.0473)  |                          |
| EG*per Capita            |                                 | -0.231***<br>(0.0858) |                          |
| Exchange Rate            |                                 | 0.00519<br>(0.0103)   |                          |
| Tariff                   |                                 | -0.00952<br>(0.00628) |                          |
| ln (per capita)          |                                 | 0.0669<br>(0.0497)    | 0.0254***<br>(0.00497)   |
| E-government             | 3.215***<br>(0.431)             | 2.188**<br>(0.849)    |                          |
| Y <sub>initial</sub>     | 0.581***<br>(0.0572)            |                       |                          |
| Capital                  | 0.314**<br>(0.152)              |                       |                          |
| Labour                   | -0.437<br>(0.295)               |                       |                          |
| Trade                    | 0.247**<br>(0.112)              |                       | 0.0344***<br>(0.00961)   |
| Urban Population         |                                 |                       | 0.00937***<br>(0.00212)  |
| EG <sub>initial</sub>    |                                 |                       | 0.554***<br>(0.0364)     |
| Fix_Tele                 |                                 |                       | 0.00208***<br>(0.000423) |
| Constant                 | 2.261<br>(1.494)                | 1.496***<br>(0.359)   | -0.314***<br>(0.0641)    |
| Observations             | 127                             | 127                   | 127                      |
| R-squared                | 0.882                           | 0.624                 | 0.957                    |
| F-stat                   | 180.63                          | 33.20                 | 540.65                   |
| Observation              | 127                             | 127                   | 127                      |

Standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 6. CONCLUSION

E-government is an important tool that enhances trade. The online service of e-government promotes frequent interactions among traders and improves the quality of information regarding price, quality, and demands of goods. It can serve as an efficient tool to increase marginal productivity of labour and alleviate disguised unemployment in a country by increasing trade. E-government is an important tool to mitigate non-tariff barriers in the way of liberalising and opening an economy. It facilitates a country in tapping the full potential of world resources.

We determine the relationships between economic growth and e-government, trade and e-government and trade and economic growth employing simultaneous equation estimation approach and a cross-section data of 147 countries. The bilateral relationships between trade and e-government are supported by SUR, OLS, and 2SLS whereas 3SLS model supports one-way causality between trade and e-government from e-government to trade openness.

Kim (2001) argued that the main reason behind resistance in e-government is insufficient allocation of budget in the area of e-government that will result in inappropriate usage of IT infrastructure. The lack of modern education and training on usage of information technology keeps public servants unaware about usage of IT tools and impedes development of e-government. In order to tap the full potential of resources and trade liberalisation, the investment in e-government may be made mandatory.

## APPENDIX

Table A 1

*Summary of Variables of Interest and Their Data Sources*

| Variables                     | Description   | Sources |
|-------------------------------|---|---------|
| Economic growth               | Natural log GDP per capita at current US \$.  | [1]     |
| Initial per-capita            | Natural log of per-capita GDP in 1990 (measured in current U.S dollars).  | [1]     |
| E-government                  | The extent of the online availability of the government, telecom infrastructure, and human capital.   | [2]     |
| Initial level of E-governemnt | The year 2003 is taken as an initial value of e-governemnt index.   | [2]     |
| Physical capital              | Gross fixed capital formation in percentage of GDP.   | [1]     |
| Labour supply                 | Share of labour force participation total % of population.  | [1]     |
| Exchange rate                 | Official Exchange rate measured as the average value of local currency in terms of U.S dollars.   | [1]     |
| Trade                         | Export plus import share of GDP.  | [1]     |
| Inflation                     | GDP deflator.   | [1]     |
| Urban population              | Initial level of urban population (year 1990).  | [1]     |
| Fix_Telephone                 | Fixed telephone lines per 100 inhabitants.  | [3]     |
| Tariff                        | Weighted mean applied tariff is the average of effectively applied rates weighted by the product import shares corresponding to each partner country. | [1]     |

[1] World development indicator (2014); [2] Global E-government reports (2003-2012); [3] International telecommunication Unions (2014)

Table A 2

## Correlation Matrix

| Variables        | 1       | 2       | 3       | 4       | 5       | 6      | 7       | 8       | 9     |
|------------------|---------|---------|---------|---------|---------|--------|---------|---------|-------|
| 1. Per capita    | 1.000   |         |         |         |         |        |         |         |       |
| 2. Trade         | 0.01    | 1.000   |         |         |         |        |         |         |       |
| 3. EG            | 0.733   | 0.075   | 1.000   |         |         |        |         |         |       |
| 4. Tariffs       | -0.4078 | -0.1421 | -0.6021 | 1.0000  |         |        |         |         |       |
| 5. Capital       | -0.062  | 0.226   | -0.021  | 0.1421  | 1.000   |        |         |         |       |
| 6. Labour        | -0.015  | -0.157  | -0.267  | 0.2628  | 0.0237  | 1.000  |         |         |       |
| 7. Urban_pop     | 0.568   | 0.0484  | 0.6814  | -0.4035 | -0.0043 | 0.657  | 1.000   |         |       |
| 8. Fix_Tele      | 0.788   | 0.0635  | 0.848   | -0.4837 | -0.0344 | 0.7576 | 0.6447  | 1.000   |       |
| 9. Exchange rate | -0.1055 | -0.1297 | -0.0693 | 0.0629  | 0.0665  | 0.0776 | -0.0068 | -0.0665 | 1.000 |

Table A3

## SEM with Control Variables

| Models                   | SUR                  |                       |                          | 2SLS                 |                      |                         | 3SLS                 |                       |                         |
|--------------------------|----------------------|-----------------------|--------------------------|----------------------|----------------------|-------------------------|----------------------|-----------------------|-------------------------|
|                          | (1)<br>(Eq3)         | (2)<br>(Eq5)          | (3)<br>(Eq8)             | (4)<br>(Eq3)         | (5)<br>(Eq5)         | (6)<br>(Eq8)            | (7)<br>(Eq3)         | (8)<br>(Eq5)          | (9)<br>(Eq8)            |
| Variables                | Growth               | Trade                 | E-gov                    | Growth               | Trade                | E-gov                   | Growth               | Trade                 | E-gov                   |
| Y <sub>initial</sub>     | 0.542***<br>(0.0639) |                       |                          | 0.554***<br>(0.0694) |                      |                         | 0.316***<br>(0.0605) |                       |                         |
| Labour                   | -0.253<br>(0.289)    |                       |                          | -0.223<br>(0.315)    |                      |                         | 0.0717<br>(0.257)    |                       |                         |
| Capital                  | 0.324**<br>(0.145)   |                       |                          | 0.237<br>(0.159)     |                      |                         | 0.210<br>(0.131)     |                       |                         |
| E-government             | 3.716***<br>(0.439)  | 2.314***<br>(0.816)   |                          | 3.850***<br>(0.481)  | 3.023**<br>(1.357)   |                         | 5.088***<br>(0.434)  | 2.027<br>(1.288)      |                         |
| Trade                    | 0.348***<br>(0.109)  |                       | 0.0380***<br>(0.00932)   | 0.497***<br>(0.148)  |                      | 0.0295**<br>(0.0149)    | 0.611***<br>(0.142)  |                       | 0.0129<br>(0.0142)      |
| Corruption Control       | -0.0394<br>(0.0852)  |                       |                          | -0.0826<br>(0.0922)  |                      |                         | 0.0213<br>(0.0781)   |                       |                         |
| Trade <sub>initial</sub> |                      | 0.550***<br>(0.0456)  |                          |                      | 0.515***<br>(0.0541) |                         |                      | 0.474***<br>(0.0517)  |                         |
| ln(per capita)           |                      | 0.101**<br>(0.0479)   | 0.0316***<br>(0.00479)   |                      | 0.193**<br>(0.0839)  | 0.0453***<br>(0.00686)  |                      | 0.268***<br>(0.0805)  | 0.0605***<br>(0.00618)  |
| EG*Y                     |                      | -0.259***<br>(0.0825) |                          |                      | -0.376***<br>(0.141) |                         |                      | -0.337**<br>(0.135)   |                         |
| Exchange Rate            |                      | 0.00705<br>(0.00988)  |                          |                      | 0.0100<br>(0.0109)   |                         |                      | 0.0106<br>(0.00977)   |                         |
| Tariff                   |                      | -0.0101*<br>(0.00601) |                          |                      | -0.0106<br>(0.00686) |                         |                      | -0.0112*<br>(0.00608) |                         |
| E-gov <sub>initial</sub> |                      |                       | 0.520***<br>(0.0349)     |                      |                      | 0.489***<br>(0.0405)    |                      |                       | 0.401***<br>(0.0362)    |
| Urban Population         |                      |                       | 0.00992***<br>(0.00203)  |                      |                      | 0.0105***<br>(0.00245)  |                      |                       | 0.00981***<br>(0.00224) |
| Fix_Tele                 |                      |                       | 0.00194***<br>(0.000404) |                      |                      | 0.00126**<br>(0.000489) |                      |                       | 0.00107**<br>(0.000426) |
| Constant                 | 1.098<br>(1.540)     | 1.310***<br>(0.346)   | -0.373***<br>(0.0618)    | 0.442<br>(1.722)     | 0.829<br>(0.539)     | -0.433***<br>(0.0834)   | 0.0299<br>(1.420)    | 0.672<br>(0.518)      | -0.437***<br>(0.0779)   |
| Observations             | 127                  | 127                   | 127                      | 127                  | 127                  | 127                     | 127                  | 127                   | 127                     |
| R-squared                | 0.880                | 0.622                 | 0.956                    | 0.876                | 0.604                | 0.951                   | 0.850                | 0.560                 | 0.939                   |

Standard errors in parentheses.

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1.

Table A3

List of Countries

List of Under Developed, Developing, and Developed Countries

**Under Develop Countries**

Armenia, Bangladesh, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo. Dem, Ethiopia, Gambia, Guiana, Kenya, Kyrgyz Republic, Liberia, Malawi, Mali, Mozambique, Nepal, Nigeria, Rwanda, Tajikistan, Togo, Uganda, Zimbabwe.

**Developing Countries**

Albania, Algeria, Angola, Argentina, Azerbaijan, Belarus, Belize, Bhutan, Bolivia, Botswana, Bulgaria, Cape Verde, China, Cameroon, Columbia, Congo. Rep, Costa Rica, Cuba,

Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Georgia, Ghana, Guatemala, Guyana, Honduras, Hungary, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Lao PDR, Lebanon, Lesotho, Macedonia. FYR, Malaysia, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Namibia, Nicaragua, Niger, Pakistan, Panama, Papua new Guinea, Paraguay, Peru, Philippine, Romania, Senegal, Serbia, Solomon island, South Africa, Serbia, Sri Lanka, St Lucia, St. Vincent and the Grenadines, Suriname, Swaziland, Syria, Thailand, Tonga, Tunisia, Turkey, Ukraine, Uzbekistan, Vanuatu, Venezuela, Yemen.

**Under Developed Countries**

Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Cyprus, Czech Republic, Denmark, Equatorial Guiana, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea. Rep, Latvia, Lithuania, Luxembourg, Macao SAR, China, Malta, Netherland, New Zealand, Norway, Oman, Poland, Portugal, Russia, Saudi Arabia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, United States, and Uruguay.

Fig. 1. Relationship between Growth and E-government

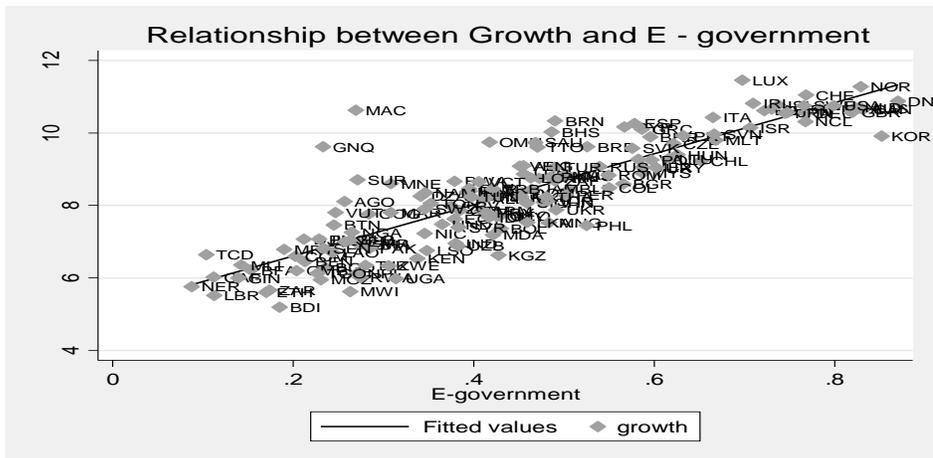


Fig. 2. Relationship between Trade and Growth

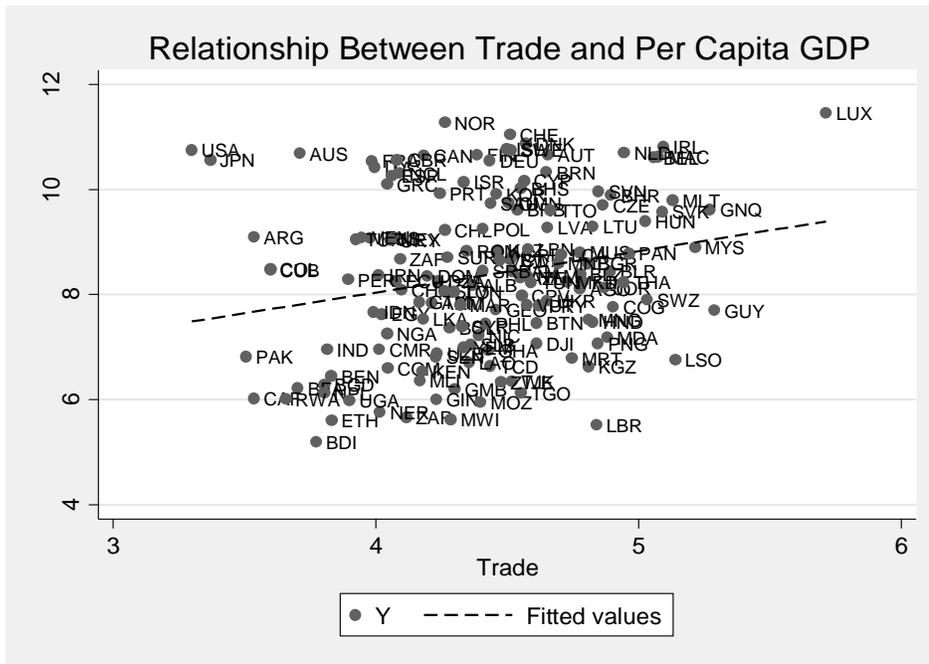
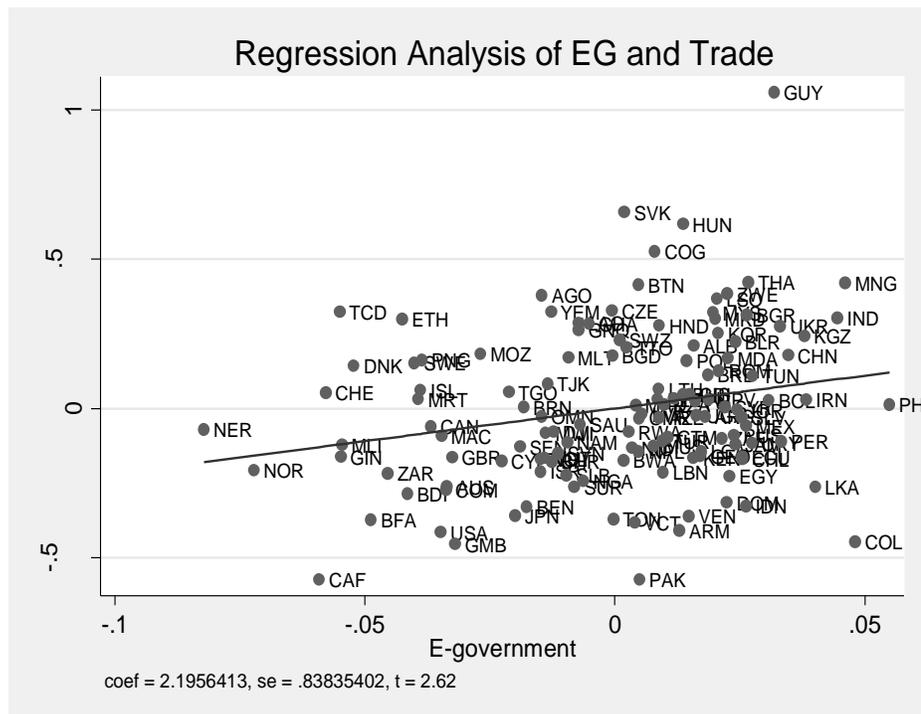
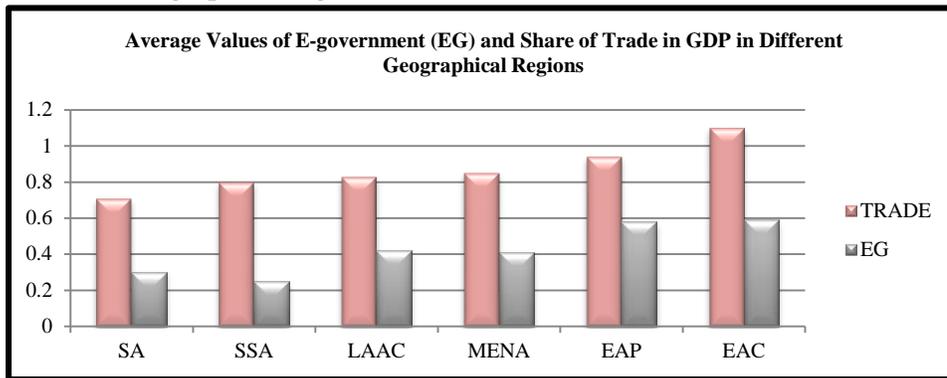


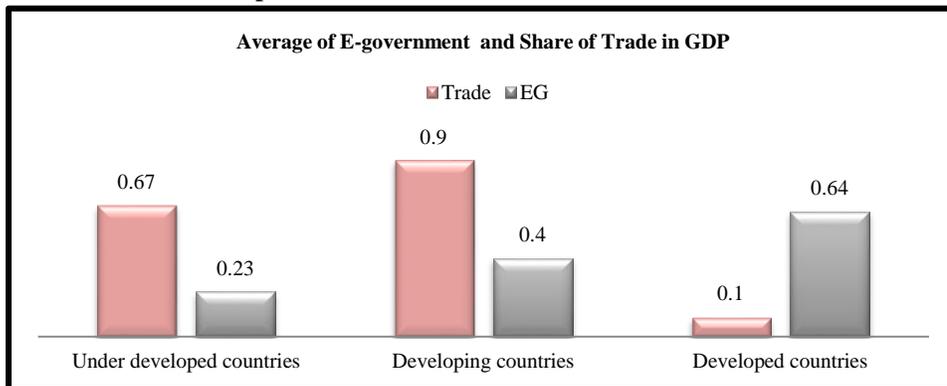
Fig. 3. Relationship between E-governemnt (EG) and Growth



**Fig. 4. E-government (EG) and Share of Trade in GDP in Different Geographical Regions**



**Fig. 5. E-government and Share of Trade in GDP in Developing, Developed and Under Developed Countries**



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## **Marginality, Social Exclusion, Labour Force Participation and Urban Poverty: A Case Study of Lahore, Pakistan**

KANWAL ZAHRA, TASNEEM ZAFAR, and MAHMOOD KHALID

Labour has always been considered as major source of income and livelihood, and the labour market of Pakistan which provides an important source to alleviate poverty and raise the standard of living. The characteristics of labour i.e. age, gender, location, caste and religion makes labour market highly segmented. And these factors often make buyer bias which indeed causes a discrimination and exclusion in labour market. This study tries to investigate the issue of social exclusion which has been faced by marginalised class in labour force participation. While analysing trends of marginalised labour force participation, the role of social networks also take into account. The marginalised labour force has been selected based on religion and gender (minorities, women, transgender) which is the part of formal and informal labour market of the city Lahore, Pakistan. The study use logit modelling to analyse the role of social exclusion and other determinants in labour force participation of marginalised class and also evaluate the role of labour force participation in the poverty status of marginalised households. Results show a strong effect of social exclusion on labour force participation and poverty.

*Keywords:* Social Exclusion, Labour Market Segmentation, Social Network

### **I. INTRODUCTION**

Household income is vibrant in nature and households can move in and out of poverty over time, but some of them get trapped in a cycle, a cycle of unemployment, low pay and poverty, it can be translated in two ways, cycle of worklessness cause cycle of poverty or vice versa. People are poor because they have fewer opportunities to earn better income, and on the other hand the less income restricts them to spend freely. There are number of problems related to household earning and make-up of their home, the important issue is the broken spell of employment or temporary employment, the issues of migration, health etc. these issues be ignored while identifying the cycle of unemployment, poverty and low pay [Goulden (2010)].

In Pakistan, the growing rural-urban migration is no doubt a big issue for the city management but the employment opportunities of native citizens is also a burning issue for policy makers. Around 10 percent of migrant population came for earning purposes from rural to urban areas in 2010-11 in Pakistan. While 25 percent urban labour force

Kanwal Zahra <kanwalzahra1@yahoo.com> is Assistant Professor, UCP Business School, University of Central Punjab, Lahore. Tasneem Zafar <incharge.eco@gcu.edu.pk> is Assistant Professor, Department of Economics, GC University, Lahore. Mahmood Khalid <mahmood.khalid@pide.org.pk> is Research Economist, Pakistan Institute of Development Economics, Islamabad.

comprised with unskilled labour force among them 23 percent population earned less than 10,000 monthly income [LFS (2011)]. A major proportion of this unskilled group is living a deprived life, among them major deprivation exist among marginalised communities, who face social exclusion and in turn worklessness

In the traditional view and transformation in the concept of labour market behaviour and labour force participation, the disadvantaged class has been ignored. Primarily it consists of marginalised class of the country. The main thrust of our work is to target marginalised class of Lahore city that resides in katchi abadies or slums and have limited access to labour market opportunities. The study also takes into account Sen's (2000) observation that social inclusion can cause social exclusion. In current situation of labour market, the working poverty is creating more issues for policy makers especially among disadvantaged class. The study aims to identify determinants of labour force participation and working poverty and focuses on the main determinants of labour force participation and working poverty along with exploring the role of network ties in their job search behaviour and poverty. The study targets marginal class and tries to explore the social exclusion which they face while participating in labour market or find job opportunities. Therefore this study mainly work in the domain of labour force participation, social exclusion, role of social networks in job search and poverty which they face in routine life.

The paper is followed by a literature review which tries to explore the labour market behaviours for socially excluded people; helps to develop our hypothesis, Section III explains data issues and sample selection, while we describe the condition of marginalised labour force in Section IV Further empirical model for investigation and results are developed in Section VI and Section VII concludes this paper.

## II. LITERATURE REVIEW

The lack of equal opportunities to certain social groups in basic socio-economic and political functioning of society leads toward social exclusion [Throat and Nidhi (2010)]. This social exclusion affect population of all ages but population fall in young age may affect more and face poverty in long run due to restricted access to socio-economic opportunities in the society [Braziene and Gediminas (2011)]. A number of literature covered issues of social exclusion, poverty, social networks etc. [Partha, *et al.* (2014); Hiekkinen (2000); Eggers and Massy (1991); Banerjee (1983)]. Great concentration has been assigned towards defining multidimensional poverty, relationship of poverty and unemployment [Wagle (2010); Knuth and Thorsten (2002)], and labour market prospects of socially excluded class and role of their social networks in job search [Hiekkinen (2000)]. However, the relationship of labour market opportunities and poverty among socially excluded class keeping their network in relationship is rather limited. In context of defining exclusion in capitalist societies, Wiber (1968) explained it in detailed manner. He defined certain types of communities that enjoyed social honor due to race, ethnicity or religion, he further included educated class, working class, high caste in these communities. These communities are enjoying socio-economic activities with each other and at same time they have very limited interaction with social inferiors and these status group has a monopolist nature and seek for such kind of work as well. Keeping this view into mind Thorat and Attewal (2007) analyse discrimination in

selection and recruitment process in Indian private sector and found existence of discriminatory process even at the first stage of recruitment process against Muslims and low caste Hindus. Thorat, *et al.* (2009) studied the exclusion of college educated Dalits and Muslims in India. They in fact tried to note the process that makes these Dalits and Muslim minorities exclude from hiring process in top Multinational Corporation and leading Indian companies. They quoted number of studies that covered issue of discrimination against caste and religion in Indian labour market. To study present day discrimination in job market of modern urban economy of India, they designed a field experiment methodology. They replied to job advertisement of leading companies by sending three application to each call for the job i.e. upper class Hindu, Dalit and as Muslim and analyse the first stage discriminatory process. Their findings confirmed the presence of exclusion in modern job market as it was in past to the margins of traditional Indian economy. It is not limited to education but it is infused in private sector as caste discrimination in present day economy. Discrimination in labour market by using the same methodology has been tested by Kaas and Christain (2010) in German's labour market. They checked discrimination in labour market by responding to 528 advertisements for student internships, two applications on similar call were sent, one with a German name and other one with a Turkish sounding name. They found discrimination against Turkish sound name as German names received 24 percent more callbacks. Eva and Raymundo (2013) used the same method in Mexican labour market to test two hypotheses of discrimination due to native language and marital status of women labour. They also used photographs representing different belongings as well as randomly varied marital status across gender and phenotypes. Findings again proved discrimination in labour market of Mexico. Similarly Susan, *et al.* (2000) targeted evaluation of risk of working poverty among labour force from different natives (broadly Latino and non-Latino). They found sizeable ethnic differences in human capital, employment positions and labour market context. Partha, *et al.* (2014) elaborated exclusion from labour market in context of developing economies. She is of the view that working poor often face exclusion from labour market because of informal sector belongings and this cause job insecurity and low wages for them.

An important aspect of exclusion which has been study in literature is gender based exclusion, literature reported such exclusion in almost all areas of the world either developed or developing [Malhotra and Degraff (1996)], Kantor (2008) associated exclusion or limited inclusion of women in labour market with labour market opportunities and outcome in case of Lucknow, India labour market. Analysis reflect that there are certain inter-related processes associated with inclusion and exclusion of women from labour market, these processes include social norms and value that do not allow women to productively participate in labour market and thus this participation has an insignificant effect on women's development and term of incorporation.

We cannot ignore the fact that lower income households in developing countries face more challenges than developed countries. They face great challenges in improving their standard of living in socio-economic and political context. Even their labour market behaviour is shaped with their family protected behaviour, cultural differences in acceptability of women at work and ethnicity [Malhotra and Degraff (1996)]. In same lines, the exclusion in term of gender discrimination also has a different face in these

countries. Nichola (2013) explains the same issue in context of Bangladesh culture, where male household head tries to meet with all socio-economic challenges alone, in special cases, when he allows his female household member to work and share burden with him, then that sharing again consist of a very short term phase, he use this as short term mean of survival. Therefore, female employment is not a choice, but rather a need of survival in urban Bangladesh. He is not focusing on women empowerment but the main objective of his paper is to see male and female perception on female employment by using qualitative research techniques. The male household heads effectively excludes them from labour market, even with working female partner; they are not ready to give her authority of household decision making and other related issues.

These excluded groups are normally working in informal sector at lower wages; another aspect which cannot be ignored among them is the social connections. They use somehow their connections to find better jobs in the field. Society builds with the help of relations among individuals networks made up ties between them [William and Joan (2008)]. An individual tries to get information about available jobs from different sources and focuses on personal ties that provide information about available jobs, while some of the individual use bureaucratic structure for this purpose [Granovetter (1973)]. These networks help to find more resources as well, Granovetter (1973) elaborates bridges between individuals, if a person (A) is connected to a person (B) and at same time person (A) is also connected with other person (C) then there is a bridge between person B and C and that bridge claimed as a weak tie.

Lack of social ties sometimes present a structural barrier in finding job especially in case of lower education attainment; however in some circumstances it can break with the help of skills and education. In same lines David (1999) tried to develop a link between network and ability to find job among inter-city residents. He found ethnic and racial differences in finding job and developing social networks. The network ties can further elaborate in the form of weak and strong ties, both has a significant impact on individual job search behaviour, educational status also plays an important role in defining social networks for job search, normally illiterate or low educated relies more on networks than highly educated workers. Wahba and Yves (2005) tried to evaluate the impact of size and quality of social networks on job search process in Egypt. According to them, the information about jobs is the crucial component, and it can be done with the help of employed friend, as he is employed so he spread information to his relative and friend about the job searcher. And this effect is stronger for uneducated people than educated one. They empirically test the probability to find job through social networks with the help of labour force survey of Egypt and employed logistic regression analysis. Their findings support their theoretical model.

Literature also gives great importance to the theory of networks and examines diversified nature of issues related with networks and labour market. It throws light on the social networking behaviour of entire community, poor class and marginalised class [Roberta, *et al.* (2013); Adam, *et al.* (2011); Mark, *et al.* (2007); Gretchen (2006); Pattison and Robins (2002); James, *et al.* (1999); Toney (1976)].

Literature on social networking of marginalised and socially excluded class gives an insight that how they use networks in searching jobs in formal and informal market. Minna (2000) considered two networks ties for young people which helps them to find

suitable job, one is community tie with family, relatives, friend etc. and the other is with welfare institution. These people are at the margin in Finish labour market, facing great risk of social exclusion. Their exclusion from economic dimension does not necessarily lead themselves excluded from their social and personal networks but their perilous status in paid employment exclude them from their social vacuum. Secondly there is a lack of any dramatic difference in network size of young adults in Finland with relation to their education and employment.

Marco, *et al.* (2010) also analyse the role of social network behaviour of unemployed individuals in Germany. Keeping network theory in mind, they tried to test the hypothesis that individual with stronger network ties use network channel more often and likely to set higher reservation wages. Their findings supported their theoretical model and concluded that people with larger network transform their formal job search into informal method of job search as they consider it a passive, low cost search channel. Xianbi and Western (2011) target western labour market to explore comparative effects of market mechanism and social network by capturing human capital into account. The comparative effect includes comparison of finding job through network ties with other methods of job search. They also analysed the effect of strong and weak ties in job searching and acquisition. With the help of Social Attitude data of Australia from 2007, they came up with three major findings, first findings refers to social network with low earning and growth opportunities than market oriented job search method, while the second finding reveal that job acquisition with strong ties has lower occupational growth than weak ties and last leads to conclusion that job attainment outcomes are poor only among those without university degree with social network ties in job acquisition.

### III. DATA AND SAMPLE DELINEATION

The data which is used for analysis is collected by self-administered survey from 750 households. The final sample consists of 1360 individual ranging from 14 to 60 years, the threshold has been selected on the basis of definition of working age in Pakistan. The respondents have been selected by their characteristics. As this study tries to see the impact of labour force participation and the social networking behaviour on the poverty of marginalised communities, therefore three types of population that is on margin has been selected (a) minorities (b) home maids and (c) transgender that resides within the boundary of Lahore city. Oxford (2004) defines seven types of marginalised groups in Pakistan, however this is also possible that a marginalised person can be non-poor and enjoy good status in the society. The general focus of this study on above three defined groups which broadly explains two types of marginalisation, one is religion based while the other is gender, however the selected working age population is based on certain characteristics. This study collect its entire sample of minorities from slums and katchi abadies to cover that sample which is potentially vulnerable to exclusion and discrimination, on the other hand gender based exclusion can be seen in deprived class, therefore home maids has been selected to represent female exclusion and transgender to represent a complete concept of gender based exclusion.

Each individual is asked about his or her earning level, type of employment, type of earning either daily or monthly, job related benefits provided by employer, exclusion issues from economic activity and its impact on their productivity and lives. The role of

social networks and type of social network also been covered in survey. A sound perspective of labour force participation, exclusion, networks and poverty has been asked in the survey. The distribution of respondent is as follows:

Table 1

*Percentage of Respondents by Category*

| Category    | Frequency | Percent |
|-------------|-----------|---------|
| Minorities  | 897       | 66      |
| Home maids  | 378       | 28      |
| Transgender | 88        | 6       |

**IV. DESCRIPTIVE ANALYSIS**

Table 2 given below shows the education profile of respondent by categories, the ratio of illiterate population is higher than the educated population and if educated than majority of population both male and female has education less than secondary while very few hence crossed secondary level and reached higher level of education. Statistics about minority show slightly better picture of education than families of home maids. For female labour force, situation is more critical, the proportion of educated females is less than the male but the case in home maid's families is different, here the proportion of educated female is greater than the male. Overall sample shows that the proportion rises at secondary level where ratio shows better proportion of people that have completed the secondary level. Examining the pattern of highly educated people, the proportion is very low which shows a better picture of their participation in labour force.

Table 2

*Percentage Distribution of Education Profile of Respondents (Age 14+)*

|                     | Overall | Minorities | Women | Transgender |
|---------------------|---------|------------|-------|-------------|
| None                | 52.7    | 44.2       | 60.5  | 54.5        |
| Pre Primary         | 1.1     | .8         | 5.4   | 2.3         |
| Primary             | 4.5     | 4.5        | 13.2  | 6.8         |
| Middle              | 11.2    | 12.3       | 3.1   | 15.9        |
| Secondary           | 15.8    | 19.8       | 8.0   | 15.9        |
| Intermediate        | 6.9     | 8.9        | 1.7   | 2.3         |
| Graduation          | 5.8     | 7.2        | 2.0   | 2.3         |
| Masters             | 1.8     | 2.3        | .6    | -           |
| Religious Education | .3      | .1         | .6    | -           |

Table 3 illustrate the gender division in the primary activities performed by them. Majority of working age population is working to earn income, only one household reported to have child labour, while after employed population ratio, the higher ratio of working age population is obtaining education at different level, while the proportion of unemployed population is low. As expected a greater proportion of female is engaged in housekeeping and is out of labour.

Table 3

*Population by Primary Activity (%age)*

|                                   | Overall | Minorities | Women | Transgender |
|-----------------------------------|---------|------------|-------|-------------|
| Working or Helping to Earn Income | 61.0    | 49.7       | 68.0  | 86.4        |
| Unemployed Looking for Work       | 10.8    | 8.8        | 30.3  | 6.8         |
| Unemployed not Looking for Work   | 2.0     | 2.5        | 1.4   | 6.8         |
| Obtaining Education               | 9.9     | 14.3       | .3    | -           |
| House Keeping                     | 15.1    | 22.8       | -     | -           |
| Sick                              | 1.1     | 1.7        | -     | -           |
| Disable                           | .1      | .1         | -     | -           |

Table 4 shows a sharp gender division in the main occupations performed. Among the whole sample, the majority of population has worked in low skill jobs, while very few are reported to have performed jobs at managerial level, unfortunately this ratio becomes more less or in the case of home maid's families, where very few respondents are working at managerial positions, a large number of labour force are working as service worker, labour and others.

Table 4

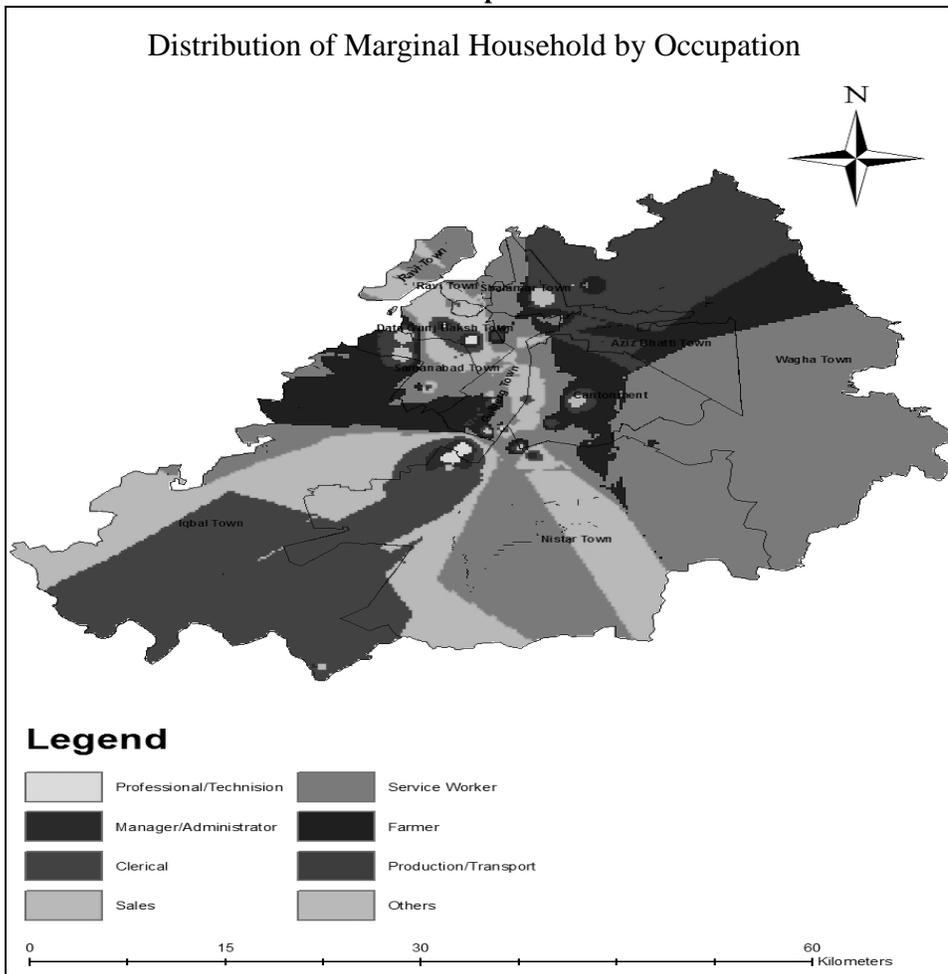
*Population by Occupation (%age)*

|                         | Overall | Minorities | Women | Transgender |
|-------------------------|---------|------------|-------|-------------|
| Professional/Technician | 5.2     | 3.3        | 1.8   | -           |
| Manager/Administrator   | 1.1     | 1.5        | .6    | -           |
| Clerical                | .8      | .9         | .6    | -           |
| Sales                   | 3.2     | 3.4        | 3.0   | 3.4         |
| Service Worker          | 43.7    | 31.8       | 73.4  | 17.2        |
| Production/Transport    | .2      | .1         | .3    | -           |
| Labour                  | 16.5    | 15.9       | 17.8  | 16.7        |
| Others                  | 29.4    | 43.0       | 2.7   | 62.7        |

The category of service workers includes waiter, sweeper and other low skilled jobs which give low monetary reward. Whereas people reported within the other option in fact includes street hawkers, though being marginalised, they are concentrated in a narrow range of occupations, but among them the condition of female labour force is vulnerable, they only have restricted opportunities in manual labouring and low wage occupations. They are excluded from whole host of professional, managerial and intermediate skill occupations.

The most vulnerable fact which we found is about khawajasaraas (transgender), the lack of community support, job opportunities and skills restrict earning source for them. Around 60 percent samples of khawajasarras earn their income through unethical sources. They claim about society attitude which degrade them and they indulge themselves in such activities just to earn income for their living. Figure 2.1 shows the occupational distribution of sample with the help of a map, this map is based on GPS points of the residence of marginal labour force to see the concentration of employment in different areas of Lahore.

Map 1



**IV.I. Social Network and Job Search**

The use of social networks is referred by different social domains, in social sciences, labour market theory has a strong role of social network in job search [Nyoni (2012); Tona and Ronit (2011); Connie, *et al.* (2000)]. Further research reported use of social network among minorities, migrants, ethnic community and other marginal classes [Heikkinen (2000)]. This use of social networks in finding job seems common among marginal communities.

Table 5

*Job Search Method by Category*

| Job Search Method | Minorities (%) | Women (%) | Transgender (%) |
|-------------------|----------------|-----------|-----------------|
| Social Resource   | 74.7           | 77.5      | 83.1            |
| Formal Method     | 25.3           | 22.5      | 16.9            |

The role of social network in job search is vibrant among minorities, 74.7 percent of total minority sample use networks in finding job in their carrier, however among women, the ratio is slight greater than minorities and around 78 percent of total women sample use social network in job search. The role of social network in finding job especially among marginal class can't be ignored, not even in developing communities; developed communities also witness the use of network in job search. Heikkinen (2000) found greater size of network among employed labour force while young people in Finland are more connected with strong network than weak network.

Table 6

*Job Search Method by Job Type*

| Job Type                  | Social Resource (%) | Formal Method (%) |
|---------------------------|---------------------|-------------------|
| High Skilled Jobs         | 42.2                | 57.8              |
| Intermediate Skilled Jobs | 31.1                | 68.9              |
| Low Skilled Jobs          | 65.5                | 34.5              |

**V. EMPIRICAL MODEL**

The generalised model is:

$$Y = f(X_{1i}, X_{2i}, X_{3i}, \dots, X_{ni})$$

Where  $Y_i$  is the dependent variable and  $X_i$  is the set of different independent variables related to socio-economic and labour market related variables that can determine labour force participation of marginalised community. If  $y^*$  capture the status of labour force participation either employed or unemployed then the regression equation can be written as follows:

$$y_i^* = \sum_{j=0}^k X_{ij} \beta_j + \varepsilon_i$$

In order to examine social factor that influence labour force participation of marginalised class, this work consist of two perspectives, poverty states of marginalised class (poor or non-poor) and employment states (employed or unemployed).

The logical and appropriate model that can be useful to employ is binary logistic regression model. This multivariate technique assumes dependent variable as dichotomous and independent variable either quantitative or qualitative. The probability of a category of the dependent variable by using a logistic transformation of a linear combination of the independent variables:

$$P(Y) = \frac{e^{\beta_0 \sum \beta_i X_i}}{1 + e^{\beta_0 \sum \beta_i X_i}}$$

$P(Y)$  represents the probability of having one of the categories of dependent variable whereas  $\beta_i$  are the coefficient values of independent variables of the model and is a row vector. The logit function is then can be written as:

$$\ln \frac{P_i}{1 - P_i} = \sum_{j=1}^k \beta_j X_{ij}$$

The Left side value is the natural log of the odds in favour of individual to be unemployed whereas  $\beta_j$  is the measure of change of the chance of the unemployed to be employed.

The relevant policy related variables include job benefits, type of job, working partner, social exclusion and social networking. The socio-demographic variables are age, marital status, education, health and standard of living. As far as the policy variables are concerned, age is considered to be one of the most important variables while the job benefits and job types also played an important role in reducing poverty. If there are more financial and non-financial benefits associated with a specific job, an individual can be better off when benefits are associated with his or her job. On the other hand the type of job are also associated with job security and productivity, there is more satisfaction associated with government job, while private job is assumed to be riskier than the government job [Faggio and Henry (2014); Zahir and Basit (2009); Tasci and Aysit (2005)]. The importance of working partner in reducing risk of poverty cannot be ignored, if both of family members (head and his partner) are working, they can better manage household expenses [Triebe (2013)]. Some socio-demographic variables are very important to built quality of human capital and communities with more low-skilled workers in general are more likely to experience high rates of poverty. The educational attainment as a measure of the quality of human capital is important, High educational attainment may imply a greater set of employment opportunities which can decrease poverty [Cameron (2000); Chaudhary, *et al.* (2009); Kantor (2009)]. Theory shows a fundamental impact of health on households, it is considered that the accessibility to health services directly influence the productivity of individual household [McDonough, *et al.* (2009); Zhong (2009)].

Some of the variables are derived from specific policy intervention. For example job benefits include all education, health, housing and bonuses related aspects while standard of living includes the perceived standard of living of the respondents. Survey includes some aspect to measure standard of living as per the respondent point of view. This gives an idea that how they feel themselves while moving in the society [Johnson (2014); Daniel, *et al.* (2010)]. Exclusion from labour market related issues are important to capture, theory revealed that these marginalised communities are victim of socio-economic exclusion, they face discrimination in hiring, wage determination and job related benefits [Wagle (2001); Knuth and Thorsten (2002)] and this exclusion decreases productivity and job satisfaction. Another important aspect which has been captured in this article is the role of social network in finding jobs. It is normally perceived that these communities are tied in network which helps them to migrate, to find better job and to improve earnings prospects. This aspect is captured by developing weak and strong ties. Literature made different attempts to find valid indicators, however the development and assessment of weak and strong ties is the most famous and a simple method to find network strength. The type of relationship and frequency of contact can be helpful to measure tie strength [Nyoni (2012); Tona and Ronit (2011); Kogan (2011); Heikkinen (2000), Connie (2000) Granovetter (1974)]. This paper use tie strength with the help of type of relationship, frequency of contacts and frequency of job acquisition through network. To measure tie strength and all other earlier prescribed variables, Principle Component Method has been used.

Different logistic regression model has been employed to capture the effect of labour force participation on poverty of working class or vice versa. Some studies used working poverty as dependent factor and evaluate effect of job market issues on it while some reviewed effect of poverty and job related discriminations on employment status of working class.

## VI. RESULTS AND DISCUSSION

Results showed the relative predictive power of both the type of variables (policy and socio-demographic) related with whole the sample as well as with the categories of marginality and shows a comparable picture of influence of these variables on employment status and poverty status of marginalised class. Results show a mixed nature (significant or insignificant) behaviour of variables while theory also suggests the same pattern in different literature. One thing which may again be noted that the target sample of this study is comprised of minorities, women and transgender specifically living in slums and katchi abadies. The sample from these areas mainly works in informal sectors. We found a large sample of minorities working as sweepers or similar occupations, while those women were specifically selected who are working as home maids or office sweepers, the sample of transgender resides mostly in slums and difficult to target for survey, therefore study took into account the sample of transgender living in any part of Lahore. The Table 7 shows the impact of socio-demographic and policy related variables on the employment states of marginal population of Lahore.

Table 7

*Logit Estimated of Overall Marginalised Sample Population:  
Dependent Variable: Employment Status*

|                    | Coefficient  | Odds Ratio | Marginal Effect |
|--------------------|--------------|------------|-----------------|
| Age                | -0.1513**    | 0.908      | -0.0042         |
| Age Square         | 0.0022**     | 1.021      |                 |
| Marital Status     | 0.3976       | 1.488      | 0.017           |
| Health             | 1.1176**     | 5.509      | 0.0746          |
| Education          | -12.459***   | 0.6969     | -0.1579         |
| Social Exclusion   | -0.6351***   | 0.594      | -0.4595         |
| Job Benefits       | -0.4372**    | 0.615      | -0.2124         |
| Standard of Living | -0.0316      | 1.135      | 0.0056          |
| Working Partner    | -4.0523***   | 0.198      | -0.176          |
| Job Type           |              |            |                 |
| Public             | -4.2892***   | 0.024      | -0.1664         |
| Private            | -6.9113***   | 0.091      | -0.2654         |
| Social Networking  |              |            |                 |
| Weak Ties          | 0.5143**     | 1.591      | 0.3564          |
| Strong Ties        | -0.4654***   | 0.679      | -0.1688         |
|                    | $R^2 = 0.83$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 8

*Logit Estimated of Marginalised Sample Population (Minorities):*  
*Dependent Variable: Employment Status*

|                    | Coefficient  | Odds Ratio | Marginal Effect |
|--------------------|--------------|------------|-----------------|
| Age                | -0.1057      | 0.704      | -0.0201         |
| Age Square         | 0.00178      | 1.002      |                 |
| Marital Status     | 0.3938       | 1.689      | 0.107           |
| Health             | 0.6548       | 0.423      | -0.1752         |
| Education          | 1.9837**     | 1.037      | 0.0074          |
| Social Exclusion   | -0.3121***   | 0.716      | -0.1680         |
| Job Benefits       | -0.3594*     | 0.675      | -0.8011         |
| Standard of Living | -0.0236      | 1.072      | 0.0143          |
| Working Partner    | -5.0788***   | 0.045      | -0.176          |
| Job Type           |              |            |                 |
| Public             | -7.3864***   | 0.049      | -0.1018         |
| Private            | -5.1516***   | 0.008      | -0.0838         |
| Social Networking  |              |            |                 |
| Weak Ties          | -0.4721      | 1.451      | 0.4596          |
| Strong Ties        | -0.4553**    | 0.667      | -0.1827         |
|                    | $R^2 = 0.88$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 9

*Logit Estimated of Marginalised Sample Population (Women):*  
*Dependent Variable: Employment Status*

|                    | Coefficient   | Odds Ratio | Marginal Effect |
|--------------------|---------------|------------|-----------------|
| Age                | -0.1043       | 0.612      | -0.0358         |
| Age Square         | 0.0013        | 1.001      |                 |
| Marital Status     | -0.1278       | 1.275      | 0.3102          |
| Health             | -0.3553       | 0.652      | -0.2252         |
| Education          | -0.3586       | 1.002      | 0.0854          |
| Social Exclusion   | -0.8752***    | 0.651      | -0.2657         |
| Job Benefits       | -1.1474***    | 0.734      | -0.6816         |
| Standard of Living | 0.4942**      | 1.241      | 0.1854          |
| Working Partner    | -4.3873***    | 0.695      | -0.275          |
| Job Type           |               |            |                 |
| Public             | -1.0785*      | 0.019      | -0.0158         |
| Private            | 1.0480        | 0.029      | -0.1845         |
| Social Networking  |               |            |                 |
| Weak Ties          | -2.0834***    | 1.654      | 0.5981          |
| Strong Ties        | -1.1980***    | 0.051      | -0.1185         |
|                    | $R^2 = 0.866$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 10

*Logit Estimated of Marginalised Sample Population (Transgender):  
Dependent Variable: Employment Status*

|                    | Coefficient   | Odds Ratio | Marginal Effect |
|--------------------|---------------|------------|-----------------|
| Age                | -0.14229***   | 0.219      | -0.0927         |
| Age Square         | 0.00216***    | 1.000      |                 |
| Health             | 0.6275        | 0.549      | 0.379           |
| Education          | -0.59563      | 0.035      | 0.176           |
| Social Exclusion   | -0.83678***   | 0.652      | -0.381          |
| Job Benefits       | -0.0703       | 0.075      | -0.189          |
| Standard of Living | -0.04253      | 1.366      | 0.252           |
| Job Type           |               |            |                 |
| Public             | -1.71289      | 0.019      | -0.0012         |
| Private            | -3.6183***    | 0.033      | -0.294          |
| Social Networking  |               |            |                 |
| Weak Ties          | -0.51509**    | 1.318      | 0.641           |
| Strong Ties        | 0.16210       | 0.291      | -0.065          |
|                    | $R^2 = 0.875$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

The above table shows the determinants of labour force participation in urban labour market. As expected results show a strong influence of both socio-demographic as well as policy related variables on labour force participation. The impact of age is negative and significant on labour force participation. The variable age square captures the non-linear relationship with dependent variable, this variable positively affect the dependent variable which shows that participation of marginalised population in labour market increase when age increase, and this variables is insignificant in case of separate analysis of marginalised category, however in the case of transgender it is significant in nature. Malhotra and Debrah (1997) and Cai (2010) also shows a significant relationship of age with labour force participation however Kantor (2009) finds a both significant and insignificant impact of age and age square, she in fact divided her sample into salary based categories and found their impact insignificant in case of domestic and casual work, however in case of subcontract, she found a positive impact of both variables on employment status. The possible reason of this insignificant relation would be the exclusion of young labour force from labour market due to multiple factor i.e. lack of social networking, experience etc. As far as the other social variables are concerned, education is significant in nature with dependent variable. Education is always being considered as an important determinant of labour force participation, Kantor (2009) also shows a significant impact of education on labour force participation. The education variable comprised of only literate and illiterate categories, as all variables related to education e.g. below metric, higher education, technical education are found to be insignificant with the dependent variable. In case of the whole sample and minorities, the variables show a significant and positive impact as reported in literature, chances of getting employment increases by 15 percent more than the illiterate person, however in case of women and transgender, the findings shows it to have an insignificant relation

with the employment decision. The possible justification of having education significant in case of one cluster and insignificant in others could be the composition of respondent working in different fields like the sample of women comprised of home maids and office sweepers are not very concerned with education. Similarly sample of transgender also associated with some poor nature of work where education is not a strong determinant, therefore this variable found insignificant in our case. The role of standard of living is also found to be important in many studies and it is tested in different manners and dimensions. For example Johnson (2014) tried to develop a link between house price and female labour force participation while Daniel, *et al.* (2010) takes into account home appliances as determinant of female labour force participation. In case of overall sample, minorities and transgender, this variable is insignificant in nature, however in case of women worker this variable shows a significant and positive impact on dependent variable. The findings confirms previous research that women associated with house maids or office sweepers related work are more concerned with their standard of living. They enter or exit the job market based upon changes in their standard of living. The role of working partner is found to be important in many studies [McGinnity (2002); Triebe (2013)]. The concept of “linked lives” is important for married labour force, they have a significant impact of working partner on their employment decision. In case of our sample, it is significant for all cases, results shows a decrease in the willingness to be employed by 27 percent among sample of women who have partner earning money as compare to non working partner. On the other hand we found marital status insignificant with employment decision. Kantor (2009), Salway, *et al.* (2003), and Stoloff, *et al.* (1999) found an insignificant nature of relationship among employment decision and marital status.

The role of policy variable in defining job prospects is significant; the study takes important policy aspects related with job into account. As the study takes into account some specific and poor pockets of Lahore, this class is found to be more influenced towards job benefits as they are mostly working in informal sector. The variable job benefits as discussed earlier is derived from different factors associated with financial and non-financial benefits of job is significant with employment status. This variable is significant in all cases except transgender and shows a negative relation with dependent variable. The sign indicates that the more the job benefits, the lesser chance to be unemployed or out of employment. Its coefficient in case of women workers shows more concerns of job benefits. This variable also found to be significant in literature as Lee and Jai (2014) shows a significant effect of job benefits on employment prospects of labour force. The sector of employment especially in developing countries is very important, people feel more secure while working in public sector [Faggio and Henry (2014); Zahir and Basit (2010), Tasci and Aysit (2005)]. Results shows a significant negative effect of both public and private sector employment on job prospects, however in case of women labour force, private sector employment shows insignificant impact, it could be the results of job insecurity associated with private sector employment for female labour force.

According to Zahra and Zafar (2015) social exclusion is the later stage of marginality and a marginalised person is stuck in poverty when he or she faced social exclusion. Results show a negative and significant impact of social exclusion on

employment prospects which leads to the conclusion that if there is a decrease in the extent of social exclusion, the participation of marginalised labour force will increase. The people normally work in informal and low skilled sector and face real challenges in finding jobs. They normally need reference in finding job, Nyoni (2012), Tona and Ronit (2011), Kogan (2011) and Heikkinen (2000) also indicate the importance of social network in finding jobs. Previous literature shows that networks normally help to find jobs in the labour market, Granovetter (1974) throw light on the strength of ties and conclude that weak ties plays more important role than strong ties. Findings revealed that as women workers strongly depend on their network for their jobs because they are associated with sweeping, therefore strong and weak ties helps them to find work, on the other hand minorities depends on strong ties due to restricted interaction with the rest of community, and overall sample shows a significant reliance on weak ties which confirms Granvetter's (1974) strength of weak ties.

Table 11

*Logit Estimated of Overall Marginalised Sample Population:  
Dependent Variable: Poverty Status*

|                    | Coefficient  | Odds Ratio | Marginal Effect |
|--------------------|--------------|------------|-----------------|
| Age                | -0.1513**    | 0.869      | -0.0021         |
| Age Square         | 0.0022**     | 1.001      |                 |
| Marital Status     | 0.522        | 0.5889     | -0.0068         |
| Health             | 1.1176**     | 1.6657     | 0.0697          |
| Education          | 12.459***    | 5.2833     | 0.2162          |
| Social Exclusion   | 0.6351***    | 1.3111     | 0.3481          |
| Job Benefits       | -0.4372**    | 0.619      | -0.0061         |
| Standard of Living | -1.0316      | 6.2962     | 0.0024          |
| Working Partner    | -4.0523***   | 1.0266     | 0.090           |
| Job Type           |              |            |                 |
| Public             | 0.6651***    | 1.9447     | 0.094           |
| Private            | -0.9113***   | 0.4825     | 0.595           |
| Social Networking  |              |            |                 |
| Weak Ties          | 0.5143**     | 0.995      | 0.401           |
| Strong Ties        | -0.4654***   | 1.428      | 0.530           |
|                    | $R^2 = 0.83$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 12

*Logit Estimated of Marginalised Sample Population (Minorities):*  
*Dependent Variable: Poverty Status*

|                    | Coefficient  | Odds Ratio | Marginal Effect |
|--------------------|--------------|------------|-----------------|
| Age                | -0.1057      | 0.767      | -0.0044         |
| Age Square         | 0.00178      | 1.003      |                 |
| Marital Status     | 0.3938       | 0.551      | -0.0098         |
| Health             | 0.6548       | 1.767      | 0.047           |
| Education          | 1.9837**     | 1.956      | 0.111           |
| Social Exclusion   | -0.3121***   | 1.141      | 0.2172          |
| Job Benefits       | -0.3594*     | 1.556      | -0.7294         |
| Standard of Living | -0.0236      | 6.195      | 0.0304          |
| Working Partner    | -5.0788***   | 2.356      | 0.1410          |
| Job Type           |              |            |                 |
| Public             | -7.3864***   | 1.532      | 0.0703          |
| Private            | -5.1516***   | 0.403      | 0.1501          |
| Social Networking  |              |            |                 |
| Weak Ties          | -0.4721      | 1.522      | 0.6927          |
| Strong Ties        | -0.4553**    | 1.634      | 0.0811          |
|                    | $R^2 = 0.88$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 13

*Logit Estimated of Marginalised Sample Population (Women):*  
*Dependent Variable: Poverty Status*

|                    | Coefficient   | Odds ratio | Marginal Effect |
|--------------------|---------------|------------|-----------------|
| Age                | -0.1043       | 0.534      | -0.0054         |
| Age Square         | 0.0013        | 1.007      |                 |
| Marital Status     | -0.1278       | 0.331      | -0.012          |
| Health             | -0.3553       | 1.419      | 0.371           |
| Education          | -0.3586       | 1.666      | 0.081           |
| Social Exclusion   | -0.8752***    | 1.082      | 0.312           |
| Job Benefits       | -1.1474***    | 1.625      | -0.312          |
| Standard of Living | 0.4942**      | 4.122      | 0.162           |
| Working Partner    | -4.3873***    | 1.231      | 0.241           |
| Job Type           |               |            |                 |
| Public             | -1.0785*      | 1.474      | 0.0027          |
| Private            | 1.0480        | 0.331      | 0.0241          |
| Social Networking  |               |            |                 |
| Weak Ties          | -2.0834***    | 1.251      | 0.631           |
| Strong Ties        | -1.1980***    | 1.471      | 0.174           |
|                    | $R^2 = 0.866$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

Table 14

*Logit Estimated of Marginalised Sample Population (Transgender):  
Dependent Variable: Poverty Status*

|                    | Coefficient   | Odds ratio | Marginal Effect |
|--------------------|---------------|------------|-----------------|
| Age                | -0.14229***   | 0.534      | -0.0054         |
| Age Square         | -0.00216***   | 0.087      |                 |
| Health             | 0.6275        | 1.021      | 0.445           |
| Education          | -0.59563      | 1.289      | 0.062           |
| Social Exclusion   | -0.83678***   | 1.126      | 0.554           |
| Job Benefits       | -0.0703       | 1.025      | -0.092          |
| Standard of Living | -0.04253      | 4.001      | 0.321           |
| Job Type           |               |            |                 |
| Public             | -1.71289      | 1.074      | 0.012           |
| Private            | -3.6183***    | 0.231      | 0.0836          |
| Social Networking  |               |            |                 |
| Weak Ties          | -0.51509**    | 1.333      | 0.716           |
| Strong Ties        | 0.16210       | 1.271      | 0.143           |
|                    | $R^2 = 0.875$ |            |                 |

Significance at \*\*\*1 percent, \*\*5 percent and \*10 percent.

At a later stage of analysis, we also try to find the impact of labour market related variables on poverty status of surveyed population (Table 14). The analysis again shows finding of overall sample, and then findings of three separate clusters. The variable age is significant in case of whole sample and minorities, but insignificant in other cases; similarly age square which we use to capture nonlinear relationship is significant only in case of women while insignificant in other cases. Wagle (2011) found a significant impact of age on poverty states on one data set while in similar study he found an insignificant impact of age for other data set. In same line Bradley, *et al.* (2001) shows an insignificant impact of age and age square on poverty status of people who are in labour market. The other variable related with demography is marital status, which is found to be insignificant in our case. Wagle (2011) and Bradley, *et al.* (2001) also found an insignificant impact of marital status on poverty. Both studies split this variable into subsample i.e. married, divorced or widowed, and found insignificant impact of all variables on poverty status. This variable is not applicable for khwaja Saraas (transgender). The role of working partner on poverty reduction is proved to be significant in literature. McGinnity (2002) and Triebe (2013) found that the household faced less poverty traps when partner of household head is working and helping to earn income. In the case of our sample, this variable is significant with negative relation which leads to prove the hypothesis that the helping hand of HHH's partner makes household out of poverty.

Employment and the quality of employment is important for poverty reduction, the informal sector growth considered to be important through education and technical education for reduction of poverty [Earnst and Janine (2013)]. Dewilde (2004) found an increase in educational attainment would cause a reduction in poverty risk, on the other hand, Dewilde (2004) found greater proportion of population with higher education

laying within poverty. Education can play a crucial role in poverty reduction, but in our case, it is found to be significant for the whole sample but insignificant for defined clusters. The possible justification of having education insignificant to employment decision can be that more than 80 percent of the sample marginalised population are reported in working in some informal and poor nature of work, where education is not a strong determinant, the proportion of population working in professional or decent work is very low, therefore this variable is found to be insignificant in our case. The studies of Wagle (2011), Bradley, *et al.* (2001) showed insignificant impact of education and health on poverty status.

Another important variable is social exclusion in the case of marginalised community poverty assessment. This variable is significant and negative in all results and shows that the lesser chances of facing social exclusion in labour market, the lesser chances to be in poverty. Zahra and Zafar (2014) and Wage (2011) also found this variable significant in case of urban poverty in Punjab, Pakistan.

The psychology related with working sector cannot be ignored, the impact of sector either public or private can't be ignored in case of evaluating impact of job related determinants on poverty status of employees. We found inconsistency related with private sector job during interviews with respondents. The role of public sector however in our case is significant in nature. It shows that the consistency of work in public sector is greater than the private sector and chances to be out of poverty are greater while working in public sector. A sufficient sample of our survey is from Lahore Waste Management Company and some other public sector organisations, however in case of Khwaja Saraas (transgender) private sector proved to be significant in poverty reduction.

The strength of ties has been proved in many studies [Thorp, *et al* (2005), Cattell (2005), Oriana (2009)], the marginalised community is connected in clan network. The role of ties in poverty reduction is significant. The whole sample revealed strength of both types of ties in poverty reduction, however in case of minorities, strong ties proved more helpful than weak ties, on the other hand weak ties in case of transgender proved to be helpful in poverty reduction.

## VII. CONCLUSION

The growing economic integration motivates rural urban migration and makes market of urban centres more competitive. This study tried to highlight issues of marginalised labour force who resides in slums of Lahore city. The study focus on the labour market of Lahore to identify to issues faced by this marginalised class. One of the considerable phenomenon is the social exclusion which this working class of marginalised communities face in job search process and during job. This phenomenon not only make them deprived but also caught them in the long term unemployment or under employment. This class mainly targets informal labour market sector and the pressure on this sector restricts job opportunities for them. The important aspect which we can't ignore is the role of their networks in job search. These people are tied with strong and weak nodes and use these ties in searching job for themselves.

The dualistic role of labour market in Lahore, Pakistan can cause a sense of social exclusion and deprivation among workers specially marginalised workers. The lack of opportunities for socially excluded young labour and the major share of informal sector

employment can cause them to remain in vicious circle of poverty. These workers cannot meet challenges of globalised service sector economies due to low level of skill and education constraints and this is the reason the share of service workers which include sweeping and other low category jobs is greater than decent work in all clusters of analysis. At the same time the majority of respondents are not educated while results shows a significant contribution of education on employment decision and working poverty among marginal working class of Lahore.

On the socio-demographic side, the analysis of this study support the theoretical framework developed earlier in the study regarding role of education and health while marital status and other variables like family size and number of children are not consistent when incorporated policy related variables. The role of perceived standard of living shows an important impact as this variable captured their perception about respondent's standard of living and this variable found consistent in case of women. As well as policy related variables are concerned, the significant impact found for all variables. The role of social exclusion which this working class of marginalised communities face in job search process and during job is found to be an important factor. This social exclusion causes discrimination in job opportunities and wage determination at time of job attainment. The role of networks ties plays an important role in finding job especially in informal sector. The study captures the use of networks in job search behaviour of marginalised labour force and found a strong use of networks in job finding.

A better understanding of dynamics of labour force participation and working poverty helps to redefine or develop social policies and policies related with labour market to support the poor. The study suggest a focus of social development programs on marginalised class includes minorities, women and khwajasarras, unfortunately when these programs target to help poor to be out of poverty, these marginalised groups were still more poor. The need of policy is the productive involvement of these groups in labour force participation. One of the most vulnerable facts about khwajasaraas earning patterns and source was found in this study, around 60 percent of Khwajasaraas indulge in unethical activities to earn livelihood. These people failed to find some reasonable and decent earning prospects due to education level and most important their gender issue. Community does not accept them to be part of economic activity as a common man. A fruitful policy is required to define social and economic policies for them to make them a productive and decent member of society. Greater policy emphasis needed to provide education and skill for workforce to make them competitive in the labour market.

As this study focus Lahore labour market to identified deteriorating factors faced by marginalised class of this city. However due to resource and time constraints, research area and sample size was limited. Better understanding would be possible if research on the topic will extend the cases and include more marginalised communities either within city or extend boundaries of research to different areas. The need of survey which target specifically marginalised class (as done in other countries) at country level is vibrant to include these marginalised groups into policy reforms.

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## Impact of Global Food Price Escalation on Poverty in South Asian Countries

MUHAMMAD ABDULLAH and RUKHSANA KALIM

The objective of this paper is to examine the impact of global food price escalation on poverty in South Asian countries since 1990 to 2011. Panel data procedure has been applied for empirical analysis. Panel unit root tests have been utilised before the application of panel co-integration. Poverty is measured through revealed behaviour approach which is considered better than other approaches, as it is based on the actual consumption made by the households. The present study uses actual average household consumption to measure poverty. Empirical results reveal that global food price escalation and per capita income positively and significantly affect average household consumption, which is the clear indication of poverty decline. International oil prices and interest rate significantly but negatively affect the average household consumption in South Asian countries. Findings of this study will be helpful for formulating effective public policies for poverty reduction in the era of trade liberalisation.

*JEL Classification:* E31, F410, I32

*Keywords:* Food Price Escalation, Poverty, Oil Prices, Per Capita Income, South Asia

### 1. INTRODUCTION

Poor sections of the society are severely affected by higher food prices because they spend a large share of their incomes on food. The situation becomes more severe in poor and developing countries because a major portion of population is living near or below the poverty line in these countries. Higher prices of food items lower the purchasing power of people. They have to alter their spending from other necessities like education and health towards food which confines their earning opportunities in future life. Not only more people are trapped in poverty but the poverty gap is also augmented [Ivanic and Martin (2008) and Chaudhry and Chaudhry (2008)].

International institutions estimates reveal that food inflation increased the number of poor people around the globe. After the 2008 food crises, more than 75 million additional people became under the trap of food insecurity [FAO (2008)]. According to the World Bank (2008) estimates, 105 million more people are facing the problem of extreme poverty. Many countries are facing adverse macroeconomic consequences as a result of global food price escalation and international commodity prices. Higher inflation rates, loss of domestic and foreign revenues, deficit in trade and budgets and slower

Muhammad Abdullah <mabdullah7586@hotmail.com> is Assistant Professor of Economics, Govt. Post Graduate College, Sahiwal. Rukhsana Kalim <drukhsana@umt.edu.pk> is Dean, School of Business and Economics, University of Management and Technology (UMT), Lahore.

growth rates, at various degrees across the countries, are the outcomes of hike in international food prices [IMF (2008)].

Higher food prices can be useful for farmers in poor agriculture economies. Higher prices may increase agriculture production resulting in higher incomes. Therefore, incentives should be given to farmers to produce market surplus. Lower agriculture development was the result of weak macroeconomic policies and lack of incentives for farmers in the past [World Bank (2007)]. Economic policies of developing countries do not address the problem of poor market integration and transmission of international prices towards domestic prices. These policies may reduce the incentives for agriculture production and development [Manssouri (2009)].

The objective of the paper is to explore the impact of global food price escalation on poverty in South Asian countries. As a customary, the paper is divided into different sections. Section 2 discusses the literature review. Section 3 is devoted to model specification and methodology. Data resources are mentioned in Section 4. Empirical results of the paper are explained in Section 5. Conclusion and some policy implications are presented in Section 6.

## 2. LITERATURE REVIEW

Many researchers have contributed to find the effects of changes in food prices on poverty and inequality. Deaton (1989) studied the different regions of Thailand to find the impact of increase in rice prices. His nonparametric analysis revealed that different groups of society benefited differently from the change in rice prices. Among these groups, middle class producers were benefitted more as compared to small and big land holders.

Ravallion (2000) analysed the impact of agriculture reforms on poor in India to find interrelationship between food inflation, poverty and wages. He documented that in the short run food prices affect adversely. In the long run, food prices are neutral because rural productivity positively affects both producers and the wages of rural workers. Therefore, food prices do not possess any impact on poverty and inequality.

Ivanic and Martin (2008) examined the household data from nine low income countries. They found that the impact of food prices on poverty depends on whether the household is net buyer or net seller of food. They conclude that upsurges in poverty were larger than poverty reduction affects of food price crisis of 2007-2008. There was 4.5 percent increase, on average, in poverty rates in their sample of nine countries. If this rate is applied to all the low income countries, 1.5 million more people will become poor at global level.

Dessus, *et al.* (2008) analysed the data of 73 underdeveloped economies to assess the extra monetary cost of alleviating urban poverty caused by food price shocks since 2005 using change in relative domestic prices of food, households' budget share of food substitution elasticity of food and non-food items for vulnerable poor households and domestic relative prices. They found small extra costs for most countries but it might be more than 3 percent of GDP of most severely affected countries by food price inflation.

Aksoy and Isik-Dikmelik (2008) documented that vulnerability of households, who were net food buyer, was different across the nine countries they examined. The marginal net food buyers (who spent less than 10 percent of their expenditure on food)

were less affected by food price shocks. The households who spent more than 30 percent of their total expenditure on food were severely affected, for example in Bangladesh almost 20 percent of net food buyers were vulnerable. They also found that most of net buyers of food were labourers and small businessmen in rural areas.

Wodon and Zaman (2010), focusing on Sub-Saharan Africa, estimated that the poverty headcount ratio increased, on average, between 2.2 and 4.1 percentage points in rural areas and between 3.7 and 5.2 percentage points urban areas. The impact was larger on poverty gap. They estimated the impact of fifty percent rise in the prices of food items like flour, bread, rice, milk, vegetable oil and sugar usually imported in Western and Central African countries from global market.

De Janvry and Sadoulet (2010) examined the possible impact of increase in cereals and edible oils prices on different households (by income) in India. Their result reveals that large farmers as a group (with minimum one hectare of land) will gain, but 59 percent of them will lose. There were 77 percent rural households, both farmers and non-farmers among the overall affected households because of increase in the prices of cereals and edible oils.

Zeza, *et al.* (2008) find that most households in rural areas are net food buyers. The households having more land and using fertilisers and pesticides, get benefits from the increase in food prices. They conclude that most of the rural households are vulnerable to increase in staple prices because they are net buyers of food. In all countries, increase in food prices resulted in welfare loss of rural households. Poor households in Viet Nam did not face any welfare loss because major proportion of these poor households was net sellers of food.

Chaudhry and Chaudhry (2008) found that impact of increase in food prices on poverty levels in Pakistan is considerably greater than those of energy price increases. Rural people were affected more as compared to urban people because of food price inflation. They concluded that 20 percent increase in food prices would result in an 8 percent augmentation in the poverty head count.

### 3. THEORITICAL FRAMEWORK

#### 3.1. Meaning of Poverty

A large variety of poverty concepts has been presented by researches and social scientists. The main objective of these concepts is to cover the multiple aspects and circumstances of lives of poor people living in different regions of the world. Variations in poverty concepts are based on the choice of poverty dimensions and their relative importance. Despite this there are some common understandings of poverty. Deprivation of some material necessities like food and shelter along with basic facilities like health and education is considered the indication of poverty. This deprivation is commonly measured by the shortfall in consumption expenditures or in real income. This approach is called money-metric measure of poverty and is adopted by many economists [Atkinson (1987) and Ravallion (1992)].

Moreover, some welfare economists have used some non-monetary proxies to measure household welfare. They constructed the asset indexes based on the variety of assets (for example, land, livestock, jewellery and housing durables) under ownership of

households [Filmer and Pritchett (1998); Montgomery, *et al.* (2000) and Sahn and Stifel (2000)]. Sen (1985, 1999) presented the person's capabilities approach to measure his/her well-being. Capabilities mean the functioning of having freedom, self-esteem, dignity and autonomy along with ability to contribute abundantly in economic social activities.

### 3.2. Measurement of Poverty

Different methodologies have been adopted to measure poverty according to the national and political requirements and targets in different countries. At macro level, two approaches are followed to measure income poverty. These are Absolute and Relative Poverty. Absolute poverty explains the proportion of population living below the minimum living standard (poverty line). The poverty line is established on the basis of nutritional requirements along with some other necessary goods. Relative poverty measure is used to compare the poor sections of population with their well to do counterparts with respect to income quintiles or deciles. Choice between these two measures depends on priorities given to living standards shortfalls or to the degree of inequality as an indication of poverty. In Less Developed Countries (LDCs), absolute measure is considered a better method to measure because average income is very low in these countries. Therefore, the development planners put emphasis on the reduction of absolute poverty because of the urgencies of malnutrition and starvation [Jamal (2002)].

Poverty can also be judged from objective and subjective point of view. In objective approach, normative measures are involved for the judgment and reduction in poverty. Majority of economist have been using this approach for poverty measurement and its cure. The subjective perspective of poverty analyses the preferences and wishes of people about the goods and services of their use. Many shortcomings and limitations are realised associated with the indicators used to measure subjective poverty. Recently, International community and institutions are showing keen interest in the subjective measure of poverty [Jamal (2002)].

'Poverty Line' is a popular yard stick to differentiate between poor and non-poor. This line is derived on the basis of minimum level of necessities available to a person for being poor or non-poor. There are two methods to translate this minimum level into necessities, although both are controversial. In many LDCs, food sufficiency (adequate calories) is used as criterion of poverty. But it is very difficult to generalise the minimum calories requirement because these requirements vary from person to person with respect to age, sex, working and living conditions. It captures only on aspect of human life. The other criterion to assess poverty is the cost of a minimum bundle of basic needs required by a household. Although it is not easy to interpret minimum bundle of basic needs. Ahmad (1993) and Gazdar, *et al.* (1994), among others, used this criteria to study poverty levels in Pakistan. Although, Sen (1999) approach is very useful to understand the characteristics of person's welfare, yet it makes the understanding and operationalisation of poverty reduction more complex and difficult.

The World Development Report (1990) introduced a 'dollar-a-day' poverty line to measure the poverty reduction at global level. This line was constructed to measure per capita household expenditures on Purchasing Power Parity (PPP) in 1985 prices. There are many shortcomings associated with 'dollar-a-day' poverty line. This line does not consider the differences of cost of living between the rural and urban people in a country

as well as regional and continental differences. It does not take into account the depth and severity of poverty incidence. Therefore, a poverty line should represent the national and country specific characteristics for effective policy implications to achieve the targets of poverty reduction.

Minimum calories approach explains only one aspect of poverty. Basic needs criteria and social status is criticised because these are subjective and arbitrary. Revealed behaviour approach is considered better because it is based on the actual consumption made by the households. This study uses actual average consumption to measure the impact of global food price escalation on poverty in South Asian countries. Many studies have used per capita consumption as proxy of poverty reduction [for example, Quartey (2005); Odhiambo (2009) and Ho and Odhiambo (2011)].

It is generally conceived that inflation worsens the poor's life. But researchers are unable to settle the stable relationship between inflation and poverty. Same is the case for the relationship between food inflation and poverty. Urban households are net food purchasers. They are severely affected as compared to their rural counterparts who are net food producers. Same situation have to face net food importing countries [Wodon and Zaman (2008)].

On the other hand, higher food prices definitely raise the incomes of food producers in rural areas. Small land holders, livestock owners and vegetables and fruit producers get benefits from higher food prices. Non-food producers might be able to receive better prices because of alternative use of land for food production resulting in decrease of supply of non-food and cash crops. Thus incomes of both groups increase because of greater economic activity and 'trickle down' effects. Rural workers are also compensated with higher wages (both in real and monetary terms) in this situation. Higher wages in rural areas affect rural-urban migration decisions. Rural migrants return to their countryside homes. This may have positive impact on the wages of urban poor. Improvement in rural and agriculture sector economic activities results in development of industrial and services sectors because output of these sectors are used as inputs in agriculture sector and vice versa. Thus incomes of masses will rise and poverty might tend to decrease [Deaton (1989) and Wash (2012)].

#### 4. METHODOLOGY

Having discussion on literature and drawing upon the theoretical frame work following model has been employed in this paper to measure the impact of global food price escalation on poverty in south Asian countries:

$$PCP = f(Y, Z) \quad \dots \quad (1)$$

Where *PCP* is Private/household Consumption Per capita, *Y* represents households' income and *Z* is a set of other factors which determine the household consumption expenditures. These factors may include substitution effects and uncertainties. Interest rate is widely used to measure the substitution effect of household consumption expenditures. To measure uncertainties unemployment rate and inflation are the suitable proxies [Davidson, *et al.* (1978); Davidson and Hendry (1981) and Blinder and Deaton (1985)].

One of the main objectives of this study is to find the impact of global food price inflation on poverty in South Asian countries, therefore, according to the nature of our study the above model can be written as follows:

$$PCP = f(GFI, OILP, IRATE, Y) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where  $PCP$  = Private Consumption Per Capita.

$GFI$  = Global food price inflation.

$OILP$  = Oil Prices.

$IRATE$  = Interest rate,

$Y$  = Per Capita GDP.

#### 4.1. Panel Data Methodology

To analyse the impact of global food price escalation on poverty of South Asian countries is one of the major objectives of the study. Panel data methodology will be applied for this purpose. This methodology has many advantages over time series and cross-section data. It takes into account the individual heterogeneity (among individuals, firms and countries). It gives more information, more degrees of freedom and efficiency. Problem of multi-collinearity among the variables is also minimised. We can study more complicated models and minimise the bias by using large number of individuals, firms and countries [Baltagi (1995)]. Equation (2) is transformed for the analysis as follows:

$$LPCP_{it} = \beta_0 + \beta_1 LGFPI_{it} + \beta_2 LOILP_t + \beta_3 LPGDP_{it} + \beta_4 LIRATE_{it} + \varepsilon_{it} \quad \dots \quad (3)$$

Where

$LPCP_{it}$  = Log of Private Consumption Per capita (measured by household consumption per capita at constant 2005 US\$) for country  $i$  at time  $t$ .

$LPGDP_{it}$  = Log of per capita GDP of country  $i$  at time  $t$ .

$LIRATE_{it}$  = Lending interest rate for country  $i$  at time  $t$ .

$LGFP_{it}$  = Global food price inflation (FAO food price index).

$LOILP_t$  = World Oil Prices (average spot price of Brent, Dubai and West Texas Intermediate, equally weighed).

$\varepsilon_{it}$  = identically and independently distributed error term.

#### 4.2. Unit Root Tests with Structural Break and Panel Unit Root Tests

Time series data may be stationary with structural breaks and outliers. Commonly used unit root tests are biased towards the non-rejection of null hypothesis of non-stationary because of structural breaks [Perron (1989)]. Perron (1989) proposed that dummy variables should be incorporated in the ADF to control one exogenous structural break.

However, in the contemporary times, the use of panel unit root tests is also common in economic empirical analysis. It is assumed that all series or a major part of all series across the cross section is stationary. Use of these tests is important to avoid the misleading results from a spurious regression. It is also argued that power of these tests increases if the cross sectional dimension of data is included. Different panel unit root tests [Im, Pesaran, and Shin (2003); Levin, Lin, and Chu (2002) and Fisher-type tests using ADF and PP tests Choi (2001)] have been applied to obtain reliable results of data.

#### **4.3. Fixed Effect and Random Effect Models**

Fixed Effects Model (FEM) and Random Effect Model (REM) or Error Component Method (ECM) are two popular methods used for panel data analysis. If there is heterogeneity in cross sectional characteristics and individual effects are correlated with explanatory variables, FEM model is considered better for estimation. Dummy variables are used to capture the cross sectional effects. Therefore, FEM is also known as least-squares dummy variable (LSDV) model. Random Effect Model (REM) or Error Component Method (ECM) is better to apply when the individual intercept is randomly taken from a larger population of cross sections. This method is suitable when intercept is un-correlated with independent variables. In this model no dummies are required to capture the individual characteristics of cross sections, therefore it is efficient in losing degrees of freedom as compared to FEM. We have also used the dynamic model of least squares (DOLS) to check the robustness of results.

#### **4.4. Panel Dynamic Ordinary Least Squares (DOLS) Method**

Panel dynamic ordinary least squares (DOLS) method of Saikkonen (1991) and Stock and Watson (1993) is commonly used for analysis and hypotheses testing when there is a co-integrating vector in panel data. Usefulness of DOLS for heterogeneous panel, in the presence of fixed effects in co-integration regression, is well documented by Kao and Chiang (2000). DOLS technique also has been utilised in this paper.

### **5. DATA SOURCES**

For empirical analysis, data from 1990 to 2011 of variables used in this study are collected from international sources for South Asian countries. Annual FAO-Food Price Index (2002-2004=100) is used as proxy of global food price inflation (GFPI). Data of this variable is extracted from the official website of Food and Agriculture Organisation of United Nation. Data of Crude oil prices (average spot price of Brent, Dubai and West Texas Intermediate, equally weighed) is collected from World Bank's official website. Data of Private Consumption Per capita (PCP) (measured by household/private consumption per capita at constant 2005 US\$), Lending interest Rate (LIRATE) and per capita GDP (PGDP) for all South Asian countries has been taken from World Development Indicators (WDI) online database by World Bank (2013). All variables are used in their natural log form except LIRATE.

### **6. RESULTS AND DISCUSSION**

#### **6.1. Correlation and Covariance Analysis**

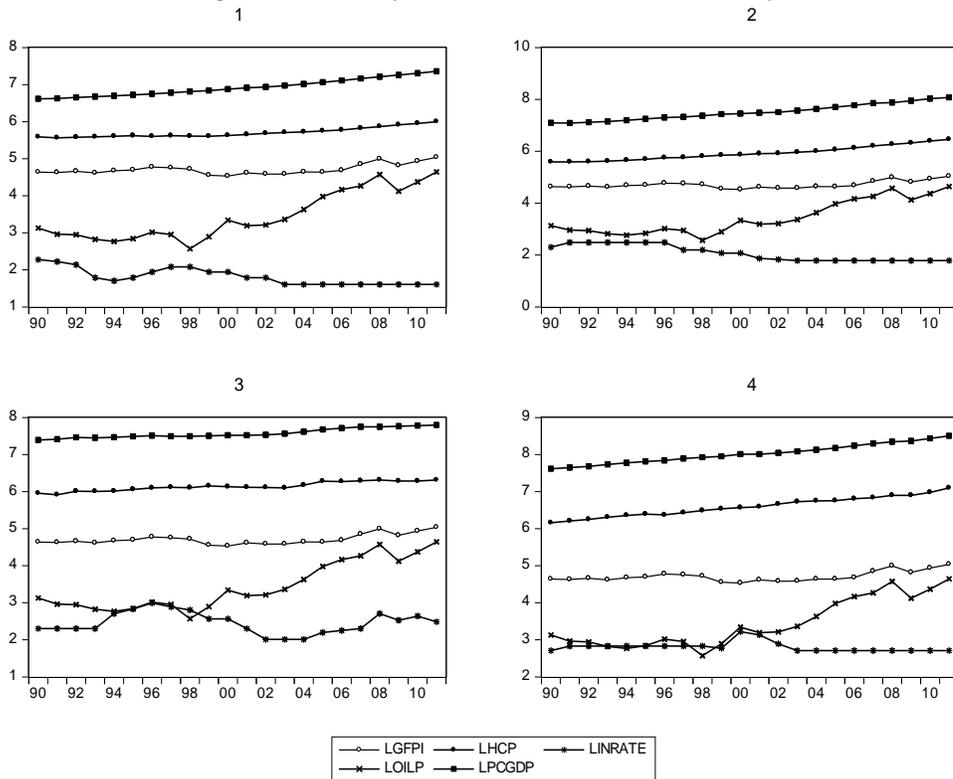
Correlation and covariance analysis is considered a good start to determine the degree and direction of any relation between the variables. It is obvious from the Table 1 that LHCP is positively and strongly related with LGFPI, LOILP, LINTRATE and LPCGDP. We can further verify this correlation by observing the trend of these variables from the Figure 1, followed by the Table 1.

Table 1  
Correlation and Covariance Analysis

| Covariance Correlation | LHCP                 | LGFP                   | LOILP                  | LINRATE              | LPCGDP               |
|------------------------|----------------------|------------------------|------------------------|----------------------|----------------------|
| LHCP                   | 0.150207<br>1.000000 |                        |                        |                      |                      |
| LGFP                   | 0.017348<br>0.328239 | 0.018597<br>1.000000   |                        |                      |                      |
| LOILP                  | 0.111064<br>0.449199 | 0.060406<br>0.694340   | 0.406987<br>1.000000   |                      |                      |
| LINRATE                | 0.096991<br>0.559950 | -0.004234<br>-0.069476 | -0.078388<br>-0.274932 | 0.199744<br>1.000000 |                      |
| LPCGDP                 | 0.169655<br>0.956416 | 0.020699<br>0.331636   | 0.134590<br>0.460946   | 0.105041<br>0.513506 | 0.209483<br>1.000000 |

Source: Authors' calculations.

Fig. 1. Trend Analysis of Variable Used in this Study



In Figure 1, 1,2,3,4 represent the economies of Bangladesh, India, Pakistan and Sri Lanka respectively.

## 6.2. Stationarity of Data

Following Perron (1989), break point ADF of unit root is applied on 14 individual time series (of panel member countries) used in the study detect break point and outliers. Results of break point ADF of unit root test are portrayed in Table 1. Majority of time series have unit root and non-stationary at level. Only four series (LINRATE of Bangladesh, Pakistan and Sri Lanka, LPCGDP for Pakistan) are stationary at level.

Panel unit root tests are still commonly used in panel data estimation. Different panel unit root tests are applied to check the stationarity of the panel data used in our study [Im, Pesaran, and Shin (1997) Levin, Lin, and Chu (2002), Fisher-type tests using ADF and PP tests]. The results of these tests are reported in Table 2. All variables (except LIRATE) are used in natural log form.

Table2  
*Results of ADF Break Point Unit Root Test*

| Country    | Series  | ADF test stat.<br>with Trend and Intercept |                      | Break<br>Dates |                     |
|------------|---------|--|----------------------|----------------|---------------------|
|            |         | At level                                   | At First Difference  | At level       | At First Difference |
| Bangladesh | LPCP    | -1.2193 (0.99)                             | -7.0321(<0.01) *     | 2006           | 1999                |
|            | LPCGDP  | -3.3385 (0.7833)                           | -5.4115 (<0.01) *    | 2005           | 2004                |
|            | LINRATE | -8.0883 (<0.01) *                          | -                    | 2002           | -                   |
| India      | LPCP    | -2.3218 (0.99)                             | -4.991(0.0340) **    | 2006           | 2004                |
|            | LPCGDP  | -2.8612 (0.9447)                           | -7.2740 (<0.01) *    | 1997           | 2002                |
|            | LINRATE | -3.4685 (0.7114)                           | -6.2071 (<0.01) *    | 1998           | 2003                |
| Pakistan   | LPCP    | -4.4502(0.1495)                            | -7.1400(<0.01) *     | 1999           | 2005                |
|            | LPCGDP  | -5.2808 (<0.01) *                          | -                    | 2009           | -                   |
|            | LINRATE | -5.8607 (<0.01) *                          | -                    | 2001           | -                   |
| Sri Lanka  | LPCP    | -3.6952 (0.5672)                           | -4.5718(0.0357) **   | 2009           | 2010                |
|            | LPCGDP  | -1.5515 (>0.99)                            | -4.6623 (0.0854) *** | 1999           | 2002                |
|            | LINRATE | -5.9197 (<0.01) *                          | -                    | -              | -                   |
| Global     | LGFI    | -3.9148 (0.4263)                           | -4.79321(0.0603) *** | 1998           | 1998                |
|            | LOILP   | -3.6099 (0.6233)                           | -6.5927(<0.01) *     | 2004           | 2008                |

Vogelsang's (2003) asymptotic  $p$ -values are in parenthesis.

\*, \*\*, \*\*\* denotes rejection of null hypothesis non-stationarity at 1 percent, 5 percent, and 10 percent level of significance respectively.

The results show that data on poverty (LPCP) is non-stationary at level but stationary at first difference and data of global food inflation (LGFI) is also non-stationary at level but stationary at first difference according to all four test statistics. Levin, Lin and Chu (LLC) test statistics reveal that oil prices (LOILP) are stationary at level while rest of the statistics indicate the presence of unit root in the data. At first difference, oil prices become stationary at 1 percent level of significance according to all four test statistics. Lending interest rate (LIRATE) and per capita GDP (LPCGDP) showed the same results. Both are non-stationary and have unit roots at level and become stationary at first difference at 1 percent significance level as indicated by the all test statistics [Im, Pesaran, and Shin (1997); Levin, Lin, and Chu (2002) and Fisher-type tests using ADF and PP tests].

Table 3

*Results of Panel Unit Root Test*  
(At level with Individual Intercept)

| Variable                 | Levin, Lin & Chu t     | Im, Pesaran and Shin W-stat | ADF-Fisher Chi-square | PP - Fisher Chi-square |
|--------------------------|------------------------|-----------------------------|-----------------------|------------------------|
| LPCP <sub>it</sub>       | 4.52004<br>(1.000)     | 5.73267<br>(1.0000)         | 1.35865<br>(0.9948)   | 0.45451<br>(0.9999)    |
| D(LPCP) <sub>it</sub>    | 1.36018***<br>(0.0869) | -2.11298**<br>(0.0173)      | 18.9985**<br>(0.0149) | 30.3945**<br>(0.0002)  |
| LGFP <sub>t</sub>        | 2.41086<br>(0.9920)    | 2.28845<br>(0.9889)         | 1.03514<br>(0.9980)   | 0.81867<br>(0.9992)    |
| D(LGFP) <sub>t</sub>     | -7.73331*<br>(0.0000)  | -6.08219*<br>(0.0000)       | 45.6928*<br>(0.0000)  | 45.6122*<br>(0.0000)   |
| LOILP <sub>t</sub>       | -3.34216*<br>(0.0004)  | -0.17069<br>(0.4322)        | 6.58290<br>(0.5822)   | 11.5238<br>(0.1737)    |
| D(LOILP) <sub>t</sub>    | -6.37770*<br>(0.0000)  | -4.95804*<br>(0.0000)       | 38.1359*<br>(0.0000)  | 49.7841*<br>(0.0000)   |
| LINRATE <sub>it</sub>    | -0.88351<br>(0.1885)   | -0.82291<br>(0.2053)        | 10.9345<br>(0.2054)   | 8.49481<br>(0.3867)    |
| D(LINRATE) <sub>it</sub> | -5.61578*<br>(0.0000)  | -6.54706*<br>(0.0000)       | 49.6684*<br>(0.0000)  | 44.6359*<br>(0.0000)   |
| LPCGDP <sub>it</sub>     | 10.4239<br>(1.000)     | 10.3269<br>(1.000)          | 0.12876<br>(1.000)    | 0.08621<br>(1.000)     |
| D(LPCGDP) <sub>it</sub>  | -4.38865*<br>(0.0000)  | -3.54689*<br>(0.0002)       | 27.0615*<br>(0.0007)  | 27.1074*<br>(0.0007)   |

Source: authors' calculations.

\*, \*\*, \*\*\* Denotes rejection of null hypothesis non-stationarity at 1 percent, 5 percent, and 10 percent level of significance respectively.

### 6.3. Panel Co-integration

Panel unit root tests' result presented in Table 5.1 show that all the variables of our interest are non-stationary and have the problem of unit root at level form. All of them become stationary at their first differences and have I (1) order of integration. Therefore, application of panel co-integration methodology is suitable for our model. Panel co-integration methods are very popular among the researchers these days. With the growing availability of time series data for many countries, use of panel co-integration methods, to discover the long run relationship, are adopted by a number of researchers in the field of economics. Pedroni's (2004) co-integration methodology has been applied in this study. Pedroni (2004) proposed seven test statistics to check the long run relationship. Four test statistics (Panel  $\nu$ -Statistic, Panel rho-Statistic, Panel PP-Statistic and Panel ADF-Statistic) are used to check the null of no co-integration for whole panel (within dimension). Results of these are shown in Table 3(A). We reject the null of no co-integration on the basis of Panel PP-Statistic and Panel ADF-Statistic at 5 percent and 1 percent level of significance respectively when we include intercept and trend in the model.

Table 4(A)  
*Padroni Panel Cointegration Results*  
 (Statistic within-dimension)

| Without Trend            |            |        |             |        |
|--------------------------|------------|--------|-------------|--------|
| Test Statistic           | Statistic  | Prob.  | Weighted    |        |
|                          |            |        | Statistic   | Prob.  |
| Panel v-Statistic        | -0.304324  | 0.6196 | -0.359041   | 0.6402 |
| Panel rho-Statistic      | 0.685853   | 0.7536 | 0.770347    | 0.7795 |
| Panel PP-Statistic       | -0.880208  | 0.1894 | -1.327365   | 0.0922 |
| Panel ADF-Statistic      | -1.483961  | 0.0689 | -2.399655*  | 0.0082 |
| With Intercept and Trend |            |        |             |        |
| Test Statistic           | Statistic  | Prob.  | Weighted    |        |
|                          |            |        | Statistic   | Prob.  |
| Panel v-Statistic        | -1.216969  | 0.8882 | -1.344343   | 0.9106 |
| Panel rho-Statistic      | 1.605308   | 0.9458 | 1.645539    | 0.9501 |
| Panel PP-Statistic       | 1.939847** | 0.0262 | -2.113501** | 0.0173 |
| Panel ADF Statistic      | -2.499526* | 0.0062 | -3.091995*  | 0.0010 |

Note: \* and \*\* denotes rejection of null hypothesis at 1 percent and 5 percent significance level respectively.

Results of three statistics (Group rho-Statistic, Group PP-Statistic and Group ADF-Statistic) are portrayed in Table 3 (B) for Between-dimension. These results explain the rejection of null hypothesis of no co-integration on the basis of Group PP-Statistic and Group ADF-Statistic at 1 percent significance level. It is concluded on basis of Pedroni (2004) methodology that long run relationship exists among the variables used in this paper.

Table 4(B)  
*Padroni Panel Cointegration Results*  
 (Statistic between-dimension)

| Test Statistic      | Without Trend |         | With Intercept and Trend |         |
|---------------------|---------------|---------|--------------------------|---------|
|                     | Statistic     | Prob.   | Statistic                | Prob.   |
| Group rho-Statistic | 1.653063      | 0.9508  | 2.475480                 | 0.9933  |
| Group PP-Statistic  | -2.571120     | 0.0051* | -3.480400                | 0.0003* |
| Group ADFStatistic  | -2.877596     | 0.0020* | -3.526626                | 0.0002* |

Note: \* and \*\* denotes rejection of null hypothesis at 1 percent and 5 percent significance level respectively.

### 6.5. The Hausman Test Results

We have employed Hausman (1978) test for model selection between Fixed Effects Model (FEM) and Random Effect Model (REM) in our study. Results of this test are presented in Table 4.

Table 5  
*Hausman Test Results*

| Test Summary    | Chi-Sq. Statistic | Chi-Sq. d.f | Probability |
|-----------------|-------------------|-------------|-------------|
| Period specific | 10.78*            | 2           | 0.0046      |

\*Denotes rejection of null hypothesis of no difference in using FEM or REM at 1 percent level of significance.

The null hypothesis of no difference between FEM and REM is rejected on the basis of the results displayed in Table 4 because the Chi-Sq. Statistic (10.78) with probability of (0.0046) is significant at 1 percent level. Therefore we have used Fixed Effects Model (FEM) to explore the impact of global food price inflation and other variables in the model on poverty in South Asian Countries. Hausman test results are certainly believable because South Asian Countries (cross-section) have different characteristics with respect to area, the size of population, and economic performance. For example, India's population is more than the collective population of all other countries of the region (sample).

## 6.6. Model Estimation

On the basis of Hausman's (1978) test results, we have used FEM in this study. For empirical analysis, panel generalised least square method (EGLS) with cross-specific fixed effects has been applied. White cross-section has been used for heteroskedasticity correction. All variables in equation (5) are used in their natural log form except Lending Interest Rate (LINRTE). Results of model are displayed in the next Table 5.

Table 6  
*Results of Regression Model*

| Dependent Variable = $LPCP_{it}$ |              |                   |             |
|----------------------------------|--------------|-------------------|-------------|
| Variable Name                    | Coefficient  | T-Statistic       | Probability |
| Constant                         | -0.310530    | -2.913774         | 0.0046      |
| $LGFPI_t$                        | 0.048718     | 2.122176          | 0.0369      |
| $LOILP_t$                        | -0.012312    | -2.311914         | 0.0234      |
| $LPCGDP_{it}$                    | 0.832295     | 65.89442          | 0.0000      |
| $LINRATE_{it}$                   | -0.002511    | -2.395679         | 0.0189      |
| F-Statistic= 2356.448            |              | Jerque-Bera=3.844 |             |
| Probability = 0.000              | $R^2 = 0.99$ | Probability=0.146 |             |

Note: \* and \*\* denotes 1per cent and 5 percent significance level respectively.

The results displayed in Table 5 show that Global Food Price Inflation ( $LGFPI_t$ ) is positively and significantly affecting the Private Per Capita Consumption ( $LPCP_{it}$ ), used as proxy of poverty, in South Asian countries. One percentage point increase in Global Food Price Inflation brings 0.05 percent increase in ( $LPCP_{it}$ ) of South Asian countries. It is clear indication of positive impact of international food inflation towards Private Per Capita Consumption. As a result, poverty tends to decrease in the South Asian region. Although the coefficient value of Private Per Capita Consumption (0.045) it might be justified that there are many other internal and household factors which affect Private Per Capita Consumption.

Impact of international oil prices is also statistically significant and negative for real Private Per Capita Consumption of South Asian countries. One percent increase in international oil prices results in 0.01 percent decrease in Private Per Capita Consumption of South Asian countries in real terms. Oil is basic energy source for agricultural, industrial and transport sectors in the whole economies of South Asian countries. Because of increase in oil prices, production cost of all commodity rises leading to

increase in commodity prices. Therefore, real Private Per Capita Consumption will decrease and poverty level will rise.

Per capita GDP (LPCGDP) is positively and significantly affecting the real Private Per Capita Consumption of South Asian countries. One percent increment in Per capita GDP increases the real Private Per Capita Consumption of South Asian countries by 0.83 percent. Increase in real Private Per Capita Consumption will definitely decrease the poverty in this region.

Interest Rate (LIRATE) showed negative and significant impact on real Private Per Capita Consumption in South Asian countries. One percentage point increase in interest rate results in 0.0025 decrease in real private per capita consumption. It is justifiable that that there is positive relation between interest rate and savings. Therefore, increase in saving decreases real Private Per Capita Consumption.

Model is well fitted as F-Statistic (2356.45) is significant and probability is (0000). Jerque-Bera statistic is 3.844 with probability (0.146), which indicates that residuals of our model are normally distributed.

### 6.7. Panel Dynamic Ordinary Least Squares (DOLS) Method

Panel Dynamic Ordinary Least Squares (DOLS) has also been applied for checking the robustness of results. The results are presented in Table 6.

Table 7

*Panel Dynamic Least Squares (DOLS) Model*

| Dependent Variable = $LPCP_{it}$ |              |                   |             |
|----------------------------------|--------------|-------------------|-------------|
| Variable Name                    | Coefficient  | T-Statistic       | Probability |
| $LGFPI_t$                        | 0.290692     | 2.189372**        | 0.0385      |
| $LOILP_t$                        | 0.007794     | 0.202987          | 0.8409      |
| $LPCGDP_{it}$                    | 0.669196     | 7.356933*         | 0.0000      |
| $LINRATE_{it}$                   | -0.121685    | -1.445174         | 0.1613      |
|                                  |              | Jerque-Bera=3.592 |             |
|                                  | $R^2 = 0.99$ | Probability=0.166 |             |

Note:\* and \*\* denotes 1per cent and 5 percent significance level respectively.

The results presented in Table 6 show that Global Food Price Inflation ( $LGFPI_t$ ) and per capita GDP (LPCGDP) are positively and significantly affecting the real Private Per Capita Consumption ( $LPCP_{it}$ ), used as proxy of poverty in South Asian countries. One percentage point increase in Global Food Price Inflation results in 0.29 percent increase in ( $LPCP_{it}$ ) of South Asian countries. As a result, poverty tends to decrease in the South Asian region. Real private per capita consumption of South Asian countries increases 0.67 per cent as a result of one percent increment in per capita GDP. Increase in real Private per capita consumption will definitely decrease the poverty in this region. However, Oil ( $LOILP_t$ ) prices and Lending Interest Rate ( $LIRATE_{it}$ ) remained statistically insignificant for real Private Per Capita Consumption ( $LPCP_{it}$ ).

## 7. CONCLUSION

This study has examined the impact of global food price inflation on Private Per Capita Consumption used as proxy of poverty in South Asian countries for the period 1990 to 2011 by applying panel data methodology.

First of all we checked stationarity of data by using panel unit root tests like Im, Pesaran, and Shin (1997), Levin, Lin and Chu (2002), Fisher-type tests using ADF and PP tests [Maddala and Wu (1999)]. All variables have the unit root problems and become stationary at their first differences and have integrating order  $I(1)$  according to all panel unit root tests mentioned earlier. After confirming the order of integration of variables, which is  $I(1)$ , we have applied two panel cointegration techniques (Fisher-Johansen and Pedroni) to find the long run relationship among the variables used in our study. Both methodologies confirmed existence of long run relationship. Panel data methodology is applied to find long run coefficients. Hausman (1978) test results helped us to use FEM for estimation. Panel estimated generalised least square method (EGLS) with cross-specific fixed effects has been applied for empirical analysis. White cross-section has been used for Heteroskedasticity correction. Panel Dynamic Ordinary Least Squares (DOLS) has also been applied to check the robustness of results.

External factors like global food price inflation and oil prices showed the significant relation with Private Per Capita Consumption used as proxy of poverty in South Asian countries. It is justifiable because most of the South Asian Countries are agricultural based. Two third of their population living in rural areas depends on agricultural products for their livelihood and employment. Any increase in global food prices and transmitted to local food prices might increase their incomes from food crops, dairy products and livestock. Incomes of cash crop producers will also rise because of competitive use of land and labour. Oil prices are negatively related to real Private Per Capita Consumption. It is because most of South Asian countries had to liberalise their economies after the application of WTO regime. Per Capita GDP is also positively and significantly related to real Private Per Capita Consumption of South Asian countries. Interest Rate (LIRATE) showed negative and significant impact on real Private Per Capita Consumption in South Asian countries because of positive relation between saving and interest rate. The empirical results proved the view [Borio and Filardo (2007) and Crowley (2010)] that external factors should be given importance while studying the economic relation between different variables. Values of F-Statistic and R-square confirmed that model was well fitted. Jerque-Bera statistic proved normality of residuals in the model.

### 7.1. Policy Implications

Impact of global food price escalation positively and significantly affected the private consumption per capita which is used as proxy of poverty in South Asian countries in present study. It indicates that poverty tends to decrease (because of increase in private consumption per capita) as a result of global food price inflation in long run. Trickle down effects, within agriculture sector and between other sectors and areas (rural-urban), will contribute in improving incomes and consumption of masses. Government should take full advantage of this situation by reconsidering its trade, developmental and agriculture policies. Trade barriers should be minimised by reducing export duties on

food and agriculture products. Import duties should also be eliminated or decreased to the lowest level on equipment, machinery and chemicals used in agriculture sector. More percentage of national and provincial budgets should be allocated for infrastructure and social services in rural areas.

Market imperfections and perishable nature of food products are two basic problems by food producers with small land holdings. Role of middle man is very critical in lowering their profits. They are helpless to sell their products at lower than competition prices, even sometime without meeting the production cost. Therefore, procurement/support price policies should be continued to avoid the major negative supply shock at the time of next harvest. At the same time financial institutions should be perused to make arrangements in time and access-able agriculture loans for small farmers. New land reforms and rearrangements of small and scattered pieces of land will be in rising agriculture production. In this sector, subsidies on inputs should continue till the maturity of competitive nature at global level. Buffer stock of food grains under government control will work as safeguard against supply short falls and rising food prices. As an immediate measure, assistance to most vulnerable can provided from this stock.

Although, global food prices seem to reduce poverty by increasing the per capita household consumption, yet there will be a vulnerable group of population. Social safety nets measures should be continued purposefully. There are different types of these measures, for example, cash transfers, universal food subsidies and payments for social assistance. These measures are already being practiced in Bangladesh, India, Nepal, Pakistan and Sri Lanka. But efficiency might be increased by solving the issues of corruption and fiscal costs associated with these programs. Monitoring and evaluation will improve the capacity of targeted delivering of social safety nets. Governments have to design long term policies for sustainable development and employment surety for reducing poverty. Public expenditures should be allocated for physical and social infrastructure to enhance agriculture productivity. Effective and solid regional cooperation is very crucial for future polices to overcome food security issues and less agriculture productivity in South Asian countries.

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# Impact of Farm Households' Adaptations to Climate Change on Food Security: Evidence from Different Agro-ecologies of Pakistan

MUNIR AHMAD, GHULAM MUSTAFA, and MUHAMMAD IQBAL

The study used data from 3298 food crop growers in Pakistan. Potential outcome treatment effects model was applied to evaluate the impact of adaptations on household food security. A household Food Security Index (FSI) was constructed applying Principle Component Analysis (PCA). Adaptation strategies employed by the farmers in response to climate change were categorised into four groups namely: changes in sowing time (C1); input intensification (C2); water and soil conservation (C3); and changes in varieties (C4). Out of 15 mutually exclusive combinations constructed for evaluation, only 7 combinations were considered for estimating the treatment effects models because of limited number of observations in other cases. Results of only two of the 7 are discussed in the paper, as the other 5 had very small number of adapters and the impact measures shown either insignificant results or had opposite signs. The first (C1234) combined all the four, while the second (C234) combined the last three strategies.

The results suggest that the households which adapted to climate changes were statistically significantly more food secure as compared to those who did not adapt. The results further show that education of the male and female heads, livestock ownership, the structure of house—both bricked and having electricity facility, crops diversification, and non-farm income are among the factors, which raise the food security of farm households and their impacts are statistically significant. The variables which are significantly negatively associated with the food security levels include age of the head of household, food expenditure management, households having less than 12.5 acres of land—defined as marginal (cultivate <6.25 acres) and small (cultivate >6.25 to ≤12.5 acres). Farmers of cotton-wheat, rice-wheat, and rain-fed cropping systems are found to be more food secure as compared to the farmers working in the mixed cropping systems where farm holdings are relatively small and high use of tube-well water adding to salinity of soils.

It is crucial to invest in the development of agricultural technological packages, addressing issues of climate change relevant to different ecologies and farming systems; improve research-extension-farmer linkages; enhance farmers' access to new technologies; improve rural infrastructure; development of weather information system linking meteorological department, extension and farmers; and establishment of targeted food safety nets as well as farm subsidy programs for marginal farm households.

## 1. INTRODUCTION

*“The impacts of global climate change on food systems are expected to be widespread, complex, geographically and temporally variable, and profoundly influenced by socio-economic conditions”* [Vermeulen, *et al.* (2012), p. 195].

The research evidence shows that climate change has direct and devastating impacts on agriculture sector since it heavily relies on climatic variations [Parry, *et al.* (1999)]. The intensity of the impact depends on the current levels of temperature and/or precipitation patterns and the biological tolerance limits for crops, per capita income, the

Munir Ahmed <munir@pide.org.pk> is Joint Director, Pakistan Institute of Development Economics, Islamabad. Ghulam Mustafa <gmpideian@gmail.com> is Research Associate, Pakistan Institute of Development Economics, Islamabad. Muhammad Iqbal <miqbal@pide.org.pk> is Chief of Research, Pakistan Institute of Development Economics, Islamabad.

proportion of economic activities linked to agriculture and the existing land use pattern [Benhin (2006)]. The impact of even a single climate- or weather-related event could ruin the long-term gains in the economic development [FAO (2008)]. Cereal crops production is already under heat stress in South Asia [Kelkar and Bhadwal (2007)]. Therefore, the crops yields could decline up to even 30 percent by the end of this century [IPCC (2007)]. Production of these crops is an important component of food security<sup>1</sup> in the region. One of the major challenges this region would be facing in the coming decades is assuring food security to rapidly increasing population—and Pakistan is no exception. With the current rate of growth, the population of Pakistan is expected to get doubled by 2050—making it the 4th largest nation by 2050 from the current status of 6th most populous state of the world [Ahmad and Farooq (2010)].

Pakistan, like other developing countries, is highly vulnerable to climate change because of its growing dependence on agriculture for food and fibre needs. Additionally, the agriculture sector of Pakistan is dominated by the small resource-poor farmers having very little ability to adapt. Climate change is expected to reduce the growing season length for major cereals in all major agro-ecological zones of Pakistan [Iqbal, *et al.* (2009a, 2009b)]. As a result, the yields could decline by 6–11 percent of wheat and 15–18 percent of basmati rice by 2080, which are the main cereals being produced in the country. A more recent study estimated that every 1<sup>o</sup>C increase in temperature only during the November and December—the sowing months would result in reduced yield of wheat by 7.4 percent [Ahmad, *et al.* (2014)]. Another study also indicates a significant negative impact of rise in temperature on both basmati and coarse rice [Ahmad, *et al.* (2014a)].

The history shows that despite all efforts made by the government of Pakistan, through investing in research and development and policy interventions to enhance food supply in the country to meet the burgeoning demand, it remained net importer of food commodities in most of the years during the last couple of decades. Since, the climate change has emerged as a new threat to the ecosystem in general and agriculture sector in particular, the food security situation is expected to get worsen in the presence of rapidly growing population in future. To avoid any potential major disruption in food supply and to check the widening food supply-demand gap, coordinated efforts are needed in the country on long term basis to develop a vibrant research system to get over the potential future threats of climate change. Besides developing high-tech technologies to raise the agricultural productivity and reduce post-harvest losses throughout the commodity value chain, efforts are essential to limit the population growth as well.

To effectively deal with the potential threats to food system in future, it is critical to analyse its linkages with the changing climate. It has however been argued that the quantification of the impacts of climate change on food security is a very challenging task because of complexity of the relationship between climatic, economic, social and political factors with the food security [IPCC (2013); Ziervogel, *et al.* (2006)]. The empirical studies analysing the subject that directly relates climate change to food

<sup>1</sup>The World Food Summit in 1996 defined the term as “food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life”. This definition embodies five aspects: availability, access, stability, nutritional status and preferences of food. All of these components are influenced by physical, economic, political and other conditions within communities and even within households, and are often destabilised by climatic shocks and natural disasters such as the conflicts [UK Parliament (2006)].

security, are therefore rarely found in the literature. Since agriculture is a major source of income for most of the rural population, adaptation of this sector to the changing climate is essential to protect the livelihoods of the poor and to ensure food security [Elizabeth, *et al.* (2009); Bradshaw, *et al.* (2004); Wang, *et al.* (2009)].

The adverse impacts of climate change on agriculture can be dealt with two ways—mitigation and adaptation strategies. Mitigation refers to interventions or policies to reduce or to enhance the sinks for greenhouse gases, and is a long-term solution to tackle climate change and limiting its negative impacts in the future [Chambwera and Stage (2010)]. Considerable efforts and resources are required as well as cooperation from those countries which are the source of cause and are resourceful—the developed world. The developing countries like Pakistan, however, face difficulties as they are short of resources and lack appropriate infrastructure to efficiently and effectively employ mitigating strategies. It has been argued that despite immediate employment of mitigation strategies, the earth's warming up will continue for decades to come, since these strategies do not have abilities to reverse impacts of the past, current and/or of unavoidable emissions in future [IPCC (2007); Chambwera and Stage (2010)]. Therefore, the looming threats can only be tackled through adaptation, which is a shorter term action to cope with the potential adverse impacts of changing climate on agricultural production, and to reduce the risk of various key vulnerabilities on human and natural systems as well as on food security [OECD (2009); Mendelsohn and Dinar (1999); Schneider, *et al.* (2007); Gebrehiwot and van der Veen (2013); Chambwera and Stage (2010)]. The adaptation is therefore, one of the fundamental policy options to moderate the impacts of climate change [Adger, *et al.* (2003); Kurukulasuriya and Mendelsohn (2008)]. The non-adjustment of agricultural systems and practices will hit hard the farming community particularly in developing countries—affecting farm productivity as well as income, food and livelihoods security [Kandlinkar and Risbey (2000); and Hassan and Nhemachena (2008)].

Adaptation is essentially an adjustment in human and/or natural systems to deal with the impacts of actual or expected changes in climate [IPCC (2001); Adger, *et al.* (2003); FAO (2008)]. The common adaptations in agriculture include shifting planting date, changing crop varieties, switching crops, expanding area, changing irrigation, diversifying income and crops, mixed crop livestock farming systems, and migrating etc. [Burke and Lobell (2010); Bradshaw, *et al.* (2004); Kurukulasuriya and Mendelsohn (2006); Nhemachena and Hassan (2007)]. The findings of some of the empirical studies suggest that household characteristics, household resource endowments, access to information and finances influence the probability of adaptation strategies [Maddison (2007); Nhemachena and Hassan (2008)].

There is no dearth of literature that links the performance of agriculture with the climate change using variant methodologies. However, there is paucity of empirical work that documents the link between farm households' food security and adaptation strategies to climate change. Majority of the studies like Maddison (2007), Nhemachena and Hassan (2007), Hassan and Nhemachena (2008), Yesuf, *et al.* (2008), Seo and Mendelsohn (2008), Gbetibouo (2009), Deressa, *et al.* (2009), Debalke (2011), Nabkolo, *et al.* (2012), Legesse, *et al.* (2013), Kurukulasuriya and Mendelsohn (2008), Di Falco (2014) dealt with adaptations and their effects on agriculture and food productivity in Africa. Some work, like Esham and Garforth (2013) has however been done on Asia. Two studies are found analysing the relationship between adaptations and food security:

Di Falco, *et al.* (2011) examined the effects of adaptations to climate change on wheat productivity and its implications for food security in Ethiopia; and Demeke, *et al.* (2011) analysed the impact of rainfall shocks on food security and vulnerability of rural households in Ethiopia. None of these studies looked at how the adaptations to climate change directly influence the rural households' food security—which is not simply food supply/production. A recent study by Pangapanga, *et al.* (2012) has however tried to examine the impacts of droughts and floods adaptations on household crop production and food security in Malawi. This study assumes that a household is considered to be food insecure, if food grains 'availability' per person per year is less than 300kgs. As such the study ignores the other components of food security as well as the endogeneity of the adaptations of agriculture to climate change.

The present study fills this gap by syndicating Demeke, *et al.* (2011) and Di Falco, *et al.* (2011) approaches and apply Treatment Effects approach to evaluate the impact of adaptations on household food security. This approach involves estimating three equations simultaneously: a selection/treatment equation involving a dichotomous adaptation variable as a dependent, and two outcome equations where a household Food Security Index (FSI) is considered as dependent variable. Following Demeke, *et al.* (2011), (FSI) is generated, comprising various factors such as size of landholdings, production of food grains, food grains received as assistance, improved food storage capacity, per capita food consumption, farm as well as household assets and access to toilet facility, by applying PCA. The farm-level adaptation strategies identified include adjusting sowing time, inputs intensification, water and soil conservation and adopting longer and/or shorter duration varieties (Details in Section 4.1) .

The remaining paper is organised as follows. Section 2 provides the details of the data, methodological framework and empirical model. Section 3 presents the empirical model and estimation strategy followed by section 4 that describes the construction of variables used in the study. The results and discussion is given in section 5. The last section concludes the paper.

## 2. DATA AND METHODOLOGICAL FRAMEWORK

### 2.1. Data

We used the data from 'Climate Change Impact Survey [CCIS (2013)]' conducted by the Pakistan Institute of Development Economics (PIDE), Islamabad, sponsored by the International Development Research Centre (IDRC). This survey was conducted for the cropping year 2012-13. Survey schedules were developed to record the household and village level information. For this three well-designed questionnaires—one each for male<sup>2</sup> and female<sup>3</sup> respondents of the same household, and one village-questionnaire was

<sup>2</sup>The questionnaire for males encompasses information regarding household profile and farm characteristics; cropping patterns; crop production practices; and climate change related questions covering farmers' perceptions about climate change and its impact on crop production, and adaptations and coping strategies adopted by them to mitigate the adverse effects of climate change.

<sup>3</sup>The survey schedule for females covers information regarding family size and composition; education and employment status of family members; extent of participation of each (working-age) member in farm and non-farm activities and income earned; information on housing and sanitation; ownership of durables; quantity of various items consumed and expenditures involved; livestock ownership and milk production; and climate related questions including their perception about climate change and its impact on human lives and coping strategies adopted.

used to obtain village profile.<sup>4</sup> Before the implementation of the survey, intensive training was imparted to enumerators and supervisors. The questionnaires were revised in the light of discussions, comments and suggestions made during training sessions as well as keeping in view the feedback received after pretesting.

The universe for this study comprises agricultural households from rural areas of Punjab, Sindh and KP provinces. The agriculture practices and cropping patterns differ within provincial boundaries, depending on variations in agro climatic conditions in different parts of each province. Each province has distinct agro climatic zones<sup>5</sup> and each of these zones is more or less homogeneous in terms of agricultural practices, mix of crops grown, and in other agricultural respects. The agro climatic zones within a province have been treated as strata for subsequent selection of districts/villages/ households for the survey.

The sample size of any survey depends upon the size of population being studied, variability of characteristics in the population being measured, desired precision level in the estimates and the financial resources available to conduct the survey. Most of the household characteristics to be measured and information to be collected in this Survey have already been covered in a number of other household surveys carried out in the past<sup>6</sup>. Based on the past experience, a sample size of 3432 farm households has been determined in such a way that the district/agro climatic zone/provincial level estimates could be developed.

In all 16 districts—8 from Punjab and 4 from each of Sindh and KP provinces were selected in such a way that all agro climatic zones in each province are duly represented in the sample. From each sampled district, 12 villages were selected randomly and from each selected village, 18 farm households were interviewed; thus giving a total sample of over 200 farm households in each district—a sample size capable of producing reliable estimates even at district level.<sup>7</sup> The sample selected represents various categories of farms—by size and tenancy, cropping patterns, and variations in agro climatic conditions/issues. In order to save the financial and time costs, instead of selecting sample farm household in selected districts by listing down all the farm households in the districts and then selecting 200 farm households through random procedure, twelve villages were selected randomly in each of the sampled district and then 18 farm households were selected from each village.

In total, 3298 farm households, out of sample size of 3432, were selected for the analysis of this study. These households were found growing any or all of major food

<sup>4</sup>Contains information like geographical area of the village and cultivated land, composition of farms by size and tenancy, population, village infrastructure, over time change in village level cropping patterns, input prices and village standard regarding usage rates of selected input/services, land values and rents by status of land fertility, and common diseases in the area etc.

<sup>5</sup>Punjab includes Rice-Wheat, Cotton-Wheat, Mixed, Barani (rain-fed), and Partial Barani; Sindh includes Rice-Wheat, Cotton-Wheat, and Mixed; and KP includes Wheat-Mix, and Maize-Wheat.

<sup>6</sup>Including Pakistan Social and Living Standard Measurement (PSLM) Survey and Pakistan Panel Rural Household Surveys etc. The Panel Household survey-rural part produced reliable estimates with a sample size less of than 3000 households.

<sup>7</sup>In district level surveys such as PSLM and Multiple Indicator Cluster Survey (MICS) respectively conducted by Pakistan Bureau of Statistics (PBS) and provincial governments, a minimum sample of 200 households has been adopted. These surveys covered urban as well as rural populations within a district whereas this study covers only rural agricultural households.

crops—wheat, rice, and maize. The village level climate related variables—temperature and precipitation were generated through ECHAM5 GCM using Grid Analysis and Display System (GrADS) software using village level observations of latitude and longitude recorded by the survey team through GPS.

## 2.2. Conceptual Framework

History of the concept of food security goes back to the Universal Declaration of Human Rights (UDHR) in 1948, when the right to food was acknowledged as an essential component of human wellbeing. It was the world food crisis of 1972–1974, when the issue of food (in) security attracted colossal attention of the researchers and policy makers. The concept continued to develop and refined overtime and the scholars advanced numerous definitions and voluminous indicators of food security to bring more clarity in the subject [Ahmad and Farooq (2010)]. The most accepted definition of food security is that it is a situation “when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life” [FAO (1996)]. This definition imbeds five fundamental aspects including availability, access, stability, nutritional status and preferences of food. These components are influenced by physical, economic, political and other conditions under which the communities live in. The conditions even vary within households, and are often destabilised by climate shocks and other natural disasters and conflicts.

The first aspect, ‘availability’, refers to sufficient quantities of quality/nutritious food available to every individual/household in a given country through any means—production, imports, or food aid etc. The second component ‘access’ involves both physical access—where food is available, and economic access—entitlement to food [Sen (1982)]. The former involves efficient market infrastructure to have access of people at low cost. The entitlement can be ensured either by own production or having food buying capacity or having access/right to other sources of getting desired food [Timmer (2000); Staaz, *et al.* (2009)]. Only the availability of sufficient food at country/local level does not guarantee that all people are food secure—since low incomes, lack of roads and infrastructure could limit access to desired quantities of quality food [Ahmad and Farooq (2010)]. Therefore, both availability and access parts of food security are inseparably inter-linked [Pinstrup-Andersen (2009)].

The third component is ‘stability’ that concerns with reliable supply of nutritious food at the national/household/individuals levels. Besides availability of food, stability requires better management of domestic production, food markets integration, and rational use of buffer stocks and trade [FAO (2002)]. The definition of food security also alludes to a fourth element which is safe and nutritious food that is required for an active and healthy life. Therefore, the human body has to effectively utilise the available nutrients in the food consumed [Staaz, *et al.* (2009)]. This aspect is influenced directly by food preparation and health conditions of an individual—influenced by sanitation, clean drinking water and proper food storage, processing and basic nutrition. The last element of the food security is the ‘preferences’ for food that relates to the social and religious norms. People with equal access to food but having different food preferences based on religion, society norms, taste etc. could reveal totally a different

nature of food security. Therefore, the foods are to be socially and culturally acceptable and consistent with religious and ethical values [Pinstrup-Andersen (2009)]. The fifth component of food security has not been taken up in the analysis because of the data limitations.

Food security is a complex matter and is not directly observable [Demeke, *et al.* (2011)]. However, its multiple dimensions can be captured using various indicators. Given the data set, we will be able to capture first four elements—availability, access stability and utilisation. Following Qureshi (2007) and Demeke, *et al.* (2011), we identified various indicators of food security including size of operational landholding, production of major food crops—wheat, rice, and maize, food crops diversification—vegetables, pulses and fruits, food grains received as assistance, food storage facility, per capita food consumption, farm as well as household assets, and access to toilets. The size of operational land holding, production of major food crops on the farm, per capita consumption of food and farm household assets represent two important elements that are availability and access to food. Having food storage facility indicates stability in the supply of food at the household level—also shows the capacity of the household to cope with any unanticipated food crisis like situation [Demeke, *et al.* (2011); Haddad, *et al.* (1994)]. Farm diversification towards fruits, vegetables and pulses is suggestive of dietary diversity which also reflects nutritional quality of the food consumed by the households [Demeke, *et al.* (2011)]. The type of toilet facility implies the level of hygiene and sanitary situation of the household, which is associated with health status of its members. Using these food security indicators, we construct an aggregate Food Security Index (FSI) using a PCA—the detailed methodology is given in the next section.

The next question is that what influences farm level household food security. The previous empirical literature indicates that the likelihood of food security is influenced by household level conditions (H) including education, health, harvest, household assets, expenses, regional conditions (D)—infrastructure, markets, enabling institutions, and climate, and adaptation strategies to moderate the impacts of climate change (A). Keeping in view the determinants, the empirical food security model can be written:

$$FSI=f(H, D, M) \quad \dots \quad (1)$$

Where FSI is food security index, H represents vector of household characteristics, D denotes the vector of regional variables—dummy variables (bivariate) will be generated to represent a particular region/cropping system/climatic zone, and M denotes the vector of adaptation strategies adapted at the farm.

As discussed earlier, the climate change poses significant threats to the agriculture sector and thus food security. The adaptation to climate change is of therefore fundamental importance in moderating these impacts. For devising appropriate adaptation policies and effective development projects, it is important to understand the role of the different factors that influence farmers' adaptation [Di Falco (2014); Gebrehiwot and van der Veen (2013)]. There are different ways to adapting to climate change in agriculture [Deressa, *et al.* (2011)]. These adaptations are affected by different factors [Nhemachena and Hassan (2007); Deressa, *et al.* (2011)]. Studies have shown that factors like education of the head of household, household size, gender of the head, livestock ownership, use of agricultural extension services, access to agricultural credit, climate

indicators—temperature and precipitation, farm assets, information about technology/adaptations, etc. affect adaptation to climate change [Deressa, *et al.* (2011); Hassan and Nhemachena (2008); Gebrehiwot and van der Veen (2013)].

### 2.3. Construction of Food Security Index (FSI)

Food security index is generated using nine indicators including size of operational landholding, production of major food crops—wheat, rice, and maize, food crops diversification—vegetables, pulses and fruits, food grains received as assistance, food storage facility, per capita food consumption, farm as well as household assets and access to toilet facility (see Table 1). Following Qureshi (2007), FSI is constructed by applying PCA.<sup>8</sup> The PCA is a statistical procedure that linearly transforms the selected indicator

Table 1

#### *Indicators of Food Security*

| Indicators of Food Security                                  | Units                |
|--|----------------------|
| Operational land   | Acres                |
| Production of major food crops i.e. wheat, rice, and maize   | Mounds (40kgs)       |
| Food crops diversification (i.e. vegetables, pulses, fruits) | Dummy variable (0/1) |
| Having improved food storage capacity                        | Dummy variable (0/1) |
| Attaining any food assistance during food shortage/shock     | Dummy variable (0/1) |
| Per capita food consumption                                  | Kgs                  |
| Farm assets (i.e. tractors, threshers, plough etc.)          | Dummy variable (0/1) |
| Domestic assets (i.e. fridge, TV, motorcycle, etc.)          | Dummy variable (0/1) |
| Does household has toilet facility                           | Dummy variable (0/1) |

*Source of Data:* Climate Change Impact Survey [CCIS (2013)].

variables of food security into smaller components that account for most of the variation in the original indicators [Dunteman (1994); Demeke, *et al.* (2011)]. Assuming there are  $n$  indicators/variables which are likely to be correlated ( $X_1, X_2, X_3, \dots, X_n$ ). The PCA technique has the ability to limit the indicators to only those, which capture the maximum variation and also has the advantage of creating uncorrelated components whereby each component is a linear weighted combination of the initial variables [Demeke, *et al.* (2011)]. This can be written as:

$$PC_1 = a_{11}X_1 + a_{12}X_2 + a_{13}X_3 + \dots + a_{1n}X_n \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

$$PC_m = a_{m1}X_1 + a_{m2}X_2 + a_{m3}X_3 + \dots + a_{mn}X_n$$

where  $a_{mn}$  represents the weight for the  $m$ th principal component and the  $n$ th variable ( $X_n$ ). The PCA will result into a series of components with the first component explaining the largest variance in the data and each of the following components explains additional but smaller proportion of the variance in the original variables—subject to the

<sup>8</sup> Kabubo-Mariara, *et al.* (2011) suggested Multiple Correspondence Analysis (MCA) to generate asset-based poverty in the case of dummy or categorical variables, but, most of the existing literature [Qureshi (2007); Dasgupta and Baschiery (2010); Demeke, *et al.* (2011)] has also used PCA to combine dummy and continuous variables. Therefore, this study uses PCA to generate food security index.

constraint that sum of the squared weights ( $a_1^2 + a_2^2 + a_3^2 + \dots + a_p^2$ ) is equal to one [Demeke, *et al.* (2011)]. Once the components of the PCA are identified, the Food Security Index (FCA) can be derived for each household as follows:

$$FSI_j = \sum F_i [(X_{ji} - X_i) / S_i]$$

Where  $FSI_j$  is the Food Security Index that follows a normal distribution with a mean of 0 and a standard deviation of 1,  $F_i$  is the weight for the  $i$ th variable in the PCA model.  $X_{ji}$  is the  $j$ th household's value for the  $i$ th variable, and  $X_i$  and  $S_i$  are the mean and standard deviations of the  $i$ th variable.

### 3. ECONOMETRIC MODEL AND ESTIMATION STRATEGY

#### 3.1. Methodological Framework

There is no dearth of empirical literature that analyses the determinants of adaptations to climate change including Maddison (2007), Gbetibouo (2009), Deressa, *et al.* (2009), Debalke (2011), Ngigi, *et al.* (2012), Legesse, *et al.* (2013), Esham and Garforth (2013), Sanga, *et al.* (2013). Kurukulasuriya and Mendelsohn (2008); Hassan and Nhemachena (2008); Mary and Majule (2009); Deressa and Hassan (2010); Babatunde and Qaim (2010); Nhemachena, *et al.* (2014), Apata, *et al.* (2010), Afangideh, *et al.* (2012), Kansime, *et al.* (2014), Gebrehiwot and van der Veen (2013) and Balew, *et al.* (2014). The estimation techniques used by these studies are also diverse including instrumental variable approach, conventional Heckman two step selection model, bivariate and multinomial Logit/Probit models.

Various published studies are found on analysing the impact of adaption of new technologies on food productivity and food security. However, the very recent examples include Di Falco, *et al.* (2011), Demeke, *et al.* (2011) and Shiferaw, *et al.* (2014). Di Falco, *et al.* (2011) examined the impact of adaptations on wheat productivity and its consequent implications for food security. This study applied two step endogenous regression technique and found that adaptations to climate positively and statistically significantly influenced wheat productivity that in turn would help achieve household food security. Demeke, *et al.* (2011) using farm household level panel data from rural Ethiopia examined the impact of rainfall shocks on household's food security. This study constructed a time variant Food Security Index (FSI) using various combinations of food security indicators and applying PCA. Based on FSI, the households were classified into relative food security groups and their determinants were assessed using fixed effects instrumental variable regression procedure. The paper highlighted the critical role of rainfall variability in households' food security among some other factors. Shiferaw, *et al.* (2014) investigated the impact of adoption of improved wheat varieties on food security in Ethiopia. The study used endogenous switching regression treatment effect model, binary and general propensity score matching approaches and found consistent results across models indicating that adaption of modern varieties increased food security. The common element in all of these studies and the present study is the farm household survey data to achieve a major objective of evaluating the impact of climate change/adaptation to climate change on farm household food security.

Evaluating just impact requires that the exposure to adaptation strategies (treatment) should be randomly assigned and the influence of observable and unobservable characteristics between the treatment and control groups is the same which would lead to differential impact attributable entirely to the treatment [Shiferaw, *et al.* (2014)]. The data used in the present study to analyse the impact of adaptation strategies to climate change (treatment) on food security relates to farm level households survey where the treatment groups are not randomly assigned. In the present study, we are interested in evaluating the impact of treatment on the outcome variable—household food security. The objective here, therefore, is to find three measurements. First, the Average Treatment Effect (ATE), Average Treatment Effect on the Treated (ATET), and Potential Outcome Means (POMs). In binary-treatment ( $t$ ) case, where  $t=1$  when an individual  $i$  gets the treatment otherwise  $t=0$ , two respective potential outcomes for an individual can be denoted as  $y_{1i}$  and  $y_{0i}$ .  $y_{1i}$  and  $y_{0i}$  are actually the realisations of the random variables— $y_1$  and  $y_0$ , respectively. Given these notations, the parameters of interest can be defined as follows.

- (1) ATE is the average effect of treatment in the population—which is expressed as  $ATE = E(y_{1i} - y_{0i})$ ; where  $E[.]$  stand for expected value,  $y_1$  is the outcome (the level of food security index) if the strategy adopted and  $y_0$  is the outcome for the same household in the absence of adaptation.
- (2) ATET is the average treatment effects of those who actually received the treatment ( $t=1$ ) and is written as  $ATET = E(y_{1i} - y_{0i} | t=1)$ .
- (3)  $POM_t$  is the average potential outcome for the treatment level  $t$  and is expressed as  $POM_t = E(y_t)$ .

### 3.2. Empirical Techniques and Estimation Strategy

The technique used in the analysis of the present study forms part of the counterfactual framework developed by Rubin (1974) which was pursued to evaluate causation in both observational and experimental studies [cited in Henderson, *et al.* (2014)]. The major problem of causal inference is that how to know about the counterfactual—what would have happened had they been not treated, and what would have happened if non-treated is exposed to the treatment. The statistical method named ‘treatment effects’ can be used to overcome this problem. We get the doubly-robust inverse-probability-weighted regression-adjusted results (IPWRA), that combines weighting and a regression estimator [Imbens and Wooldridge (2009); cited in Henderson, *et al.* (2014)]. The IPWRA overcomes the fundamental issue of causal inference by identifying the effect of a particular treatment—adaptation strategy, by directly finding the actual value of the treatment and a counterfactual measure.

In order to implement the ‘treatment effects’ model using inverse-probability weighted regression adjusted (IPWRA) technique, we stipulate the potential outcome model that specifies the observed outcome variable  $y_i$  is  $y_{0i}$  when  $t=0$ , and  $y_{1i}$  when  $t=1$ . Mathematically, we can express this as  $y_i = (1-t) y_{0i} + t y_{1i}$ . The outcome functions—outcome model, conditional on adaptation, can be written as

$$y_0 = x\beta_0 + \varepsilon_{0i} \quad \text{if } t = 0 \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$y_1 = x\beta_1 + \varepsilon_{1i} \quad \text{if } t = 1 \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where  $y_1$  and  $y_0$  are outcome variables representing Food Security Index (FSI) for adapters and non-adapters, respectively;  $x$  represents a vector of covariates, and  $\beta$  represents the parameters to be estimated. The  $\varepsilon_1$  and  $\varepsilon_0$  are error terms that are not related to  $x$ . The potential outcome model proposed above separates each potential outcome into a predictable component,  $x\beta_i$ , and an unobservable  $\varepsilon_i$ .

The treatment assignment process is written as

$$t = \begin{cases} 1, & \text{if } z\gamma + \eta > 0 \\ 0 & \text{otherwise} \end{cases} \quad \dots \quad (3)$$

where  $\gamma$  is a vector of unknown coefficients to be estimated, and  $z$  represents a vector of covariates. The  $\eta$  is an unobservable error term that is not related to either  $x$  or  $z$ . The treatment assignment process is separated into a predictable component of  $z_i \gamma$  and an unobservable error term  $\eta$ .

It is important to state here that  $y_i$ ,  $t_i$ ,  $z_i$  and  $x_i$  are the variables which are observed, while the data do not provide information on both  $y_{0i}$  and  $y_{1i}$  for any given  $i$ , while the model for  $t$  determines how the data on  $y_0$  and  $y_1$  are missing. To estimate the model given in Equations 1 and 2, we used '*teffects ipwra*' command in STATA 13. This command provides *doubly robust estimators*. These estimators have remarkable property that though the estimation involves two models, only one of the two requires to be specified correctly in order to get correct estimates from the whole system of equations. This technique requires certain assumptions, such as [Bördös, Csillag, and Scharle (n.d.)]:

- (1) Unconfoundedness criterion, which indicates that the potential outcomes of the treated and untreated do not depend on treatment if conditioned on the covariates. It implies that unobserved shocks that affect, whether a subject is treated, do not affect the potential outcomes, and unobserved shocks that affect potential outcome have no impact on treatment. This is a reasonable assumption given our objective and the nature of study. The objective variable, i.e. Food Security Index (FSI), is constructed using nine household level indicators—food security is not simply the household food production or availability which forms only the one constituent indicator of multidimensional food security. This assumption facilitates estimation technique that combines regression adjustment (RA) and inverse probability-weighting (IPW) methods. The data only reveal information about  $E(y_0|x, z, t = 0)$  and  $E(y_1|x, z, t = 1)$ , but we are interested in an average of  $E(y_0|x, z)$  and  $E(y_1|x, z)$ , where  $x$  represents the outcome covariates and  $z$  the treatment-assignment covariates. This assumption allows us to estimate  $E(y_0|x, z)$  and  $E(y_1|x, z)$  directly from the observations for which  $E(y_0|x, z, t=0)$  and  $E(y_1|x, z, t=1)$ , respectively.
- (2) The overlap assumption states that each individual has a positive probability of receiving each treatment level—we can match treated subjects with similar non-treated subjects to have accurate estimate of the counterfactual.
- (3) The independent and identically distributed, *iid*, sampling assumption—that the potential outcome and the treatment status of each individual are unrelated to the potential outcomes and treatment statuses of all other individuals in the population.

To estimate the potential outcome model presented in Equations 1 to 3, the first assumption imposes a set restrictions on the covariance matrix of the error terms— $\varepsilon_0$ ,  $\varepsilon_1$  and  $\eta$ . Assume having normal distribution:

$$\begin{pmatrix} \varepsilon_0 \\ \varepsilon_1 \\ \eta \end{pmatrix} \sim N \left\{ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_0^2 & \rho_{01}\sigma_0\sigma_1 & \rho_{\eta^0}\sigma_0 \\ \rho_{01}\sigma_0\sigma_1 & \sigma_1^2 & \rho_{\eta^1}\sigma_1 \\ \rho_{\eta^0}\sigma_0 & \rho_{\eta^1}\sigma_1 & 1 \end{pmatrix} \right\} \dots \dots \dots \quad (4)$$

where  $\sigma_0$  and  $\sigma_1$  are standard deviations of  $\varepsilon_0$  and  $\varepsilon_1$ , respectively,  $\rho_{01}$  is the correlation between  $\varepsilon_0$  and  $\varepsilon_1$ ,  $\rho_{\eta^0}$  is the correlation between  $\eta$  and  $\varepsilon_0$  and  $\rho_{\eta^1}$  is the correlation between  $\eta$  and  $\varepsilon_1$ . In the normally distributed latent variable specification of a binary dependent variable, variance of  $\eta$  is normalized to 1. Since the CI assumption specifies that  $\rho_{\eta^0} = \rho_{\eta^1} = 0$ , the expression in 4 can be written as:

$$\begin{pmatrix} \varepsilon_0 \\ \varepsilon_1 \\ \eta \end{pmatrix} \sim N \left\{ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_0^2 & \rho_{01}\sigma_0\sigma_1 & 0 \\ \rho_{01}\sigma_0\sigma_1 & \sigma_1^2 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right\}$$

The above covariance matrix highlights the fact that unobserved shocks influence treatment assignment expression but not the potential outcomes.

The *t effects* can yield various estimators: estimators based on outcome variables; based on treatment assignment; based on both treatment assignment and outcome variables; that match on covariates; and that match on predicted probabilities of treatment. We prefer to use combination of probability of treatment and outcome models, because of its advantage of yielding consistent estimates even if one of the two is correctly specified—the property called doubly-robust. What this approach does is that it uses the Inverse Probability Weighted Regression Adjustment (IPWRA) estimators combine models for outcome and treatment status. This methodology, the inverse-IPWRA uses the inverse of the predicted probabilities obtained from the propensity score regression as weights when performing regression adjustment. The IPWRA estimators use a three-step approach to estimating treatment effects:

- (a) Estimates the parameters of the treatment model and calculates the inverse-probability weights;
- (b) Uses the estimated inverse-probability weights to fit weighted regression models of the outcome for each treatment level and obtains the treatment-specific predicted outcomes for each subject;
- (c) Computes the means of the treatment-specific predicted outcomes that yield the estimates of the ATEs and ATETs.

**4. DESCRIPTION OF VARIABLES USED IN THE STUDY**

**4.1. Adaptive Strategies**

This study focuses on four major food crops--wheat, basmati rice, coarse rice and maize. Adaptation strategies have been categorised into four groups: (1) changes in sowing time; (2) input intensification; (3) water and soil conservation; and (4) changes in

varieties. Changes in sowing time strategy covers adaptation strategies of those farmers who are cultivating the above mentioned food crops. Input intensification comprises more usage of fertiliser and seed rates. Water and soil conservation covers usage of irrigation, introduced intercropping, changed crop rotation, laser land levelling, tillage practices, liming, manuring, used water harvesting technique. The varietal change consists of planting drought tolerant varieties, planting shorter and longer cycle varieties, planting flood tolerant varieties, etc. Since the farmers prefer multiple strategies to deal with the impacts of climatic and non-climatic stresses, we used the combination of these strategies by making these combinations mutually exclusive. There are 15 combinations in total and all are mutually exclusive and the details are given in Table 2.

Table 2

*Farm Level Adaptation Strategies to Climate Change (All Mutually Exclusive)*

| S. No.                            | Strategy                                    | Description  |
|-----------------------------------|---|--|
| <b>Single Strategy</b>            |   |  |
| 1                                 | C1 Changing sowing time                     | C1 = 1 if the farm household only changed the timings of sowing as adaptation strategy; 0 otherwise  |
| 2                                 | C2 Inputs intensification—seed & fertiliser | C2 = 1 if the farm household intensified use of seed rate and fertiliser as adaptation strategy; 0 otherwise   |
| 3                                 | C3 Water and soil conservation strategies   | C3 = 1 if the farm household only adapted water and soil conservation strategies as adaptation strategy; 0 otherwise   |
| 4                                 | C4 Changes in varieties                     | C4 = 1 farm household changed crop only as strategy; 0 otherwise   |
| <b>Combinations of Strategies</b> |   |  |
| 5                                 | C14   | C14 = 1 if the farm household only adapted changing wheat varieties and delayed/early sowing as adaptation strategies; 0 otherwise                                     |
| 6                                 | C 24  | C24 = 1 if the farm household only adapted changed varieties and inputs use as strategies, 0 otherwise   |
| 7                                 | C34   | C34 = 1 if the farm household changed only adapted varieties and water and soil conservation as strategies; 0 otherwise  |
| 8                                 | C12   | C12 = 1 if the farm household only adapted delayed/early sowing and changed inputs use as strategies; 0 otherwise  |
| 9                                 | C13   | C13 = 1 if the farm household delayed/early sowing and water and soil conservation strategies as adaptation strategies; 0 otherwise                                    |
| 10                                | C23   | C23 = 1 if the farm household only adapted changed inputs use and water and soil conservation strategies as strategies, 0 otherwise                                    |
| 11                                | C124  | C124 = 1 if the farm household only adapted changing wheat varieties, delayed/early sowing and changed inputs use as strategies; 0 otherwise                           |
| 12                                | C134  | C134 = 1 if the farm household only adapted changing varieties, delayed/early sowing and water and soil conservation strategies as strategies; 0 otherwise             |
| 13                                | C234  | C234 = 1 if the farm household only adapted changing varieties, changed inputs use and water and soil conservation strategies as adaptation strategies; 0 otherwise    |
| 14                                | C123  | C123 = 1 if the farm household only adapted change in sowing, changed inputs use and water and soil conservation strategies as strategies; 0 otherwise                 |
| 15                                | C1234                                       | C1234 = 1 if the farm household adapted changing varieties, change in sowing, changed inputs use and water and soil conservation strategies as strategies; 0 otherwise |

#### 4.2. Determinants of Adaptations and Food Security

*Socio-economic household characteristics:* The literature suggests that various socio-economic household characteristics play crucial role in adapting to climate change. The first set of variables includes *age*, *education* and *gender* of the household head. No female head of the farming households were found in the data. However, the educational status of female responsible for household chores is considered to see its impact on food security. All heads of households are male and the education of heads of households is reported in number of years completed.

*Livestock Ownership:* It is considered to be an important variable that influences the adaptation capacity of the farmers in general and small farmers in particular—since it serves as ready cash. A variety of animals is therefore always owned by the farmers. Therefore, the number of animals has been converted into cow equivalents (see Table 3).

Table 3

##### *Cow Equivalent Animal Units*

| Animal Type    | Age and Sex Composition | Weight |
|----------------|-------------------------|--------|
| Buffaloes      | Buffaloes in milk       | 1.50   |
|                | Buffaloes (dry)         | 1.20   |
|                | Heifer Buffaloes        | 0.60   |
|                | Young stock (Buffaloes) | 0.30   |
|                | Male Buffaloes          | 1.20   |
| Cow            | Milking Cow             | 1.00   |
|                | Breeding Cow            | 1.00   |
|                | Heifer Cow              | 0.40   |
|                | Young stock Cow         | 0.25   |
|                | Dry Cow                 | 0.80   |
|                | Bullocks                | 1.20   |
| Goat and Sheep |                         | 0.25   |
| Camel          |                         | 1.50   |
| Horses         |                         | 1.00   |
| Donkeys        |                         | 0.50   |

*Access to Credit Market:* It is another determinant considered to be impacting the adaptive capacity positively; particularly for those farm households that have poor resources to mobilise in case of any shock. This variable is categorised in two groups—formal sources of borrowing including banks and other government or non-government organisations and non-formal sources of borrowing including friends, relatives, and village dealers, traders etc.

*Agricultural extension:* The major source of formal technical advice and information about the technology at the government level has been the department of agricultural extension. The literature suggest that access to information and guidance regarding adaptation strategies through the department of agricultural extension does play a significant role in adapting agriculture to climate change to moderate its impacts. This variable takes a value of 1, if a farmer received any information/guidance about agricultural practices or technologies; otherwise zero is assigned.

*Household's savings:* Household savings and management is another variable that is expected to influence adaptation to climate shocks positively. Household savings include seed stocks kept for next season and other personal savings etc. This again takes values of zero or 1—takes value of 1, if a household consumed up any or all types of savings, otherwise zero.

*Food expenditure management:* Various households resort to reducing expenditures on food as a coping strategy in case of any shock. Reduction in food expenditure could be in the form of buying less expensive foods, reduced proportions of meals by adult women, reduced proportions of meals by children, and reduced proportions of meals by elderly, etc. This is again a binary variable: takes a value of 1 when any or all of these strategies is adopted by the household, otherwise zero.

*Crop diversification:* Diversification towards growing a number of crops is another important coping strategy that has potential of reducing food insecurity and provides greater financial stability and flexibility. The variable is introduced as a dummy—taking value of 1 for growing more number of crops.

*Operational holding:* This comprises total area of the farm under cultivation net of rented out and rented in and farmers are categorised into three major group: marginal farmers—cultivate up to 6.1 acres of land; small farmers—possess land greater than 6.1 to 12.5 acres; and the large farmers operating on above 12.5 acres of land. This study uses two variables—marginal and medium farmers and large farm category is considered as a reference.

*Social index:* It represents a social structure which is made up of a set of social actors—individuals or organisations. The individuals/families get help/assistance of each other in various activities whenever the families/individuals face shock or any urgency. Examples of such activities include land preparation, planting crops, harvesting, sharing farm implements, borrowing seeds, green/dry fodder, food grains, look after livestock, etc. Using these indicators and applying PCA, we constructed a social networking index.

*Household infrastructure:* Two dummies are used to capture household infrastructure: 1) does the household live in a *pakka* or *kacha* house? A dummy variable is generated—where *pakka* house is assigned value of 1 and the *kacha* 0; and 2) household enjoys the facility of electricity or not—again 1/0 for yes/no observations.

*Off-farm income opportunities hours:* The availability of time is an important factor affecting technology adoption [Bonabana-Wabbi (2002)]. The impact could be positive or negative on the adoption. The participation heavily draws on the leisure time farmer that may hinder adoption. Having the time to earn some extra resources without affecting the farming activities, participation in non-farm activities can promote the adaptations.

*Climate change variables:* Farm level adaptations basically are in response to climate change. To capture the influence of long-term changes in climate and short-term weather shocks, this study uses 10 years' average temperature and precipitation normals for *kharif* (summer) and *rabi* (winter) seasons representing climate change, and respective seasonal deviations of survey year's temperature and precipitation from long-term means (10 years) to represent weather shocks.

*Ecological zones:* There are various ecological zones in the country representing different cropping systems. These are cotton-wheat, rice-wheat, and rain-fed areas.

## 5. RESULTS AND DISCUSSION

This study aims to identify the impacts of farmer's adaptations to climate change on food security. In order to achieve this objective, the study applies the *'teffects IPWRA'* command in STAT 13 and estimates the model given in Equations 1 to 3 separately for 7 adaptation strategies which are constructed mutually exclusively (see Table 2). The *'teffects IPWRA'* command/ technique provides the actual measure of the impact and its counterfactual. To investigate the effects of adaptations on food security, Potential Outcome Means (POM), Average Treatment Effect (ATE), and Average Treatment Effect for Treated (ATET) are estimated. These measures imply the impacts of adaptations on food security, and their counterfactual. The determinants of food security and the decision to adapt have also been found by applying the said procedure. The outcome variable is Food Security Index (FSI). The covariates in outcome equations include educational level of male and female decision makers, age of male household head, family size, farm size—small and large dummies, household savings, access to formal and informal credit market, access to non-farm income, food expenditure management, crop diversification, having facility of electricity and *pakka house*, cropping zones dummies—rice-wheat, cotton-wheat, and arid, while mixed cropping zone was taken as base. The treatment equation includes some of the variables used in outcome equations besides various other covariates—like social networking, tenancy status—owner and owner-cum-tenants, agricultural extension, electronic media, and climatic variables—'last 10 years' average' of temperature and precipitation as well as their deviations from survey year's temperature and precipitation for *Kharif* and *Rabi* seasons.

Of the 15 mutually exclusive combinations (Table 2), only 7 combinations are considered to estimate the treatment effects models because of limited number of observations in other cases. The results of 7 of these models are reported in Table 5. Further to this, we will discuss only two of the 7 since the other 5 combinations have very small number of adapters (see last two columns of Table 5). The table shows that only two combinations, C1234 and C234, have significant number of adapters, 1399 and 828 of respective strategy/combination, respectively, while the results from strategy models show either negative impact on the outcomes or their impacts are non-significant.

Table 5

### Calculations of ATE, ATET and Potential Outcomes

| Strategy | POMs      |            | ATE        | ATET       |            | Adapters | Non-adapters |
|----------|-----------|------------|------------|------------|------------|----------|--------------|
|          | POM(0)    | POM(1)     |            | 1 vs 0     | POM(0)     |          |              |
| C1234    | -0.01946* | 0.0258*    | 0.0452***  | 0.0425**   | 0.00001    | 1,399    | 1,903        |
| C234     | -0.0096   | 0.0363**   | 0.0459***  | 0.0403**   | -0.0097    | 828      | 2,474        |
| C134     | -0.0001   | 0.0484     | .0485483   | 0.0682*    | -0.0728    | 50       | 3,252        |
| C124     | 0.0005    | -0.0101*** | -0.1013*** | -0.0226    | -0.1586*** | 93       | 3,209        |
| C123     | 0.00110   | -0.02300   | 0.0242     | -0.01851   | 0.0548     | 152      | 3,150        |
| C23      | 0.0034    | -0.0808*** | -0.0842*** | -0.0561*** | -0.0404    | 169      | 3,133        |
| C34      | 0.0003    | -0.0002    | -0.0004    | 0.0056     | -0.0113    | 153      | 3,149        |

Note: \*\*\*, \*\* and \* indicate the level of significance of the estimates at least at 1 percent, 5 percent and 10 percent level of probabilities.

The results reported in Table 5 suggest that C1234 and C234 combinations of adaptation strategies are advisable to be discussed—since the reliability of the results from other models is questionable due to limited number of observations of adapter households. The difference between these two is only of ‘changing sowing timing’ as adaptation strategy, while the other strategies are the same—input intensification, water and soil conservation, and varietal change. The results given in Table 5 for the C1234 strategy indicate that potential outcome means (POM) for those households which adapted this combination are higher than those of non-adapting households. The measure of POM (1) for adapters is found to be positive (0.0258) and is highly statistically significant whereas POM (0) for non-adapters is negative (−0.01946) and is also statistically significant. These significant differences in POM suggest that the households which are adapting to climate changes are more food secure as compared to those which did not adapt. The ATE is the population average and indicates the difference of outcomes if the whole population adapts to climate and none adapts to climate changes. This measure came out to be 0.0452 having positive sign and is statistically highly significant suggests that the households which adapted to climatic changes are significantly more food secure than those which did not adapt. However, it is to be noted that the farmers are smart and resourceful to adapt to all possible adaptation measures to reduce the impact of climate change on food security. These adaptation strategies include changes in sowing time, input intensification, water and soil conservation, and varietal changes.

The average treatment effect among treated households (ATET) is also measured. This measure specifies that if the adapter households have had not adapted to the climate change then what would have been their outcome condition—the level of food security. If all of the adapter households were to become non-adapters, the average outcome would be 0.00001 which indicates that the adapting households appeared to be better off than non-adapting sample of households even if had they not adapted to climate change they still would have been relatively more food secure than the actual non-adapters in the population. If all adapting subsample households become non-adapters, the ATET (=0.0425) estimate came out to be approximately equal to the ATE (=0.0452). This result highlights the fact that the non-adapter households have significantly lower levels of food security than those which adapted to climate change, while the base point or non-adapters are experiencing the small potential outcome means, i.e. 0.00001, that is also statistically insignificant—may be due to small variation within the sample. Intuitively, it suggests that those farmers who adapted to climate change were already more food secure than that as if they were non-adapters.

The values of ATET, ATE and POMs obtained from model that uses C234 combination of strategies also shows positive and significant impacts on food security implying that the farm households who adapted combination of input intensification, water and soil conservation, and variety change are also more food secure than those who have not adapted to climate change. There is a significant difference between adapters and non-adapters where potential outcome means and ATE are positive and significant for adapters. ATET suggests if treated households became untreated or non-adapters, they would be food insecure. Hence, estimated results are suggestive that combination C234 has also been beneficial for the farm households which adapted it.

It is worth mentioning that all other combinations either have ATE and ATET measures negative or are statically non-significant. Therefore, it can safely be concluded that the farm households resort to adapting multiple strategies to moderate the impact of climate change.

The determinants of food security of adapter and non-adapter households are reported in Table 6. The potential outcome model given in Equations 1 to 3 is estimated using treatment effects technique ‘*teffects*’ applying inverse-probability-weighted-regression-adjustment ‘IPWRA’ command in STATA that combines models for outcome and treatment status. The estimates thus obtained are doubly-robust. The *teffects IPWRA* command estimates endogenous treatment effect model using three equations—two outcome equations one each for adapters and non-adapters, and a treatment or selection equation. The parameter estimates are reported respectively in Tables 6 and 7.

The most of parameter estimates in outcome equations for both strategies—C234 and C1234, are statistically significant and having expected signs. The results of both of these strategies are to a great extent similar in direction of the impact in outcome equations of the non-adapters and adapters. We did not find significant departure in terms of deriving the overall conclusions. The dependent variable in outcome equations is food security index and thus it’s a continuous variable. Therefore, the signs and magnitude of the parameter estimates are important while interpreting the results. The results show that education of the male and female heads, livestock ownership, the structure of household—both bricked and having electricity facility, crops diversification and non-farm income are the factors which raise the food security of farm households and their impacts are statistically significant.

The female education turned out to be more pronounced and thus have important implications from policy point of view. These findings are consistent with the results of Li and Yu (2010) and Aslam and Rasool (2014). In order to reduce food security at the rural farm household level, the priority has to be given to educate the rural masses—in particular the female education is crucial in this regard. Livestock ownership is another important factor which contributes significantly positively to ensure farm household food security—more the number of animals have the household the better is its food security status. It normally acts as a liquid asset and the households can meet their needs immediately by selling animals (small ruminants in particular) and their products (especially the milk).

The farm households which are having bricked houses and have access to electricity connections, are more food secure as compared to those, who do not have access to such facilities. Basically, both of these variables imply that these households are relatively better off than those who live in mud houses and without electricity. Diversification towards growing more number of crops including minor and major crops, fruits, and vegetables, pulses and oilseeds crops implies greater financial flexibility and nutrient diversification. Lin (2011) argues that crop diversification improves the resilience by suppressing pest and disease outbreaks on a single crop under changing climate scenarios, and also acts as buffer against crop failures due to the frequently occurring climatic and extreme events. The provision of incentive both at markets and technological development levels for the major crops hinders promotion of this strategy and encourages mono-cropping system. Therefore, in order to improve food security in

the country crop diversification needs to be encouraged through a balanced economic policy and improved inputs and output markets infrastructure.

The parameter estimates of non-farm income variable are positive and statistically significant in all equations implying a considerable potential in reducing food insecurity at the farm household level by generating off-farm employment opportunities. Pakistan's agriculture is dominated by the very small holdings having poor resources and thus is more vulnerable to climate change. Since agriculture involves a high degree of risk and is extremely vulnerable to a range of climatic and non-climatic stresses, the off-farm income is considered to be an instrument to deal with such risks [Mishra and Chang (2008); Joo and Mishra (2013)]. This result is consistent with the studies done by Mustafa (2014) and Babatunde (2010).

The variables which are significantly negatively associated with the food security levels include age of the head of household, food expenditure management, households having less than 12.5 acres of land—defined as marginal (cultivate <6.25 acres) and small (cultivate >6.25 to ≤12.5 acres). The aged farmers are considered to be more risk averse and hesitate to implement new ideas and innovations which make them less productive under the changing climate. The 'reduction of expenditure on food items as strategy to tackle the weather shocks' has significantly negatively impacted the level of household food security—especially of the non-adopter households to climate change. The results show a very alarming situation of the farm households having less than 12.5 acres of land since they are significantly more food insecure than the medium and large farmers (>12.5 acres of land). Agriculture Census of Pakistan (2010) shows that 89 percent of the farmers cultivate ≤12.5 of land and area under their cultivation is 48 percent of the total, while the remaining 52 percent of land is being cultivated by the only 11 percent of the total farm households. The marginal and small farmers are resource poor, less productive and less efficient. This indicates that financial and technological resources should be well targeted to reduce the food security in the country.

Table 6

*Parameter Estimates of the Outcome Equations*

| Variables                   | C234         |                      | C1234        |                      |
|-----------------------------|--------------|----------------------|--------------|----------------------|
|                             | Non-adapters | Adapter              | Non-adapters | Adapter              |
| Education of female head    | 0.0049*      | 0.0082               | 0.0048*      | 0.0066               |
| Education of male head      | 0.0049***    | 0.0115****           | 0.0048***    | 0.0114***            |
| Age of farmer               | -0.0012*     | -0.0024**            | -0.0012*     | -0.0026**            |
| Marginal farmer             | -0.7465***   | -0.8697***           | -0.7472***   | -0.8693***           |
| Small farmers               | -0.5280***   | -0.6369***           | -0.5292***   | -0.6421***           |
| Livestock ownership         | 0.0255**     | 0.0071 <sup>^^</sup> | 0.0254**     | 0.0064 <sup>^</sup>  |
| Household savings           | 0.0235       | 0.0045               | 0.0237       | 0.0069               |
| Family size                 | -0.0005      | 0.0069 <sup>^^</sup> | -0.0008      | 0.0062 <sup>^^</sup> |
| Formal credit               | -0.0191      | 0.1770***            | -0.0188      | 0.1947***            |
| Informal credit             | -0.0463      | 0.0541               | -0.0465      | 0.0575               |
| Electricity                 | 0.0896***    | 0.1131***            | 0.0903***    | 0.0879**             |
| Pakka house                 | 0.1061***    | 0.1186***            | 0.1054***    | 0.1167***            |
| Food expenditure management | -0.0674*     | -0.0057              | -0.0669*     | -0.0102              |
| Crop diversification        | 0.1328***    | 0.0679               | 0.1330***    | 0.0624               |
| Non-farm income             | 0.0469**     | 0.0592 <sup>^^</sup> | 0.0436**     | 0.0798**             |
| Cotton-wheat zone           | 0.1699***    | 0.1458***            | 0.1685***    | 0.1601***            |
| Rice-wheat zone             | 0.0838***    | 0.0680**             | 0.0788***    | 0.0885***            |
| Arid-zone                   | -0.0493***   | -0.0654***           | -0.0496***   | -0.0607**            |
| Constant                    | 0.3339***    | 0.3273***            | 0.3379***    | 0.3531***            |

The cropping zones' parameter estimates show that farm households located in cotton-wheat, and rice-wheat systems are significantly more food secure than those of living in mixed cropping system and arid zone. This result however is against our expectations—particularly in the rice-wheat and cotton-wheat systems. These systems are more of mono-cropping systems, while the mixed system has more diversified cropping system. This could be due to the reason that wheat grain contributes about half of the calories in total consumption, and it is the only crop where government intervenes highly by not only fixing prices but also assuring market/procurement. During the last couple of years, wheat prices remained mostly above the international level. Despite surplus production, it remained unaffordable by even the rural poor. Districts included in our sample of mixed zone are normally short of wheat production.

The next question is what determines the adaptation decisions of the farm households. Since the dependent variable is binary, we applied the *logit* model to evaluate the factors determining the farm household decisions. The parameter estimates of adaptation equation are reported in Table 7. The comparison of the results obtained from both the estimated models—combinations C1234 and C234, shows that some of the signs of the parameter estimates turned out to be opposite. Our major aim in this study is to analyse the impact of adaptations to climate change on farm household food security, however, we need to briefly discuss the factors that determine the adaptations so as to derive effective policy implications.

Table 7

*Parameter Estimates of Treatment/Adaptation Equation*

| Variables/Determinants             | C234                | C1234                |
|------------------------------------|---------------------|----------------------|
|                                    | Coefficients        | Coefficients         |
| Education of male head             | 0.0164*             | 0.0164*              |
| Formal credit                      | 0.1981 <sup>^</sup> | 0.1929 <sup>^</sup>  |
| Informal credit                    | 0.1303              | 0.0781               |
| Age of male head                   | 0.0024              | 0.0020               |
| Non-farm income                    | 0.4812***           | 0.4219***            |
| Social index                       | -0.2163***          | -0.2208***           |
| Owner cultivator                   | 0.2278*             | 0.2821**             |
| Owner-cum-tenant                   | 0.1980 <sup>^</sup> | 0.2526*              |
| Agri. extension                    | 0.0612              | 0.1186 <sup>^</sup>  |
| Electronic media                   | -0.5066***          | -0.556***            |
| Precipitation Normal <i>kharif</i> |                     | 0.0060***            |
| Precipitation Normal <i>rabi</i>   |                     | 0.0099***            |
| Temp. Deviation <i>khareef</i>     | 0.7695***           |                      |
| Temp. Deviation <i>rabi</i>        | -0.4423****         |                      |
| Precip. Devition <i>kharif</i>     |                     | -0.0132***           |
| Precip. Devition <i>rabi</i>       |                     | 0.0089 <sup>^^</sup> |
| Cotton-wheat zone                  | -0.1673             | -0.3528***           |
| Rice-wheat zone                    | -1.2558***          | -1.3233***           |
| Arid zone                          | -0.4324***          | -0.4984***           |
| Constant                           | -1.2179             | -1.7866***           |

Note: \*\*\*, \*\*, \*, <sup>^</sup> and <sup>^^</sup> indicate the level of significance at least at 1 percent, 5 percent, 10 percent, 15 percent and 20 percent.

The factors which are more likely to contribute positively—across the models, towards farm level adaptations to climate change include education of the head of household, access to formal credit, non-farm income, owner and owner-cum-tenant cultivators, and access to government's agricultural extension department. Though some of these parameter estimates are statistically non-significant, but the signs do imply the positive influence on adaptations to climate change. The empirical literature on technology adoption shows that these factors play an important role in facilitating farm level adaptation [e.g. Feder, Just, and Zilberman (1985); Daku (2002); and Doss and Morris (2001)]. The signs of the parameter estimates are however consistent across models. The owner and owner-cum-tenant cultivators are likely to be more adaptive to climate changes as compared to sole tenants. The most probable reason could be that the tenants, who do not have the right of ownership, work under constant fear of eviction. They have no incentive to make long term investments in land improvements and technologies/adaptations, and using farm resources more optimally. The farm households who are using electronic media as information source for agricultural practices and weather related issues are less likely to adapt to changes in climate. The reason for this unexpected sign could be that the electronic media though is doing a marvellous job in disseminating the day to day weather conditions, but the farming community gets no information on long term patterns of climate changes to which the farming is supposed to respond. An important implication of this result is that since the threat of climate change is real, it requires effective actions including creating awareness among farming communities.

Regarding the influence of climate change variables on the adaptation to climate, we used average of last 10 years of temperature and precipitation (climate normals) in *Kharif* and *Rabi* seasons, and deviations of survey year's temperature and precipitation from the respective long-term means. We statistically tested the contribution/impacts of climatic variables by controlling the other non-climatic variables by running logit regressions and the test results are reported in Annex 1. The results show that the temperature normals—both in *kharif* and *rabi* seasons, have jointly no influence in both adaptation regressions—C234 and C1234. The precipitation normals—both *kharif* and *rabi*, however have significantly influenced the adaptation in C1234, while these variables had no joint impact on adaptations in C234 strategy. The temperature deviations from long term means significantly impacted adaptation C234, but have shown no influence in C1234 adaptation, while the precipitation deviations from long-term means have shown impact in contrary. It is difficult to make any solid conclusion from the response of the climatic variables to adaptations to climate changes, since the nature of data used in the study which relates to only one cropping year. However, the results of this study are suggestive of the influence of climatic related variables on the adaptations to climate change, which in turn play an important role in assuring food security.

The results of location variables show that the farming households in cotton-wheat, rice-wheat and arid zones are less likely to adapt to changes in climate as compared to mixed zones. The fixed crop rotations are being followed in rice-wheat and cotton-wheat systems having a little flexibility in following diverse adaptations. The farmers in rain-fed areas also face the same situation as of having limited crop choices and diversification.

## 6. SUMMARY AND CONCLUSIONS

The study uses data regarding 3298 food crop growers out of a total sample of 3432 farm household from 16 randomly selected districts of Pakistan for the Climate Impact Survey (CCIS, 2013). This study assesses different adaptation strategies employed by Pakistani farmers in response to climate change; identify various factors that influence adaptation decisions, and determine whether these strategies help to achieve food security for rural farm households.

A household Food Security Index (FSI) comprising various factors<sup>9</sup> is constructed by applying PCA. The identified adaptation strategies have been categorised into four groups namely: changes in sowing time (C1); input intensification (C2); water and soil conservation (C3); and changes in varieties (C4). In total, 15 mutually exclusive combinations were constructed. Out of 15, only 7 combinations have been considered to estimate the treatment effects models because of limited number of observations in other cases. Results of only two of the 7 have been discussed in the paper, as the other 5 combinations have very small number of adapters and the impact measures shown either insignificant results or had opposite signs. These two combinations are C1234 and C234. The first (C1234) combined all the four while the second (C234) combined the last three strategies.

This study used Potential Outcome Treatment Effects Model (POTEM) to evaluate the impact of adaptations on household food security. The estimated measures include Potential Outcome Means (POM), Average Treatment Effect (ATE) and Average Treatment Effect among Treated households (ATET). The results suggest that the households which adapted to climate changes are statistically significantly more food secure as compared to those who did not adapt.

The results from both C234 and C1234 strategies are to a great extent similar in direction and significance of the impact in outcome equations of the non-adapters and adapters. The results show that education of the male and female heads, livestock ownership, the structure of house—both bricked and having electricity facility, crops diversification, and non-farm income are among the factors which raise the food security of farm households and their impacts are statistically significant. The variables which are significantly negatively associated with the food security levels include age of the head of household, food expenditure management, households having less than 12.5 acres of land—defined as marginal (cultivate <6.25 acres) and small (cultivate >6.25 to ≤12.5 acres). Farmers of cotton-wheat, rice-wheat, and rain-fed cropping systems are found to be more food secure as compared to the farmers working in the mixed cropping systems where farm holdings are relatively small and high use of tube-well water adding to salinity of soils.

The determinants of adaptation decisions of the farm households include education of the head of household, access to formal credit, non-farm income, owner and owner-cum-tenant cultivators, and access to government's agricultural extension services. The farm households in which electronic media is used as information source for agricultural practices and weather related issues are less likely to adapt to changes in climate. Though

<sup>9</sup>factors such as size of landholdings, production of food grains, food grains received as assistance, improved food storage capacity, per capita food consumption, farm as well as household assets, and access to toilet facility

the electronic media is doing a marvellous job in disseminating information on day to day weather conditions, but it has failed to provide information on long term patterns of climate changes to which the farming is supposed to respond. The sign of the social networking/farm dependency index also came out to be negative and statistically significant as well. This index includes getting help in land preparation, planting crops, and harvesting along with sharing farm implements, borrowing seeds, green/dry fodder, and food grains; and looking after livestock etc. The index in its true sense is reflective of either one or more of the adverse conditions including shortage of labour, lack of certain skills, scarcity of farm capital, and limited financial resources. Therefore, it negatively affects the outcome of the adaptation decisions.

The results indicate that the temperature normals—both in *kharif* and *rabi* seasons have jointly no influence on adaptation. However, the precipitation normals, temperature and precipitation deviations are likely to influence the adaptations but the effects are not consistent across models. The location variables show that the farming households in cotton-wheat, rice-wheat and arid zones are less likely to adapt to changes in climate as compared to households in mixed zones. The fixed crop rotations are being followed in rice-wheat and cotton-wheat systems having a little flexibility in following diverse adaptations. The farmers in rain-fed areas also face the same situation of limited crop choices and diversification.

It is crucial to invest in the development of agricultural technological packages addressing issues of climate change relevant to different ecologies and farming systems; improve research-extension-farmer linkages; enhance farmers' access to new technologies; improve rural infrastructure; development of weather information system linking meteorological department, extension and farmers; and establishment of targeted food safety nets as well as farm subsidy programs for marginal farm households.

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## **Environmental Pollution and Sustainable Development in Developing Countries**

MUNAZAH NAZEER, UZMA TABASSUM and SHAISTA ALAM

Environmental Pollution is cost of economic growth via increased industrialisation, urbanisation, mechanisation, use of fertiliser and pesticides in agriculture and mismanagement to dump human waste, especially in developing countries, where environmental laws usually are relatively less strict. Hence growth and pollution are positively linked in developing countries expectedly. Sustainable development may be defined as continuous increase in the socio-economic standard of living of a country's population, normally accomplished by improving the quality of its physical and human capital. The research's foremost objective is the generation of environmental pollution index that incorporate various production and consumption side indicators that are majorly responsible for pollution. While, the at-most objective of the study is to examine the causal relationship between the generated pollution index and human development through a panel causality analysis using a panel of 32 developing countries over the period 2000-2013.

*JEL Classification:* Q2, Q3, Q4, O13

*Keywords:* Pollution Indices, HDI, Renewable Energy, Panel Causality, Sustainable Development

### **1. INTRODUCTION**

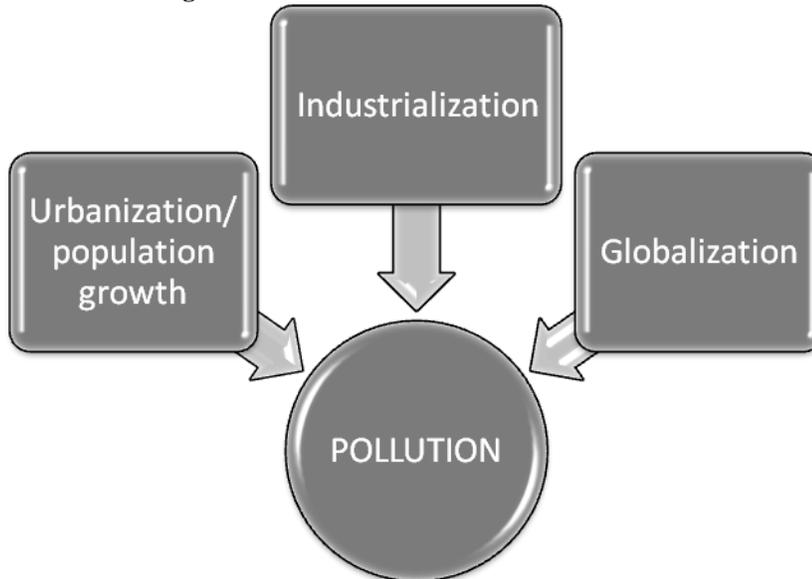
The haste of globalisation, urbanisation and industrialisation has led to severe environmental concerns in developing countries. Over the past few decades the natural resources have depleted remarkably resulting from accelerated pace of economic and social transformation. Economic and social changes such as natural growth of population, migration from rural to urban areas, increase in mechanisation have transformed the country's natural resource base, both as a source of factor inputs and as a by product of pollution associated with economic activity. The continuously accelerated and unabated environmental degradation in the country is dangerous for sustainability of human development that is the foundation for long-term economic development. Especially in developing countries the impact of environmental pollution is more rigorous, leading to ill health, increase disabilities and mortality rate annually [Greenstone and Hanna (2014)]. Developed nations have advanced technologies and resources to combat pollution consequently they experienced relatively fewer health risks and the probable repercussions of climate change.

Munazah Nazeer <munza\_83@hotmail.com> is MPhil Scholar, Applied Economics Research Centre (AERC), Karachi. Uzma Tabassum is Research Associate, Applied Economics Research Centre (AERC), Karachi. Shaista Alam is Senior Research Economist, Applied Economics Research Centre (AERC), Karachi.

Environmental pollution may destabilise development process and competitiveness of developing nations whose economies depends on natural resources. Economic development and human development efforts are increasingly constrained by environmental concerns, including degradation of forest and fisheries, lack of fresh water resources, and poor human health as a result of air and water pollution [Banister (1998); Chu and Yu (2002)]. Intensified crop and livestock production combined with misdirected incentive have contributed to increased production of chemical and organic waste, natural resource and biodiversity loss and soil erosion. Inadequate clean water supply, explosive growth in population, and artificial method of cultivation are the most severe environmental problem in many developing countries. Environmental degradation is costing developing countries 3 to 10 percent of the country's GDP in a sample of 20 countries representing about forty percent population of developing countries. Moreover, environmental experts believe that the environmental degradation cost might cross about Rs.450 billion so far [World Bank (2012)].

Fundamentally, there exist three major driver of pollution namely industrialisation, urbanisation and globalisation surging the level of air, water and noise pollution. This link can be seen from Figure1.

**Fig. 1. The Fundamental Drivers of Pollution**



*Source:* Author's presentation of fundamental drivers of pollution.

Industrialisation is the first fundamental cause of pollution. Among other things, industrialisation set in motion the widespread use of fossil fuels (oil, gas and coal) which are now the main sources of pollution. Industrial pollution contribute majorly in emitting waste gases like carbon monoxide, sulphur oxides, and nitrogen oxides which are the waste products of industry and end up in the air as well as dumping of industrial waste into water, endangering human life. Such industries include petroleum refineries, metal smelting, iron and steel mills, grain mills, and the flour handling industry.

Urbanisation is the second fundamental cause of pollution. With population numbers literally exploding around the world, the demand for food and other goods goes up. This demand is met by expanded production and use of natural resources which in turn leads to higher level of pollution. On the other side of the coin consumption demand of these produced good is higher for higher concentrations of people which in turn are associated with higher waste generation.

The process of urbanisation and emergence of urban centre involve concentration of economic activities which in turn require human capital that leads to concentration of people in a geographically smaller area. For supporting such growing economic activities and human concentration, infrastructure is inevitable but once the availability of infrastructure fall short to accommodate the urban demand, problems of poverty, high prices, low grade and unmaintained housing, congestion, environmental degradation and low living standards will begins to take hold. Urbanisation is characterised by industrialisation, population growth, high rises and slums resulting in rising demand for production and consumption for goods and services which yield more and more waste generation from production and consumption polluting the urban environment.

Globalisation is another cause of pollution. Globalisation has become an effective facilitator of environmental degradation. Developing countries are usually lenient to implement laws and regulations on environmental protection Weng, *et al.* (2009). With this benefit and easy availability of cheap labour, investors or owners of dirty industries move their industries to such 'pollution havens' rather than installing them in more regulated markets [Eskeland and Harrison (2003)].

Hence industrialisation, population growth and globalisation are the roots of the gigantic pollution tree. Rising pollution not only affects human life directly but also indirectly by affecting what humans need from Mother Nature to continue their survival. Pollution directly affect human environment via increased emission of various gases depleting of ozone layer that repel high frequency ultraviolet radiations. All these result as an obstacle in sustainable development. Indirectly, degradation of environment is leading to destroy the natural habitat that provide basic survival needs for human such as increasing water pollution is leading to loss of marine output and species (fishes, herbs etc.), deforestation is causing low tree food production and soil erosion is lowering agricultural yield. What industries would process or stock-out if natural resources are exhausted! High pollution levels are more likely the case with developing countries with low or no environmental regulations. This becomes the rationale behind this study.

The focal objective of the study is to explore the causal relationship between pollution and sustainable development in a panel dataset using indices of pollution and development for 32 developing countries over a period of 14 years from 2000 to 2013. For this purpose the study estimates a dimension index of pollution with the combination of various production and consumption side indicator based on secondary sources of data, while for reflecting development we use Human Development Index (HDI).

This study is unique in the sense that it adds in the existing literature the construction of a combined pollution index. For this combined pollution index production and consumption based pollution indices are also generated using various production and consumption side variables. Moreover, none of the literature reviewed relates so generated pollution index to human development index. Further this study explores the causal relationship between pollution and sustainable growth in a panel analysis.

The rest of the paper is organised as follows. Section 2 states sources of environmental pollution, Section 3 presents review of empirical literature while Section 4 describes the research plan along with methodology and dataset. Empirical results are reported in Section 5 and finally the research is concluded in the last section.

### 2. SOURCES OF ENVIRONMENTAL POLLUTION

Environment enters as an input into the production function of many goods. For example steel cannot be manufactured without using environment as a dumping ground for pollution. Let  $E$  denote the input of environment into the production function, the production function now becomes

$$Y = Af(K, L E) \quad \dots \quad (1)$$

If the firm uses a little  $E$ , that is equivalent to disposing only a small amount of pollution; a large  $E$  would correspond to dumping a large amount of pollution. Production of output now involves  $L$ ,  $K$  and  $E$ , representing labour, capital and environment respectively. If the environment is cheap to use (no regulation or low level of regulation) firms will tend to use a good deal of  $E$ . On the other hand if environment becomes more expensive to use (tight regulation or high Pigouvian fee) firms would substitute other factors, such as capital, in place of  $E$ .

The famous Say’s law states that production is for consumption. Hence not only production but consumption also contributes towards pollution. Thus this make production the primary and consumption the secondary source of pollution as one can consume what is produced first. The following figure provides sub-heads under the main production and consumption heads.

**Fig. 2. Sub Sources of Production and Consumption Engaged in Generating Pollution**



Source: Tropical-RainForest-Animals.com.

Production is treated as the primary cause of pollution, as it involves the whole cycle of extracting and processing natural resources and then manufacturing and selling processed goods. Manufacturing industries, power generation, road, rail and air transport and agriculture and timber production are the major polluting production sectors which can further be segmented down into many other industries/sub-industries. The secondary source of pollution is consumption, refers to consumption by residential, commercial and social sectors which utilise the goods offered by the production side. Hence any industry belonging to either production or consumption plays its part in polluting the environment. The Figure 2, further, tell us that the pollution generated by production—consumption process was partially recycled to some extent, not fully, and the rest was dumped to pollute the physical environment.

Environmental Pollution is mainly divided into three components, air pollution, noise pollution and water pollution. Air pollution is primarily a by-product of energy consumption. Impurities in fuels lead to emission of sulphur dioxide and particulate matter. Troposphere ozone is not directly emitted from combustion but results chemically from high concentration of nitrogen oxides (from fuel combustion) and organic vapours (from paint drying and gasoline evaporation, among other things), in the presence of sunshine.

Water gets contaminated either from point or non-point sources. Point sources are direct sources of water pollution that can be controlled and monitored such as factories, sewage system, power plants, underground coalmines, oil wells. While non-point sources are indirect from various pollution sources that are relatively inelastic to control. Examples of non-point sources includes rain or snow that moves through the ground picking up pollutants, agricultural runoff of fertilisers from farm animals and crop land, urban run offs, air pollutants getting washed or deposited to earth, storm water drainage from lawns, parking lots, and streets etc. which eventually fall in major water sources. Noise pollution mainly produced from mechanisation of human life including indoor machineries to outdoor traffic.

Environmental pollutants are at their worst in urban areas, due to concentration of people, both as sources of the pollution (directly or indirectly) and as victims of the pollution. Air pollution can lead to health problems, including sickness as well as irritation and reduced human's mental and physical performance. The young and those weakened by other illnesses may be particularly susceptible to the effects of urban air pollutants. Urban air pollution also damages materials (such a buildings), increases the cost of maintenance (such as increased cleaning requirements), and degrades aesthetics (no one likes to live in a brown haze). Similarly water pollution also leaves harmful effect on individual's health. A critical problem of water pollution is groundwater pollution. Groundwater is the source of drinking water for many people. Because of the cleaning ability of the earth above the aquifer, groundwater has traditionally been relatively contaminant free. However, groundwater contamination does occur primarily from leaking storage facilities on the surface, either waste storage or storage of bulk liquids such as gasoline. In the past, chemical wastes have been dumped on the surface, finding their way into the groundwater many years later. Another source of groundwater pollution is the leaching of pesticides and fertilisers into the groundwater.

The best way to evaluate effects of environmental pollution over human environment is to compare it with the well known human development index (HDI) which is designed to account for the basic yardstick indicators of living standard prevailing in a country. HDI is a composite index of human development that includes income (GNI), education and health. Pollution is the cost of economic growth via increased industrialisation especially in developing countries where environmental laws usually do not exist or are relatively less strict. Hence growth and pollution are positively linked in developing countries expectedly Low educational attainment is usually associated with high polluting countries. Finally countries with high pollution level experiences low health conditions and deteriorated health indicators [Naveed, *et al.* (2013)]. Thus on overall basis, HDI index is expected to be inversely related to pollution levels prevailing in a nation.

Following *Human Development Report* (2011) by 2050, projection-scenarios exercises recommends that facing current “environmental challenge” it was estimated that HDI would be declined by 8 percent worldwide from the baseline figure while the decline for South Asia and Sub-Saharan Africa will be 12 percent. As in the case of “environmental disaster” scenario the global HDI is expected to fall 15 percent down from the projected baseline. “Environmental challenge” is one that accounts for negative global warming effects on agro-based production, clean water accessibility, sanitation facilities improvement and finally on pollution. While “environmental disaster” scenario deals with the adverse disaster effects caused by deforestation, degradation of land, sharply deteriorating biodiversity and boosting extreme weather occurrences.

### 3. REVIEW OF EMPIRICAL LITERATURE

It is observed that majority of the existing research on pollution considers a single type of pollution either air, water or noise rather considering it from production and consumption point of view. Few studies report its impact on human health or growth but not specifically related it with the human development index. Some studies are summarised below from the existing literature.

Lean and Smyth (2009) investigate the relationship between carbon dioxide emissions, electricity consumption and economic growth. The methodology used in this study is panel vector error correction model. The sample of the study is based on ASEAN countries from 1980 to 2006. The results indicate that there is statistically significant positive relationship between electricity consumption and  $CO_2$  emission, and also a non-linear significant relationship between  $CO_2$  emission and output.

The study proposed by Azomahou, *et al.* (1997) examines the relationship between greenhouse gas emissions and economic growth. This panel study samples the period from 1960 to 1996. The outcome of this study is existence of a constant relationship between per capita  $CO_2$  emissions and per capita GDP. In the same way, Grubb, *et al.* (2002) examine the national level  $CO_2$  emissions and GDP linkages for advanced economies. The sample period used in their study starts from 1950 to 2001. They also reached at the same conclusion.

In the broader context, [Liu (2006)] examine the relationship between different gasses emissions including  $CO_2$ ,  $CO$ ,  $SO_2$ , and  $NO_x$  and the per capita real GDP on the Norwegian Countries. The study covered the sample period from 1973 to 2003 and

discussed the existence of unidirectional relationship between the emissions of air gasses and per capita real GDP. It is found that the relationship between  $CO_2$  and  $CO$  existed a long-term relationship with GDP, while  $SO_2$ , and  $NO_x$  has short-term relationship with per capita GDP. Coondoo and Dinda (2002) examine the relationship between the  $CO_2$  emissions and income for North America, Eastern and Western Europe and found the existence of unidirectional relationship between the  $CO_2$  emissions and national income as well.

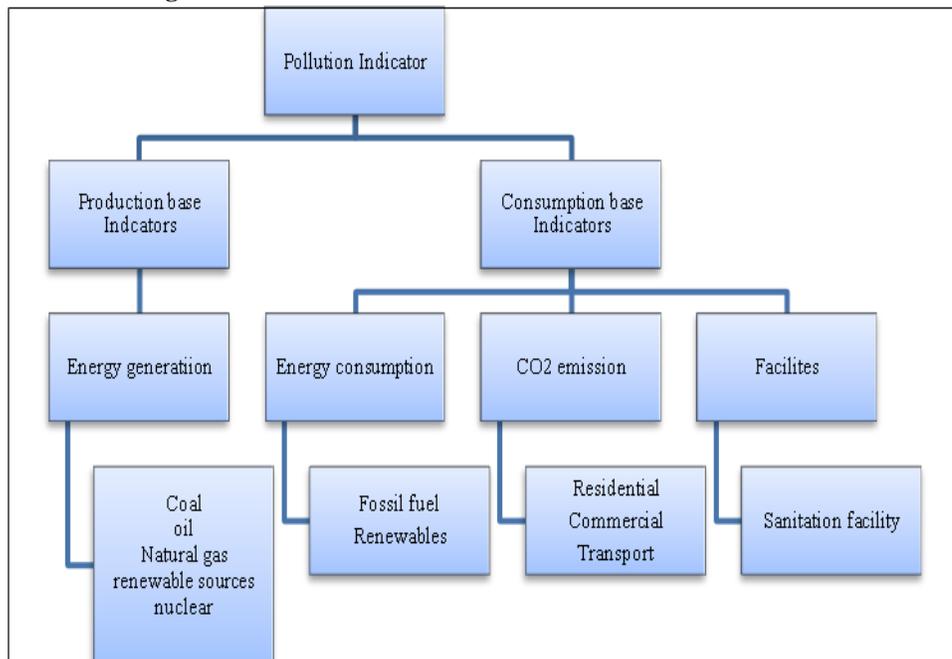
#### 4. RESEARCH PLAN

Our research plan is divided into three parts. The first part explain the construction and the variables used for generating production and consumption side pollution indices ( $PI^P$  and  $PI^C$  respectively) which are then added to generate a combined pollution index (PI) along with the human development index. In the second part methodology adopted is discussed in sub-Section 4.2 and finally in the third part dataset and its sources are stated.

##### 4.1. Generating an Index for Pollution

As stated above there are two major sources of pollution that is pollution generated from primary sources (production process) and secondary sources (consumption process). Production side pollution index is generated using production side variables and like-wise consumption side pollution index is developed using consumption side variables. The following figure presents the variables selected from production and consumption sides used in the construction of the pollution index.

**Fig. 3. Variables Used in the Construction of Pollution Index**



Source: Author's flow for variables used for constructing pollution index.

As per the flow, production side is captured from energy generation processes with more weight given to non-renewable source as they participate more in polluting the environment. For representing consumption side, we took energy consumption from fossil fuel and renewable sources, carbon dioxide emission from residential, commercial and transport sectors and sanitation facilities to account for waste management. From production side 5 variables and from consumption side 6 variables are selected. Two of these eleven variables are negatively linked to the negative outcome i.e. pollution, namely energy consumption from renewable sources as this accelerates the demand for renewable energy and the improved sanitation facilities that reflect organised waste disposal.

**4.1.1. Production-Based Pollution Index (PI<sup>P</sup>)**

Production based pollution index (PI<sup>P</sup>) is a dimension index based on a combination of various variables. The formula used for this index is as follows

$$PI_{it}^P = \frac{w_1 EP_{it}^{coal} + w_2 EP_{it}^{renewable} + w_3 EP_{it}^{nuclear} + w_4 EP_{it}^{oil} + w_5 EP_{it}^{n.gas}}{W} \dots (2)$$

Where *i* and *t* reflect countries and time respectively

|                        |  |
|------------------------|--|
| $EP_{it}^{coal}$       | Electricity production from coal sources (% of total)                              |
| $EP_{it}^{renewable}$  | Electricity production from renewable including hydroelectric sources (% of total) |
| $EP_{it}^{nuclear}$    | Electricity production from nuclear sources (% of total)                           |
| $EP_{it}^{oil}$        | Electricity production from oil sources (% of total)                               |
| $EP_{it}^{n.gas}$      | Electricity production from natural gas sources (% of total)                       |
| $w_i = 1, 2, \dots, 5$ | individual weights given to variables in equation 2 <sup>1</sup>                   |
| $W$                    | sum of all individual weights ( $w_i$ )  |

**4.1.2. Consumption-Based Pollution Index (PI<sup>C</sup>)**

Consumption based pollution dimension index (PI<sup>C</sup>) take into account variables responsible for polluting the environment via consumption. Consumption based pollution index is designed to cover energy consumption variables, CO<sub>2</sub> emission from various sources and an improved facility provision (sanitation). This index was calculated using the formula stated below.

$$PI_{it}^C = \frac{EC_{it}^X + CO_{it}^Y + IP_{it}^{sanitation}}{W} \dots \dots \dots (3)$$

provided  $EC_{it}^X = EC_{it}^{fossil\ fuel} + EC_{it}^{renewable} / 2 \dots \dots \dots (4)$

and  $CO_{2it}^Y = CO_{2it}^{transport} + CO_{2it}^{residential} + CO_{2it}^{mfg\ \&\ cnstr} / 3 \dots \dots \dots (5)$

where *i* and *t* represent countries and time period respectively.

<sup>1</sup>Coal is given the highest weight followed by oil, natural gas, nuclear and renewable sources.



$$DI_{it}^Z = \frac{\text{Maximum Value} - \text{Actual Value}}{\text{Maximum Value} - \text{Minimum Value}} \dots \dots \dots (9)$$

While for the variables that are negatively related to the negative outcome (pollution) is

$$DI_{it}^Z = \frac{\text{Actual Value} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}} \dots \dots \dots (10)$$

HDI index is interpreted as the more the index value is closer to 1, greater the human development is. While when it comes to pollution index, it is interpreted as the more the index value moves closer to 1, the higher the level of pollution it reflects.

Next for causality analysis between HDI and the generated PI, first stationarity of the two series is tested whether they contain a unit root processes or not. If the series have a unit root it's a non-stationary series and we have to first make it stationary before going for causality.

If the two series are not found to be stationary at level, their individual integration order would be checked. In case both series are stationary at first difference that is they are integrated of order 1 denoted as I (1).The panel co-integration test performed as per Pedroni (2004) approach and afterwards panel causality analysis carried out.

### Dataset and Data Sources

The data set comprises of 32 developing countries (cross-sectional units) and 14 years period from 2000 to 2013. Developing countries included are selected on the basis of their data availability both from WDI and UNDP website. List of the selected countries by their region are tabulated in the appendix at the end.

The data for all of the variables except HDI, explained earlier is extracted from the World Development Indicators (WDI)at country level for sample countries. Data for human development index is gathered from United Nation Development Programme (UNDP) website.

### Empirical Results

Following methodology defined earlier first stationarity of the two series are tested and the results are presented in Table 1. For this purpose Im, Paseran, and Shin (2003) unit root test is applied to our panel under the null hypothesis that the series do have a unit root process. The test was performed considering intercept and intercept plus trend both.

Both the series are non stationary at level as seen from insignificant coefficient probabilities in the table. Though at first difference they are stationary hence the two series are integrated of order 1. Descriptive summary and graphical representation of individual series are presented in the appendix.

Further panel co-integration is conducted following Pedroni's panel co-integration test considering intercept and intercept plus trend. The test states eleven statistics, 8 for within dimensions and 3 for between dimensions. The outcome of this test is tabulated below in Table 2.

Table 1

*Results of Panel Unit Root Test*

| IPS Panel Unit Root Test |             |                  |                            |
|--------------------------|-------------|------------------|----------------------------|
| Log HDI                  |             | Intercept        | Intercept and Trend        |
| At level [I(0)]          | Coefficient | -5.41459         | -1.03375                   |
|                          | Probability | 1                | 0.1506                     |
| At 1st Difference [I(1)] | Coefficient | -3.94366         | -2.48204                   |
|                          | Probability | 0                | 0.0065                     |
| <b>Log PI</b>            |             | <b>Intercept</b> | <b>Intercept and Trend</b> |
| At level [I(0)]          | Coefficient | -0.82619         | -0.08066                   |
|                          | Probability | 0.2043           | 0.4679                     |
| At 1st Difference [I(1)] | Coefficient | -7.24905         | -4.07594                   |
|                          | Probability | 0                | 0                          |

Table 2

*Panel Co-integration Test Results*

| Peroni Panel Cointegration Test   |           |        |                    |       |
|---|-----------|--------|--------------------|-------|
| Ho: No Cointegration  |           |        |                    |       |
| Test  | Statistic | Prob.  | Weighted Statistic | Prob. |
| <b>C (With Intercept)</b>   |           |        |                    |       |
| Alternative Hypothesis: Common AR Coefs. (within-dimension)             |           |        |                    |       |
| Panel v-Statistic   | -0.46692  | 0.6797 | -0.406769          | 0.66  |
| Panel rho-Statistic   | -4.73123  | 0      | 0.226185           | 0.59  |
| Panel PP-Statistic  | -6.9592   | 0      | -0.849225          | 0.2   |
| Panel ADF-Statistic   | -6.83485  | 0      | -0.08727           | 0.47  |
| Alternative Hypothesis: Individual AR Coefs. (between-dimension)        |           |        |                    |       |
| Group rho Statistic   | 1.73063   | 0.9582 |                    |       |
| Group PP-Statistic  | -0.0453   | 0.4819 |                    |       |
| Group ADF-Statistic   | 1.524532  | 0.9363 |                    |       |
| <b>C and T (With Intercept and Trend)</b>                               |           |        |                    |       |
| Alternative Hypothesis: Common AR Coefficients. (within-dimension)      |           |        |                    |       |
| Panel v-Statistic   | 0.115263  | 0.4541 | 18.73086           | 0     |
| Panel rho-Statistic   | -6.33794  | 0      | -0.438462          | 0.33  |
| Panel PP-Statistic  | -17.5429  | 0      | -4.987027          | 0     |
| Panel ADF-Statistic   | -16.3816  | 0      | -5.513152          | 0     |
| Alternative Hypothesis: Individual AR Coefficients. (between-dimension) |           |        |                    |       |
| Group rho Statistic   | 1.966385  | 0.9754 |                    |       |
| Group PP-Statistic  | -6.05836  | 0      |                    |       |
| Group ADF-Statistic   | -3.87748  | 0.0001 |                    |       |

As can be seen majority of the statistics while considering only intercept are insignificant indication acceptance of the null hypothesis of no co-integration between the two series. But once deterministic trend is considered along with the intercept, eight out of eleven statistics are statistically significant reflecting strong long-run relationship among HDI and PI series at 5percent level of significance.

There may have a possibility of existence of homogenous or heterogeneous causality across cross-sections when considered individually. For checking this, the study performs Dumitrescu and Hurlin Test (2012) of causality in heterogeneous panels where all coefficients are allowed to vary across cross section. Null hypothesis under Dumitrescu and Hurlin Test (2012) is homogenous non-causality that is there is no causality among the two series for any cross-sectional unit in the panel. While the alternative hypothesis is of heterogeneous non-causality under which two subgroups of cross-sectional units are allowed. For one subgroup of cross-sectional units there exists causality among the series while for the other group there is not. Here heterogeneous panel with fixed time coefficients is considered. The outcomes to this test are reported in Table 3.

Table 3

*Dumitrescu and Hurlin Test Results*

| Pairwise DumitrescuHurlin Panel Causality Tests |         |            |          |
|---|---------|------------|----------|
| Sample: 2000 2014                               | Lags: 2 |            |          |
| Null Hypothesis:                                | W-Stat. | Zbar-Stat. | Prob.    |
| DLOGPI does not Homogeneously Cause DLOGHDI     | 6.01341 | 4.99158    | 6.00E-07 |
| DLOGHDI does not Homogeneously Cause DLOGPI     | 7.58533 | 7.339      | 2.00E-13 |

The empirical results reject the null hypothesis of homogenous non-causality and accept the alternative one. Thus there exist a bilateral causality flow between the generated pollution index and human development index in heterogeneous panel considered by this study. On the basis of the probability, it is concluded that the direction of causality is stronger from growth (HDI) to pollution (PI) in the context of developing countries. This is justified on the basis that in most developing countries production technologies adopted are majorly profit motivated in the absence of or flexible environmental control policies for production and consumption. As a result pollution as an input to production becomes relatively cheap and producers opted for technologies that substitute other input with this relatively cheaper input. Hence growth and pollution goes side by side.

**Conclusions and Policy Suggestions**

Growing industrialisation, urbanisation, mechanisation, use of fertiliser and pesticides in agriculture and mismanagement to dump human waste is costing economic growth in the form of increased pollution and environmental degradation, especially in developing countries where environmental laws usually don't exist or are relatively less strict. Though pollution and growth go side by side do not imply that countries should stop developing or compromise their pace of growth for controlling pollution, by any means. Combating pollution and enhancing growth can be attained together by analysing what factors or technologies responsible in the growth process that cause pollution, and by replacing such pollution boosting technologies by relatively more environment friendly ones. Energy is crucial for growth and is demanded for both production and consumption purposes by economic agents (industries, households etc.). If energy is produced from non-renewable resources like coal, oil etc. it will contribute greatly in

polluting the environment. The more you use non-renewable resources for meeting the growing energy demand for growth, the greater will be your environment on stack. One can grow at the cost of pollution for now but cannot sustainably grow because the consequences of pollution will not only lower individual productivity but also individual's life span that will result in loss of their productive life years as well. For example adverse health effects will cause frequent illness of individuals, lowering their productivity on one hand while on the other it will cause diseases that may decrease their average age of living, resulting in loss of their productive years which they could have worked in absence of such diseases. On the contrary, if one switches from non-renewable to renewable sources for energy production, the rising pollution proportion can be potentially decreased especially if sustainable development is the prime goal to be achieved.

This study aimed at analysing the causal association between pollution and sustainable growth. For this purpose, first production and consumption based pollution indices are generated which then are summed to form a combined pollution index. Afterwards, causality analysis is performed for the generated combined pollution index series and human development index series. The results indicate that the two series are co-integrated as indicated by panel co-integration test at a 5 percent significance level. Further, two way causality is found between the pollution and development with stronger causality flowing from HDI to PI which is justified in the case of developing countries with no or minimal environment friendly production policies as GDP is a part of this index.

Sustainable development can only be attained when all the three economic agents are part of the policy design and all agents contribute towards the goal achievement. Government can use both voluntary and involuntary measures for this purpose. Voluntary measures include awareness regarding the consequences of increasing pollution, scarcity of resources, Effective waste management from both production and consumption point of views, Incentive base persuasion etc. Involuntary measures includes regulation for curtailing pollution leading to sustainable production and consumption by restricting pollutant emission and waste, Progressive taxation on emission and waste, Maintaining pollution standards etc. The Government can then use the funds from this taxation for installation of waste management and recycling processes.

Government should promote shifting of consumption patterns towards groups of goods and services with lower energy and material intensity and for that government should make sure availability and affordability of energy-efficient products and services. Sustainable consumption thus requires action by industry and by governments as well as by consumers.

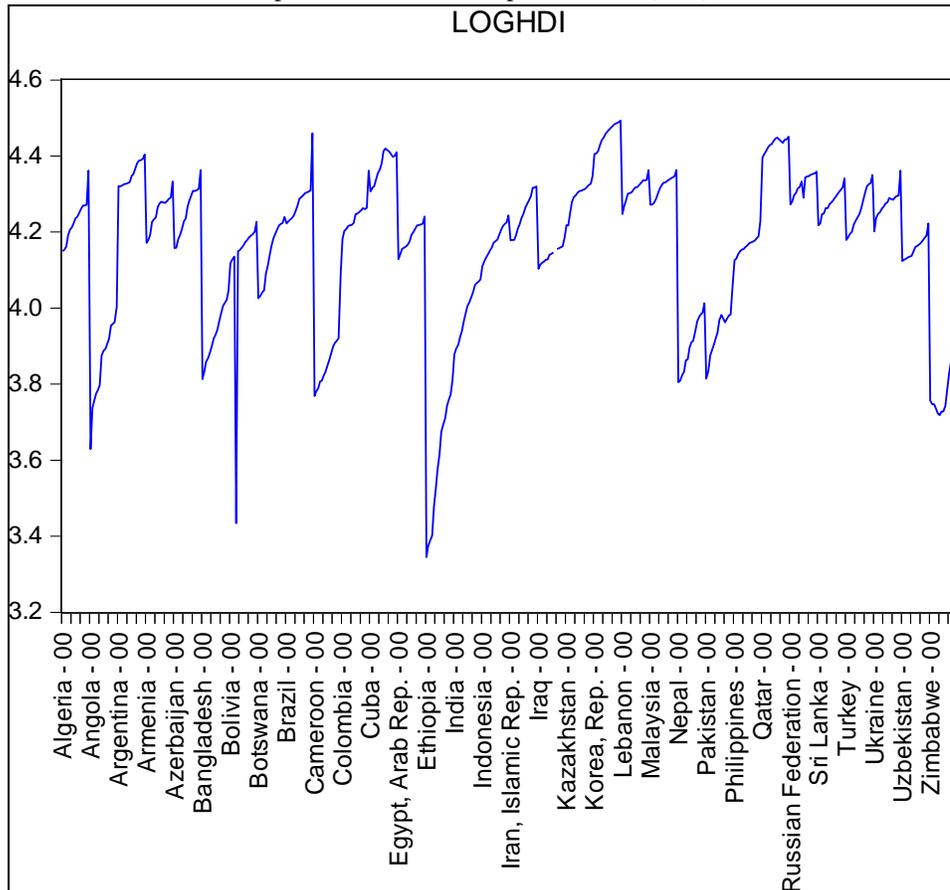
Energy is a major element for sustainable development. Energy production is highly pollutant if generated using non-renewable resources which is usually the case with developing countries.

## APPENDIX

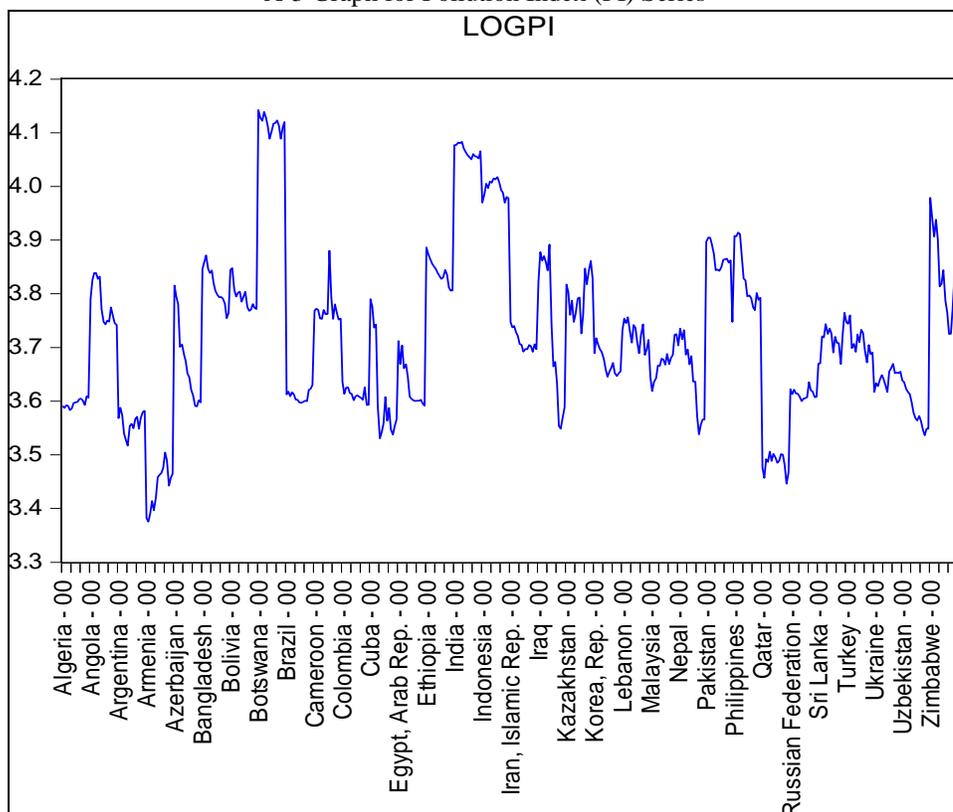
A-1 Descriptive Summary

| Descriptive  | LOGPI    | LOGHDI   |
|--------------|----------|----------|
| Mean         | 3.723634 | 4.160764 |
| Median       | 3.705677 | 4.217447 |
| Maximum      | 4.142515 | 4.493121 |
| Minimum      | 3.375549 | 3.344728 |
| Std. Dev.    | 0.15501  | 0.210096 |
| Skewness     | 0.635884 | -1.15133 |
| Kurtosis     | 3.253464 | 4.237615 |
| Jarque-Bera  | 33.63275 | 136.3939 |
| Probability  | 0        | 0        |
| Sum          | 1787.344 | 1993.006 |
| Sum Sq. Dev. | 11.50951 | 21.09916 |
| Observations | 480      | 480      |

A-2 Graph for Human Development Index (HDI) Series



A-3 Graph for Pollution Index (PI) Series



A-4 Lag Selection as per Various Criteria

| Lag Selection for Panel Causality Analysis |         |       |
|--|---------|-------|
| Criteria Selected                          | Log HDI | LogPI |
| Akaike Info Criterion                      | 2       | 2     |
| Schwarz Info Criterion                     | 2       | 2     |
| Hannan-Quinn Criterion                     | 2       | 2     |
| Modified Akaike Info Criterion             | 2       | 2     |
| Modified Schwarz Info Criterion            | 2       | 2     |
| Modified Hannan-Quinn Criterion            | 2       | 2     |
| t-statistic                                | 2       | 2     |

A-5 List of Developing Countries included in this Study

| S. No. | Region                       | Name of Countries  | Count |
|--------|------------------------------|--|-------|
| 1.     | South Asia                   | Bangladesh, India, Nepal, Pakistan and Sri Lanka.                            | 5     |
| 2.     | East Asia and Pacific        | Indonesia, Korea, Malaysia and Philippines.                                  | 4     |
| 3.     | Europe and Central Asia      | Armenia, Azerbaijan, Kazakhstan, Russian Federation, Uzbekistan and Ukraine. | 6     |
| 4.     | Sub-Saharan Africa           | Angola, Botswana, Cameroon, Ethiopia and Zimbabwe                            | 5     |
| 5.     | Middle East and North Africa | Turkey, Qatar, Egypt, Iran, Iraq, Lebanon and Algeria.                       | 7     |
| 6.     | Latin America and Caribbean  | Bolivia, Brazil, Colombia, Cuba and Argentina.                               | 5     |
| Total  |                              | 32   |       |

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## Impact of Rising Energy Prices on Consumer's Welfare: A Case Study of Pakistan

SHAMAILA AZIZ, MUHAMMAD RIZWAN YASEEN, and SOFIA ANWAR

This work investigated the impact of higher energy prices on consumer's welfare for the Pakistan from 1987 to 2012. The central objective of the study is to quantify the consumer welfare through Compensating Variation (CV) after estimating the demand elasticities by applying the Linear Almost Ideal Demand System (LA/AIDS) for main energy sources. Welfare change is also measured in four scenarios (two price shocks) for Pakistan in order to analyse the impact of energy price change in different time period. Coal, gasoline and High Speed Diesel (HSD) oil are relatively less elastic, where High Octane Blended Component (HOBC), kerosene and Compressed Natural Gas (CNG) are relatively more elastic, while electricity and natural gas is unit elastic. Additionally, the results of Compensating Variation suggest that due to higher energy prices, more income compensation is required to pay for consumer in order to achieve the initial energy utility. So mixture of price controlling and income policies should be adopted for each energy source.

*JEL Classification:* D6, Q4

*Keywords:* Rising Energy Prices, Consumer Welfare, LA/AIDS, CV, Time Series Data

### INTRODUCTION

In developing countries like Pakistan, energy is to be considered the one of the most significant sector because almost all the economic activities depend on energy. Energy development is directly related to well-being along with success throughout the world. Advance energy improves the lives of people [Ramchandra and Boucar (2011)]. The main two components of global energy situation are rapid population increase and the increase in the living standard associated with entire societies. Per person energy consumption is considered as degree of per person income as well as welfare of any nation [Rai (2004)].

Energy supply is also a source of providing the fuel to fruitful activities which include farming, trade, manufacturing, industries as well as exploration. Then again, a reduction in supply of energy plays a part in poverty and starvation that may contribute to fall in economic growth as well as prosperity [Azarbaijani, *et al.* (2012)]. Within the period association with globalisation, higher energy demand as well as dependency on

Shamaila Aziz <anmolpearl520@gmail.com> is MPhil Student, Department of Economics, Government College University, Faisalabad. Muhammad Rizwan Yaseen <rizwany2001@yahoo.com> is Assistant Professor, Department of Economics, Government College University, Faisalabad. Sofia Anwar is Professor and Chairperson, Department of Economics, Government College University, Faisalabad.

energy for any nation suggests that energy will be considered as the most significant issues at world level in next century. Almost all the economic sectors are interconnected with each other due to energy circulation in all of these areas, so almost any changes in energy price ranges effect the whole economy and left the significant results [Azarbaijani, *et al.* (2012)]. Especially this is why energy pricing is to be considered more difficult than ordinary goods pricing. In the developing nations like Pakistan, this matter is to be taken as leading concern. Having rising industrial sectors in addition to higher population growth rate, the demand for energy throughout Pakistan is set to increase in future [Haider, *et al.* (2013)]. Suitable pricing is, yet, to be taken as necessary situation for encouraging energy efficiency and for attaining any sustainable energy segment [Erbaykal (2008)].

Global oil price is taken to be as a main cause of energy inflation because few nations are responsible to control the supply of oil and any disturbance in its supply leads to sudden rise in the prices. Pakistan is the net importer of oil and any disturbance in oil supply makes Pakistan helpless by putting subsequent burden on its import bills [Haider, *et al.* (2013)]. International economic depression in 1970 due to oil shocks produced by OPEC created a serious problem for oil importing nations around the world and led to sudden rise in energy prices and created a large demand gap. Oil importing nations were unable to maintain the huge energy demand and energy policy goals to fill this specific gap to ensure that such kind of recessions usually do not take place once again [Kolev and Riess (2007)]. Since 2000, global oil prices have been increased but this increase has been seen very sharp from 2003 to 2008 then international oil prices have been increased from 2010 to 2013 [Tlhalefang and Galebotswe (2013)]. Higher oil selling prices reduce true wealth and consumption spending [Malik (2008)]. A rise in oil price expects to experience a reduction in total welfare by 20 percent for oil importing countries [Thoresen(1982)]. Beznoska (2014) stated that rise in prices of energy source such as fuel, gas as well as electricity affects badly the consumer welfare. So prices and income are the most important determinants of consumer welfare whose effect is never quantified in case of energy consumption for Pakistan.

Many previous studies explored the welfare effect of rising energy prices such as, Conrad and Schroder (1991); Davoodi and Salem (2007); Ahmadian, *et al.* (2007); Oktaviani, *et al.* (2007); Walawalkar, *et al.* (2008); Asghar, *et al.* (2010); Manzoor, *et al.* (2012); Huang and Huang (2012); Ememverdi, *et al.* (2012); Araghi and Barkhordari (2012); Ahmad, *et al.* (2013) and Beznoska (2014) for different countries and concluded that consumers adversely effected by the rise in petroleum product prices. But there is no relevant study for Pakistan that calculated welfare cost of energy consumption due to rising prices even we cannot find study that calculated price and expenditure elasticities for all energy sources simultaneously.

The purpose of this study is to calculate the welfare cost resulted from rising energy prices. In order to study the welfare cost, it is necessary to estimate the demand functions of main energy sources and then to calculate the change in welfare. The Linearised Almost Ideal Demand System (LA/AIDS) is used to estimate the demand functions while Compensating Variation (CV) measure is employed to assess the change in welfare resulted from the variations in energy product prices. Furthermore, this sort of study can be helpful for policy makers to know about the behaviour of energy consumers

under different prices and income. As demand elasticity helps to forecast the future demand of energy sources under differential setting of price and income so this study will be an effort to achieve this target.

### METHODOLOGY

Linear Approximation of Almost Ideal Demand System [presented by the Deaton and Muellbauer (1980a, 1980b)] is used to calculate the demand system for main eight energy sources. LA/AIDS is based on a particular form of the cost function and n-1 share equation  $w_i$  for utility maximising agents is calculated as following [Holt, *et al.* (2009)]

$$\omega_i = \alpha_i + \sum_{i=1}^n \gamma_{ij} \ln p_j + \beta_i \ln \left( \frac{x}{P} \right) \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where P is price index

$$\ln P = \alpha_0 + \sum_{k=1}^n \alpha_k \ln p_k + \frac{1}{2} \sum_{k=1}^n \sum_{j=1}^n \gamma_{kj} \ln p_k \ln p_j \quad \dots \quad \dots \quad (2)$$

The original form of AIDS is not linearised in coefficients, which produce some complications not only in parameter estimation but also in the calculation of elasticities. So we applied the linear version (LA/AIDS) of the AIDS approach. In this version the price index is approximated by the linear function:

$$\ln P = \sum_i \omega_i * \ln(p_i) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

The LA/AIDS has following three restrictions of demand system such as: adding up across the share equations which can be achieved by dropping one out of the eight energy demand equations and estimate only seven share equations. The second is symmetry of the second-order derivatives and third one is linear homogeneity of degree zero which can be achieved by considering the price of other energy sources as constant and equating to 1.

$$\sum_{i=1}^n \alpha_i = 1, \quad \sum_{i=1}^n \gamma_{ij} = \sum_{j=1}^n \gamma_{ij} = 0, \quad \sum_{i=1}^n \beta_i = 0, \quad \gamma_{ij} = \gamma_{ji}$$

Marshallian, expenditure and Hicksian elasticities are estimated by the following expressions:

**Marshallian (or uncompensated) elasticity:**

$$\begin{aligned} \varepsilon_{ii} &= -1 + \gamma_{ii} / \omega_i - \beta_i & i = 1, \dots, n \\ \varepsilon_{ij} &= \gamma_{ji} / \omega_i - \beta_i \left( \frac{\omega_j}{\omega_i} \right) & i, j = 1, \dots, n; i \neq j \end{aligned}$$

**Expenditure (income) elasticity:**

$$\eta_i = 1 + \beta_i / \omega_i \quad i = 1, \dots, n$$

**Hicksian (or compensated) price elasticity:**

$$\begin{aligned} \delta_{ii} &= -1 + \gamma_{ii} / \omega_i + \omega_i & i = 1, \dots, n \\ \delta_{ij} &= \gamma_{ij} / \omega_i + \omega_i & i, j = 1, \dots, n; i \neq j \end{aligned}$$

The FIML (Full Information Maximum Likelihood) method makes sure that the coefficients from the equations are independent to the excluded equation. Dummy variables are used to capture the unreliable facts and discontinuity of the data. Normally, the price or even income fluctuations usually not immediately and completely effect the energy market in the current year rather its influence will be felt above numerous periods and is dependent upon the situation of the preceding time interval. To overcome this problem, we established the lagged value of the expenditure share in each equation. The time series data (consumption and price) from 1987-2012 used in LA/AIDS model for Pakistan is mainly taken from energy year books, economic survey of Pakistan and World Bank statistics. Regarding the energy sources taken into account, we selected eight energy sources(including coal, gasoline, high speed diesel oil, kerosene oil, high octane blended component, compressed natural gas, natural gas and electricity).

### Estimation of Compensating Variation

To estimate the compensating variation, the data on energy source consumption before price change and after price change is taken into consideration [Friedman and Levinsohn (2002)]. The general first order equation of CV may write as:

$$\Delta \ln c \approx \sum_{i=1} w_i \Delta \ln p_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

The substitution effect is not taken into account in first order approximation of compensating variation thus it produces the overestimated results. So to overcome this problem, CV can be approximated using a second order Taylor-series expansion. As second order approximation compensating variation contains compensated (Hicksian) elasticities so it produces more reliable results as compared to first order approximation by solving problem of substitution effect.

$$\Delta \ln c \approx \sum_{i=1} w_i \Delta \ln p_i + \frac{1}{2} \sum_{i=1} \sum_{j=1} w_i \varepsilon_{ij}^* \Delta \ln p_i \Delta \ln p_j$$

where,  $w_i$  is the budget share of energy source  $i$  in the initial period,  $\Delta \ln p_i$  is proportionate change in the price of energy source  $i$ , and  $\varepsilon_{ij}^*$  is the compensated price elasticity of energy source  $i$  with respect to the price change of energy source  $j$ .

### Inflation Scenarios

In the present study, the welfare change is measured in four different scenarios for Pakistan in order to analyse the impact of energy price change in different time span.

|              |   |
|--------------|---|
| Scenario I   | In this scenario, we analyse the impact of energy price change during 26 years (1987-2012) on consumer welfare of Pakistan.   |
| Scenario II  | In this scenario, we estimated the impact of energy price change in scenario of 7 years (1990-1996) on consumer welfare.  |
| Scenario III | Since 2000, global oil prices have grown up but this rise has been seen extremely during 2003-2008 and international oil prices have risen by 347.6% [Thalefang and Galebotswe (2013)]. So, to measure the impact of global energy price shock occurred in 2008 on consumer welfare, the price change from 2003 to 2008 is taken in Pakistan. |
| Scenario IV  | Thalefang and Galebotswe (2013) reported that during 2010-2013 international oil prices have risen by 68.6%. So, in this scenario the impact of oil price change on consumer welfare is measured by taking price change from 2009 to 2012.  |

### 3. ANALYSIS OF MAIN RESULTS

#### Empirical Results of Demand Equations

The results of estimations for different energy source demand for Pakistan are presented on Table 1 to 5 (see Appendix). The structural parametric coefficients of seven equations along with their standard error (in parenthesis) as well as significant levels are presented in Table 1. Positive as well as statistically significant expenditure coefficient values revealed that budget shares for each energy source increased along with rise in total energy spending and vice versa. The lag values of expenditure shares depicts that the current year expenditure share of energy sources is affected due to previous year expenditure shares of own energy source.

The variations in budget share of each energy source due to independent variables are measured by value of R-square which lies between ranges from 74 percent to 87 percent.

The estimated results of Hicksian short run elasticities are reported in Table 2. The diagonal values represent own price elasticities while cross price elasticities are shown by off diagonal values. The absolute value of own price elasticities of coal, gasoline, high speed diesel oil and natural gas are relative inelastic while High Octane Blended Component (HOBC), kerosene, CNG and Electricity are relative more elastic. Like short run, almost all the energy sources (except coal and natural gas) followed the same trend in the long run as well. It is clear from the results of Hicksian long run elasticity estimates reported in Table 3. Only gasoline and high speed diesel oil are relative less elastic in long run.

Table 4 represents the Marshallian and expenditure elasticities for main energy source of Pakistan. The last column of table represents the expenditure elasticity while rest of the columns provides the Marshallian elasticity corresponding to each energy source. It is clear from Table 4 that all own uncompensated (Marshallian) price elasticities for each energy source is negative which is consistent with consumer demand theory. The absolute values of uncompensated own-price elasticities of HOBC, kerosene, CNG, natural gas and electricity are more than unit. So these energy sources are relatively more price elastic while coal as well as gasoline are relatively less price elastic as the price elasticity of both energy sources is smaller than unit. Moreover, high speed diesel oil and natural gas is unit elastic.

Furthermore, it is clear from Table 4 that all energy sources have positive consumption expenditure elasticities excluding Kerosene and CNG, implying that all are "normal energy sources" except kerosene and CNG. While Kerosene as well as CNG is "inferior" as the expenditure elasticities are negative.

According to elasticities of substitution reported in Table 5, coal-CNG, natural gas-CNG and natural gas-HOBC are energy sources which are complement to each other while coal-gasoline, coal-HSD, gasoline-HSD, gasoline-CNG, HOBC-electricity, HSD-kerosene, HSD-natural gas, HSD-electricity, natural gas-electricity, electricity-kerosene as well as electricity-CNG are substitute to each other. The S shows that the energy sources are substitutes and C states that energy sources are complements.

#### Results of Compensation Variation

In this paper, the welfare cost is measured in first order as well as second order approximations. Through first order approximations the impacts of price changes on welfare is analysed by completely ignoring the response of households' behaviour in

connection with price change. While the second order approximation produce the significant as well as appropriate measure of welfare cost [Banks, *et al.* (1996); McCulloch (2003); Niimi (2005); Nicitia (2004b); Friedman and Levinsohn (2002)]. In first order approximation, all the elasticities are considered to be zero so consumers are unable to change their consumption patterns due to price change. As the substitution effect is not taken into account for the first order approximation welfare analysis so this is the reason that it is considered to be seriously biased [Banks, *et al.* (1996)]. While through second order approximation full effect (including substitution effect), price change is analysed. Though, for comparison purpose, both first order as well as second order approximations results are stated in the present study. So estimated Hicksian (compensated) elasticities are utilised to quantify the welfare cost due to rising energy prices in four different scenarios. Following the previous studies [Niimi (2005); Nicitia (2004b); Friedman and Levinsohn (2002)], Compensating Variation (CV) technique is used to measure the change in consumer welfare.

The following Tables 6 and 7 represent the CV estimates, as a percentage of average consumer expenditure, for each energy source based on their budget share and price change in distinctive scenarios for Pakistan. For comparison purposes, we also presented estimates from a first-order approximation to the price changes, which disregards substitution effects in consumption. The Table 6 presents the first-order effects while Table 7 shows the full effects. It is clear from Table 6 that in Scenario I the consumer required 289 percent of their total expenditure (per year) to compensate the consumers' income to reach at initial utility level due to higher energy prices, without allowing for substitution to relatively cheap energy source. At disaggregate level, 149.79 percent of total expenditure as compensation (per year) is required to attain 1987s' consumption pattern in case of high speed diesel oil. Similarly, CNG consumer needs 0.01 percent compensation to maintain the initial consumption level. Furthermore, natural gas and electricity consumer required 9.9 percent and 43 percent respectively as compensation respectively. While in Scenario II, 84.24 percent of total expenditure (annually) is needed to pay the consumer to achieve the 1990s' utility level as a result of increase in energy prices which they faced during 7 years. Furthermore, at disaggregate level, high speed diesel oil consumer required 32.92 percent of total expenditure as compensation (per year) to attain 1990s' consumption level. Correspondingly, gasoline consumer required 13.75 percent compensation to maintain the initial consumption level. While, natural gas and electricity consumer required 2.62 percent and 25.75 percent respectively as compensation to reach at initial utility level without substitution. In scenario III, 67.24 percent of total expenditure (per year) is necessary to pay the consumer to achieve the 2003s' utility level which they faced during 6 years without allowing for substitution. While at disaggregate level, in case of high speed diesel oil 44.85 percent of total expenditure as compensation (per year) is required to attain initial consumption level. Correspondingly, gasoline consumer required 10.39 percent compensation to maintain the earlier consumption level. Furthermore, natural gas and electricity consumer required 3.58 percent and 6.38 percent respectively as compensation to reach at initial utility level without substitution. In Scenario IV, 52.19 percent of total expenditure (per year) is necessary to pay the consumer to achieve the 2009s' utility level as a result of increase in energy prices which they faced during the scenario of 4 years without allowing for substitution. While for high speed diesel oil 29.22 percent of total

expenditure as compensation (per year) is required to attain initial consumption level. Correspondingly, gasoline consumer required 6.18 percent compensation to maintain the earlier consumption level. Furthermore, natural gas and electricity consumer required 5.79 percent and 13.75 percent respectively as compensation to reach at initial utility level.

Table 7 represents CV including substitution effect that is considerably smaller than the estimates without the substitution effect and it is clear from Table 3.2. But this situation is opposite in the long scenario of 26 years as in the long run the substitution effects also contributes in the welfare loss. While in scenario II when we considered the substitution effect, compensating Variation declines from 84.24 percent to 78.30 percent. Scenario III covers the oil shock occur during 2003-2008. In this scenario welfare also declines as a result of energy inflation. As the average consumer of Pakistan needs 36 percent compensation on their total expenditures to attain the consumption level that they enjoy in 2003. While in scenario IV, 52.59 percent of total expenditure is required to attain the consumption level of 2009. The overall results suggest that all household groups suffered welfare lost arising from the energy price increases in all scenarios.

Table 6

*First order estimation of Compensation Variation*

| Energy Sources        | Scenario I | Scenario II | Scenario III | Scenario IV |
|-----------------------|------------|-------------|--------------|-------------|
| Coal                  | 12.42      | 2.18        | 1.66         | 1.91        |
| Gasoline              | 60.24      | 13.75       | 10.39        | 6.18        |
| HOBC                  | 13.16      | 6.98        | -0.034       | 0.009       |
| Kerosene              | 0.05       | 0.01        | 0.0029       | 0.002       |
| High Speed Diesel Oil | 149.79     | 32.92       | 44.85        | 29.22       |
| CNG                   | 0.01       | 0.0002      | 0.39         | 1.90        |
| Natural Gas           | 9.89       | 2.62        | 3.58         | 5.79        |
| Electricity           | 43.11      | 25.75       | 6.38         | 13.75       |
| Total                 | 288.70     | 84.24       | 67.24        | 58.76       |

Source: Authors' own calculations.

Table 7

*Second Order Estimation of Compensation Variation*

| Scenario I | Scenario II | Scenario III | Scenario IV |
|------------|-------------|--------------|-------------|
| 326.38     | 78.30       | 63.03        | 52.59       |

Source: Authors' own calculations.

## DISCUSSION

Unfortunately, there are very few studies in Pakistan which estimate the energy demand at disaggregate level to capture the demand elasticities for coal, gas, gasoline, electricity, diesel, kerosene, CNG and HOBC such as Burney and Akhtar (1990); Malik, (2008); Khan and Ahmad (2008); Akmal, (2002); Chaudhry, *et al.* (2012).

Electricity is considered to be essential energy source in Pakistan. So, in the present study, in accordance our results the demand for electricity is essential and the

same results are found in Akmal (2002); Khan and Ahmad (2008). But price elasticity of electricity is not less responsive to electricity price contrary with Siddiqui (1999); Khan and Ahmad (2008); Iqbal, *et al.* (2013) but similar to Chaudhry, *et al.* (2012) conclusions. Coal is also essential energy source according to present study and also Khan and Ahmad (2008) supports our finding. In addition it, price elasticity of coal is less responsive to coal price following to Siddiqui (1982).

Since 1980s' natural gas is considered as a big source to provide energy in manufacturing sector as well as to generate electricity [Siddiqui (1999)]. Moreover, the natural gas consumption share in Pakistan is more than 50 percent (Pakistan (2012)]. According to present study the natural gas is essential energy source and this result is consistent with Iqbal (1983); Siddiqui and Haq (1999); Khan and Ahmad (2008) results. So, its demand responses as price change. Our results suggest that demand for natural gas responses more to price change of natural gas which is inconsistent with Iqbal (1983); Siddiqui and Haq (1999); Khan and Ahmad (2008) results. In addition to it, electricity or coal is alternatives of natural gas which is similar with Siddiqui (1999) results.

In transport sector, gasoline as well as high speed diesel is mainly used while kerosene is mostly used by domestic sector. The demand for High Speed Diesel Oil is affectedly increased as a result of low taxes on HSD on the other hand gasoline prices tend to rise due to higher taxes on gasoline prices. Furthermore, rising CNG demand in transport sector also affect the gasoline demand [Ahmad and Kumar (2007)]. So, in present study the demand for HSD is essential, gasoline is superior according to our results and finally CNG is inferior due to less improvement in vehicles' efficiency. Moreover, HOBC and Kerosene is superior and inferior respectively in the present study. Furthermore, our results suggest the substitution among gasoline-HSD and gasoline-CNG and gasoline-coal (but not close substitute) and these results support the Chaudhry, *et al.* (2012) conclusion as well as electricity and kerosene are alternatively used in domestic sector similar with Siddiqui (1999) findings.

The gasoline energy source is found to be less responsive to gasoline price in present study similar with Ahmadian, *et al.* (2007); Burney and Akhtar (1990). Finally, it is easy to say that in present study, the demand for energy in most cases is price responsive and variation in income causes the change in energy demand similar with Siddiqui and Haq (1999) findings.

Unfortunately, there are no studies which made efforts to estimate the consumers' compensating variation measure of energy consumption pattern due to rising energy prices at disaggregate level in Pakistani energy market. But very few studies are conducted to quantify the welfare implications as a result taxation and shortage of energy supply such as Ahmad, *et al.* (2013); Ali and Nawaz (2014). The present study estimates that due to growing energy prices, especially in inflationary scenarios, the consumers' welfare fall, and compensating variation cost is required to compensate the consumers' income to recover the earlier consumption pattern. These findings are consistent with Davoodi and Salem (2007); Asghar, *et al.* (2010); Nikban and Nakhaie (2011); Araghi and Barkhordari (2012); Ahmadian, *et al.* (2007) studies conducted in Iran, Huang and Huang (2012) conducted in US.

## CONCLUSION

The results of the AIDS demand system for energy sources confirmed that higher energy prices have an adverse impact toward consumers' welfare in Pakistan. From the elasticities it is concluded that coal, high speed diesel oil, natural gas as well as electricity is considered to be necessity<sup>1</sup> energy source in Pakistan, moreover the demand elasticities also confirmed the nature of these energy sources as these are relatively less elastic or unit elastic. While in case of kerosene and Compressed Natural Gas, the demand elasticities were relatively more elastic that explained the inferior<sup>2</sup> energy source.

Furthermore, It is concluded from the measure of compensating variation in four scenarios that when energy prices increase inadequately, consumer required more amount of total expenditure in term of percentage (per year) as a compensation to recover/attain the initial consumption pattern, without allowing the substitution. But when consumers are allowed to move to inexpensive energy source then the measure of compensation is significantly smaller. While in case of scenario of 25 years the amount of compensation with substitution remains higher as compared to measure of compensation without substitution.

The results of the present study are important for policy-maker to modify the price as well as income policies. In order to propose effective energy pricing policy for future, the present study will be helpful and both public and private investors can get benefits for future decision from this study. In case of relatively price elastic energy source, as price rise then consumers demanded less for energy source. In this situation policy maker should adopt price control policy to enhance the energy consumption. As natural gas is essential energy source in Pakistan and relatively elastic too in the present study. So, in order to control its consumption, price control policy should be adapted by policy makers. Unfortunately, Pakistan is facing the shortage of natural gas. The awareness should be prevailed among consumers for efficiently utilisation of energy sources in order to overcome the problem of shortage of energy. Electricity is considered to be a secondary source of energy in Pakistan. In developing countries like Pakistan oil is used to generate the electricity. As Pakistan is importer of oil so, Pakistan's electricity generation is extremely influenced by imported oil seeing that every year about 14.5 billion dollar is spent to import oil in Pakistan, the mostly oil is used for electricity generation [Pakistan (2013)]. As electricity is also essential and relatively price elastic energy source in Pakistan. So, price control policy is benefit to control the consumption level. The electricity prices are badly affected due to any disturbance in global oil prices. So, Pakistan should decrease the dependency on imported oil to generate electricity. Pakistan should invest in coal, natural gas as well as electricity generation in order to decrease the import bill.

<sup>1</sup>Because the expenditure elasticity for coal, high speed diesel oil, natural gas and electricity is less than zero which implying the essential energy source.

<sup>2</sup>As the expenditure elasticity of kerosene as well as CNG is negative indicating the inferior energy sources.

## APPENDIX

Table 1

*Coefficients of Shares Equations for Pakistan*

| Independent Variables | Dependent Variables   |                     |                     |                     |                     |                     |                     |
|-----------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                       | Gasoline              | HOBC                | Kerosene oil        | HSD                 | CNG                 | Natural Gas         | Electricity         |
| Constant              | -0.577*<br>(0.343)    | -0.030<br>(0.118)   | -0.09***<br>(0.031) | 2.307***<br>(0.369) | -0.150*<br>(0.087)  | -0.057<br>(0.038)   | -0.86***<br>(0.250) |
| Coal                  | 0.003<br>(0.012)      | 0.000<br>(0.005)    | 0.001<br>(0.001)    | -0.034**<br>(0.016) | 0.003<br>(0.004)    | -0.002**<br>(0.001) | 0.011<br>(0.007)    |
| Gasoline              | 0.117***<br>(0.033)   | -0.024**<br>(0.011) | -0.001<br>(0.003)   | -0.074**<br>(0.034) | -0.006<br>(0.008)   | -0.01***<br>(0.004) | -0.009<br>(0.024)   |
| HOBC                  | -0.048***<br>(0.013)  | -0.005<br>(0.004)   | -0.003**<br>(0.001) | 0.050***<br>(0.014) | -0.01***<br>(0.003) | 0.003*<br>(0.001)   | 0.024**<br>(0.009)  |
| Kerosene              | 0.091<br>(0.057)      | 0.047**<br>(0.019)  | 0.012**<br>(0.005)  | -0.067<br>(0.061)   | 0.021<br>(0.014)    | 0.004<br>(0.006)    | -0.071*<br>(0.042)  |
| HSD                   | -0.053<br>(0.069)     | 0.004<br>(0.023)    | -0.003<br>(0.006)   | 0.059<br>(0.072)    | 0.002<br>(0.017)    | -0.02***<br>(0.008) | -0.032<br>(0.050)   |
| CNG                   | 0.007<br>(0.035)      | 0.008<br>(0.012)    | 0.007**<br>(0.003)  | 0.024<br>(0.037)    | 0.013<br>(0.008)    | -0.003<br>(0.004)   | -0.049*<br>(0.025)  |
| Natural Gas           | -0.063***<br>(0.021)  | -0.013*<br>(0.007)  | -0.01***<br>(0.002) | 0.025<br>(0.022)    | -0.005<br>(0.005)   | 0.053***<br>(0.002) | 0.030**<br>(0.015)  |
| Electricity           | -0.045***<br>(0.013)  | -0.03***<br>(0.004) | 0.003<br>(0.001)    | -0.05***<br>(0.014) | -0.003<br>(0.003)   | -0.01***<br>(0.002) | 0.173***<br>(0.009) |
| Cost_deflat           | -0.215 ***<br>(0.076) | -0.09***<br>(0.026) | -0.02***<br>(0.006) | 0.44 ***<br>(0.082) | -0.025<br>(0.019)   | -0.018**<br>(0.009) | -0.09*<br>(0.056)   |
| Lag                   | 0.164***<br>(0.009)   | 0.263***<br>(0.012) | -2.13***<br>(0.078) | 0.059***<br>(0.009) | 0.027**<br>(0.010)  | 0.113***<br>(0.009) | 0.085***<br>(0.008) |
| dum_00_01             | 0.005<br>(0.010)      | 0.001<br>(0.005)    | -                   | -0.006<br>(0.017)   | -0.002<br>(0.004)   | -                   | -                   |
| dum_03_06             | -0.006<br>(0.007)     | -0.003<br>(0.003)   | -                   | 0.012<br>(0.011)    | 0.001<br>(0.002)    | -                   | -                   |
| R-Square              | 0.82                  | 0.80                | 0.74                | 0.89                | 0.83                | 0.81                | 0.87                |
| Adjusted R-square     | 0.64                  | 0.59                | 0.57                | 0.77                | 0.74                | 0.62                | 0.76                |

Source: Authors' own calculations.

\*\*\* Indicates significant at 1 percent level of significance.

\*\* Indicates significant at 5 percent level of significance.

\* Indicates significant at 10 percent level of significance.

Note: For each pair of estimates, the upper figure is the estimated parameters, and the lower figure in parenthesis is the standard error.

Table 2

*Hicksian Short Run Elasticities*

| Prices      | Energy Consumption |          |         |        |          |        |             |             |
|-------------|--------------------|----------|---------|--------|----------|--------|-------------|-------------|
|             | Coal               | Gasoline | HOBC    | HSD    | Kerosene | CNG    | Natural Gas | Electricity |
| Coal        | -0.582             | 0.340    | -0.384  | 0.423  | -0.170   | -0.218 | -0.550      | 1.14        |
| Gasoline    | 0.298              | -0.791   | -0.186  | 0.485  | 0.002    | 0.052  | 0.049       | 0.30        |
| HOBC        | 0.131              | 18.410   | -1.569  | 0.735  | 1.048    | -0.095 | -0.429      | 0.05        |
| HSD         | 0.045              | 0.142    | -0.046  | -0.554 | 0.001    | 0.005  | 0.064       | 0.26        |
| Kerosene    | -14.6              | -19.30   | -17.854 | 22.981 | -35.675  | 7.002  | 6.455       | 1.66        |
| CNG         | -0.360             | 0.495    | 5.843   | -0.287 | -0.031   | -1.447 | -0.294      | 0.29        |
| Natural Gas | 8.178              | -2.733   | -0.372  | 0.609  | -0.029   | 0.011  | -0.899      | 1.03        |
| Electricity | -0.432             | -0.654   | 0.261   | 0.369  | -0.023   | 0.042  | 0.101       | -1.05       |

Source: Authors' own calculations.

Table 3

*Hicksian Long Run Elasticities*

| Prices      | Energy Consumption |               |               |               |                |               |               |               |
|-------------|--------------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|
|             | Coal               | Gasoline      | HOBC          | HSD           | Kerosene       | CNG           | Natural Gas   | Electricity   |
| Coal        | <b>-1.401</b>      | 0.702         | -0.792        | 0.873         | -0.351         | -0.451        | -1.135        | 2.356         |
| Gasoline    | 0.299              | <b>-0.796</b> | -0.187        | 0.488         | 0.002          | 0.052         | 0.050         | 0.305         |
| HOBC        | 0.131              | 18.461        | <b>-1.574</b> | 0.737         | 1.051          | -0.095        | -0.430        | 0.048         |
| HSD         | 0.045              | 0.141         | -0.046        | <b>-0.557</b> | 0.001          | 0.005         | 0.0646        | 0.261         |
| Kerosene    | -11.2              | -18.37        | -17.673       | 22.749        | <b>-35.913</b> | 6.931         | 6.833         | 1.646         |
| CNG         | -0.375             | 0.515         | 6.087         | -0.299        | -0.032         | <b>-1.507</b> | -0.307        | 0.311         |
| Natural Gas | 8.292              | -2.771        | -0.377        | 0.618         | -0.029         | 0.011         | <b>-1.013</b> | 1.045         |
| Electricity | -0.432             | -0.654        | 0.261         | 0.369         | -0.024         | 0.041         | 0.101         | <b>-1.049</b> |

Source: Authors' own calculations.

Table 4

*Expenditure and Marshallian Elasticity*

| Prices      | Consumption  |              |              |              |               |              |              |              |       |
|-------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|-------|
|             | Coal         | Gasoline     | HOBC         | HSD          | Kerosene      | CNG          | Natural Gas  | Electricity  |       |
| Coal        | <b>-0.61</b> | 0.179        | -0.405       | 0.018        | -0.170        | -0.23        | -0.596       | 0.90         | 0.907 |
| Gasoline    | 0.26         | <b>-0.87</b> | -0.211       | 0.015        | 0.002         | 0.041        | -0.005       | 0.034        | 1.052 |
| HOBC        | 0.09         | 18.245       | <b>-1.59</b> | 0.317        | 1.048         | -0.105       | -0.478       | -0.19        | 1.004 |
| HSD         | 0.01         | -0.034       | -0.07        | <b>-0.98</b> | 0.001         | -0.005       | 0.013        | 0.01         | 0.991 |
| Kerosene    | -11.4        | -18.02       | -17.68       | 26.21        | <b>-35.68</b> | 7.078        | 6.829        | 3.51         | -7.23 |
| CNG         | -0.36        | 0.504        | 5.84         | -0.265       | -0.031        | <b>-1.45</b> | -0.292       | 0.31         | -0.04 |
| Natural Gas | 8.169        | -2.781       | -0.37        | 0.487        | -0.029        | 0.008        | <b>-1.01</b> | 0.96         | 0.273 |
| Electricity | -0.46        | -0.831       | 0.23         | -0.077       | -0.024        | 0.031        | 0.049        | <b>-1.60</b> | 0.944 |

Source: Authors' own calculations.

Table 5

*Elasticity of Substitution*

|             | Energy Consumption |          |      |     |          |     |             |             |
|-------------|--------------------|----------|------|-----|----------|-----|-------------|-------------|
|             | Coal               | Gasoline | HOBC | HSD | Kerosene | CNG | Natural Gas | Electricity |
| Coal        |                    | S        | C    | S   | C        | C   | C           | S           |
| Gasoline    | S                  |          | C    | S   | S        | S   | S           | S           |
| HOBC        | S                  | S        |      | S   | S        | C   | C           | S           |
| HSD         | S                  | S        | C    |     | S        | S   | S           | S           |
| Kerosene    | C                  | C        | C    | S   |          | S   | S           | S           |
| CNG         | C                  | S        | S    | C   | C        |     | C           | S           |
| Natural Gas | S                  | C        | C    | S   | C        | C   |             | S           |
| Electricity | C                  | C        | S    | S   | S        | S   | S           |             |

Source: Authors' own calculations.

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## Pakistan's Governance Goliath: The Case of Non-Professional Chairman, FBR

MUHAMMAD ASHFAQ AHMED

The governance crisis of Pakistan's public sector is wide, deep and historically imbedded. There are a host of factors which contribute at varying degrees towards the extent of governance mess. The body of scholarship created to analyse the underlying factors of public sector management mess of Pakistan is not only scant but also deficient in quality, coverage and construct validity. In the entire administrative morass of Pakistan, the quagmire of Federal Board of Revenue (FBR)—house of the state's extractive function—is by far the most sombre and serious one. The paper picks up FBR as the unit of analysis and there too, only one variable, that is, appointment of a non-professional generalist as its Chairman to analyse below par performance of Pakistan's revenue function—by far the lowest in the world. It posits that appointment of non-professional Chairman, FBR, is a compelling exposition of a collusive duopoly arrangement between elites and generalist cadres of Pakistan civil services—both symbiotically pursuing their perverse particularistic interests at the expense of citizenry at large. The paper develops a theoretical framework within which it attempts to analyse domination of Pakistan's extractive function over history from various dimensions. It argues that, since the entire institutional infrastructure of the state has fallen hostage to elites-generalist duopoly paradigm, the control of its extractive function is only a logical consequence thereof, and that a non-professional generalist chairman is imposed on the revenue function only to precisely, and fully control the extractive policy formulation process as well as the extractive operations on the ground—to the ultimate advantage of the duopoly.

*JEL Classification:* H1

*Keywords:* Public Sector Management, Federal Board of Revenue, Civil Service of Pakistan, Inland Revenue Service, Chairman, FBR, Institutionalism

*“The true pilot must pay attention to the year and seasons and sky and stars and winds, and whatever else belongs to his art, if he intends to be really qualified for the command of a ship.”<sup>1</sup>*

### I. INTRODUCTION

Institutionalism—in all its conceptualisations, forms and variants—be that *old institutionalism* attending primarily to the formulation and behaviour of public sector formal institutions as a path to understanding politics, government and state conduct;<sup>2</sup> *rational choice institutionalism* focusing “rational actors who pursue their preferences

Muhammad Ashfaq Ahmed <muhammad.ashfaq@fbr.gov.pk> is Officer of Inland, Revenue Service of Pakistan and is currently posted as Commissioner Inland Revenue, Regional Tax Office, Islamabad.

<sup>1</sup>Plato, *The Republic* (Frankfurt: Penguin Books, 1960), 170.

<sup>2</sup>R. Parrish, *Sports Law and Policy in the European Union* (Manchester University Press, 2003), 54.

following a ‘logic of calculation’ within political institutions, defined as structures of incentives;”<sup>3</sup> *historical institutionalism* consecrating itself to the study of “development of political institutions, described as regularised patterns and routinised practices subject to a logic of ‘path dependence,’” and viewing the institution as a tool to gauge, approximate, detect “social, political, economic behaviour, and change across time and space;”<sup>4</sup> *sociological institutionalism* concentrating “on social agents who act according to a ‘logic of appropriateness’ within political institutions defined as socially constituted and culturally framed rules and norms;”<sup>5</sup> or even *discursive* or *neo-institutionalism* emphasising the “‘sentient’ agents who convey substantive ideas through the interactive discursive processes according to a ‘logic of communication’ within political institutions, understood as structures and constructs of meaning”<sup>6</sup>—for a least common denominator, singularly juxtaposes the “institution” in the heart of all efforts, and analyses geared to better understand and predict the world in its various dimensions and manifestations.

Theoretically, the institution itself could be defined in a variety of ways, but both operationally and contextually it means not any material structure, but a process or a set of processes put in place by the state to perform its certain avowed functions.<sup>7</sup> The importance of the institution emanates from the fact that it is the smallest unit of analysis with critical mass on the landscape of an organised society and the state. Moreover, “Institutions also matter because they (or at least actors within them) typically wield power and mobilise institutional resources in political struggles and governance relationships.”<sup>8</sup>

The extant body of scholarship on institutionalism is silent on two important counts; firstly, it does not appear to take account of macro-dynamics of the institution, that is, what triggers architectonic change in the institution, in its outlook, performance or behaviour?; and secondly, it does not theorise on the role of headship in the context of growth, role, and impact of the institution—for itself; for the society; for the polity and for the world. While the former aspect of the matter has not yet been adequately addressed under any related discipline, the latter has been taken care of but there too only in the knowledge stream on organisation and management; hence this paper. In the context of this paper, and by implication, Pakistan, the identified two gaps in literature, which, at certain level, transmute into unity, are analysed with reference to Pakistan’s house of extractive institutional framework, that is, Federal Board of Revenue (FBR), by assuming that appointment of the head of revenue function is not only a macro-dynamic of the institution but of the state, too.

In the modern-day entrepreneurial management, Chief Executive Officer (CEO)—the pilot of a Platonic ship—is the key role in any organisation or institution. The CEO is important; in fact, so important that the success or failure of any organisation, largely, if

<sup>3</sup>P.M. Telò, *Globalisation, Multilateralism, Europe: Towards a Better Global Governance?* (Ashgate, 2014), 110.

<sup>4</sup>Ibid.

<sup>5</sup>Ibid.

<sup>6</sup>Ibid.

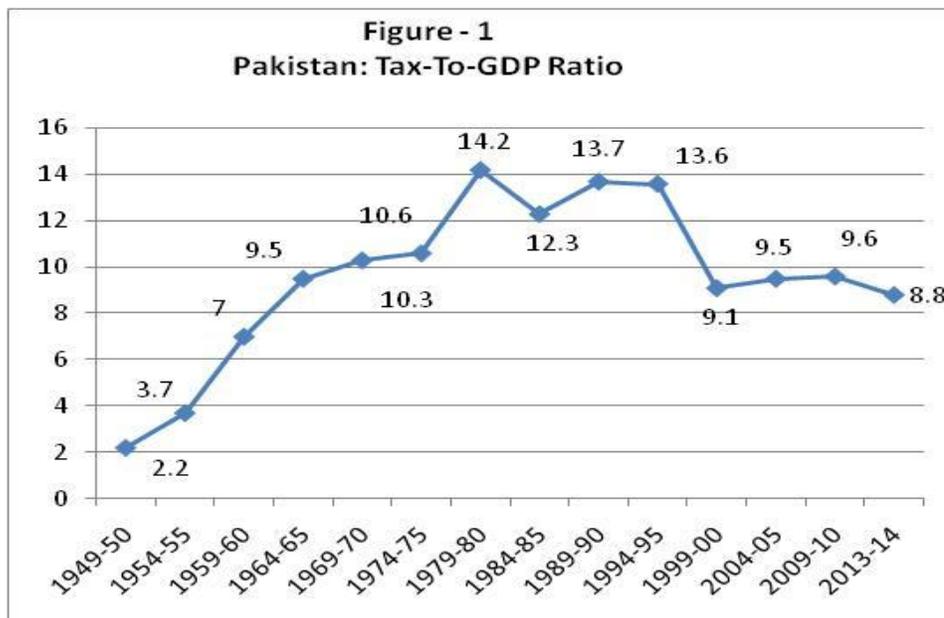
<sup>7</sup>Accordingly, non-state institutions like businesses and non-profit organizations fall out of the framework of Institutionalism.

<sup>8</sup>Stephen Bell, “Institutionalism: Old and New,” in *Government, Politics, Power and Policy in Australia*, ed. Stephen Bell (Pearson Education, 2002), 1.

not exclusively, is attributable to its CEO without many caveats and qualifications. Without being monocausal, this is simply because organisations exhibit natural propensity to imitate and replicate the top man. If the top man is a professional, competent, and comprehends his role full well, he would inspire esprit de corps, command respect and motivate and mobilise its human capital into achieving the optimum. A professional CEO, since he already masters both the organisation and its functions, would constantly look to innovate and keep himself and his organisation in the cutting-edge mode of ever-exploding new realities—the sole survival tactic in the modern world of cut-throat competition.

It follows that even an elementary textbook of business management or leadership would prescribe two sets of qualifications for an ideal CEO. One, *professional qualifications*, that is, specialised in-depth knowledge of the working of the organisation; comprehensive understanding of its governing and operating laws, rules, regulations and procedures; cognition of its objectives; command of the functional nuts and bolts across its domains acquired through practice; mastery of the tricks of the trade; and the latest trends sweeping across the ontological landscape in which he and his organisation have to survive and thrive. Two, *general qualifications* like the ability to influence the behaviour of the rank and file, stimulate and stir them towards achieving organisational objectives, and an empathy and aura to identify himself with people and peers in and around the organisation.

The first set of qualities, it is posited, is in the nature of a *sine qua non*—not only for CEO himself but also for the organisation. However, those that fall in the second set are prescriptively desired capabilities for a CEO to possess in order to be a successful leader of men running a professional organisation. This is because ultimately it is specialised and professional leadership that is identified as the least common denominator in all successful organisations.



Here, a distinction between a private sector CEO and public sector CEO may be required to be drawn and reconciled. Brosnahan posed a very pertinent question: “Is there a difference in the leadership characteristics and values required of the private sector leader compared with those required of a leader in the public sector?”<sup>9</sup> Then he himself hastened to answer it: “I have identified a great deal of commonality, as indicated by the core leadership roles and characteristics, including the emotional and spiritual qualities outlined earlier.”<sup>10</sup> What Brosnahn is trying to put across is that the qualities and qualifications required for both the private and public sector CEOs are closely similar. Real life empirical evidence to the proposition comes from the fact that not only that the private sector has for long moved to specialised and professionally-lead organisational model across the globe, but also the public sector in advanced countries, and to a lesser degree, in the developing world, too. It will not be an exaggeration to state that the modern-day successful management is conveniently synonymised with professionalisation—professional leadership being its hallmark.

Against the backdrop of the foregoing debate, if the appointment of head of public sector institutions in Pakistan, in general, and that of FBR, in particular, is juxtaposed, all the set and established theories of organisational leadership and management go topsy turvy, and are rendered irrelevant and meaningless. At the time of the appointment of Chairman, FBR—the institution that collects about 90 percent of total federal revenues and upon whose performance is contingent the performance of the rest of institutional framework of the state—the first set of qualifications is ignored in entirety, and, for a norm, a non-professional generalist is preferred to a professional specialist. This is an important and intriguing question of state management in Pakistan. The paper, without making another attempt to establish the importance and centrality of the revenue function within the array of state’s avowed functions, quickly moves to argue that extractive outcomes of a revenue system are directly dependent on the availability, quality and adequacy of a number of inputs e.g. policy handles, enforcement handles, human resources, logistical infrastructure, financial allocations for operational overheads, and last but not least, its head – contextually Chairman, FBR. Intriguingly, right in the face of blatantly unwholesome,<sup>11</sup> and declining or, at best, stagnating national tax take, as plotted in Figure 1, while all other inputs have repeatedly been changed and tinkered with, the particular input (practice) of appointment of a non-professional Chairman, has not altered. Resultantly non-professional Chairmen of all shades and hues continue to be placed at the helm of affairs of the state’s revenue operations, ignoring equally senior and competent professionals; whenever even a professional gets appointed as Chairman, FBR, it is basically for a stop-gap arrangement, and as a valve to give a vent to take steam out of the system or some concomitant ulterior motive. A non-professional Chairman, FBR, in fact, is perhaps the only persistently supplied input to the system. This intricate paradox gives rise to an important plausible research question: Why the state of Pakistan—in the wake of consistently below par performance of its revenue function and against the forward march of operating public sector management styles from generalism

<sup>9</sup> Jo Brosnahn, “Public Sector Reform Requires Leadership,” in *Government of the Future*, ed. OECD (Paris: OECD Publishing, 2001), 225.

<sup>10</sup> Ibid.

<sup>11</sup> Refers to undifferentiated and indiscriminatory taxation majorly based on an extended withholding regime coupled with the fiction of income-presumptivisation of gross-receipt of businesses.

to professionalism and from professionalism to super-professionalism as exhibiting across the globe—rigidly continues to appoint a non-professional generalist as Chairman, FBR? This paper is singularly aimed to address this particular question.

The paper is divided into VII sections, each dealing with a different dimension of the matter. After introducing the topic in section I, the narrative in section II deals with theoretical concepts which underpin the ensuing debate. In this context, the elitist framework developed earlier along with Elites Ltd—a convenient conceptual innovation, is employed to anchor the debate in, and to argue that repeated and persistent appointments of non-professional generalists as Chairmen, FBR, is a direct and logical consequence of elites' domination of Pakistan's political economy achieved through entering into a collusion with generalist mandarins of Pakistan civil services. Section III shapes up the concept of the Generalist Juggernaut and traces various aspects of alliance formation between power-wielding elites and the generalist mandarins in a historical context, and seminarily tries to conceptualise and dissect duopoly tactical mechanics. In sections IV, V, and VI—the very core of the paper—the duopoly operational paradigm hierarchically reduces its focus from the domination of the institutional framework of the state; to the monopolisation of the revenue function; and finally, to the absolute control of extractive policy formulation and operational mechanics through appointment of a generalist as Chairman, FBR, respectively. It is argued that, shorn of all additives, Elites Ltd-Generalist Juggernaut duopoly attains the outright domination of Pakistan's extractive function by according a subservient status to FBR—the nerve-centre of state's extractive operations, and by appointing a generalist Chairman, FBR, which can well be reckoned as two well-orchestrated, nicely-coordinated, and deftly implemented stratagems aimed at maximising respective particularistic gains of the partners-in-alliance. The paper comes to a close in section VII by drawing conclusions.

## II. THEORETICAL FRAMEWORK

Although, the elitist framework has long been exploited to analyse Pakistan's power and politico-economic structures,<sup>12</sup> yet Ahmed developed the convenient conceptual vehicle of Elites Ltd, crystallised the elitist model, and extended its framework to systematically analyse monopolisation of Pakistan's extractive function, and disaggregated it to comprehend various mutually reinforcing dynamics and cross-cutting mechanics at work by way of an explanation of its historically embedded low performance.<sup>13</sup> The state's political crust, it is argued therein, is essentially underpinned by Elites Ltd which, in turn, is composed of six effective elite groups i.e. industrial elite, business elite, religious elite, feudal elite, military elite, and sundry (judicial, media, non-profits, and professional) elite; that while elites enter into zero-sum transactions on the political chessboard, they resort to non-zero-sum transactions in the economic realm; that

<sup>12</sup>See, for instance, Asaf Hussain, "Elites and Political Development in Pakistan," *The Developing Economies* 14, no. 3 (1976); Hamza Alavi, "The State in Post-Colonial Societies: Pakistan and Bangladesh" *New Left Review* 1, No. 74 (1972); Saeed Shafqat, *Political System of Pakistan and Public Policy: Essays in Interpretation* (Lahore: Progressive Publishers, 1989); Ishrat Husain, *Pakistan: The Economy of an Elitist State* (Karachi; New York: Oxford University Press, 1999).

<sup>13</sup>Muhammad Ashfaq Ahmed, "Elites, Extraction, and State Autonomy: Pakistan and U.S in Comparison," Area Study Centre for Africa, North and South America (Islamabad: Quaid-e-Azam University, 2015).

elites face a rational actor dilemma in that they need a state to govern but they also want to maintain it at the least cost to themselves; that in order to get out of this dilemma, the elitist state takes to optimally extract from international sources; and that since an infinite international extraction is not possible, it descends down to undertake internal extraction through six unwholesome and perverse modes by way of domestic resource-match.<sup>14</sup> Ahmed reckons extraction as a critical variable of state-building, and in Pakistan's context, lays bare the level of importance which various societal agents accord to it, and enquires into how elites, after effectively monopolising the *infrastructure* i.e. means of production,<sup>15</sup> take to exploit the *superstructure* to numb and opiate the citizenry to conveniently rig the extractive policy formulation process and weaken the state's extractive arm. This position is based on the premise that only a weak extractive system can help elites underwrite full control over their riches that they amass over time through monopolisation and manipulation of the infrastructure, and maintenance of the economic status quo. He further posits that in order to achieve their spurious agenda of maintaining and enhancing the economic status quo, at strategic level, Elites Ltd forms alliance with the Generalist Juggernaut—generalist cadres of Pakistan civil services—an elites-generalist duopoly of sorts.

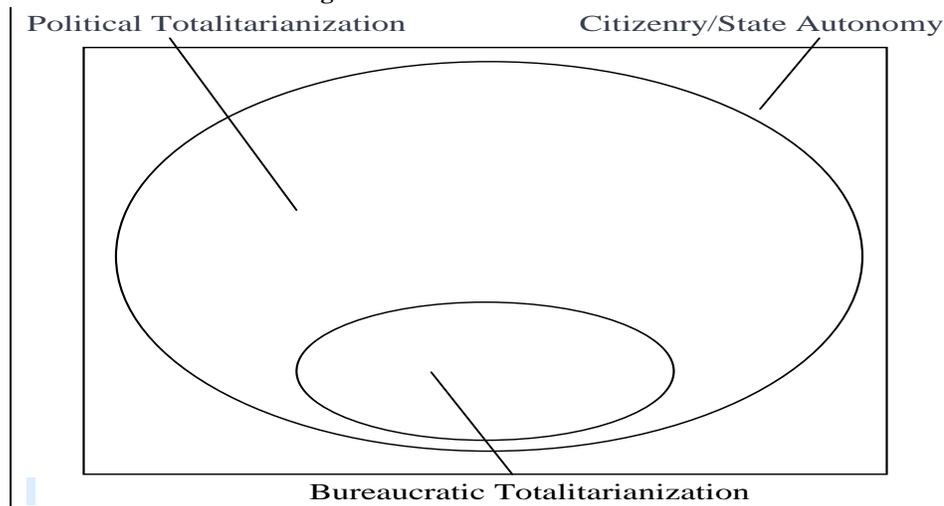
This study builds on the conceptual framework recapitulated hereinabove, and lowers down its focus to dissect the strategic alliance—Elites Ltd-Generalist Juggernaut duopoly—into its elements, and to see how it pans out at tactical level and operationalises itself towards the achievement of its objectives. The paper identifies a tri-tiered hierarchically stratified domination of Pakistan's polity, and argues that the duopoly ventures to dominate the extractive policy formulation and extractive operational system at three levels. At level one, the entire institutional framework of the state is dominated through appointment of generalists at the top of all key institutions and penetrated through at the middle and lower tiers of the government machinery to drive home maximum gains of an overall monopolisation of the public policy formulation process. At level two, the focus is reduced to the domination of FBR (a) by according it a “subserfient” administrative status within the state's institutional framework; (b) keeping it a united monolith and refusing to bifurcate it in accordance with the professional imperatives; and (c) under-allocating funds to it to undertake extractive operations. It is at level three that in order to directly and effectively control extractive policy formulation process as well as extractive operations on the ground that a non-professional Chairman, FBR, is appointed. The appointment of a generalist mandarin as Chairman, FBR, it is averred, is the perfect exposition of collusive symbiotic machinations of the duopoly. The symbiotic collusion between Elites Ltd and Generalist Juggernaut renders Pakistan pretty much a polity with two mutually interdependent and reinforcing totalitarian realities. Totalitarianism, contextually, means a system or an urge to establish a system of governance wherein a particular group, faction, or class, which occupies state's governance apparatus, aspires to identify itself with the state and regards no limits to its authority and strives to regulate every aspect of public and private life wherever feasible in accordance with its own vision, creed, interests or objectives. Totalitarianisation is characterised by authoritarianism sprinkled with ruthless pursuance of group interests at

<sup>14</sup>Ibid.

<sup>15</sup>For a detailed analysis see Husain, *Pakistan : The Economy of an Elitist State*, 133.

the cost of public interest. This is done in complete negation of what Jones calls “superior form of socio-wisdom.”<sup>16</sup> Firstly, political totalitarianisation refers to ruling dispensations of all shades and hues—essentially underpinned and underwritten by Elites Ltd—which look to define the state’s objectives i.e. “national interest” precisely from the point of view of their own aggregated and un-aggregated interests and try to muster requisite wherewithal to get public policy tailored squarely to achieve those elitist objectives—to the exclusion of the citizenry at large. Secondly, bureaucratic totalitarianisation refers to identification of Generalist Juggernaut with the state, its own existentialist imperatives that push it into collusive arrangement with Elites Ltd. Thus, operating both as a rational actor and proxy at the same time, Generalist Juggernaut, by dint of its control of public policy formulation process, takes to carry out biddings of the elites while simultaneously pursuing its own basely interests and objectives. There had been “a time not very long ago when Pakistan’s civil servants could occasionally be motivated to advise the government in accordance with their enlightened self-interest and the national interest,”<sup>17</sup> which is not the case. However, for decades now “self-interest” has started availing outright primacy over “national interest” as the generalist juggernaut exhibited a ready proclivity to get politicised<sup>18</sup> and enter into wedlock of any or no moral standing with the ruling dispensation—be it a political, a military or a hybrid one. It is, therefore, understandable that Pakistan’s ruling dispensations find generalist cadres easy to work with as they lack any professional expertise, and are only too eager to carry out biddings of ruling masters—whether right or wrong, legal or illegal, and pro-people or pro-elite merely for the sake of retaining their own positions. This makes the relationship mutually symbiotic but externally parasitic—for governance and the state.

**Fig. 2. Two Totalitarian Realities**



<sup>16</sup>Garth N. Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition,” *Asian Journal of Public Administration* 19, no. 2 (1997): 329.

<sup>17</sup>Ilhan Niaz, “Advising the State: Bureaucratic Leadership and the Crisis of Governance in Pakistan, 1952-2000,” *The Journal of Royal Asiatic Society* 3, 21, 1 (2011): 41.

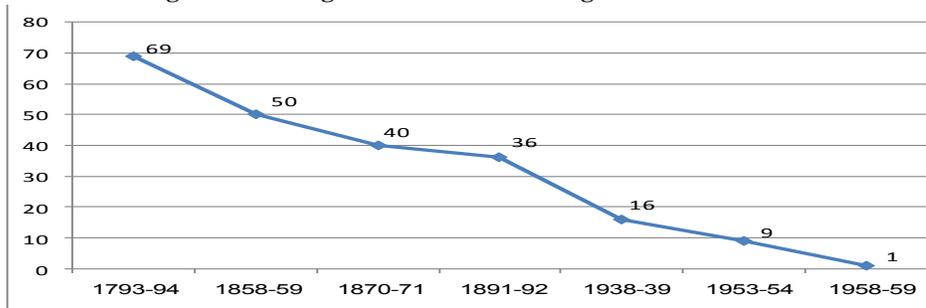
<sup>18</sup>Hussain, “Elites and Political Development in Pakistan,” 228.

The two totalitarian realities are graphically depicted in Figure 2. The square in the picture dimensionally depicts the polity. The bigger ovular circle represents politico-elitist control of the polity. The inner shorter circle represents the bureaucratic reality implying that mandarins, for a norm, play a subsidiary proxy role to political oligarchs. However, since they have their own lowly interests to pursue, to that extent they do look to operate as rational actors. It would not be incorrect to say that history of Pakistan's political economy is essentially reducible to the interplay of these two totalitarian realities.

### III. THE GOVERNANCE GOLIATH

In order to lay bare the mechanics of alliance formation between Elites Ltd and Generalist Juggernaut, a deconstruction of Pakistan's civil service structures in a historical context would be useful. This is important because monopolisation of state's extractive function is taken as an exhibition and outgrowth of an overall monopolisation of the state's institutional system by the duopoly through which both elites and generalists promote their respective perverse interests. The British had ruled India through their much-touted "steel frame"<sup>19</sup> Indian Civil Service (ICS), which enjoyed substantial privilege, clout and power. The clout that ICS officers enjoyed originated from their twin-role of (land) revenue collectors, and municipal administrators. This dual role rendered them attractive and much sought-after socio-familial counterparts particularly for the landed aristocratic class of pre-partition India. Paradoxically though, while on the one hand, ICS' clout ingratiated them deeper and deeper with well-off segments of the society, on the other, the *raison d'être* of their clout—the role of revenue collector—eroded. The erosion of their role caused by changes in real world i.e. technology-driven industrialisation, enhanced international trade spurred and sustained by mechanised shipping, spread of rail system and concrete road networks facilitating bulk trading through mechanised mass movement of goods, and diffusion of professional education, which factors started generating incomes and wealth heretofore unheard of outside the agricultural sector. Simultaneously, an increased demand on the exchequer raised by tense inter-war global security environment culminating in World War II, and eventually leading to partition itself and its aftermath, expanded the non-conventional revenue-base that further undermined the traditional ICS hold that emanated from their primary role of a tax collector.

**Fig. 3. India: Agri Income Tax as %-age of Total Revenue**



<sup>19</sup>The term "steel frame" is credited to have been coined and used, for the first time, by former British Prime Minister David Lloyd George, who while delivering a speech in the House of Commons, in 1935, referred to the clonally-oriented Indian Civil Service as "the steel frame on which the whole structure of our government and of our administration in India rests."

Thus, while land revenue dwindled, the ICS' clout having seeped into the very psyche of the society, continued to be associated with and claimed by them even after the partition. Bird has suggested that total central and state revenues in respect of land tax received constituted 69 percent in 1793-94, 36 percent in 1891-92, 16 percent in 1938-39, 9 percent by 1953-54, and by late 1950s the figure had fallen to 1 percent in India, with situation in Pakistan being not much different.<sup>20</sup> Likewise, as Chaudhry, *et al.* have put share of land revenues in total revenue collected by British India which was 50 percent in 1858-59 had declined to 40 percent by 1870-71.<sup>21</sup> The rate of decline in collection of agricultural income tax as plotted in Figure 2 essentially signified the process of de-professionalisation of a professional outfit and its transformation into a generalist one, which was bound to affect their psyche and their survival instincts. The gradual process of de-professionalisation and its denouement in 1950s effectively drove CSP into a serious existentialist syndrome affecting its outlook, behaviour, and actions, all at the same time, leaving it to fend for itself. This is how, at independence, CSP having lost its primary role of a revenue collector to an emerging competitor outfit—a specialised revenue service, stood at a crossroads.

At this juncture, the de-professionalised ICS had three options. First, to internalise, assimilate and completely assume the new modes of revenue generation like income and excise taxation of businesses, industries, salaries, and passive incomes so as to lawfully keep its colonial ways intact in rather an acceptable and ostensibly legitimate manner. Second, let go of their revenue administrator's role gracefully, and focus instead only on their municipal administrator's role and psychologically adjust and reconcile to new realities of life of reduced clout and importance. Third, inhibit the growth of the emerging revenue service(s) by feeding into and parasitising on their role and development, and make spurious attempts to cling on to the colonial-time tactics, privileges and service conditions.

The paper argues that CSP's exercise of first option would have perhaps been better for the polity as then it could have reoriented itself with the new business model of revenue generation, and all the control ploys that it resorted to subsequently, would not have played havoc with the state. The CSP's exercise of third option instead, it could be reckoned, turned out to be a major cause of much of the current metastatic maladies of Pakistan's polity. Its choice to opt for such a perverse strategy resulted in three direct implications for the country's revenue system. Firstly, it never allowed modern tax bases like income, wealth, (capital) gains, gift, and inheritance to be imposed on the agriculture for one reason or the other because primarily it wanted to stonewall landed aristocracy as a sphere of influence of its own to the exclusion of every other state outfit. Secondly, it took to inhibiting growth of the modern revenue services i.e., IRS and PCS by keeping them deficient on coercive enforcement tools customarily associated with revenue services internationally. It is common knowledge and perception that even the usage of official nomenclatures of Commissioner and Collector being used by IRS and PCS, respectively, would bother the CSP; the latter would consider such honorific titles as their exclusive domain and property. Three, it never let FBR—the house of state's revenue

<sup>20</sup>R. M. Bird, *Taxing Agricultural Land in Developing Countries* (Boston: Harvard University Press, 1974).

<sup>21</sup>Tapan Raychaudhuri, *et al.* *The Cambridge Economic History of India* (Cambridge [Eng.]; New York: Cambridge University Press, 1982).

function—operate as an important, independent, and professionally-run institution, as it always tried to stunt its growth and monopolise it.

The CSP's existentialist paranoia triggered by a compelling process of de-professionalisation as explicated above led it to come up with a two-pronged response. Firstly, it resorted to propagate a myth of the generalist—essentially a British legacy—into the psyche of the Pakistani people with vengeance as the monolithic model of a civil servant and a state manager. Secondly, it frantically took to forming an alliance of perverse interests with Elites Ltd as a survival tactic and pursued it with an unwavering commitment.

### (a) Myth of the Generalist

The myth of the “generalist” was embedded into the consciousness of Pakistan's polity and society systematically. One experiences its manifestation in every dimension of state functioning in Pakistan. The society, in general, and intelligentsia, in particular, seems to have been wheedled into by an overwhelming propagation of the myth of the generalist as a catholicon of governance. Iqbal, exploring into a nexus between good governance and civil service reforms, posits “Pakistan's civil service has been following the British model, but now it is being professionalised ... the generalists are preferred to specialists, and lifetime employment is provided to its incumbents.”<sup>22</sup> One wonders what kind of good governance could be ensured by promoting a *professionalism* which *prefers generalists to specialists* in the 21st century. Numerous studies like this one carrying angular overtones were released to justify and reinforce the dubious myth of the generalist civil servant as a superior legal-rational agent. The myth, should have, by all means, demised with the exit of the British in that the very purpose of the colonial state was to subjugate, and that of the nation state to serve its citizenry, create a bonding, and do service delivery as Jones contended that “imperial civil service may be effective in dealing with expedencies but not with socio-economic change and development.”<sup>23</sup> Since subjugating role of Generalist Juggernaut also converged with vested interests of Elites Ltd, the myth of the generalist was rather stoked to blossom in post-independence period.

### (b) Alliance with Elites

Traditionally, Generalist Juggernaut has been involved in patron-client strategic alliances with both military and non-military governing elites.<sup>24</sup> The civil service,<sup>25</sup> played a lead role in the governance of the country for almost a decade, until “military's entry into politics in October 1958 dislodged civil service from the apex of economic decision-making.”<sup>26</sup> Wilder points out that although the “military regime under General

<sup>22</sup>Muhammad Iqbal, “Is Good Governance an Approach to Civil Service Reforms?,” *The Pakistan Development Review* 45, No. 4 (2006).

<sup>23</sup>Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition,” 324.

<sup>24</sup>Andrew Wilder, “The Politics of Civil Service Reform in Pakistan,” *PJIA Pakistan Journal of International Affairs* 63, no. 1 (2009): 21-23.

<sup>25</sup>The term “civil service” in the context of this paper generally and broadly refers to the generalist cadres howsoever styled i.e. Inidan Civil Service (ICS), Civil Service of Pakistan (CSP), District Management Group (DMG), Pakistan Administrative Service (PAS), Office Management Group (OMG), and the Secretariat Group.

<sup>26</sup>William E. James and Subroto Roy, *Foundations of Pakistan's Political Economy : Towards an Agenda for the 1990s* (New Delhi: Sage, 1992), 139.

Ayub Khan took measures to reign in the powers of the CSP, but overall there was a close symbiotic relationship between the military and the civilian bureaucracy,” and that “systematic militarisation of the bureaucracy began in earnest following General Zia-ul-Haq’s overthrow of the Bhutto government in a military coup in 1977.”<sup>27</sup> He contends that the Generalist Juggernaut had happily welcomed Bhutto’s downfall since in their perception, his administrative reforms had undermined their power and independence.<sup>28</sup> Thus, with the re-advent of military into power in 1977, “CSP was back in the saddle” and “natural comity of interests between civilian and military bureaucrats had been restored.”<sup>29</sup> It has been argued that “The civil service became the linchpin of the entire system—controlling local bodies, planning and executing development projects and jealously guarding its privileged position as the interpreter and executor of the state’s will.”<sup>30</sup> Once the generalist had assumed the role and status of the final arbiter of power in Pakistan, his positioning in that role logically demanded adapting to this role and maintaining it at all costs, which process had implications.

Throughout 1960s, Generalist Juggernaut was universally blamed and battered for bungling governance on all fronts. Hussain avers that “CSP grossly mishandled the political situation in East Bengal...in governmental affairs,” which was primarily because of its having abandoned an apolitical role and becoming “immersed in regional, ethnic politics, and concern for its own political perpetuation,” the logical effect of which “process had been to severely weaken and frustrate the political development of stable, responsive political institutions.”<sup>31</sup> As other elite entities began to gain cognition and consciousness, develop their own particularistic economic identities, give themselves semblance of loosely organised groups, Generalist Juggernaut’s coming into conflict with them was only inevitable. “This was particularly true in the case of the (Landed Elite) LE who were interested to maintain a traditional feudalistic state that the bureaucratic elites wished to promulgate. Even though it was occasionally necessary to cooperate with other elite groups the relationship was only transitory, yielding again to maintaining control of the power junction.”<sup>32</sup>

When Zulfikar Ali Bhutto came to power in December, 1971, after the debacle of East Pakistan, he was suspicious of military, but probably more so of Generalist Juggernaut. Bhutto vehemently exhorted: “No institution in the country has so lowered the quality of our national life as to what is called *Naukarshahi*. It has done so by imposing a caste system on our society. It has created a class of Brahmins or mandarins, unrivalled in its snobbery and arrogance, insulated from life of the people and incapable of identifying itself with them.”<sup>33</sup> Bhutto further insisted “that the bureaucratic apparatus is a neutral instrument which can be bent to any kind of policy. But this neutrality is mythical. The bureaucracy itself is a powerful vested interest, concerned more with its

<sup>27</sup>Wilder, “The Politics of Civil Service Reform in Pakistan.”

<sup>28</sup>Ibid.

<sup>29</sup>Ibid.

<sup>30</sup>Niaz, “Advising the State: Bureaucratic Leadership and the Crisis of Governance in Pakistan, 1952-2000,” 47.

<sup>31</sup>Hussain, “Elites and Political Development in Pakistan,” 229.

<sup>32</sup>Ibid., 228.

<sup>33</sup>Cited in W. Gustafson, “Economic Reforms under the Bhutto Regime,” *Journal of Asian and African Studies* 8, No. 3-4 (1973): 256.

own good than with the good of the public.”<sup>34</sup> Bhutto, not only “suspended the operation of the bureaucratic model for a while even though the civil service was used by politicians to implement their programme for advancing the state’s control over the economy,”<sup>35</sup> he also aggressively took to cataclysmically reforming bureaucracy so as to (a) purge it of corruption and corrupt elements; (b) weaken its steel frame colonial overhang; (c) make it subservient to political elite;<sup>36</sup> and (d) render it responsive to the needs of the people.<sup>37</sup> In order to achieve these objectives, apart from expelling a large number of bureaucrats senior civil servants from the service for “inefficiency” and “misconduct,” Bhutto regime espoused to give civil service a totally new look by splitting it into various functions and specialised cadres.

The reforms were extended a legal cover through the Civil Servants Act, 1973. A uniform set of Basic Pay Scales (BPS) was developed with the basic entry-level scale being 17, and the highest 22 reserved for federal secretaries and other heads of government departments. A corresponding system of promotions was also put in place to raise an impersonal and legal-rational Weberian bureaucracy. A hybrid system of common and specialised trainings was started to homogenise functioning between various government functions. This was a comprehensive and all-encompassing reform-package conceived with professed purpose to democratise Generalist Juggernaut, and implemented with commitment—at least, during first half of PPP government tenure. In its second half, Bhutto government was badly embroiled in too many explosive issues and had its attention completely diverted from civil service reforms and their implementation.

It was at this juncture that the Office Management Group (OMG) joined in as junior partners to CSP to perfect and galvanise the meaning and myth of the generalist civil servant and provide semantic explanations to an extreme degree of self-serving and officious behaviour in the state management of Pakistan. The “generalist” buzzword was then optimally exploited by military regimes of General Zia-ul-Haq (1977-88) and General Pervez Musharraf (1999-2008) to justify mass induction of both serving and retired military officers on civilian positions creating a harrowing specter in terms of policy planning and service delivery domains of the state.

Intriguingly, although Elites Ltd and Generalist Juggernaut were fully engrossed and engaged in optimising the opportunities being thrown open by the duopoly collusive operational paradigm, yet they were never oblivious of hostile and unstable nature of the alliance in that they were constantly trying to outwit and manage each other—within the very ambit of the alliance. The Juggernaut exhibiting persistent polyandrous propensity shuffled across members of Elites Ltd for more favourable quid pro quos—from feudal elite to military elite, from military elite to industrial elite and business elites, and finally to judicial elite—trying to maintain firm domination of the polity. Elites Ltd—by dint of their control of ruling coalitions—out-maneuvered the Juggernaut by creating surplus internal peer competitors whereby two, three or even more officers were made to

<sup>34</sup>Cited in Shahid Javed Burki, “Ayub’s Fall: A Socio-Economic Explanation,” *Asian Survey* 12, no. 3 (1972): 201-12.

<sup>35</sup>Shahid J. Burki, “The Management of Crises,” in *Foundations of Pakistan’s Political Economy: Towards an Agenda for the 1990s*, ed. William E. James and Suboroto Roy (New Delhi: Sage, 1992), 141.

<sup>36</sup>Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition,” 338.

<sup>37</sup>PPP, “Manifesto-1970,” <http://www.ppp.org.pk/manifestos/1970.html>.

compete for one position particularly at the top. The phenomenon multiplied the insecurity already operating on the generalists as now, out of fear of getting surplus, became officious, basely compliant, and ever-ready to put pen to any paper. This scenario is akin and comparable to what Marx called 'the reserved army of the unemployed,' which actually created opportunities for exploitation of the proletariat by the bourgeoisie.

### ***Professional-Non-Professional Divide***

It is on the basis of these reforms that the paper seminally divides and categorises the civil services of Pakistan into two distinct and distinguishable types i.e. professional cadres, and generalist cadres. The *professional cadres* included (i) Commerce and Trade Group (CTG); (ii) Foreign Service of Pakistan (FSP); (iii) Inland Revenue Service (IRS);<sup>38</sup> (iv) Information Group (IG); (v) Military Lands and Cantonment Group (ML&C); (vi) Pakistan Audit and Accounts Service (PAAS); (vii) Pakistan Customs Service (PCS);<sup>39</sup> (viii) Police Service of Pakistan (PSP); (ix) Postal Group (PG); and (x) Railways (Commercial and Transportation) Group (RC&TG). Like the very nomenclatures indicate, each of these cadres was supposed to manage some specific and specialised function of the state. The cadre strength of these groups was pre-fixed by the Establishment Division (ED), and their terms of reference were set out by the government. Normally, cadre officers of these groups start their careers and retire in their respective groups.

The *generalist cadres*, on the other hand, included (i) Pakistan Administrative Service (PAS);<sup>40</sup> (ii) Office Management Group (OMG); and (iii) Secretariat Group (SG). The former essentially start their careers as municipal administrators at sub-divisional, district, and divisional level. The OMG officers, in turn, start as office managers and specialise in managing the federal secretariat business at junior level. Importantly, the very induction-time training model of these two particular groups was geared to mould their officers into performing their non-niche generalist functions.<sup>41</sup> While PAS—direct descendant of CSP—already embedded into societal mores as legitimate bureaucratic rulers, OMG—the other generalist cadre—aspired to form an uneasy alliance with former. Both groups, despite internal fissures, conflicts, and constant turf war, exhibit significant signs of identical behaviour to situate themselves in the backing of each other and against the rest of the specialised and professional cadres thereby collusively shutting out the latter from the top federal government policy formulation and management positions—including the purely economic ones for which they are hardly trained. Similar other symptoms of common intra-generalist cadres behaviour are: (a) lack of professional expertise as a class; (b) multiple attempts at elimination from Central Superior Services (CSS) cadre list; (c) claim as “generalists” to entitle themselves to the entire “residual” federal government; (d) an existentialist mode of behaviour, that is, a strong propensity to support their own group-officers with least or no regard to merit and public interest; and

<sup>38</sup>Prior to 2010, Inland Revenue Service was essentially called “Income Tax Group.”

<sup>39</sup>Prior to 2010, Pakistan Customs Service was called “Customs and Excise Group.”

<sup>40</sup>Prior to 2012, Pakistan Administrative Service was called “District Management Group.”

<sup>41</sup>At mid-career point both PAS and OMG officers loosely and conveniently streamed into SG into which officers from other groups and cadres were also to be inducted as envisioned in the Bhutto-era civil service reforms. However, the latter's induction into SG was never streamlined through framing of proper rules and regulations.

(e) a penchant to exhibit overly officious behaviour to serve ruling oligarchs. Such self-serving collusive tendencies have rendered Generalist Juggernaut pretty much a *nomenklatura*—a caste rather than a class—interested only in serving the superior partners in a perverse symbiotic relationship. “In practical terms,” writes Chaudry of the training of the non-professional cadres at the Civil Services Academy, Lahore, “this meant that the academy had set out to produce jacks of all trades in the true generalist tradition.”<sup>42</sup> It was only logical then that training of these two groups rendered in the generalist tradition coupled with generalist institutional grooming of both PAS and OMG officers transformed them into jacks of all trades, and not proverbially but literally—specialist of none.

#### **IV. DUOPOLY DOMINATION: STATE’S INSTITUTIONAL FRAMEWORK**

Generalist Juggernaut reacted to the reform process with a vengeance, successfully neutralised its potentially adverse effects (for itself), and with a thrust took to promoting its own agenda rather more vigorously. Elites Ltd—already in a long-term collusive arrangement with Generalist Juggernaut—lent full support to the latter’s overtures—simultaneously optimising on its own gains, too. This way Generalist Juggernaut was able to conveniently occupy the entire state structure distinctively from three different dimensions, that is, monopolisation of SG, control of ED, and domination of public policy formulation, which points are explicated in the succeeding paragraphs.

##### **(a) Monopolisation of SG**

One of the prime objectives of the 1973 civil service reforms was to prepare a strong, robust, professional and inclusive bureaucracy to manage the federal government. This was to be achieved through formation of SG consisting of top-notch officers from all groups at mid-career level, that is, BS 19 and 20. It was envisioned that officers of all occupational groups would perform their duties during initial 12 years of their careers, that is, in BS 17 and 18, in their respective cadres, and then best of them would be inducted in SG through a competitive, transparent, and rule-based system implemented across the board. The very purpose of creation of SG was to develop a corps of superior quality officers to manage federal government functions i.e. line ministries, attached departments, autonomous bodies, parastatals, and other programmatic tertiaries and project-oriented entities. Section 10 of the Civil Servants Act, 1973 was to provide an additional window through which officers from various services and groups even in BS 17, 18, and above could be brought into federal secretariat to better administer federal government business at the top. While the rules were neither ever framed nor operationalised to populate SG in a transparent and merit-based manner, section 10 *ibid* was allowed to selectively operate as a safety-valve to the system.

The Commission on Taxation and Tariff (1964-66), had unequivocally recommended competition for the Economic Pool positions—precursor of SG—and observed “While merit may be the sole criterion, it should be ensured that equal

<sup>42</sup>Aminullah Chaudry, *Political Administrators: The Story of the Civil Service of Pakistan* (Karachi: Oxford University Press, 2011), 63.

opportunity is available to officers of all services. One way of achieving this objective could be to put the eligible officers to written and oral examinations and psychological fitness tests and thus make the selection on a competitive basis.”<sup>43</sup> This was, of course, not done. Thus, when PPP regime’s reform agenda rolled out in the shape of law, rules, and policy directives, and started hitting the interests of the heretofore exclusive ruling mandarins—generalists—effective recoil was triggered with the avowed help of elites—worthy partners of symbiotic relationship—thereby comprehensively reversing the reform process, frustrating its objectives, and in the process out-rightly monopolising SG as no rules were framed to systematically induct professional civil servants into its fold.

### (b) “Ministry of Truth’s” Control

Interestingly, while Elites Ltd controlled political power, in a parallel unfolding of a subsidiary plot, their generalist operatives monopolised federal government machinery at the expense of professionalism through the control of ED. The ED being a non-specialised Division of the federal government fell for spoils to the generalists. Under the duopoly dispensation, ED plays George Orwell’s ‘Ministry of Truth’<sup>44</sup>—the very nerve-centre of Pakistan’s civil service with its own dubious Newspeak deftly contrived to promote and propagate the myth of the generalist at the expense of professionalism. According to rules, ED’s role is to perform the primary functions of recruitment, promotion, transfers, postings, determination of cadre strengths of other civil service cadres, creation of positions and determination of their strengths in various parastatals, and creation of new institutions and departments in the public sector. It has authoritatively been pointed out that “mainspring of the Pakistan Administrative State is the Establishment Division,” and that “Through its control of a compact personnel system, the Establishment Division exercises inordinate authority throughout the entire organisational apparatus,” and further that “Basically it functions as the strategic apex of the administrative state and profoundly influences performance of the technical cores of function/line agencies,” whereby “it exercises command-like authority over the entire personnel system.”<sup>45</sup> However, ED has veritably fallen from its position of being a nerve-centre of the state’s entire bureaucratic leviathan to a lowly den of the generalists.

With ED having fallen to and become a bastion of the Juggernaut, it is only relevant for them—as all other service groups feel alienated, disconnected, and detached. Understandably then, ED finds obliged only to do career planning, transfers and postings, and grooming of the generalist cadres, while the professional cadres have been left out to fend for themselves.<sup>46</sup> “The Establishment Division is charged with the maintenance of the establishmentarian character of the administrative state, which it secures by the skilful play of “brokerage” politics—the determination as to who gets the best and worst of jobs along with other rewards,” and that “Within its concentrated authority the Establishment Division exercises control over core personnel functions including their processes of

<sup>43</sup>GOP, “The Commission on Taxation and Tariff (Second Report),” (Islamabad: Ministry of Finance, 1966), 38.

<sup>44</sup>George Orwell, *Nineteen Eighty Four* (San Diego: Harcourt Brace Jovanovich, 1984).

<sup>45</sup>Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition,” 330.

<sup>46</sup>Due to its inter-provincial nature, Police Service of Pakistan, to an extent, is also managed by Establishment Division.

execution and follow-up.”<sup>47</sup> Since imperial organisational and administrative structures were built on distrust rather than trust, and since by their very diverse nature, personal obligations rested on birthplace, kinship, ethnicity, sectarian affinity, and regionalism, it was of critical import that bureaucratic structures of nation-state were built on transparent and fair rules and regulations, and their across-the-board implementation. No doubt, in Pakistan having right connections is a great social value, but as far as the conduct of ED is concerned, in near-entirety, its working is driven by perverse group-feeling of generalist cadres. It has been curtly remarked that in the bureaucratic morass of Pakistan “Those in strategic positions are obligated to secure appointments of friends and kin in the civil service, as well as using their influence in securing special privilege.”<sup>48</sup> Likewise, it has been observed with precise reference to ED that “Postings and transfers have become increasingly arbitrary,” and that “Absent greater transparency in career planning by the establishment division and other departments, an officer’s progress remains uncertain, thus weakening his or her professional commitment.”<sup>49</sup> Totalitarian control of ED by Generalist Juggernaut works viciously against the professionalised services and the state at various levels. Total disarray within which the polity presently finds itself may, to a significant extent, be attributable to the duopoly’s ruthless pursuance of their respective perverse objectives—partly realised through its control of ED on its part.

### (c) Domination of Policy Formulation

By dint of an exclusive control of SG and ED, it is only logical that Generalist Juggernaut would monopolise the entire tally of top positions in the government thereby creating requisite wherewithal to whip up the bureaucratic totalitarian reality, its most important manifestation being the generalist availing the primacy over the professional. “Pakistan’s groundings for constituting a nation-state with a full measure of freedom, equality, and progress are constantly being frustrated,” as a consequence of which “civil service rules through its imperial inherited structures...obsolesced into an establishmentarian character.”<sup>50</sup> It has been observed that “secretariat system which is based on the premise of a separation between policy and implementation is extremely entrenched in the administrative state,” and “secretaries continue to play a predominate role” in policy-making, and whereby “Policy-making is considered a general function fit only for persons educated in the English liberal tradition,” and that “technical personnel, ... who supposedly do not have the breadth of knowledge and skill to deal with complicated policy matters, continue to occupy a second-class status in policy-making and governance.”<sup>51</sup>

This way, slowly and steadily, Generalist Juggernaut occupied the entire ‘residual’ federal government i.e. all Ministries, Divisions, Attached Department, Autonomous Bodies, Regulatory Authorities, and various Public Sector Entities (PSEs), and by implication, entire process of public policy formulation, allocation of public funds under

<sup>47</sup>Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition.”

<sup>48</sup>Ibid.

<sup>49</sup>ICG, “Reforming Pakistan’s Civil Service,” (International Crisis Group, Asia Report No. 185, 2010), 19.

<sup>50</sup>Jones, “Pakistan: A Civil Service in an Obsolescing Imperial Tradition.”

<sup>51</sup>Ibid., 329.

Public Sector Development Program (PSDP), and almost all fountains of revenue. The result is an interesting pattern in which elites reap maximum benefits of economic growth in a rigged economic market, and generalists reap all benefits of bureaucratic governance process i.e. they monopolise not only all top positions in bureaucracy but also rapid promotions, foreign training opportunities, and other public resources like government-owned housing and other facilities.<sup>52</sup>

However, the worst fall-out of duopoly paradigm was that it obviated the very process of division of labor in the public sector. There is set scholarship to support the view that division of labor does lead to specialisation and increase in productivity. Since Generalist Juggernaut successfully thwarted divisioning of labour—at least, at the top level, a wholesome and balanced growth of the public sector was badly stunted, allowing mere increase in its size in a haphazard and conical fashion not its outreach and effectiveness. Resultantly, while all other branches of the government—some of them absolutely necessary—desperately strived for exposure and succor eventually getting *bonsaied*, Generalist Juggernaut thrived in a perversely fashion. Thus, now we have what Mills calls “virtually complete absence of a civil service that constitutes a politically neutral, but politically relevant, depository of brainpower and executive skills.”<sup>53</sup> Resultantly, public policy formulation process in Pakistan is completely rigged carrying pronounced anti-people and pro-elite biases and leanings.

## V. DUOPOLY DOMINATION: REVENUE FUNCTION

The duopoly collusive laid bare in Section II and Section III, having taken charge of the state's institutional superstructure, in general, reduces its focus and tactfully moves to wrest control of the state's revenue function, in particular. It is against this backdrop that FBR falls into the nexus of the elites-generalist duopoly paradigm. At this level the duopoly achieves domination of state's extractive function by (a) according FBR a subservient administrative status; (b) refusing to bifurcate it along functional-thematic lines; and (c) retaining allocational powers and placing insufficient funds to carry out the state's revenue operations. If one were to identify a single most critically important structural bane of Pakistan's extractive system—may even be of the state itself—it will, in fact, be this very issue.

### (a) FBR's 'Subservient' Status<sup>54</sup>

Primarily, the duopoly takes to achieving FBR's domination by according it a subservient administrative stand and status within the overall institutional framework of the state. The underlying assumption is that if the nerve-centre of state's revenue function could be kept in a constant state of quandary, fissures, and chaos, it could just be a walk-in-the-park for the duopoly to subjugate it, control its functions, its inputs and its resultant outcomes. The subservient status also helps the duopoly frustrate all efforts at reforming the tax system, which could potentially threaten weakening of its domination.

<sup>52</sup>A separate segregated analysis of as to how much of these facilities and benefits have been monopolized by the generalists and how much of them have gone to professional outfits, would be educative.

<sup>53</sup>C. Wright Mills, *The Power Elite* (New York: Oxford University Press, 1956), 296.

<sup>54</sup>Serfs were land-tillers who occupied a piece of agricultural land and were required to work for the landlord who actually owned the farm, and in return were entitled to exploit certain fields within the farm to maintain their own subsistence.

The CBR—BR’s predecessor organization—was created on April 1, 1924 through enactment of the Central Board of Revenue Act, 1924. Prior to the promulgation of the Income Tax Act, 1922, income tax was administered through the provincial land revenue machinery under the Income Tax Act, 1918, and in the preceding periods under other relevant laws. The Income Tax Act 1922, created a separate organisation for the assessment and collection of tax on income. The Board of Inland Revenue constituted at the Centre for administration of income tax was replaced in 1924 by CBR to which was entrusted the administration of all the direct and indirect taxes levied by the Central Government.<sup>55</sup> The system so created in the early 1920s remained pretty much the same till it was inherited by Pakistan in 1947, barring a few sector-specific isolated attempts aimed at reforming it.

Administratively, in 1944, a full-fledged Revenue Division had been created under Ministry of Finance as revenue needs of British India ballooned up in the wake and aftermath of World War II. In the post-independence scenario, by way of analysing the aforementioned proposition, FBR, as an institution would be dissected from three distinct perspectives, over clearly demarcated ten periods of its history in respect of (a) its to-and-fro binary movement between an independent Revenue Division (RD) and an Attached Department (AD); (b) its sparingly allowed financial autonomy pattern, that is, its Principal Accounting Officer (PAO); and (c) as to who actually exercised FBR’s PAO-ship, that is, was it devolved to FBR itself or it was exercised by a Finance Secretary (FS), in his vicarious capacity of head of state’s revenue function, to lend credence to the premise that it has been kept in a ready-to-dominate state. A periodised history of FBR divided over ten distinct periods with reference to three cross-cutting perspectives, that is, its own administrative status, the status of its Chairman, and the status of its PAO is graphically plotted in Figure 4.

**Fig. 4. Periodisation of FBR History**

| Revenue Division<br>(1)               | Attached Department<br>(2)            | Attached Department<br>(3)                | Revenue Division<br>(4)                   | Attached Department<br>(5)                           | Attached Department<br>(6)                        | Attached Department<br>(7)                | Revenue Division<br>(8)                   | Attached Department<br>(9)                | Revenue Division<br>(10)                  |
|---------------------------------------|---------------------------------------|---|---|--|---|---|---|---|---|
| 14-07-1947<br>to<br>30-06-1960        | 01-07-1960<br>to<br>10-10-1971        | 11-10-1971<br>to<br>02-10-1991            | 03-10-1991<br>to<br>11-01-1995            | 12-01-1995<br>to<br>12-07-1995                       | 13-07-1995<br>to<br>21-12-1995                    | 01-01-1996<br>to<br>06-11-1998            | 07-11-1998<br>to<br>17-05-2009            | 18-05-2009<br>to<br>18-03-2010            | 19-03-2010<br>to date                     |
| FS/Ex-officio<br>Chairman;<br>FBR/PAO | FS/Ex-officio<br>Chairman;<br>FBR/PAO | Independent<br>Chairman<br>FBR;<br>FS/PAO | Independent<br>Secretary<br>RD/FBR<br>PAO | No<br>Secretary<br>RD;<br>Chairman<br>FBR;<br>FS/PAO | Independent<br>Vice<br>Chairman<br>FBR;<br>FS/PAO | Independent<br>Chairman<br>FBR;<br>FS/PAO | Independent<br>Secretary<br>RD/FBR<br>PAO | Independent<br>Chairman<br>FBR;<br>FS/PAO | Independent<br>Secretary<br>RD/FBR<br>PAO |

During first period which started on August 14, 1947 and ended on August 30, 1960, FBR retained its RD status, and since FSs continued to retain slot of Chairmen, FBR in an ex-officio capacity, they were also PAOs in respect of all expenditures incurred on revenue operations. In spite of dire financial needs on account of defense, development, and rehabilitation of refugees, the polity operating under duopoly paradigm preferred to explore other sources of funds like extraction at the international level.<sup>56</sup>

<sup>55</sup>GOP, “The Taxation Enquiry Committee Report (Volume 1),” (Karachi: Ministry of Finance, 1960), 139.

<sup>56</sup>For an in-depth analysis, see Ahmed, “Elites, Extraction, and State Autonomy: Pakistan and U.S in Comparison.”

“This is why officials in the ministries of finance and commerce ... had begun learning the ropes of the international financial system even if in the process they neglected to refine the art of domestic economic management.”<sup>57</sup> The second period starts on August 31, 1961, and continues till October 10, 1971. Under recommendations of the Administrative Re-organisation Committee, which, in turn, was overly being infiltrated into by military elite and industrial elite, stripped CBR of its independent status of RD, and slapped it a subservient one of an AD, with effect from August 31, 1961. This essentially meant that CBR would now be directly dependent upon Ministry of Finance (MOF)—already a bastion of Generalist Juggernaut—for decisions on even most trivial matters. Military elite and industrial elite made most of it as not only that they rigged industrial, and import and export policies, but also tax policy thoroughly in their favor. Throughout the 1960s, a dysfunctional tax system ensured that bulk of the national wealth amassed in the hands of the proverbial 22 families, while state kept extracting from international sources, and feeding back into the duopoly under a process which could well be termed as extraction-in-reverse or even subtle predation.

During this third period ranging between October 11, 1971 and October 2, 1991, the subsidiary status of FBR continued to hold. However, operating under massive pressure to muster increased finances for defense and law and order particularly in East Pakistan, the polity chose to let go of partial control of the revenue function, and for the first time a professional Chairman was risked with and Muhammad Zulfiqar was appointed as Chairman, CBR. However, this time status of Chairman, CBR, was relegated to the status of an ex-officio Additional Secretary, and made to report to Secretary Finance, instead of Prime Minister—like all other federal Secretaries—through, of course, respective ministers.<sup>58</sup> It is pertinent to mention, without being monocausal, which it was during Zulfiqar's tenures as Chairman, CBR, as depicted in Figure 1 that Pakistan's tax-to-GDP ratio increased from 10.3 to 14.2 in the mid-1970s. When Zulfiqar was replaced on December 11, 1975, generalists were again brought to bear on CBR one after the other. Since Zulfiqar was heading a below-par rump organisation, in that, CBR had already been stripped of its status of RD and been reduced to an AD, FSs continued to be PAOs, and making all critical decisions.

The U.S. withdrawal from Afghanistan, and the West's waning interest in Pakistan, put the polity under pressure compelling it to put its own house in order as far as extraction was concerned. Thus, October 3, 1991, marks the beginning of fourth period in FBR's history, when its status of RD was restored, and for the first time Chairman, FBR, was also given the charge of Secretary, RD. This arrangement continued till January 11, 1995. The flagrant ways of the republic continue and on January 12, 1995, marking the beginning of the fifth period, FBR was again stripped of its status of RD and reduced to an AD, but more importantly, during this entire period spanning over critically important months, officially neither any Chairman, FBR, was appointed, nor the charge of PAO was given to FS, and the entire budget exercise was carried out on ad-hoc basis and in a haphazard manner. In an intriguing coincidence, revenue figures start to take a decline as shown in Figure 1, too. This period ended on July 12, 1995. The polity, under

<sup>57</sup>Ayesha Jalal, *The State of Martial Rule : The Origins of Pakistan's Political Economy of Defence* (Cambridge [England]; New York: Cambridge University Press, 1990), 96.

<sup>58</sup>This aspect of the matter is explicated, at length, in the next section, too.

duress of squeezing revenues, chooses to bring in a professional to lead its revenue operations yet once again signifying the onset of the sixth period w.e.f. July 13, 1995. The duopoly makes a last ditch effort to retain its control of the extractive function through fictional innovation of a Vice Chairman, CBR, and by appointing Alvi Abdul Rahim—a professional—as Vice Chairman, instead of a full Chairman, FBR, and by simultaneously retaining FBR's status of an AD. This period comes to an end on December 31, 1995.

During the seventh period beginning on January 1, 1996 and ending on November 6, 1998, while the position of Chairman, FBR, was restored under pressure of wide-spread resentment across the revenue administration, FBR's subserfient status of AD was retained. Moreover, FSs continue to be PAOs in respect of expenditures incurred on extractive operations. On November 7, 1998, marking start of the eighth period, FBR's status as RD was restored, and for the first time in history, Chairman, FBR, was also given charge of the position of Secretary, RD. This period drew to a close on May 17, 2009. The RD status of FBR was yet once again shelved on May 18, 2009, signifying start of the ninth period, and accorded the subserfient status of AD. Despite the fact that the FBR Act, 2007, which apart from renaming CBR as FBR, had granted some autonomy to the institution, but rarely to be implemented. In the tenth and final period, FBR's status of independent RD was resurrected on March 19, 2010, which holds to-date, with the charge of Secretary, RD, continues to be given to Chairmen, FBR, who acts as PAO in respect of all expenditures incurred on extractive operations. The duopoly, however, continues to control the extractive function through appointment of a generalist Chairman, FBR.

#### **(b) Resistance to Bifurcate FBR**

Like explicated above, while in Pakistan extractive function was kept in a constant state of meltdown, the CBR, India was bifurcated as far back as 1963, into CBR, Direct Taxes, and CBR, Excise and Customs.<sup>59</sup> The division of CBR, India, into two specialised entities to be managed by two professional service cadres i.e. Indian Revenue Service and Indian Customs and Excise Service respectively, was set to have far-reaching implications. Such a forceful administrative decision emanating from superior political wisdom and far-sightedness, shut all doors for non-professional generalists for all times to come, to have a go at the state's extractive function, cow it down into adopting a servile attitude towards elites and sinisterly play their role towards preservation of status quo by perversely exploiting it as a tool of domination. Moreover, the state chose to empower its extractive services with all requisite power tools.<sup>60</sup> By way of an aside,

<sup>59</sup>In India, the Central Board of Revenue created in 1924 under the Central Board of Revenue Act, 1924, was split into the Central Board of Revenue Direct Taxes and the Central Board of Revenue Customs and Excise vide the Central Board of Revenue Act, 1963, Act No. 54 of 1963, dated December 30, 1963, which came into force with effect from January 1, 1964.

<sup>60</sup>Quite unlike in Pakistan, Indian Revenue Service and Indian Customs and Excise Service were made responsible to manage all affairs pertaining to revenue collection and enforcement of fiscal codes of all kinds e.g. the Indian Stamp Act, 1899, (to the extent falling under the Union jurisdiction), Central Sales Tax Act, 1956, Narcotic Drugs and Psychotropic Substances Act, 1985, Smugglers and Foreign Exchange Manipulators (Forfeiture of Property) Act, 1976, Foreign Exchange Management Act, 1999, Prevention of Money-Laundering Act, 2002, and Conservation of Foreign Exchange and Prevention of Smuggling Activities Act, 1974.

while in India, IRS is a dreaded outfit—aggressive, forward-looking and enforcement-oriented, in Pakistan, it is paranoid, harassed, incapacitated, and compliance-oriented—no better than, to quote a jest, a municipal termite eradication department.

Why was FBR not bifurcated in Pakistan a la India? A united FBR creates requisite amount of tactical space for the duopoly to act, imperialise, and dominate the polity's extractive institutional order by blowing up the argument that since both IRS and PCS indulge in an in-fight, it is imperative that a neutral outsider is appointed to head it; neutral, contextually meaning a generalist. The bifurcation of FBR has been desisted successfully over the history despite its repeated surfacing every now and then as the unfinished agenda of the administrative state. In Pakistan, the question of bifurcation of CBR into two separate organisations to manage direct and indirect taxes came under careful examination of The Taxation Commission—1970-74 (TC), when two conflicting views were put forth for debate. The first view was that a bifurcation of CBR into two with distinct functions would result in better tax administration and larger revenue collection because both work-streams were markedly different as while direct taxation required an audit and mercantile approach, indirect taxation was concerned with valuation, import status and classification of goods.<sup>61</sup> The second view was that CBR's bifurcation would not solve any problems and that coordination would still be needed between the two boards, and that the key man in tax administration was Member in-charge of a department; and therefore, if Members were ineffective, tax administration would remain ineffective bifurcation or no bifurcation. After a protracted debate, the Taxation Commission reached the conclusion "that the existing structure is satisfactory except that a Revenue Division should be established and the main responsibility of this Division should be to manage the taxes and duties."<sup>62</sup> The duopoly scrambled to implement the recommendation and readily ended up establishing the Revenue Division as it would add another position to their already large tally of top positions in government hierarchy.<sup>63</sup>

The National Taxation Reform Commission—1985-87 (NTRC), also deliberated this important aspect of the revenue system but then desisted from recommending CBR's bifurcation in a rather summary manner. Was it a mere coincidence that a stalwart generalist Qamar-ul-Islam was heading the NTRC with all elite groups being represented in the NTRC as its members?<sup>64</sup> Begum Salma Ahmad, MNA, in 1988, speaking on the NTRC Report, on behalf of the Sub-committee of National Assembly Standing Committee on Finance (SNASCF)<sup>65</sup> announced that SNASCF had recommended that "CBR be bifurcated into two Boards."<sup>66</sup> Similarly, the Sub-Committee of the Senate

<sup>61</sup>GOP, "The Taxation Commission Report (Volume 1)," (Islamabad: Ministry of Finance, 1974), 187.

<sup>62</sup>Ibid.

<sup>63</sup>Ahmed, "Elites, Extraction, and State Autonomy: Pakistan and U.S in Comparison." has argued that Elites Ltd selectively implements only those recommendations that suit it, and ignores such others which do not suit it.

<sup>64</sup>For a detailed account of elitism being at work in NTRC, see *ibid.*

<sup>65</sup>The SNACF was headed by Haji Younas Elahi, and comprised Begum Salma Ahmad, Begum Dureshahwar Mazari, and Sh. Mansoor Ahmad and was constituted to deliberate upon and firm up the National Assembly's observations and recommendations on the National Taxation Reform Commission's Report (1985-87).

<sup>66</sup>GOP, "Official Report - N.A. 1st Session of 1988 (Wednesday, the 9th March, 1988)," in *The National Assembly of Pakistan DEBATES (Volume 1)* (Islamabad: N.A. Secretariat, 1988), 2357.

Standing Committee on Finance (SSSCF)<sup>67</sup> had strongly supported CBR's splitting up into two separate boards in the same fashion as it had earlier been done in India.<sup>68</sup> In the same vein, in 1988, the Study on Direct Taxes which was sponsored by Government of Pakistan and funded by the Government of the United Kingdom, had categorically recommended to "split the CBR into Boards responsible for direct and indirect taxes, to carry out the major task of reform implied in the report."<sup>69</sup> All these vociferous voices fell on deaf ears of the polity.

Next time, it was in 1991, when the Committee on Tax Reforms (CTR) deliberated upon the "Proposals ... made by several quarters from time to time that as is the position in India, UK etc. the Central Board of Revenue should be bifurcated into two separate Boards; one each for the administration of direct and indirect taxes."<sup>70</sup> Although, CTR did acknowledge the fact that not only that "the British experts engaged by the Government<sup>71</sup> to study and propose improvements in the taxation system of Pakistan," but also that the SSSCF, had strongly supported CBR's bifurcation a la in India and so many other countries, yet it declined to back up the proposition stating that the "earlier recommendations were based mainly on the practice operating in some other countries," and that "This Committee is of the view that facts and circumstances peculiar to Pakistan do not seem to have been taken into consideration fully in arriving at that conclusion."<sup>72</sup> The CTR, however, did not take pains to draw distinction as to how the peculiar circumstances of Pakistan were different from other countries which had two specialised agencies performing direct and indirect taxation functions. It has been argued that CTR was a high-intensity elitist initiative constituted by the first PML-N government (1990-1993), and composed of known industrial elite and business elite agents.<sup>73</sup>

The Task Force on Reforms of Tax Administration (2000-01) (TFRTA) gave a great deal of importance, and attention to CBR's organisation and reckoned it "cylindrical rather than functional, as both policy and operational matters were handled by the line members." Although, broad issues of tax administration were decided in Board-in-Council, yet, "in the absence of adequate policy analysis emanating from the office of the Member Tax Policy, revenue considerations tend to dominate as the underlying rationale for decisions in the Board-in-Council."<sup>74</sup> Thus, arguing that "improving the efficiency and integrity of tax collection, and creating public confidence in the tax machinery would require radical and sustained changes in business processes, administration of individual taxes, recruitment, training, compensation, performance management, reward and discipline of staff, reconfiguration of staff and information

<sup>67</sup>The SSSCF was headed by Prof. Khurshid Ahmed and comprised General (R) Saeed Qadir, Fazal Agha, Aman-e-Rome, and Qazi Abdul Majeed, and was constituted to deliberate upon and firm up the Senate's recommendations on the National Taxation Reform Commission's Report (1985-87).

<sup>68</sup>GOP, "The Committee on Tax Reforms Report," (Islamabad: Ministry of Finance, 1991), B45.

<sup>69</sup>GOP/UK, "Study of Direct Taxation," (London: Coopers & Lybrand, 1989), (Paragraph 16 of the Executive Summary).

<sup>70</sup>GOP, "The Committee on Tax Reforms Report," B45.

<sup>71</sup>Reference is to GOP/UK, "Study of Direct Taxation."

<sup>72</sup>GOP, "The Committee on Tax Reforms Report," B45.

<sup>73</sup>Ahmed, "Elites, Extraction, and State Autonomy: Pakistan and U.S in Comparison," 445-58.

<sup>74</sup>GOP, "The Task Force on Reform of Tax Administration Report," (Islamabad: Ministry of Finance, 2001), xx.

management,” TFRTA set broad parameters of a redesigned house of state’s revenue function, in terms of: (a) adequate budgetary resources and budgetary flexibility for the maintenance of high quality staff and infrastructure; (b) authority to make changes in staffing processes and organisation as needed; (c) capacity for sustained analysis and guidance in key policy and functional areas; (d) operational decentralisation; recruitment and maintenance of high quality professionals; and (e) a well-functioning information system to assist management and operations.<sup>75</sup> However, TFRTA tactfully evaded the burning and the most important question of splitting CBR into two stand-alone functional organisations.

In spite of the fact that the matter of bifurcation of FBR has dwelt on the mind of the polity for a long time, and has kept surfacing every now and then, but it could never get over the hump with a correct decision; it always desisted and dithered away from making a required decision, and back-pedaled from the edge. Consequently, the house of the state’s revenue function continues to be dominated by Generalist Juggernaut which control is then leveraged by Elites Ltd to maintain and enhance the status quo by getting appointed a non-professional Chairman, FBR.

### (c) Cost of Collection

The duopoly’s control on the revenue functions helps the former keep the latter under-financed and, thus stunted, and constrained on its operations. It is abundantly understandable that against the world-average of 3 percent, Pakistan’s tax collection cost is 0.73 percent, which when further divided between IRS and PCS works out at 0.33 percent for the former—the agency which is exclusively responsible to conduct state’s inland extractive operations and collect good about 90 percent of its total tax revenues. Interestingly, such was not the scenario at the time of independence when the colonial state allocated full required amount of resources to its extractive arm so as to undertake optimal revenue generation. But there is evidence that soon after independence the post-colonial elitist state had started to cut on its revenue function’s expenditure. Vakil, in 1950, stated that “the cost of collection of various taxes,” in “proportion to total revenue in India is higher than that in Pakistan.”<sup>76</sup> The trend continues, and in 1960, the Taxation Enquiry Committee observed that for “the Central Government the cost of collection of taxes is roughly 3 percent,” and as a “proportion of total expenditure, the cost of collection of taxes has declined from 3.77 percent in 1949-50 to 3.12 percent in 1957-58,”<sup>77</sup> to amply indicate corrosive degenerative process that had seemingly taken roots by then—finally bringing it down to such ridiculously low levels as at present. The NTRC had also eulogised Pakistan’s tax system for being cheap and keeping the collection cost less than 1 per cent of the revenue collected.<sup>78</sup> Likewise, CTR observing that the “cost of collection (in respect of Sales Tax) went down from 0.71 per cent in 1986-87 to 0.62 per

<sup>75</sup>Ibid.

<sup>76</sup>C. N. Vakil, *Economic Consequences of Divided India; a Study of the Economy of India and Pakistan* (Bombay: Vora, 1950).

<sup>77</sup>GOP, “The Taxation Enquiry Committee Report (Volume 1),” 24.

<sup>78</sup>“The National Taxation Reform Commission Report (Part 1),” (Islamabad: Ministry of Finance, 1986).

cent during 1988-89,”<sup>79</sup> recommended “that expenditure of CBR should be treated as development expenditure, and that it be allowed to spend a fixed percentage of revenues collected.”<sup>80</sup> In the same vein, it was proposed that the present level of CBR’s expenditure should be raised by 0.5 per cent of revenue collected and also that it should be given complete financial autonomy.<sup>81</sup> Over two decades down the road, all of these recommendations continue to be unimplemented. Astonishingly, while the polity has historically exhibited strong penchant to go in for relentlessly fashionable institution making—merely imitating developed countries or implementing off-the-shelf recipes of multilateral frameworks—it has let its own revenue function to stunt and rot for over-head financing.

The cumulative effect of the three preceding interventions has historically kept FBR in a clear state of malfunction, which may be both the cause and effect of the duopoly domination of state’s revenue function. The result being field officers are left to beg, borrow and steal to carry out revenue collection. To head such under-financed—resultantly, understaffed and underequipped field formations—a non-professional Chairman, riding on generalist narratives and abstract conceptions, is dispatched to honcho the polity’s extractive function.

## **VI. DUOPOLY DOMINATION: NON-PROFESSIONAL CHAIRMAN, FBR**

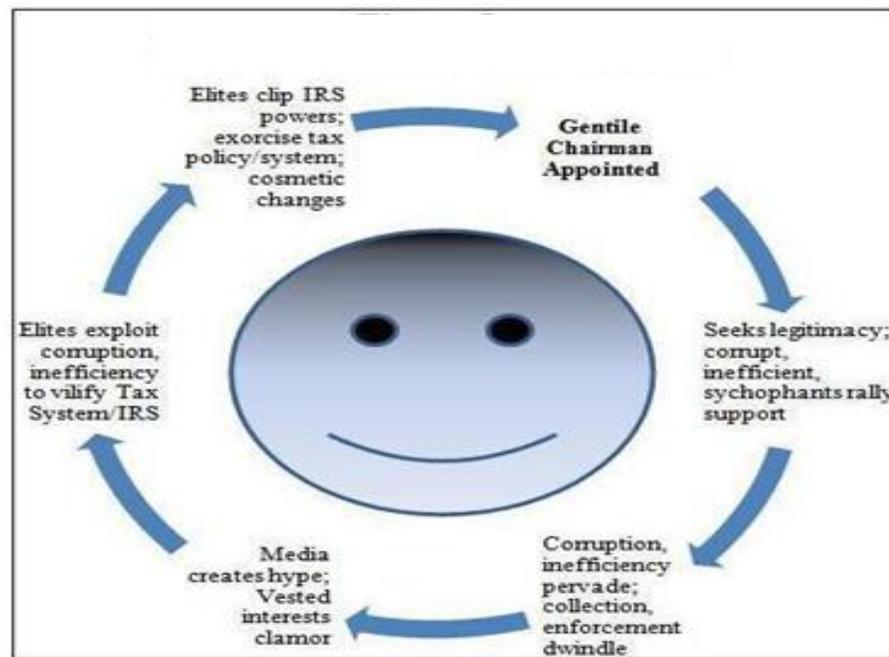
It is at this stage that the duopoly zeroes in the focus of its domination—from overall governance apparatus as laid bare in Section IV, as well as that of the extractive function by taking FBR into its clutches as explicated in Section V— to the very control of the extractive policy formulation and the extractive operational system. This is achieved by appointing a non-professional generalist to head the state’s revenue function. A non-professional Chairman, FBR, contextually means somebody who is not in active service of professional tax collection outfits administered by and under FBR, namely, IRS and PCS. Theoretically, a non-professional Chairman—since neither professionally knows his job, nor belongs to FBR Services that he is supposed to administer, nor conversant with cultural mores of the organisation, nor aware of the strengths and weaknesses of the human resource that he is supposed to man and manage—he is a man in desperate search of legitimacy and some semblance of control on the organisational power sinews. This is where the professional relevance and skill-set as amplified in the opening section of the paper attains so huge an importance. The overarching and ultimate objective of appointing a generalist to head FBR is to control the state’s revenue policy and its implementation wherewithal to the smallest mechanical joint so as to drive home the maximum advantage from the state’s fiscal function.

<sup>79</sup>“The Committee on Tax Reforms Report,” D2.

<sup>80</sup> *Ibid.*, B46.

<sup>81</sup> *Ibid.*

Fig. 5. Duopoly Domination —Action Sequence



Like bifurcation and reorganisation of the house of state's revenue function has repeatedly hovered on the mind of the polity, the concomitant issue that was deliberated upon—not at the same frequency though—was that of the appointment of its non-professional Chairman. The first time when the issue of appointment of non-professional Chairman, CBR, came up for public deliberations was with TC, and that too, in conjunction with the proposition to split CBR into two separate organisations. A decision to bifurcate CBR was pended merely because a consensus in the Commission could not be achieved *vis-à-vis* Generalist Juggernaut's attempt to optimise on the opportunity of having a non-professional Chairman heading two professional CBRs. "The idea to have a non-professional Chairman to coordinate the administration of direct and indirect taxes was opposed as it was thought that administrative coordination also required professional expertise as technical issues like creation of charges, division of revenue units and career planning required technical knowledge and professional outlook."<sup>82</sup>

The icing on the cake came from A. A. Akmut, a TC member, through a note of dissent, who exhorted that "Development and exploitation of revenue resources are matters of planning, not of *ad hoc* solutions, (which) can only be rationalised and indeed achieved with a revenue collecting agency, which is independent: a Revenue Division headed, not as the majority report proposes, by a 'professional with the status of Secretary' but by a non-professional."<sup>83</sup> This dissension was good enough for TC to defer the decision on both of the issues i.e. bifurcation of CBR and appointment of a professional as its Chairman. "The Commission after weighing both the view points and

<sup>82</sup>"The Taxation Commission Report (Volume 1)," 187.

<sup>83</sup>*Ibid.*, 423.

considering all the allied questions concluded that the existing structure is satisfactory except that a Revenue Division should be established and the main responsibility of this Division should be to manage the taxes and duties.”<sup>84</sup>

However, in 1988, Begum Salma Ahmad, MNA, speaking on the NTRC report, on behalf of the SNASCF, took an unequivocal position to recommend that CBR be “manned totally by specialists.”<sup>85</sup> In the same vein, recognising the fact that the “post of Chairman CBR is one of the more difficult and challenging position in the public sector,” and observing that “during the last ten years the average tenure of Chairman has been less than a year and some persons of questionable integrity and capacity were appointed to this important position,” TFRTA reverberated the generalist narrative and proposed that the position of Chairman, FBR, “must be filled by a person of known leadership and management capacity and integrity,” and that he should be competitively appointed by considering the “candidates from public and private sectors.”<sup>86</sup> It was also prescribed that “Chairman must have a fixed term of five years,” and that he “should be removed only...for a significant failure in meeting agreed performance criteria.”<sup>87</sup> TFRTA’s intriguing omission of “professionalism” from the catalogue of qualities that a Chairman, CBR, in its view, should have, speaks volumes of the way the state’s extractive system was being conceived to be re-designed. TFRTA’s desire to have a term fixed for Chairman was also never implemented as average tenure of appointment as shown in Figure-6 has further come down to about nine months since 2000 onwards.

An opportunity arose in 2007 to fix this simmering problem when General Musharraf’s government under the World Bank prescription took to granting autonomy to CBR. The Federal Board of Revenue Act, 2007, was accordingly legislated, which apart from renaming CBR as FBR, ended up introducing certain cosmetic changes. However, due to the working of the duopoly paradigm, and the fact that an outsider, Abdullah Yusuf, had already been placed as Chairman, FBR, the opportunity was effectively neutralised when it came to fixing structural problems of the organisation. The FBR Act, 2007, which like all other laws that are intended to create or govern an organisation, should have laid down with clarity the qualifications of the person who, in view of the Parliament, be deemed eligible to head it. Although, the Act was perfectly preambled to “creating a motivated, satisfied, dedicated and competent professional workforce,” yet its section 3 was deftly formulated to state that “The Federal Government may appoint the Chairman on such terms and conditions as it may determine,”<sup>88</sup> thereby creating requisite amount of tactical space for the duopoly to exploit and push up a generalist for appointment as Chairman, FBR, at its own free will.<sup>89</sup> It can be reckoned as a perfect exhibition of an intense urge and its fulfilment on part of the duopoly to dominate the state’s extractive infrastructure.

The working of how a non-professional Chairman, FBR, given his limitations, would tend to operate, and how the organisation at various levels would react to his

<sup>84</sup>Ibid.

<sup>85</sup>“Official Report - N.A. 1st Session of 1988 (Wednesday, the 9th March,1988),” 2357.

<sup>86</sup>“The Task Force on Reform of Tax Administration Report,” (xxii).

<sup>87</sup>Ibid.

<sup>88</sup>*The Federal Board of Revenue Act, 2007.*

<sup>89</sup>The Supreme Court of Pakistan and High Courts, too, have held in a plethora of case law that all laws that are intended to create or govern an organization, must lay down the qualifications of its head, with clarity.

legitimacy-seeking overtures, is graphically presented in Figure 5. What the picture exhibits is that Elites Ltd gets an outlier non-professional Chairman appointed. The generalist Chairman, of course, does not have a constituency within the tax administration; lacks legitimacy, knowledge of complicated fiscal codes, operational know-how of the functional tax system, intricacies of tax policy; and merits and demerits of the human resource; and is, therefore, prone to conduct himself perversely for the polity, but to the ultimate advantage of the duopoly. In order to run the system, but being entirely new to its working culture, dynamics, and professional needs, the non-professional Chairman desperately requires and seeks legitimacy, support, and cooperation from within the organisation. The sycophants, the unprofessional, the rent-seekers, and the inefficient top-layers within the tax administration rally support and scramble to lend legitimacy. In return, they get appointed on key positions at the headquarters while professionals who take pride in their job and feel hurt at having been ignored for the top slots and being coerced to work under a gentile leader, go into withdrawal mode. Similar pattern is replicated through the length and breadth of the field formations and the specialised support Directorates where also merit is ignored and sycophants get to rule the roost. In no time, perverse ambitions start to prevail across the organisational horizons, and the logical outcome is collusion between the taxpayer and the tax-collector resulting in rent-seeking and sub-optimal tax take, mass mismanagement and below par revenue performance.

At this juncture, parapraxis, elitised and 'astroturfed' media gets into gear. The stories about corruption, inefficiency and under-performance of FBR start surfacing in print and electronic media. Media picks up these stories to bash FBR as an inefficient and corrupt entity. Elites rally immediate support and a systematic drive to have a go at the tax system is launched afresh. Parliament, already an elites' bastion, rushes to buy elitist arguments and takes to clip tax system's powers yet once again by optimally exploiting corruption, inefficiency, and misuse of power as ever-available pretenses. The revenue takes a further dip. In order to ensure continuity of the system domination and maintenance of the status quo, the non-professional Chairman is replaced with another non-professional—another conqueror-designate soaring high on the saddle of identical generalist constructs; and the cyclical process starts afresh, and runs another full circle. Intriguingly, no audit is conducted of abstract normative meta-narratives which were used as a justification to put a non-professional at the helm of affairs in FBR in the first place; or of his failures. Everything is taken as business as usual by the ruling oligarchs while getting ready for the next round.

Paradoxically, professionalism so highly eulogised and prescribed by the politicians for the private sector, suddenly becomes a *bête noir* for FBR—a death-knell for the duopoly. Bukhari and Haq wrote of Ali Arshad Hakeem, a non-professional Chairman appointed in July 2012, and removed by Islamabad High Court in April 2013, that on assumption of charge, the Chairman made tall claim of surpassing revenue target of Rs 2,381 billion by "using extraordinary managerial skills, innovative IT tools and meaningful amnesty schemes," but by the time he made to make a forced exit, the national exchequer had received an unprecedented hit of Rs 465 billion.<sup>90</sup> Did actually

<sup>90</sup>Huzaima Bukhari and Ikramul Haq, "Urge to Purge," *The News*, April 14 2013.

the non-professional Chairman fail? May be he did not. May be he did achieve his “objectives.” The real-life evidence to this pattern is tabulated in Figure 6 below.

**Fig. 6. Chairmen, Federal (Central) Board of Revenue**

| #  | Chairmen               | From       | To         | #  | Chairmen                | From       | To         |
|----|------------------------|------------|------------|----|-------------------------|------------|------------|
| 1  | Sir Victor Turner      | 14-08-1947 | 01-02-1950 | 20 | M. Mubeen Ahsan         | 03-11-1992 | 03-05-1993 |
| 2  | Abdul Qadir            | 01-02-1950 | 25-02-1952 | 21 | Qazi M.Alimullah        | 03-05-1993 | 17-07-1997 |
| 3  | Mumtaz Hassan          | 25-02-1952 | 01-11-1958 | 22 | Javed Talat             | 26-07-1993 | 01-07-1994 |
| 4  | A.H.Majid              | 01-11-1958 | 29-07-1960 | 23 | A.R.Siddiqui            | 11-07-1994 | 11-01-1995 |
| 5  | M.Ayub                 | 29-07-1960 | 19-06-1961 | 24 | <b>Alvi Abdul Rahim</b> | 13-07-1995 | 28-08-1996 |
| 6  | Mumtaz Mirza           | 19-06-1961 | 06-03-1963 | 25 | <b>Shamim Ahmed</b>     | 28-08-1996 | 11-11-1996 |
| 7  | M.M.Ahmed              | 06-03-1963 | 30-05-1966 | 26 | Hafeezullah Ishaq       | 11-11-1996 | 02-01-1998 |
| 8  | Ghulam I. Khan         | 31-05-1966 | 08-09-1970 | 27 | Moinuddin Khan          | 02-01-1998 | 06-11-1998 |
| 9  | A.G.N.Kazi             | 08-09-1970 | 10-10-1971 | 28 | <b>Mian Iqbal Farid</b> | 06-11-1998 | 08-11-1999 |
| 10 | <b>M.Zulfiqar</b>      | 11-10-1971 | 17-11-1973 | 29 | Riaz Hussain Naqvi      | 08-11-1999 | 03-07-2001 |
| 11 | <b>Riaz Ahmad</b>      | 17-11-1973 | 30-09-1974 | 30 | <b>Riaz Ahmed Malik</b> | 03-07-2001 | 11-03-2004 |
| 12 | M.Zulfiqar             | 01-10-1974 | 11-12-1975 | 31 | M.Abdullah Yusuf        | 12-03-2004 | 23-07-2008 |
| 13 | N.M.Qureshi            | 11-12-1975 | 14-12-1980 | 32 | Ahmad Waqar             | 23-07-2008 | 15-05-2009 |
| 14 | F.Rahman Khan          | 14-12-1980 | 20-08-1985 | 33 | Sohail Ahmad            | 15-05-2009 | 24-12-2010 |
| 15 | I.A.Imtiaz             | 11-08-1985 | 20-08-1988 | 34 | Salman Siddique         | 24-12-2010 | 05-01-2012 |
| 16 | Aitezazuddin A.        | 20-08-1988 | 02-01-1989 | 35 | <b>Mumtaz H. Rizvi</b>  | 10-01-2012 | 10-07-2012 |
| 17 | G. Yazdani Khan        | 22-01-1989 | 11-08-1990 | 36 | Ali Arshad Hakeem       | 10-07-2012 | 10-04-2013 |
| 18 | <b>Ahadullah Akmal</b> | 16-08-1990 | 24-07-1991 | 37 | <b>Ansar Javed</b>      | 11-04-2013 | 30-06-2013 |
| 19 | <b>Sajjad Hassan</b>   | 24-07-1991 | 03-11-1992 | 38 | Tariq Bajwa             | 01-07-2013 | Today      |

- 1-9 were basically Finance Secretaries, who also officiated as Chairmen, CBR.
- 19-23 also held the position of Revenue Division on simultaneous additional charge basis.
- 24-27 headed the tax administration as Vice-Chairmen, CBR.
- 28-34 also held the position of Secretary Revenue Division, except sparse interruptions.
- 35 held the position of Chairman, FBR, for the entire 6-month period i.e. January-June on additional charge basis.
- Professional Chairmen, FBR, are written in bold.

An analysis of the data plotted above reveals that during 67 years of Pakistan’s history i.e. 1947-2014, FBR has been headed by 38 Chairmen out of whom only 10 were professional tax collectors. While average tenure per Chairman since 1947 till 2014 comes to 1.7 years, which in itself speaks volumes as to how state’s revenue function has been kept bereft of any semblance of stability, calm and order, average tenure of 10 professional Chairmen works out at meager 0.9 years. It also transpires that since 1985 to-date average tenure of Chairmen, FBR, has declined from 1.7 to almost one year, and not surprisingly it is during this period that worst decisions in Pakistan’s tax history were made.<sup>91</sup> Since 2008, Chairman FBR’s average tenure has got down to as low as 0.9 years, interestingly which period coincides with re-introduction of so-called full democracy in Pakistan i.e. sans an apparent overbearing influence of military elite in the running of the polity.

<sup>91</sup>Some of the glaring perverse policy choices made include introduction of mass-scale PTR, extended withholding taxes regime, shift of tax administration from enforcement to facilitation mode, and inflated reliance on indirect taxes at the expense of direct taxes, repeal of the gift tax and wealth tax, and horizontal fragmentation of the state’s fiscal base.

A non-professional at the helm of the state's extractive function can have far-reaching implications both horizontally and vertically. Firstly, since Chairman, FBR represents his organisation before the Prime Minister, Finance Minister, Cabinet, ECC, and Public Accounts Committee, and since he is neither loyal to it (being gentile), nor masters its functions, nor, theoretically speaking, is interested in protecting its interests, he will not undertake, to borrow an expression from Almond and Powell, optimal 'interest articulation' on behalf of the organisation he heads resulting in sub-optimal 'interest aggregation' at the national level.<sup>92</sup> It is now perfectly understandable as to how every year FBR ends up getting a budgetary allocation far less than its requirements.<sup>93</sup> Secondly, as already posited, organisations do exhibit natural proclivities to replicate the topman. If the topgun is confident, knows his job, is aware of weaknesses and strengths of his workforce, at least, at the top and mid-management levels he is supposed to be supervising, he will be confident in his bureau and the entire organisation will tend to imitate him. Harmony and professionalism would prevail and permeate across organisational horizons. On the contrary, if the top-man is paranoid, lacks in confidence, seeks legitimacy, does not know his job, merit becomes the first casualty, which then becomes order of the day throughout the length and breadth of the organisation. The latter is a perfect description of FBR presently.

Thirdly, such consistent trend of appointment of non-professionals as Chairman, FBR, unleashed tremendous degree of job attrition in the workforce. While, on the one hand, as Wilder pointed out that already the "most critical problem...was the increasing inability of the civil service to attract and retain the best and the brightest at the officer levels,"<sup>94</sup> on the other, a large number of IRS and PCS officers have recently been found opting to get themselves inducted into other so-called inferior civil service groups<sup>95</sup> signifying complete inability of FBR to compete for, attract, and retain top quality human resource. Still a larger number of FBR officers are also going into 'hiding' through resignations, transfer to low-profile postings in insignificant government departments, secondments with the international agencies, NGOs, and extended sabbaticals on different grounds. This trend has a converse effect, too: an outlier Chairman brings along outlier officers for appointment at key positions within FBR to control it, which further heightens the impact of non-professional domination of the extractive system.

Fourthly, a non-professional Chairman, FBR, creates a robust incentive for the rank and file to under-perform. Not surprisingly then, repeated and vociferous exhortations of top political and bureaucratic leadership for an extra tax effort in the wake of ever-expanding fiscal deficit triggered by numerous national exigencies, have fallen on FBR's deaf ears with a rock-bottom morale for having been under domination for decades. Of course, a war cannot be won with topnotch generals commanding a demoralised force. While evaluating the Tax Administration Reform Project's implementation during 2002-11, the World Bank observed that "during nearly seven years of project life, four Chairmen were appointed, with some of them coming from

<sup>92</sup>Gabriel A. Almond and G. Powell Bingham, *Comparative Politics: A Development Approach : An Analytic Study* (Boston: Little, Brown and Company, 1966).

<sup>93</sup>This point has already been elucidated earlier in in sub-section on cost of collection.

<sup>94</sup>Wilder, "The Politics of Civil Service Reform in Pakistan," 25.

<sup>95</sup>In 2011, 7 young IRS officers willingly got themselves inducted into Military Lands & Cantonment Group.

outside the income tax and customs services which did not go down well with...FBR's staff."<sup>96</sup> The duopoly though ready to give in to IFIs' all demands—from elimination of subsidies to jacking up of utility tariffs—is not ready to budge an inch on their control of state's extractive function. Lastly, this lack of loyalty and ownership on part of gentile Chairmen have caused an unprecedented slow-down in promotions, leaving mid-career tax managers sulking in a sense of injured merit. Majorly because of this very phenomenon, FBR Services tend to lose pride in their job to a significant degree—a prerequisite for optimal output in any organization—private or public. All these problems since not taken care of at the top, add to the frustration, dissonance, and demoralisation of the extractive corps of the state, which feeds back into the low national tax take.

It is thus apparent that the way duopoly has treated and managed FBR, negates all cannons of institutionalism, organisational development, human resource management, political foresight and governance wisdom. It cannot be gainsaid that any organisation of whatever import and magnitude can be raised on solid footing and expected to perform optimally if its head is qualitatively as deficient and dependent, his turnover as high and abrupt, and its workforce as demoralised, as in case of FBR. It is a veritable fact that FBR has, in all periods of history, operated under duress and grievance of outside domination by non-professional generalists and hardly ever motivated to perform its avowed function.

#### ***Elitist Connection—Fresh Evidence***

It is now quite predictable that hard-boiled professionalism—the hall-mark of all modern management models—will not be allowed to operate on Pakistan's institutional framework where brute and tardy generalism rules the roost even in the 21st century. There is abundant anecdotal evidence of recent past to prove that Elites Ltd, directly or indirectly, does play its due part in sustaining the trend of appointing a non-professional to head state's revenue function.<sup>97</sup> Elites Ltd in unison scrambled to defend and guard appointment of Sohail Ahmed as Chairman, FBR, on May 18, 2009. Ahmed was a junior BS-21 PAS officer. Since most of FBR's other officers were senior to him by some years, his appointment induced immediate reaction particularly at the head office. The agitation reached its crescendo when four senior most FBR Members declined to report to and work under him, giving a jolt to and bringing revenue operations to a grinding slowdown.<sup>98</sup> At the peak of this high intensity institutional crisis, Adviser to Prime Minister on Finance and Revenue, Shaukat Tarin, went public to defend Ahmed's appointment as Chairman, FBR, as “a prudent decision,” simply because he “is honest, upright and knows how to accomplish the task by taking people along with him.”<sup>99</sup> While revenue operations continued to be conducted on low key by a demoralised workforce, Ahmed was given an extended run as Chairman, FBR, till December, 2010, when another non-professional replaced him.

<sup>96</sup>Shahnawaz Akhter, “Tax Reform Programme Failed to Deliver, Government Admits,” *The News*, July 26, 2012.

<sup>97</sup>See, for instance, Husain, *Pakistan : The Economy of an Elitist State*. with reference to expenditure policy and industrial policy, in particular.

<sup>98</sup>The two IRS Members, FBR, who refused to work under Sohail Ahmed, were Irfan Nadeem Sayed, and Afzal Naubahar Kayani.

<sup>99</sup>Reporter, “Government Defends Appointing Junior as F.B.R Head,” *Dawn*, May 16, 2009.

The polity appeared to have learned nothing from the 2009-upheaval, as on July 10, 2012, yet another non-professional, Ali Arshad Hakeem, was appointed as Chairman, FBR. Hakeem, was way too junior to not only all Members, but also most of FBR Chiefs. On October 31st, 2012, a petition challenging Hakeem's appointment was filed in the Supreme Court of Pakistan under Article 184(3) of the Constitution of Pakistan. The petition was filed, inter alia, to highlight steeply falling revenue which was causing budget deficit to balloon up beyond 7 percent, rampant and rife stories of corruption, senseless appointments of below par officers on key positions both at head-office and field formations, and massive institutional mismanagement. The petition was initially disposed of *in-limine*, inter alia, on the grounds that: (a) it did not raise any issue of public importance; and (b) appointment was not violative of any fundamental rights of the petitioner. This was in spite of fact that Supreme Court, in a plethora of case law, had already held that it was citizenry's right to be governed by a capable, transparent, efficient, and merit-based dispensation. Similarly, as regards (b) the Supreme Court itself had admitted and decided a number of cases challenging appointments of heads of various institutions including the Oil and Gas Regulatory Authority (OGRA), and the Security and Exchange Commission of Pakistan (SECP). An appeal was instantly filed against Supreme Court's summary disposal of such an important petition. While revenue hemorrhage continued, appeal was not fixed for months during all the cacophony of *suo moto* notices and judicial activism. Finally, on February 20, 2013, Supreme Court heard the petition and disposed it off in 5 minutes by advising the petitioner "that in view of the facts and circumstances of the instant case," the petitioner may "approach the learned High Court and if need be, subsequent thereto, he would institute appropriate proceedings before this court."<sup>100</sup> By that time, the shortfall in revenue had touched a staggering figure of Rs 350 billion for the year.

Consequently, a fresh *quo warranto* petition was filed in the Islamabad High Court (IHC) under Article 199 of the Constitution. Media elite stepped in big time to justify appointment of a non-professional Chairman, FBR. A number of prime-time TV talk shows eulogised Hakeem as an IT wizard who would revolutionise tax system by creating a nexus between National Database Registration Authority (NADRA)'s information system and FBR.<sup>101</sup> It was only on April 8, 2013, that IHC passed a restraining order and stopped Hakeem from performing his functions as Chairman, FBR.<sup>102</sup> IHC found that Hakeem's appointment was the "result of colourable exercise of authority, without due process, non-transparent approach, against the principles of healthy competition, fairness, openness, merit, offensive to the constitutional provisions and besides the dictums laid down by the Honourable Supreme Court of Pakistan," and held that "Under no stretch of imagination, (the) appointment... can be termed as credible and in requirement of law applicable."<sup>103</sup> IHC judgment also directed the Government to (a) "appoint regular Chairman, Federal Board of Revenue, through competitive process;"

<sup>100</sup>Muhammad Ashfaq Ahmed vs. Ali Arshad Hakeem (2013).

<sup>101</sup>Between November 1, 2012, and April 10, 2013, popular political talk shows like "Aaj Kamran Ke Sath," on Geo TV, and "Hasb-e-Haal" on Dunya TV, in particular, more than once, allocated generous prime time to defend Hakeem's appointment as Chairman, FBR, castigating both active and passive resistance that the IRS was putting up, and outrightly ignoring the nosediving revenue collection.

<sup>102</sup>Faisal Kamal Pasha, "I.H.C Suspends Chairman F.B.R's Appointment," *The News*, April 9, 2013.

<sup>103</sup>Muhammad Ashfaq Ahmed vs. Ali Arshad Hakeem etc. (2013).

(b) appoint “as a time gap arrangement most senior regular employee of FBR having requisite qualification and experience;” and (c) “evolve competitive process for appointment of Chairman, FBR, which must commence with proper advertisement and be completed within one month but not later than 30th June, 2013.”<sup>104</sup> The direction at (b) was leveraged to give a vent to high tide of anger and frustration when a professional IRS officer Ansar Javed was appointed as Chairman, FBR. The other two directions were never implemented. The result being that after the intervening period of about three and a half months during which a professional chairman was at the helm in FBR, on July 1, 2013, yet another generalist was posted to head state’s revenue function, who too, came riding high on the wings of old generalist narratives e.g. a great leader and visionary with bread-based experience. It is astonishing that no contempt case against the government on non-implementation of IHC judgment was instituted. The superior judiciary’s role loaded with all essentials of elitist overtones has helped the duopoly to completely dominate revenue function for perverse gains. The media has also invariably toed the elitist line, and has relayed whatever coloured explanations are given out by the sitting governments to justify appointments made on considerations other than professionalism.

## VII. CONCLUSION

The Institutionalist analysis of Pakistan’s extractive function as carried out in the paper does supply robust empirical evidence and sound ‘logic of calculation’ to the theoretical framework applied and developed upfront in Sections I and II. In purely theoretical terms, the evaluative dissection of the state’s revenue apparatus from the perspective of non-professional headship and concomitant organisational disharmony, may have added a new dimension to the existing knowledge pool on Institutionalism. The analysis started off by conceptualising Pakistan’s Governance Goliath, breaking it down into its compositional anatomy, and by tracing the mechanics of its rational choice alliance formation with elites, which, in fact, enables the duopoly to dominate the entire institutional order of the state. At level two, the duopoly paradigm’s reduction in focus to dominate FBR is brought into spotlight to argue that the institution’s constant binary back-and-forth shuffle between AD and RD statuses, is a forced upon state of anarchy. In the same vein, it was pointed out that the institution’s sustained fluid state coupled with dogged resistance to bifurcate it and increase allocation for its operational overheads are, in fact, effective tools of domination. At level three, it is posited that a non-professional Chairman, FBR is appointed to directly control both the extractive policy formulation and the extractive operations so as to drive home maximum benefits to Elites Ltd. At certain stage, all three levels enmesh, intertwine, and cross-cut into one another and it does become difficult to extricate one from the other.

The paper unfurls as to how the duopoly, in a sustained and systematic manner, ensured its domination of the state’s institutional framework, particularly the one put in place to perform its revenue function. This brute domination was guaranteed and underwritten through elimination of available options, and relentless indoctrination and propagation of superiority and legitimacy of Pakistan’s governance goliath into the semantics of the society. The myth of the generalist was performed on the polity with

<sup>104</sup>Ibid.

such sustained ferociousness that the Generalist Juggernaut emerges as the only manager and saviour at the massive expense of any room for professionalisation of the state's governance structures. The process was so systematic, self-healing and natural-looking that all the negative fall-outs and implications of the perversely dominated system were also made out to appear emanating from rather an under-supply and under-domination of the state's infrastructure. All efforts made at throwing up alternatives were rigged and reversed successfully, and the myth of the generalist was propped as the panacea of all ills that the state and society were found inflicted with. The duopoly domination, as it pans out, can be taken as the parameter of Pakistan's extractive system and its performance, and by implication of the state itself.

In overall terms, three important conclusions can be gleaned from the paper, the first two being interpretive and the last being predictive in nature. Firstly, but not seminally, the paper argues that Pakistan's economic polity is majorly characterised by an intense interplay of two predominant totalitarian realities, that is, bureaucratic totalitarian reality and political totalitarian reality—both engaged in an arduous struggle to identify themselves with the state, mould it their way, and formulate its policies to their ultimate politico-economic benefits at whatever cost or implications. Having factions and classes in a polity and their internal vertical and horizontal haggling and competitive engagement or even with the state structures for optimisation of economic and other interests is no way unique to Pakistan. What, in fact, unique to Pakistan is that these factions and classes operating in the polity do not *compete*; instead, they *cooperate* to the eventual chagrin of the people; the state. Non-zero-sum transactions that follow from cooperation of various interests do not play out economic interests of competing groups; they actually play up at the expense of un-represented and un-organised sections sulking on the margins. The paper amply explicates this aspect of Pakistan's polity with precise reference to its extractive function.

Secondly, and seminally, the paper asserts that all traditional typologies of Pakistan's civil service taking it as one whole may be substantially deficient in construct validity in that the same neither is nor can be taken as a homogenous monolith. Contrarily, it is argued that Pakistan's civil service is in a bitter and simmering conflict within itself i.e. between professional and generalist cadres, and that any meaningful analysis of the state's civil services should be within the given context of fractured paradigm i.e. professional service groups pitched up against non-niche, non-professional groups as their respective dynamics, approach, and operating philosophy are not only outrightly different, but conflicting, too. The paper effectively changes the unit of analysis of Pakistan civil services. It should now be the constructed clustering of professional and non-professional cadres, or still better, the cadres themselves that be put to analytical scrutiny and not the civil service per se—as one needs a ball to play around and not a fireball, which the civil service of Pakistan has become lately.

Thirdly, the main take-home of the paper is that the duopoly's control on Pakistan's polity is currently strengthening and not weakening—its extractive function being no exception. This conclusion is based on three recent developments. One, the duopoly backed itself up to perform yet another unspeakable rite on the polity, when on October 2, 2014, ED abolished APUG with one stroke of administrative pen, usurped all top positions in the government, reclaimed the title of 'civil servant' only unto Generalist

Juggernaut by evicting all other service groups out of its ambit.<sup>105</sup> This is a significant gain surreptitiously made. The government of the time, part operating under duopoly paradigm, and part, under opposition's relentless agitation and sit-ins in Islamabad, chose to go with Juggernautical push for a deeper ingress to gain an absolute control on the state—supplying more of the same. This factor in itself is good enough to prove that not only that reversal of the rot is not possible but also that it will worsen and pervade with time and at a faster pace.

Two, in 2014, unlike on all previous such occasions, when “Federal Minister for Finance and Revenue” was “pleased to constitute ‘Tax Reform Commission (TRC),’”<sup>106</sup> the compositional cake of TRC was so evenly distributed amongst various interest groups as per the economic-political power that they wielded in the polity so as to dampen any residual optimism.<sup>107</sup> To top all, a private person, Masood Naqvi, an accountant, was appointed as TRC's head. If that was not enough, the non-professional Chairman, FBR, was also appointed as Secretary, TRC, to control its inner core and sit in the very driving seat of the initiative. This will not be out of place to mention that historically a senior public servant or a member of the Parliament had been appointed to head all such commissions, and mid-career professional tax collector or a civil servant as their secretaries. Just to be doubly sure and to wrest an absolute control of the revenue system, an industrial tycoon, Haroon Akhtar Khan, has been appointed as Adviser to the Prime Minister on Revenue—with the status of a Minister—and sit right in FBR and shepherd its operations.

Three, in the aftermath of the Eighteenth Amendment to the Constitution, whereby substantial extractive powers were devolved to the Provinces, Federation's tendency to non-professionally manage revenue operations appears to have trickled down to the lower tier of governance, too. Out of the four provincial revenue authorities, the three that have been operationalised so far are being headed by non-professionals. While the Eighteenth Amendment created more positions and ploys for Generalist Juggernaut, it fragmented state's fiscal base rendering it near-impossible to undertake effective and healthy extraction. The Punjab Revenue Authority (PRA), during its inception phase, hired, Iftikhar Qutab, a professional to head it. However, as soon as the organisation had taken roots, he was replaced with a generalist.<sup>108</sup> It was reported in 2012, that Government of Sindh was “planning to replace the Chairman of Sindh Revenue Board (SRB) to induct a person who enjoys patronage of a political leader,” and “that an advertisement was recently published for the post of SRB Chairman which was ‘entirely person specific’ and did not ‘fulfil the qualification and experience’ required for the post.”<sup>109</sup> Likewise, Khyber Pakhtunkhwa Revenue Authority (KPRA), since its inception, has been headed by a generalist and that too on part-time basis, as his main charge was Secretary, Excise and Taxation Department, KPK. It is apparent that the duopoly operational paradigm has

<sup>105</sup> Establishment Division's SRO No. 88 and 89 of 2014, dated October 02, 2014.

<sup>106</sup> FBR, “Notification No. C. No. 6(5) Coord/2014, Dated September 25, 2014—Constitution of Tax Reforms Commission,” (Islamabad 2014).

<sup>107</sup> TRC, inter alia, officially included a member each of the Traders; Federation of Pakistan Chambers of Commerce and Industry; Karachi Chamber of Commerce and Industry; Lahore Chamber of Commerce and Industry; Peshawar Chamber of Commerce and Industry; Quetta Chamber of Commerce and Industry; Institute of Chartered Accountants of Pakistan; Institute of Pakistan Cost and Management Accountants; All Pakistan Tax Bar Association; Overseas Investment Chamber of Commerce and Industry.

<sup>108</sup> Special Correspondent, “P.R.A Chairman Transferred,” *The News*, January 10, 2014.

<sup>109</sup> Parvaiz Ishfaq Rana, “Sindh Government Replacing Chairman, S.R.B.,” *Dawn*, May 11, 2012.

been full well replicated at the sub-national level, too, to track and monopolise the extractive powers devolved to the provincial governments.

Thus, the final conclusion of the paper is that since the weakening of the perverse domination of the polity is not visible even on distant horizons, the extant system with its malignant atrophies and malaises is there to stay and will continue to undertake unwholesome below par extraction for a time.

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# Authoritarian Regimes and Economic Development: An Empirical Reflection

KARIM KHAN, SAIMA BATOOL, and ANWAR SHAH

Since the recent emphasis on institutions for overall economic development of the countries, the research in this strand has expanded enormously. In this study, we want to see the impact of political institutions on economic development in pure cross-country setting. We take the Human Development Index (HDI) as a measure of economic development and use two alternative measures of dictatorship. We find that dictatorship is adversely affecting economic development in our sample of 92 countries. For instance, transition from extreme dictatorship to ideal democracy would increase HDI by 17 percent. Moreover, our results are robust to alternative specifications and the problems of endogeneity and reverse causation as is shown by the results of 2 Stages Least Squares (2SLS).

*JEL Classification:* P16, H11, H41, H42

*Keywords:* Economic Development, Human Development Index, Dictatorship

## 1. INTRODUCTION

The implications of political orientations have long been debated in the profession of economics almost throughout the second-half of the 20th century. In particular, the implications of democracy for economic freedom, and overall economic development have been the focus of literature, since the industrial revolution. In the capitalistic structure, democratic institutions are the political aspect of the broad set of institutions associated with capitalism. It is presumed proximately that economic freedom encourages Schumpeterian creative destruction which, in turn, results in higher productivity, and, thus, overall economic development [Acemoglu and Robinson (2012)]. Alternatively, in order to have sustained economic development in a society, economic freedom needs to be ensured which is only possible in democratic structure. In contrast, dictatorship is usually associated with expropriation. The fear of expropriation makes the innovators, investors and the new entrants shy in investing in research and development and in long term investments respectively. Besides, the anti-militarism claims that democracies allocate fewer resources on military spending; and, instead, devote more resources to the provision of public goods which translates in higher economic development. In comparison, dictators allocate more resources to military and other types of patronage-related activities. In this paper, we make an endeavour to reinvestigate the repercussions of authoritarian regimes for economic development in the cross-country setting.

Karim Khan <karim.khan@pide.org.pk> is Assistant Professor, Department of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad. Saima Batool <saimabatool\_13@pide.edu.pk> is Graduate Student, Pakistan Institute of Development Economics (PIDE), Islamabad. Anwar Shah <anwar@qau.edu.pk> is Assistant Professor, School of Economics, Quaid-i-Azam University, Islamabad.

Broadly, an authoritarian regime is defined as a system in which the concentration of power lies within few hands. In its worst form, there is a single individual-centred dictatorship. The dominant coalition in this form of the government usually does not grant significant powers to its populous or their representatives. Instead, it usually delegates power to special interest groups such as unions, churches, legislature, and political parties as long as such organisations did not hold the regimes accountable. However, the strategies that dictators need to apply in order lengthen their rule may vary across different regimes. For instance, the use of force, self-regulated constitutional process, patronage, propaganda, control of information etc. are the most obvious strategies from history [Magalhaes (1995)]. Although most of these strategies are socially undesirable; but they have often been successful as is shown by the persistence of dictatorships. According to Deacon (2009), 68 percent of the world's countries are governed by nondemocratic regimes during the last half of the 20th century, and over one-third remained nondemocratic as of 2000. Similarly, with regard to the persistence of military rule, Mulligan, *et al.* (2004) claim that three-fourth of the countries in the world have experienced direct military rule since 1945. Thus, the persistence of dictatorship has been a never-ending reality on the space.

The politically dominant coalition in authoritarian regimes also has a privileged position in the economic sphere as the political system is often used to regulate competition in order to create or distribute rents [North, *et al.* (2009)]. Given the absolute power with the dictator and his close associates, we conjecture that dictatorships to be negatively associated with Schumpeterian creative destruction, and, thus, economic development. This conjecture may be justified by a variety of factors. First, in order to safeguard their tenure and to remain in power for a longer period of time, dictators allocate fewer resources to the provision of social service, in general and education, in particular.<sup>1</sup> Second, the fear of expropriation discourages the investors, new entrants and innovators in making investments. Third, dictators may create regional differences, or group differences. For instance, authoritarian governments may have an incentive to invest less in the process of human development specifically in the impoverished regions. This is because human advancement is likely to create highly mobilised rural politics which has been usually a threat to the dictatorial regimes.<sup>2</sup> Rest of the paper is organised in four sections. Section 2 provides some glimpse of related literature in order to clarify the issue discussed in the paper. In Section 3, we provide the theoretical background, the details of data, the construction of variables and the econometric methodology. Section 4 provides the empirical findings of our analysis while Section 5 concludes the paper.

## 2. REVIEW OF LITERATURE

The existing literature proclaims that dictatorship has adverse implications for political, economic and social aspects of life. In terms of politics, it hampers the institutionalisation and stabilisation of democratic norms in societies [Ikpe (2000)]. Also, it boosts patronage political culture and encourages the development of clientalistic networks [Wintrobe (2000)]. Similarly, in terms of economic development, dictatorship and its associated absolutist

<sup>1</sup>For instance, education empowers the young and improves the ranks of the middle class. According to Lipset (1959), educated individuals serve as agents of liberalisation and they might possibly replace dictator.

<sup>2</sup>Van de Walle (2001) finds that most contemporary African elites are only interested in the needs and interests of small fraction of population as compared to general population.

economic institutions discourage Schumpeterian creative destruction [North (1990); Wintrobe (2000); Acemoglu, *et al.* (2010); Acemoglu and Robinson (2012)]. As is stated earlier, the fear of predation by dictators discourages investments in research and development and new entry. Thus, the theoretical conjecture is that dictatorship is inversely related to economic progress of the societies.

In terms of social aspect, authoritarian regimes are associated with lower provision of social services. For instance, according to the United Nations Development Programmes (UNDP) (1994), the world poorest countries spend less on peoples' welfare such as education and health and use their scarce foreign exchange reserves to purchase weapons and spend more on military.<sup>3</sup> Likewise, Lake and Baum (2001) notes that the levels and quality of public services declines when dictatorship is imposed. For instance, when Nigeria came under military rule in 1983, the primary school enrolment fell from 81 percent to 72 percent and childhood disease immunisation rates has been fallen by more than one-half. In Argentina, the rural population's access to safe drinking water increases after civilian rule that established in 1973, but then fall short markedly after the military coup in 1976. During 1970 in Greece's infant mortality rate drop by one-fourth as the country made the transition to democracy. Qualitative evidence suggests that that the quality of public services declines when dictatorship is imposed and improves when dictatorship is replaced [Deacon and Saha (2005)]. For instance, according to Deacon (2009), countries that either lack a legislature or have only a rubber stamp body enrol only 20 percent of their school age populations in secondary school; countries with effective legislatures enrol 81 percent. Thus, there is substantial qualitative evidence across the globe as far as the adverse consequences of authoritarian regimes are concerned.

In general, the world has experienced two types of dictatorships. In the first case, the military rules directly where it decides about the patronage to itself, and the provision of non-excludable public goods to citizens. In the other type, the dictatorship is rather civilian while the military serves as an agent of the elite in that structure. In such arrangements, the civilian dictators determine the size of patronage to the military, the provision of private benefits to the special interest groups, and the provision of non-excludable and non-rival public goods to the citizens. In both of these forms, the military provides the coercive force needed to maintain the regime security. For instance, the military may monitor the activities of competing groups; or even it may conduct violence on the competing groups. In return, the military receives rents via a share of government expenditure [Hewitt (1992); Sandler and Harley (1995); Goldsmith (2003)]. Alternatively, since dictators need lesser support relative to the representative democrats from the public; therefore, they provide lesser public goods compared to their democratic counterparts. In this study, we conjecture that the provision of social services and hence the economic development should be poor in authoritarian regimes.

### 3. THEORETICAL FRAMEWORK, THE CONSTRUCTION OF VARIABLES AND DATA

In this section, we provide the theoretical background for our analysis. In addition, we provide the details of the construction of variables and their sources of data. Finally, we provide a glimpse of the data by providing and discussing the summary statistics.

<sup>3</sup>For instance, in 1992, world military expenditure is approximately equivalent to the income of almost half the world's population.

### 3.1. Theoretical Framework

The most commonly used measure for economic performance is the growth rate of the Gross Domestic Product (GDP); however, the growth rate in GDP is neglecting several other aspects of human development. In particular, the growth rate of GDP does not show us the distributive aspect of growth or the trickle-down effect as is known in the literature. Therefore, we prefer Human Development Index (HDI) as our measure of economic development; and, accordingly, we use it as our dependent variable. As far as the list of explanatory variables is concerned; the existing literature has identified a variety of factors that can cause cross-country disparities in economic development. In this study, our focus is on the impact of authoritarian regimes while controlling for a bunch of other established variables. We control for variables like social infrastructure, industrialisation, population density, remittances, ethnic heterogeneity etc. There are a variety of theoretical justifications for the inclusion of these controls. For instance, industrialisation raises the incomes of individuals through the creation of jobs opportunities, thereby having positive implications for economic development. Alternatively, as industrialisation improves the return to human capital; so it promotes innovation, labour skills, and technical education [Hawash (2007)].<sup>4</sup>

Likewise, with regard to the social infrastructure, Chin and Chou (2004) find that the countries which invest more on social infrastructure have been able to achieve higher levels of economic development. This is because social infrastructure generates positive externalities. Education and health are social goods. For instance, education as a social infrastructure enhances the growth process through the provision of skilled labour force, entrepreneurs, and professionals. Accordingly, there is an increased emphasis on spending on educations. For instance, UNESCO recommends that at least 15 percent of the national expenditure should be allocated to education. Likewise, public health is a major determinant of labour productivity and efficiency which, in turn, has beneficial implications for the overall economic performance. As far as the relationship between remittances and economic development is concerned; it has been verified by a number of studies. For instance, Iqbal and Sattar (2005) conclude that remittances are one of the important factors that significantly contribute to economic development in Pakistan.<sup>5</sup> In the same way, Adam (2006) finds that remittances generally reduce poverty and can redistribute income.<sup>6</sup> The justification is that remittances inflow can enhance capital accumulation in recipient countries [Adam (2006); Andenutsi (2010)]. Besides, remittances may result in improvements in the credit worthiness of countries [Fayisaa and Nsiah (2010)].

<sup>4</sup>According to UNDP (2005), overall the industrialisation has a strong, significant and positive impact on human development in Kenya. The report focuses on the relationship of industrialisation with different indicators of human development like income, education, employment, agricultural productivity, skill formation and entrepreneurship. At the same time, the study also mention some challenges that limit the process of industrialisation such as rapid urbanisation, uneven development and limited skills over specialisation, poor worker health, environmental degradation and over-crowded services. The study projects that if industry flourish, it would be supportive for human development via tackling poverty, improving opportunities to work, providing clean and healthy environment, creating job security and ensuring quality of infrastructure such as training and education, addressing gender disparity, and creating information and awareness.

<sup>5</sup>They do empirical exercise for Pakistan for the period, ranging from 1972 to 2003.

<sup>6</sup>Also Andenutsi (2010) empirically investigates the long run impact of remittances on human development in lower income countries. Using a panel of eighteen Sub-Saharan countries, for the period from 1987 to 2007, he finds that remittances have a significant positive impact on the human development in Sub Saharan countries. Fayisaa and Nsiah (2010) find similar results for 37 African countries.

To some, ethnic heterogeneity also has implications for economic development. For instance, ethnic heterogeneity may cause rigidity; and, thereby, may slow down the pace of economic development. Alternatively, ethnical homogenous societies presumably face less risk of violent conflicts. Relatedly, Filmer and Pritchett (1999) explore that ethnical homogenous societies like Sweden and Japan have been able to get impressive levels of human development.<sup>7</sup> Likewise, the distributive justice prevails in societies where there are common language and common culture as these characteristics are usually associated with equal opportunities for all. Furthermore, the scale of societies like population or the structure of societies like population density, rural-urban decomposition etc. might have implications for development. For instance, Molina and Purser (2010) find that demographic transition, urbanisation, and declining fertility rate improve life expectancy and literacy rate.<sup>8</sup> Also, the famous “Dutch Disease” presumes that countries having abundance of natural resources end up with higher levels of rent-seeking and lower levels of economic development [Auty (1990); Sach and Warner (1997, 2001)]. Likewise, to some, foreign aid is a curse like natural resources as it worsens the institutions of countries; and thereby may have negative implications for economic development [Knack (2001); Brautigam and Knack (2004); Djankov, *et al.* (2008)]. The inclusion of all these controls has two advantages. First, by incorporating these, we would be able to eliminate the econometric problem of omitted variables. Second, it would provide us an opportunity to check the sensitivity of our variable of interest, i.e. authoritarian regimes. Thus given this historical background, we conjecture that:

$$HDI = f(DIC, SI, IND, PD, OP, REM, UB, SXP, AID, SAF, EH).$$

*HDI* denotes human development index. Similarly, the authoritarian regimes are denoted by *DIC*, stands for dictatorship. Likewise, *SI*, *IND*, *OP* show social infrastructure, industrialisation, and openness, respectively. Ethnic heterogeneity is denoted by *EH* while urbanisation is denoted by *UB*. Similarly, *REM*, *PD*, *SXP*, and *PD* represent remittances, population density, share of natural resources, and population density, respectively. Finally, in order to control for if our results are not driven by particular countries, we control for Sub-Saharan Africa (*SAF*).

### 3.2. Description of Variables and the Sources of Data

Economic development is multi-dimensional which incorporate factors like health, education, working environment, market condition, and domestic and global policies besides economic growth. Since economic growth is narrow in its sense; therefore, we use HDI as our dependent variable which is an aggregate measure of development covering three dimensions health, education, and income.<sup>9</sup> The data on HDI is taken from the Human Development Reports (HDR) published by the UNDP.

<sup>7</sup>For instance, the study shows that these countries are free from racial, ethnic and linguistic divisions. Accordingly, coherence and brotherhood in such homogenous societies fasten the pace of development.

<sup>8</sup>While using data from 1970 to 2005, they find that human development trend are robust with the longer term trend of demographic and population change.

<sup>9</sup>It is the geometric mean of three indexes, i.e. the Life Expectancy Index, the Education Index and the Income Index. These component indexes are based on life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita. For the detailed definition, see Table A3 in the Appendix.

The first measure for dictatorship is taken from the project of Polity IV. The Polity IV data base of Marshall and Jagger (2000) rates countries on the basis of political competition, the openness and competitiveness of executive recruitment, and the extent of legislative and judicial constraints on the chief executive. Using the database, we construct the indexes that by subtracting the score on autocracy from the score of democracy in order to measure a nation's polity score. It is adjusted in such a way that it ranges from 1 (extreme dictatorship) to 0 (ideal democracy), averaged from 1964 to 2009, depending upon the availability. In order to check the sensitivity, we also use another measure of dictatorship which is based Golder (2005). Golder (2005) measures regime type in a country for a typical year by introducing a dummy variable where democracy takes a value 0 while dictatorship takes a value of 1. This variable is averaged from 1960 to 2000 and constructed in such a way that ranges from 0 (ideal democracy) to 1 (extreme dictatorship).

In addition to dictatorship, some control variables like social infrastructure, ethnic heterogeneity, industrialisation, population density, and remittances represent all the other factors that could probably affect the process of economic development. In order to measure for capital accumulation, we use a measure of the industrialisation of a country. In the existing literature, a variety of proxies has been used in order to see the impact of industrialisation on economic development. Here, in this study, we use the average industry value added as a percentage of GDP. It is a net output of manufacturing sector after adding and deducting intermediate product. Likewise, we use social infrastructure in order to see the impact of human capital accumulation. For this purpose, we use the average of education expenditure along with health expenditure as percentage of GDP as a proxy of social infrastructure. In order to measure for the scale of an economy, we take three different variables. First is the population density which is defined as mid-year population divided by land area in square kilometres. The data is taken from 1960 onwards from World Development Indicator and is averaged over the available periods for all countries. Second, we also use openness which is measured as the sum of imports and exports of goods and services as percentage of GDP which is taken from the World Development Indicators, and is averaged from 1960 to 2013. Finally, we also use the area which comprises the total area in square kilometres and is taken from the World Development Indicators.

Remittances have been one of the important sources of financing different activities in developing countries. Therefore, to see its impact, we use the average of personal remittances as percentage of GDP as one of the control variables. It comprises all current cash transfer or in kind received by resident households to or from non-resident households. Again the data is taken from the World Development Indicators from 1960 to 2013. Recently, there has been an increased emphasis on the development of cities for sustainable development. In order to measure for this factor, we use urbanisation in the list of our control variables. It is taken as the average value of urban population as percentage of total population from 1960 to 2013, taken from the World Development Indicators. In order to control for heterogeneity across the nations, we use ethnic heterogeneity. This measure of Ethno-Linguistic Fractionalisation is based on Easterly and Levine (1997) which is the likelihood that the two randomly selected individuals from a particular country not belonging to the same ethno-linguistic group.

For instance, the greater probability entails more ethno-linguistically diverse society. In order to see the impact of Dutch Disease and the Curse of Aid, we use the share of natural resources and foreign aid. The share of natural resources is measured as the percent share of natural resources exports (including agricultural and raw material exports, fuel exports, food exports, and ores and metal exports) in GDP, averaged from 1960 to 2000. Likewise, to see for the curse of aid, we use the total aid received by a country which represents Official Development Assistance (ODA) and the other official aid received in constant US dollars, taken as average from 1960 to 2013. In order to see that our results are driven by a set of particular countries, we also use the dummy for Sub-Saharan African (SAF) countries which takes a value of 1 if the country belong to Sub-Saharan African countries, 0 otherwise.

### 3.3. Data and Summary Statistics

The analysis is based on cross-section data and comprises mainly on annual averages. However, the data is highly variable specific, depending upon the availability of data. There are three justifications for the use of pure cross-section data. First, the panel is not balanced, i.e. the data is not available for many variables for a very long period for all countries. Second, the variable of our interest, i.e. the institutional variable is highly persistent. For instance, democracy in advanced countries or monarchy in Arab countries, and military rule in other countries are highly persistent over the last fifty years. Thirdly, the potential endogeneity caused by time series analysis in case of some variables restrict us to only the cross-section analysis.

Table 1 provides the summary statistics of variables in the analysis. Given the values of the dictatorship 1 and dictatorship 2, almost 40 percent of the countries in our analysis have experience dictatorship since 1960. Likewise, the continent wise distribution shows that the European and Neo-European countries have experienced almost ideal democracy over the entire course of history. In contrast, Asia and Sub-Saharan Africa have experienced relative higher instances of dictatorships. The average value of Human Development Index (HDI) for our sample of the world is 0.65. Again, European and Neo-European countries are dominating in terms of human development while Sub-Saharan countries are suffering with an average of 0.45 for HDI and 0.30 for inequality adjusted HDI.

Likewise, in terms of social infrastructure and urbanisation, the European and Neo-European countries are performing better than the rest of the world. Alternatively, the European and Neo-European countries are relatively more urbanised and well-equipped with social infrastructure relative to Asian and Sub-Saharan Africa. Since 1960, Asia is dominating in terms of the Industrial value added as percentage of GDP as compared to other regions. This may be due to the higher level of industrialisation in the Asian tigers and the recently emerging economies like China, Malesia, India etc.<sup>10</sup> Population density is higher in Europe and Asia as compared to other regions. Asia, Neo-Europe, and Sub-Saharan Africa are relatively higher ethnically diverse societies while Asia and Sub-Saharan Africa are natural resources rich regions in our sample.

<sup>10</sup>The Asian Tigers comprise Taiwan, Hong Kong, Singapore, and South Korea.

Table 1

*Summary Statistics of the Variables*

| Variable                              | World              | Europe           | Asia               | Sub-Saharan Africa | Neo-Europe       | Others            |
|---------------------------------------|--------------------|------------------|--------------------|--------------------|------------------|-------------------|
| Human development index               | 0.65<br>(0.17)     | 0.84<br>(0.401)  | 0.69<br>(0.11)     | 0.45<br>(0.11)     | 0.89<br>(0.013)  | 0.65<br>(0.09)    |
| Inequality adjusted HDI               | 0.65<br>(0.17)     | 0.46<br>(0.25)   | 0.50<br>(0.24)     | 0.30<br>(0.27)     | 0.37<br>(0.28)   | 0.54<br>(0.28)    |
| Dictatorship1                         | 0.45<br>(0.27)     | 0.104<br>(0.178) | 0.62<br>(0.35)     | 0.61<br>(0.18)     | 0<br>(0)         | 0.43<br>(0.26)    |
| Dictatorship2                         | 0.43<br>(0.32)     | 0.157<br>(0.291) | 0.76<br>(0.36)     | 0.92<br>(0.11)     | 0<br>(0)         | 0.56<br>(0.37)    |
| Industrial value added as% of GDP     | 32.2<br>(12.4)     | 29.38<br>(4.71)  | 41.5<br>(15.6)     | 26.8<br>(13.0)     | 28.2<br>(4.35)   | 33.9<br>(10.9)    |
| Social infrastructure                 | 7.71<br>(3.07)     | 11.87<br>(2.183) | 5.87<br>(2.03)     | 5.75<br>(1.69)     | 12.1<br>(1.16)   | 7.17<br>(1.87)    |
| Population Density                    | 86.1<br>(120.9)    | 140.6<br>(116.5) | 155.6<br>(195.8)   | 40.0<br>(38.9)     | 11.8<br>(12.1)   | 54.5<br>(70.3)    |
| Openness                              | 54.3<br>(41.1)     | 72.0<br>(76.5)   | 58.5<br>(32.2)     | 43.5<br>(16.5)     | 36.1<br>(16.2)   | 53.3<br>(26.5)    |
| Remittances                           | 1.84<br>(2.29)     | 0.93<br>(1.21)   | 1.66<br>(2.06)     | 1.67<br>(1.76)     | 0.40<br>(0.48)   | 2.92<br>(3.03)    |
| Urbanisation                          | 49.0<br>(23.1)     | 68.3<br>(12.4)   | 48.0<br>(23.4)     | 27.8<br>(13.2)     | 80.3<br>(5.03)   | 51.1<br>(19.4)    |
| Ethno-Linguistic Fractionalisation    | 0.23<br>(0.28)     | 0.16<br>(0.26)   | 0.28<br>(0.33)     | 0.24<br>(0.26)     | 0.56<br>(0.43)   | 0.19<br>(0.24)    |
| Area (in thousands square Kilometers) | 1050.9<br>(2024.8) | 229<br>(184.6)   | 1225.6<br>(2283.1) | 669.25<br>(537.25) | 6955.1<br>(4574) | 972.1<br>(1620.9) |
| Natural Resources                     | 16.5<br>(13.4)     | 9.74<br>(9.77)   | 22.0<br>(18.4)     | 15.8<br>(11.2)     | 10.2<br>(6.29)   | 19.4<br>(13.1)    |
| Aid Per Capita (in US \$)             | 14.73<br>(19.01)   | 3.9<br>(11.4)    | 12.51<br>(27.26)   | 21.81<br>(10.62)   | 0<br>(0)         | 17.71<br>(20.53)  |
| Sub Saharan Africa                    | 0.24<br>(0.43)     | 0<br>(0)         | 0<br>(0)           | 0.92<br>(0.28)     | 0<br>(0)         | 0<br>(0)          |

*Note:* Each entry is the Average of the variable with Standard Deviation in the Parenthesis.

#### 4. EMPIRICAL RESULTS AND DISCUSSION

Table 2 summarises the Ordinary Least Squares (OLS) estimation for the Human Development Index (HDI). As is mentioned earlier, we use HDI as an indicator of development instead of GDP growth. Again, HDI is based on the approach of achievements which focuses on outcomes and gives a nicer picture of development. Also, it overcomes the limitation of mean perspective view. In columns I and II of Table 2, we show the estimation of our baseline models for our two measures of dictatorships, i.e. dictatorship1 and dictatorship 2, respectively. These baseline regressions include industrialisation, social infrastructure, population density, and openness as control

Table 2

variables. As is evident that dictatorship1, which is based on nations' polity scores, is adversely affecting HDI in a significant way. For instance, it shows that going from ideal democracy to extreme dictatorship would cause a reduction of 0.17 in the index of HDI. Alternatively, complete transition from extreme dictatorship to ideal democracy would increase human development by 17 percent. Likewise, for our second measure of dictatorship, which is based on dummy for dictatorship, complete transition from extreme dictatorship to ideal democracy would increase human development by 13.5 percent. This result strongly support the claim that dictatorial regimes are less interested in investing in the provision of social services like education, health etc. In other words, democratic regimes take care of the needs of the wide cross-section of society. In both of these specifications, industrialisation, social infrastructure, and population density are significantly contributing to human development while openness has no significant influence on human development. The significance of industrialisation and social infrastructure are consistent with the empirics of traditional growth theory. Population density and openness are both serving as measures of size of the economies. That may be the justification that population density is significant while openness is not. Overall, these baseline explanatory variables explain 70 percent of the variations in HDI which is indicated by the value of  $R^2$ .

In order to check the robustness of our baseline results, from column III onwards, we do the sensitivity analysis by checking for additional controls. For instance, in columns III and IV, we add remittances to the list of explanatory variables for our two measures of dictatorship, respectively. In both of the cases, we find not significant effect of remittances on human development; however, this result is unexpectedly contrary to much of the findings with regard to the impact of remittances. The reasons may be the high collinearity between remittances and dictatorship or between remittances and population density; however, this statement is not complete. Likewise, in columns V and VI, we add urbanisation to the baseline regressions for both measures of dictatorship; and we find that urbanisation has significant positive effect on human development.

Since there is no significant difference between the results of the two measures of dictatorships; so column VII onwards, we do the sensitivity analysis with only dictatorship1, which is based on polity score. For instance we add ethnolinguistic fragmentation, area of the country, country's natural resources, aid received by the country, and the dummy for Sub-Saharan Africa in columns VII, VIII, IX, X, and XI, respectively. We find that area has beneficial impact on the level of human development which is consistent with the results with regard to the size of the market, i.e. the greater the size of the market, the higher is the level of development. Similarly, our results confirm the prevalence of Dutch Disease with respect to the share of natural resources, i.e. the higher the natural resources in a country, the lower is the level of its development. Also, the dummy for Sub-Saharan Africa is significant which indicates the lower level of development in the Sub-Saharan Africa. Aid and the ethno-linguistic fragmentation have no significant effects on human development. One finding is notable that, in all of the specifications in the sensitivity analysis, the significance of our main variables and the other baseline explanatory variables remains intact.

After getting the initial estimates, it is always necessary to check that the results are robust to the problems of endogeneity and reverse causation. For instance

it is quite possible that higher development liberalises the political process which, in turn, may replace the dictatorship. Also, it is equally likely that the higher levels of development may enhance the spending on social infrastructure. In order to check the robustness of our results to these problems, we adopt the approach of instrumental variables. In the second case, we avoid the problem by using the average of spending on education and health instead of the outcome variables for social infrastructure. In the first case, we use legal origin and Muslim denomination as instruments for dictatorship. Legal origins are regarded as colonial legacy and most commonly used instrument for the quality of institution [La Porta, *et al.* (1999)]. Whereas, since the spread of Islam, Muslim rulers have attracted that earth belong to God and they rule as a God's deputy or lieutenant on this earth. Thus, Muslim beliefs have an associated legitimacy for the persistence of dictatorships. Second, it is a Muslim belief that religion and politics are not separated entities. This is also evident by the fact that Muslim majority countries are less democratic relative to the non-Muslim majority countries. To the best of our knowledge, we are the first to use Muslim denomination as an instrument for dictatorship. It also has been shown that there is negative correlation between Islamic denomination and democracy. For instance, according to the data of the Polity IV project which ranks the countries from extreme dictatorship (-10) to ideal democracy (10), the average score for non-Muslim majority countries is 5.45 which is closer to ideal democracy. In contrast, the average score for Muslim majority countries is -2.16 which is rather dictatorial. Moreover, none of the Muslim countries has highest score in democracy.

Similarly, according to La Porta, *et al.* (1999), the legal origins of coloniser determine the current legal system and institutions which, in turn, affect economic outcomes like economic development. It has been shown that legal origins shape institutions because different legal traditions, imposed during colonisation, have different implications for the legal system of native population.<sup>11</sup> Thus, we also use the British Common Law as an instrument for dictatorship. These instruments are expected to circumvent the problem of endogeneity, i.e. Muslim denomination and legal origins affect the current political institution; but they don't have direct implication for the outcomes of development. Also, the instrument does not have any role in the current policy choices.

Given the instruments, the results of 2 Stages Least Squares (2SLS) are given in Table 3. Firstly we check whether the alternative measures of dictatorship are endogenous and we find that there exists the problem of endogeneity. Alternatively, our 2SLS results will be consistent. For verifying the validity of instruments, we apply the Sargan Test. The results of Sargan Test indicate that our instruments are valid.<sup>12</sup> The results of 2SLS show that both measures of dictatorship negatively affect economic development in a significant way. Alternatively, if countries make transition from dictatorship to democracy there would be improvement in the level of Human Development index.

<sup>11</sup>For instance, according to La Porta, *et al.* (1999), the British Common Law is relatively more open as compared to French Civil Law and Socialist Law.

<sup>12</sup>The results show that the P-values > 0.05 which implies that  $H_0$  cannot be rejected; hence our instruments are valid.

Table 3

*2SLS Regressions for Human Development Index*

| Dependent Variable: Human Development Index<br>Explanatory Variables | I                    | II                   | III                   | IV                   | V                       | VI                   | VII                      |
|--|----------------------|----------------------|-----------------------|----------------------|-------------------------|----------------------|--------------------------|
| Constant   | 0.543***<br>(0.037)  | 0.587***<br>(0.038)  | 0.394***<br>(0.037)   | 0.435***<br>(0.0501) | 4.17***<br>(2.00)       | 0.495***<br>(0.041)  | 0.65***<br>(0.035)       |
| Dictatorship1  | -0.193***<br>(0.068) |                      | -0.178***<br>(0.057)  |                      |                         | -0.241***<br>(0.073) | -0.283***<br>(0.054)     |
| Dictatorship2  |                      | -.278***<br>(0.058)  |                       | -.172***<br>(.055)   |                         |                      |                          |
| Industrialisation  | 0.006***<br>(0.001)  | 0.007***<br>(0.0009) | 0.003***<br>(0.001)   | 0.003<br>(0.001)     | 0.005***<br>(0.001)     | 0.009***<br>(0.001)  | 0.005***<br>(0.001)      |
| Social infrastructure  | 0.018***<br>(0.0034) | 0.017***<br>(.0043)  | 0.013***<br>(.003)    | 0.023***<br>(0.0037) | .017***<br>(0.003)      | 0.027<br>(0.0047)    | 0<br>.0187***<br>(0.005) |
| Population density   | 0.00006<br>(0.0001)  | 0.00001<br>(0.00009) | 0.0001**<br>(0.00007) | 0.0001<br>(0.00007)  | 0.0003<br>(0.0002)      | -0.00003<br>(0.0001) | -0.00008<br>(0.00009)    |
| Openness   | 0.0003<br>(0.0002)   | 0.0004<br>(0.0002)   | 0.00002<br>(0.0003)   | 0.0001<br>(0.0003)   | 0.0007***<br>(0.0002)   | 0.001***<br>(0.0004) | 0.0001<br>(0.0002)       |
| Urbanisation   |                      |                      | 0.0045***<br>(0.0006) | 0.004***<br>(0.0007) |                         |                      |                          |
| Area   |                      |                      |                       |                      | 1.52e-08*<br>(9.12e-09) |                      |                          |
| Share of Natural Resources   |                      |                      |                       |                      |                         | 0-.005***<br>(0.002) |                          |
| Sub Saharan African  |                      |                      |                       |                      |                         |                      | -0.169***<br>(.028)      |
| Adjusted-R <sup>2</sup>  | 0.65                 | 0.86                 | 0.66                  | 0.81                 | 0.36                    | 0.63                 | 0.74                     |
| Wald-chi2  | 58.5***              | 63.4***              | 318.4***              | 278.9***             | 277.2***                | 60.9***              | 275.9***                 |
| N  | 92                   | 92                   | 92                    | 92                   | 92                      | 92                   | 92                       |

Note: \* Significant at 10 percent; \*\* Significant at 5 percent; \*\*\* Significant at 1 percent. Robust Standard Errors in the Parenthesis. In 2SLS, the  $R^2$  has no statistical meaning and therefore is omitted from the table. For all of our specifications: For the Sargan test statistic P-Value >0.05, which implies the validity of instruments. Similar comparing the OLS coefficients with those of 2SLS: For Hausman t-statistic, P-Value >0.05 for 6 cases, which implies no significance difference between OLS and 2SLS estimates in these cases. We report 2SLS results only for those specification in which some of the coefficients are significant in case of OLS along with baseline regressions.

## 5. CONCLUSION

This study is motivated by the recent research on the institutional perspective of economic development. The institutional perspective of economic development proclaims that the traditional factors like capital accumulation, including both physical and human, and technological change etc. are only the proximate causes of development while the institutions are the fundamental ones. Given this argument, we want to see the impact of political institutions on economic development in a cross-country setting. The dependent variable in the analysis is Human Development Index (HDI) while two different measures of dictatorial regimes have been used. The sample comprises ninety two countries and most of the variables are taken as averages from 1960 to 2013. Besides two measures of dictatorship which are proxies for political institutions, we control for bunch of other factors like industrialisation, social infrastructure, population density, urbanisation, remittances, shares of natural resources wealth, foreign aid, ethno-linguistic fragmentation, and Sub-Saharan Africa. We conjecture that dictatorship to be associated inversely with HDI.

We find that dictatorship hampers economic development in list of the countries used in the analysis. The justification for the results is that dictators spend less on the provision of social services such as education, health, safe drinking water, and public sanitation etc. Thus, we conclude that transition from dictatorship to democracy would improve the level of human development across the globe. Our results are robust to different specifications which we conducted by using different set of controls in different models. Also, our results are robust to the problems of endogeneity and reverse causation.

## APPENDIX

Table A1

*Results of the Sargan Test for Over-Identifying Restriction Human Development Index*

| Specification | Sargan Results            |           |
|---------------|---------------------------|-----------|
|               | Sargan Chi- Square Values | P -values |
| I             | 1.16886                   | 0.2796    |
| II            | 2.374                     | 0.315     |
| III           | 0.085                     | 0.77      |
| IV            | .254085                   | 0.6142    |
| V             | 3.675                     | 0.118     |
| VI            | 1.39                      | 0.124     |
| VII           | 1.941                     | 0.163     |

Table A2

*Regional Divide of countries.*

| Regions             | No. of Countries | List of Countries   |
|---------------------|------------------|---|
| Europe              | 18               | Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom  |
| Asia                | 18               | Bangladesh, Sri Lanka, China, India, Indonesia, Iran, Japan, Kuwait, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, Vietnam, Syria, Turkey, South Korea, UAE  |
| Sub- Saharan Africa | 24               | Angola, Botswana, Cameroon, Central African Republic, Chad, Democratic Republic, Ethiopia, Gabon, Ghana, Guinea, Kenya, Madagascar, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Zimbabwe, Togo, Uganda, Tanzania, Burkina Faso, Zambia, Mali                             |
| Neo- Europe         | 4                | Australia, Canada, New Zealand, United States of America  |
| Others              | 28               | Algeria, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Libya, Mexico, Morocco, Nicaragua, Panama, Papua New Guinea, Paraguay, Peru, Sudan, Trinidad and Tobago, Uruguay, Venezuela, Tunisia, Egypt |

Table A3

*Summary of the Definition and Sources of Variables*

| Variable                | Definition   | Source   |
|-------------------------|--|--|
| Human Development Index | It is the geometric mean of three indexes, i.e. the Life Expectancy Index, the Education Index and the Income Index. These component indexes are based on life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita.  | Human Development Report published by UNDP                 |
|                         | $\text{Life Expectancy Index(LEI)} = \frac{LE-20}{85-20}$ $\text{Education Index (EI)} = \frac{MYSI - EYSI}{2}$ <p style="text-align: center;">Mean Years of Schooling Index</p> $(MYSI) = \frac{MYS}{15}$ <p style="text-align: center;">Expected Years of Schooling Index</p> $(EYSI) = \frac{EYS}{15}$ $\text{Income Index(II)} = \frac{\ln(GNIPC) - \ln(100)}{\ln(75,000) - \ln(100)}$ |  |
|                         | <p style="text-align: center;">Human Development Index(HDI) = <math>\sqrt[3]{LEI * EI * II}</math></p>   |  |
| Dictatorship1           | Polity IV project data on Polity=democracy- autocracy. It is constructed such that it ranges from 1(Extreme Dictatorship) to 0(Ideal democracy), averaged from 1964-2009, depending upon availability.   | Polity IV, (Marshall and Jaggers, 2000)                    |
| Dictatorship2           | This indicator is based on regime type by a dummy variable where democracy takes a value 0 while dictatorship takes a value of 1 in a Particular year. It is averaged from 1960 to 2000, so that it becomes an index ranging from 1(Extreme Dictatorship) to 0(Ideal Democracy)  | The data on Yearly regime type is taken from Golder (2005) |
| Industrial value added  | Average industry value added as a percentage of GDP. It is a net output of manufacturing sector after adding and deducting intermediate product.   | World Development Indicators, World Bank                   |

*Continued—*

Table A3—(Continued)

|                                    |   |  |
|------------------------------------|---|--|
| Social infrastructure              | We used average of education expenditure along with health expenditure as % of GDP as a proxy of social infrastructure.   | World Development Indicators, World Bank |
| Population density                 | Population density is defined as midyear population divided by land area in square kilometre.   | World Development Indicators, World Bank |
| Openness                           | It is measured as the sum of imports and exports of goods and services as percentage of GDP. It is averaged from 1960 to 2013.  | World Development Indicators, World Bank |
| Remittances                        | The average of personal remittances as a percentage of GDP. Personal transfers consist of all current cash transfer or in kind received by resident households to or from non-resident households. Data is taken from 1960 to 2013. | World Development Indicators, World Bank |
| Urbanisation                       | Average of urban population as percentage of total population from 1960 to 2013.  | World Development Indicators, World Bank |
| Ethno-Linguistic Fractionalisation | It is the likelihood that the two randomly selected individuals from a particular country not belonging to the same ethno-linguistic group. The greater probability implies more ethno-linguistically diverse society.              | Easterly and Levine (1997)               |
| Area                               | Total Area in Square Kilometres. Data is taken from 1960 to onward.   | World Development Indicators, World Bank |
| Share of Natural Resource          | It has been measured as the percent share of natural resources exports (including agricultural and raw material exports, fuel exports, food exports, and ores and metals exports) in GDP, averaged from 1960 to 2000.               | World Development Indicators, World Bank |
| Aid Per capita                     | Total aid Received by a Country. It represents Official Development Assistance (ODA) and other official aid received in constant US dollars.  | World Development Indicators, World Bank |
| Sub Saharan Africa                 | Dummies are introduced. It takes value 1 if country belong to Sub Saharan Africa continent,0 otherwise.   | Taken from (Khan and Shah, 2015)         |
| English Common law                 | Dummies introduced, It takes a value of 1 if the country's legal origin is based on British common law and 0 otherwise.   | La Porta et al. (1999).                  |
| Muslim                             | We have taken percentage of population in a country belonging to Islam in 1999. La Porta et al. calculated these values for 1999.   | La Porta et al. (1999).                  |

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## **Economic Institutions and Growth Nexus: The Role of Governance and Democratic Institutions—Evidence from Time Varying Parameters’ (TVPs) Models**

GHULAM MURTAZA and MUHAMMAD ZAHIR FARIDI

The present study has investigated the channels through which the linkage between economic institutions and growth is gauged, by addressing the main hypothesis of the study that whether quality of governance and democratic institutions set a stage for economic institutions to promote the long-term growth process in Pakistan. To test the hypothesis empirically, our study models the dynamic relationship between growth and economic institutions in a time varying framework in order to capture institutional developments and structural changes occurred in the economy of Pakistan over the years. Study articulates that, along with some customary specifics, the quality of government and democracy are the substantial factors that affect institutional quality and ultimately cause to promote growth in Pakistan.

*JEL Classification:* O40; P16; C14; H10

*Keywords:* Economic Institutions, Growth, Governance and Democracy, Rolling Window Two-stage Least Squares, Pakistan

*‘Once you start thinking about economic growth, it is hard to think about anything else’.*

Robert Lucas, Jr. (1988), Nobel Laureate Economist

### **1. INTRODUCTION**

The objective of high economic growth rate for nation’s prosperity and progress is not novel and, traditionally, has been a central issue of economic policies throughout the world [Haller (2014)]. In the last few decades, cross countries income differentials have altered the attention of economic planners and economic scientists to unveil the factors responsible for this high income gaps across developed and developing nations [Flachaire, *et. al* (2014)]. That is why recent studies in new growth context argue a number of factors, beyond some traditional growth factors, that persuade long-term growth process.

Ghulam Murtaza <ghulammurtaza\_14@pide.edu.pk; gm.qai@gmail.com> is a PhD Research Scholar, Pakistan Institute of Development Economics, Islamabad. Muhammad Zahir Faridi <zahirfaridi@bzu.edu.pk> is Director, School of Economics, Bahauddin Zakariya University, Multan, Pakistan.

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The studies of [Rodrik, *et al.* (2004); Acemoglu, *et al.* (2001); Easterly and Levine (2003)], among others) accentuate ‘*economic institutions*’ as new growth imperative and acknowledge the potential role of economic institutions characterized in term of protection of property rights, effective legal system, enforcement of law and order, large size of government dealings, sound monetary system, freedom of international trade, and solid labor, housing, business and financial/credit market regulations [Knack and Keefer (1995); Chong and Calderon (2000); Engerman and Sokoloff (1997); Hall and Jones (1999); Frankel and Romer (1999); Acemoglu, *et al.* (2000); Doucouliagos and Ulubasoglu (2008); Gwartney and Lawson (2003)].

Moreover, existing literature on this issue make us available with a conclusion that besides a number of other factors, including social asymmetry, cultural barriers, gender biasness, ethnic and racial discrimination, and economic inequalities—the *quality of government* (QoG) or good governance—is one of the significant factor persuades economic development because mere budget allocations of public resources do not necessarily outgrowth higher outcomes if budget formulation, execution and monitoring is malfunctioned [Dzhumashev (2014); Ryvkin and Serra (2012); World Bank (2003)].

In the same way, fragile administration and management, especially in developing counties, has been well cited in order to explain the factors behind government failure in establishing institutions with a such incentive system that could reduce fraud, increase cost efficiency, and cause to promote growth process [Rajkumar and Swaroop (2008); World Bank (2003)]. Additionally, authors such as, Flachaire, *et al.* (2014) and Acemoglu, *et al.* (2005) proposed that the deep and proximate causes of growth rely on political institutions which devise economic institutions through the hypothesis of hierarchy of institutions.

The narration of the above expressions implies that the effect of quality of governance under different political regime is observed indirectly via the improvement in economic institutions which, eventually, lead to economic growth. This paper seek to investigate empirically the role of governance in different political regimes, in explaining the relationship between growth and economic institutions incase of Pakistan. Using time series data, we employ rolling window two-stage least squares method to test the time varying relationship among concerned variables in order to capture institutional developments and structural changes in the economy of Pakistan over the period of time.

After the introduction in the first section, rest of the paper follows as; Section 2 reviews the literature. Data and methodology is presented in Section 3. Results and discussions are made in Section 4, while Section 5 concludes.

## 2. LITERATURE REVIEW

There exist numerous studies on the relationship between economic growth and institutions at cross country level based on different income groups of countries. Yet evidences are not in surfeit in case of time series data. Most of the empirical research draws a conclusion that institutions are the factor that significantly expresses the cross country differences through different channels or controlling variables. In the following, review of different prior studies is made to have a comprehensive debate on institutions-growth nexus with different perspectives.

Since the seminal work of [North (1982)] on institutions and development, the researchers have made a noteworthy contribution to literature. Most of the empirical work is based on the pure cross section approach to investigate the links between institutions and economic growth, such as [Acemoglu, *et al.* (2001); Hall and Johns (1999); Grogan and Moers (2001); Knack and Keefer (1995), among others]. Evidences show that the impact of institutions on economic growth is significantly positive and very clear. Yet the channels through which the growth effects of institutions get upsurge, are different and involve countries' geographic conditions, initial income level, countries income level groups, accumulation of human capital, political stability, trade openness, political regime and quality of governance, along with many others factors [see, for example, Acemoglu, *et al.* (2005); Eicher and Leukert (2009); Lipset (1960); Glaeser, *et al.* (2004); Flachaire, *et al.* (2014)].

The empirical findings of Lee and Kim (2009) and Law and Bany-Ariffin (2008) demonstrate that there is bi-directional relationship between institutions and economic growth. However, the effects are strong in case of low and middle income countries group then that of high income countries.

The consensus over the direction of causality between economic growth and institutions has aroused strong opposition in cross-section data approach, and subjected to econometric techniques as well as to the number of countries used in panel data (sample selection)- wherein some countries institutions cause economic growth, while in other countries economic growth effect institutions but full sample analysis fails to show different causality patterns each country inhabits [Butkiewicz and Yanikkaya (2006)]. Moreover, the direction of causality may get change with the addition or reduction in the number of countries. For that reason time series data is more preferable [Law and Bany-Ariffin (2013)]. Yet, the unavailability of long-time data set on institutions is one of the reasons for which time series analysis is sparse.

A number of studies are available to explore the impact of political institutions on economic growth, although the findings are controversial regarding sign of correlates, and direct/indirect impact of political institutions on growth. For instance, Glaeser, *et al.* (2004) pointed out that political institutions impacts are direct and autocratic regimes are also often more growth promoting as compared to democratic regimes. In support to this, De Long and Shleifer (1993) and Jones and Olken (2005) argue that autocrats impose such a strict economic policies that are growth stimulating even if it cost for some sectors of electorates, while others prefer to dissuade growth in order to favor some dominant coalitions of political powers. Yet, Larsson and Parente (2011) is not in favor of above arguments and also claimed that political intuitions do not directly determine growth, instead they control the coefficients of covariates in the growth regression equation.

In the light of above literature, our priority is that the economic institutions are the key determinants of growth and also translate indirect impact of other factors of growth including governance and political institutions. Thus it is the matter of great interest to investigate the economic institutions and growth nexus under novel confounding variables to propose some prudent policy framework to enhance economic growth in Pakistan.

### 3. DATA, MODEL AND METHODOLOGY

#### 3.1. Data Description

Study uses fresh time series data for the analysis starting from 1984 to 2013, collected from different sources based upon the availability of data. The data on GDP per capita ( $y$ ) measured in current US Dollar, Gross fixed capital formation ( $k$ ) measured in current US Dollars, is collected from World Development Indicators (WDI). While employed labor force ( $l$ ) measured in millions of workers is gathered from Pakistan Labor Force Survey.

In order to measure the economic institutions (EFW), different studies have used different proxies. For example, studies like Vega-Gordillo and Alvarez-Arce (2003) have used economic freedom as a proxy of economic institutions from *Fraser Institute*. While S.H., Law (2014) measured economic freedom with three indicators including corruption, law and order and bureaucratic quality from the *International Country Risk Guide* (ICRG), a monthly publication report of *Political Risk Services* (PRS).

Mostly cross-section studies follow Kaufmann, *et al.* (2008) approach, based on six indicators to measure different dimensions of institutional quality and governance, reported in *World Governance Indicators* (WGI), World Bank. But shorter time span and alignment with the governance indicators limit its use to employ these indicators for the institutional quality. Following Gwartney and Lawson (2003), this paper uses a revised *Economic Freedom of World Index*<sup>1</sup> (*EFW-Index*, thereafter) to measure economic institutions represented by economic freedom as a proxy. The dimensions/Indicators on which the *EFW-Index* is constructed are elaborated in Table 3.1.

Table 3.1

| <i>Indicators for Quality of Governance (QoG) and Quality of Economic Institutions (EFW)</i> |                |  |                |
|--|----------------|--|----------------|
| <i>Quality of Governance (QoG)</i><br>Dimensions/Indicators                                  | Index<br>Range | <i>Quality of Economic Institutions</i><br>Dimensions/Indicators     | Index<br>Range |
| ▪ Internal Conflict Index (IC)   | 0 – 12         | ▪ Legal System and Property Rights                                   | 0 - 10         |
| ▪ Government Stability Index (GSTAB)   | 0 – 12         | ▪ Regulations: Labor, financial/credit, and business regulation etc. | 0 - 10         |
| ▪ Investment Profile Index (IP)  | 0 – 12         | ▪ Freedom of trade internationally                                   | 0 - 10         |
| ▪ Law and Order Index (LAO)  | 0 – 6          | ▪ Sound Monetary System  | 0 - 10         |
| ▪ Democratic Accountability Index (DACC)   | 0 – 6          | ▪ The size of Government: Revenues, Expenditures, and Enterprises    | 0 - 10         |
| ▪ Index for Army in Politics (AIP)   | 0 – 6          |  |                |
| ▪ Corruption Index (CORR)  | 0 – 6          |  |                |

*Note:* The maximum value of index shows the best situation while zero indicates the worse condition.

<sup>1</sup>The new and revised version of the EFW Index is built on the five indicators/areas to represent the economic freedom. For more detail see, Gwartney, and Lawson (2003). The concept and measurement of economic freedom. *European Journal of Political Economy* 19:3, 405–430.

Following Flachaire, *et al.* (2014), the data on political institutions (*Dem*) to measure the degree of democracy<sup>2</sup> is proxied by Polity IV collected from the *Integrated Network for Societal Conflict Research* (INSCR) Database, *Centre for Systematic Peace*. The index ranges from 0 (autocratic government) to 10 (full democratic government). The Quality of Governance (QoG) measured with a number of indicators/dimensions, is collected from *International Country Risk Guide* (ICRG). The Table 3.1 explains the different dimensions/indicators to measure the quality of governance.

### 3.2. The Model

#### *Economic Institutions in the Growth Process*

The main objective of the study is to investigate empirically the impact of economic institutions on economic growth in Pakistan. For this sake, drawing insights from Solow (1956), the production function can be defined as:

$$Y(t) = A(t)[L(t)]^\alpha [K(t)]^\beta \quad \alpha > 0, \beta > 0 \quad (1)$$

Where  $Y(t)$  is the real output per capita,  $L(t)$  represents employed labor force,  $K(t)$  is the fixed capital formation and  $A(t)$  is the multifactor productivity (often termed as state of the technology or knowledge) that grows exponentially over time from its given initial level.

$$A(t) = A(0)e^{gt} \quad (2)$$

Taking insights from ‘*New institutional economics*’ that accentuate the role of institutions in explaining growth, beyond labour, physical and human capital accumulation (as taken in Solow and Ramsay Growth Models) and technological progress (Endogenous growth Theories). So, the extended production function can be specified by combining institutional quality proxies with some traditional growth factors i.e., labour and capital, as suggested by [Kirman (2007); Balamoune-Lutz and Ndikumana (2007); Gwartney, *et al.* (2006)].

Following the study of Butkiewicz and Yanikkaya (2006), the evolution of the technology<sup>3</sup>  $A(t)$ , in Solow’s growth model, can be observed by incorporating economic institutions (EFW), governance (QoG) and democratic institutions (*Dem*) as the function of technology,  $A(t)$ , such as:

$$A(t) = f(EFW, Dem, QoG) \quad (3)$$

The impact of *EFW*, *Dem* and *QoG* can be observed by adding them as shifting factors of production function besides Labor and Capital:

$$A(t) = A(0)e^{gt} EFW^\lambda Dem^\delta QoG^\lambda \quad (4)$$

By putting the above value of  $A(t)$ , the Equation (1) can be written as:

$$Y(t) = A(0)e^{gt} EFW^\lambda Dem^\delta QoG^\lambda [L(t)]^\alpha [K(t)]^\beta \quad (5)$$

<sup>2</sup>Basically, the term democracy indicates the provision of political rights of the individuals to participate in the political process actively, such that they have right for vote, freedom to compete for the public office, and for the electorates to have decisive votes on public policy issues [Gastil (1986-1987), p. 7].

<sup>3</sup>Landes (1999) has also emphasized that the embracement of the institutions is a major determinant that encourage innovations, technological progress and entrepreneurship.

Assuming the returns are constant, the above production function takes the following augmented Cobb-Douglas form:

$$Y(t) = A_t L_t^\alpha K_t^\beta EFW_t^\gamma Dem_t^\delta QOG_t^\lambda e^u \dots \dots \dots \dots \dots \quad (6)$$

By taking log, Equation (6) can be represented into the linearised Cobb-Douglas form:

$$\gamma_t = \alpha_0 + \alpha l_t + \beta k_t + \gamma EFW_t + \delta Dem_t + \lambda QoG_t + \theta T + u_t \dots \dots \quad (7)$$

Finally the Equation (7) indicates the elasticities of economic growth with respect to labour, capital, economic institutions, and also *w.r.t* control/confounding variables that include governance and level of democracy (autocracy). In the next section, we represent the econometric methodology to estimate Equation (7).

### 3.3. Empirical Methodology

A number of econometric methods are available in case of estimating the relationship between institution and economic growth, depending on the data type, sample size and time series characteristics of data. Mostly cross-sectional studies have used instrumental variable (IV) techniques like, Panel GMM method, 2SLS/3SLS, IV-Random-effect, along with some other estimation methods like Pooled Mean Group, SUR estimation technique and Meta-regression analysis, because of particular advantages of these methodologies over others, e.g., fixed/random effects, Pooled OLS. For example, the studies of [Glaeser, *et al.* (2004); Aixala and Fabro (2008); Law and Bany-Arifin (2008); Efendic, *et al.* (2011)], among other] are well illustrative to the problem of the heterogeneity and reverse causality among variables.

For causality inferences, Panel Least squares dummy-variable causality, Panel/pooled causality tests are prominent for panel data, while for time series analysis, VAR-based causality test are observed [Vega-Gordillo and Alvarez-Arce (2003); Chong and Calderon (2000)].

Our priority in this paper is to estimate the effects of economic institutions on economic growth in Pakistan by testing the contemporaneous effects of governance and democracy (autocracy) in the growth-institutions regression equation.<sup>4</sup> Redek and Susjan (2005) and Eicher and Schreiber (2010) declared that the institutional changes have been observed as a dramatic phenomenon evolving rapidly over the time especially in transitional countries. Moreover is that when structural changes occur, institutional development materializes into difference sectors of economy and policy shift take places, then time series data might not have a single stable regime and experiences a structural breaks that, consequently, result in unstable regression parameters. Thus policy implication based on such results may lead to wrong directions. This paper takes into account the non-constancy of regression parameters and attempts to investigate the time varying relationship between economic institutions and growth.

<sup>4</sup>Although sufficient studies have made efforts to test bi-directional relationship between institutions and growth [see, Lee and Kim (2009); Chong and Calderon (2000); Barro (1996)]. Empirical findings of these studies reveal that institutions follow income. Our study does not take the causality inferences because this is beyond the scope of this paper, as we hypothesize to test the concurrent role governance and democracy for growth-institutions nexus in a novel time varying framework.

### Rolling Window Two-Stage Least Squares

The study uses rolling window two stage least square estimation technique in order to test our prior hypothesis that institutions and growth correlates in a non-constant fashion as time passes i.e., the coefficient of the variables do not remain constant for full sample size estimation [see, Pesaran and Timmermann (2012)]. Rolling two stage least squares regression is primarily an instrumental variable (IV) technique that tackles the problem of endogeneity of economic institution.<sup>5</sup> This methodology is favorable in case of time series analysis to capture structural adjustment in a precise manner. The use of time varying estimation provides solution to a number of problem including model misspecification, unidentified functional form and spurious conclusion [Hall, *et al.* (2009, 2010)].

In order to estimate the time varying relationship for each observation, we need to set a window size ( $l$ ), and step size which is usually taken one in time series data. There is no hard and fast rule in choosing window size ( $l$ ), yet it should have a substantial size, balancing the tradeoff between accuracy and representativeness [Koutris, *et al.* (2008) and Balcilar, *et al.* (2010)].

Time varying rolling estimation procedure is actually a process of sub-sampling which starts with a benchmark sample size that remains constant over the whole analysis, and adds one observation to the benchmark sample size by dropping the last one observation from it so that to obtain the regression parameters at each point of time for the whole sample.

In the next section, we have estimated different dynamic versions of Equation (7) of the form written as under:

$$y_t = \omega_t + \sum_{i=1}^a \varphi_t y_{t-i} + \sum_{i=0}^b \alpha_t J_{t-i} + \sum_{i=0}^c \beta_t k_{t-i} \sum_{i=0}^d \gamma_t EFW_{t-i} + \sum_{i=0}^e \delta_t QoG_{t-i} + \sum_{i=0}^f \lambda_t Dem_{t-i} + \theta T + u_t \quad u_t \sim N(0, \sigma^2) \quad \dots \quad \dots \quad (8)$$

Where  $\omega_t$ ,  $\varphi_t$ ,  $\alpha_t$ ,  $\beta_t$ ,  $\gamma_t$ ,  $\delta_t$ ,  $\lambda_t$ ,  $\theta_t$  are the time varying parameters while  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ ,  $f$  indicate the lag length, and  $u_t$  is the error term.

## 4. EMPIRICAL FINDINGS AND DISCUSSION

In this section, time varying estimates are presented, using rolling window two-stage-least squares regressions. Our sample size, in this analysis, consists of 30 observations while window size<sup>6</sup> for rolling regressions is chosen 14. The instrumental variables (IV) used in the regression, are the immediate lags of explanatory variables as literature on time series analysis recommends.

The preliminary regression results indicate employed labor force has been contributing positively to economic growth historically as indicated in Figure 1, yet

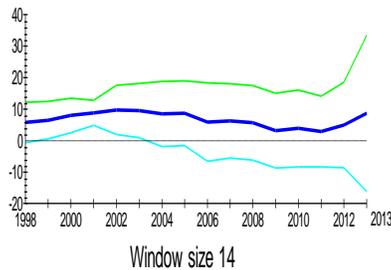
<sup>5</sup>In our support of using this IV technique, Efendic, *et al.* (2011) argues that evidences on growth-institutions correlation are robust and significantly positive, yet degree of effect is sensitive to model specification and (non)treatment of endogeneity of the institutions.

<sup>6</sup>Mostly in literature, studies have taken window size equals to one-third of the whole sample size. Yet we have chosen a bit larger size taking into account our use of dynamic regression analysis that involves lags.

capital contribution has not stimulated the output of the country and indicates a shortage of capital over the years, as shown in Figure 2. Growth has also effected from its immediate lag positively with a small negative impacts in the initial times as estimated in Figure 3. After investigating the time varying impact of labor and capital, subsequently output function is extended to include the economic institution (EFW), and further comprises on the democratic institutions (*Dem*).

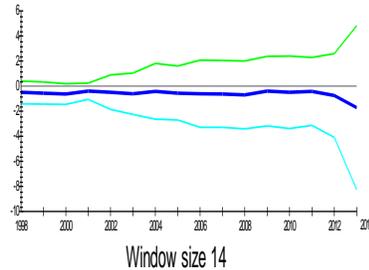
**Fig.1:**  $y=f(l,k, y(-1))$

Coefficient of LL and its two\*S.E. bands based on rolling IV



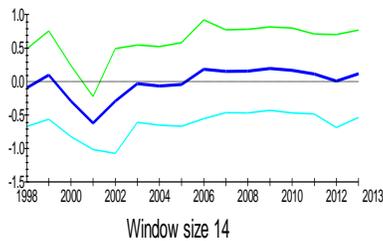
**Fig.2:**  $y=f(l, k, y(-1))$

Coefficient of LK and its two\*S.E. bands based on rolling IV



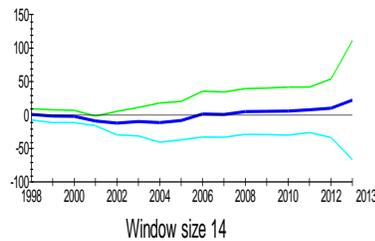
**Fig. 3:**  $y=f(l,k, y(-1))$

Coefficient of LRGDPPC(-1) and its two\*S.E. bands based on rolling IV



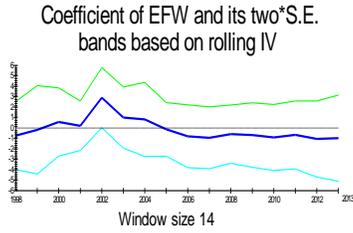
**Fig.4:**  $y=f(l,k, y(-1))$

Coefficient of C and its two\*S.E. bands based on rolling IV

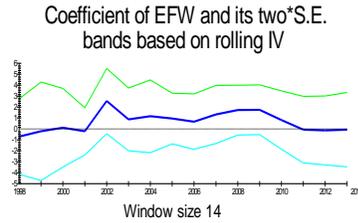


The results indicate that economic institutions impact on growth is very poor, but the inclusion of time trend upsurges the institutions impact on growth. This shows that the institutions evolve over time that ultimately cause to promote growth positively [see, Figure 5 and Figure 6]. The effects of democracy on economic growth are nearly close to zero (Figure 7), while the inclusion of the time increases its positive impacts. This demonstrates that there is no direct impact of democracy-(autocracy) on growth; rather this relationship depends on time as Figure 8 makes the empirical evidences more clear. Moreover, the democratic institutions have indirect impact and via economic institutions it effect economic growth. However, the indirect impact is too small, unless time is added in regression, the comparison of Figure 5, Figure 9 and Figure 10 reveals.

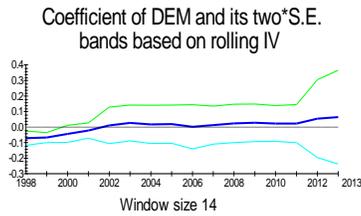
**Fig. 5:**  $y=f(l.k, y(-1), EFW, EFW(-1))$



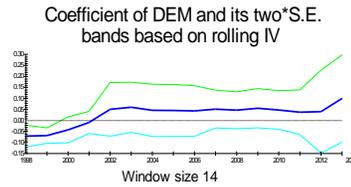
**Fig. 6:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Time trend)*



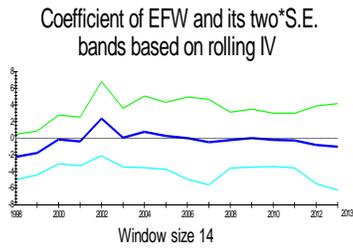
**Fig.7:**  $y=f(l.k, y(-1), Dem, Dem(-1))$



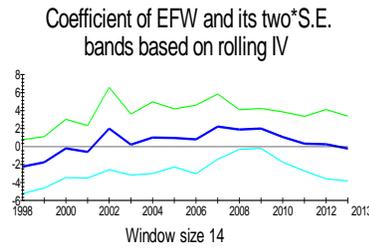
**Fig. 8:**  $y=f(l.k, y(-1), Dem, Dem(-1),$   
*Time Trend)*



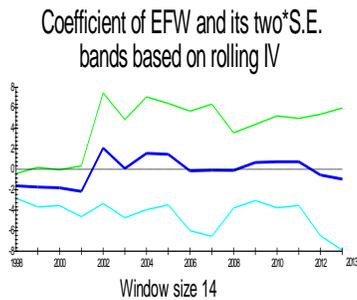
**Fig. 9:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1))*



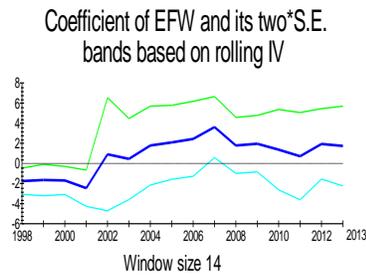
**Fig. 10:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), Time trend)*



**Fig.11:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), LAO, LAO(-1))*



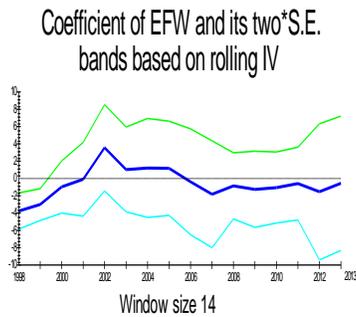
**Fig. 12:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), LAO, LAO(-1), Time*  
*Trend)*



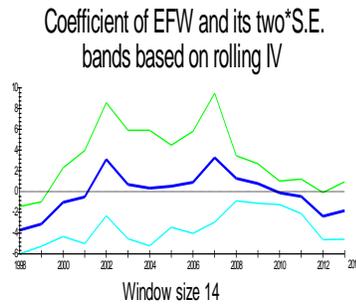
**Contemporaneous Role of Governance and Democratic Institutions in Economic Institutions—Growth Nexus**

Furthermore, our analysis takes governance and democratic institutions in explaining time varying impact of economic institutions on growth. Figure 11 reveals that the impact of law and order (LAO) in the country is growth encouraging by providing incentives to the economic institutions to grow. The indirect impact of law and order is significantly large when time is added in the regression, indicating that this development involves time (as it is clear from Figure. 12 in comparison to Figure. 11 and Figure 9).

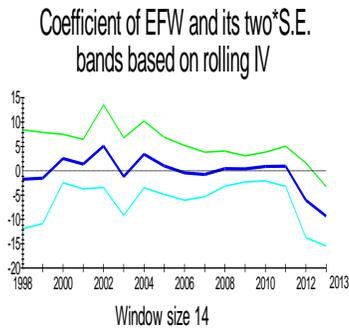
**Fig. 13:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), IP, IP(-1))$



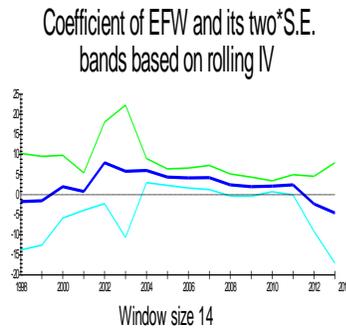
**Fig. 14:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), IP, IP(-1), Time trend)$



**Fig. 15:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), IC, IC(-1))$



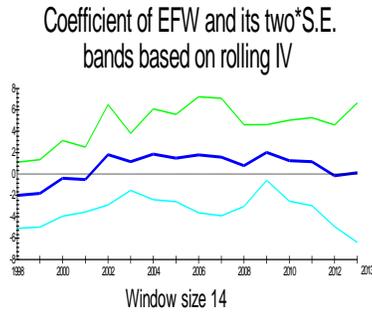
**Fig. 16:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), IC, IC(-1), Time Trend)$



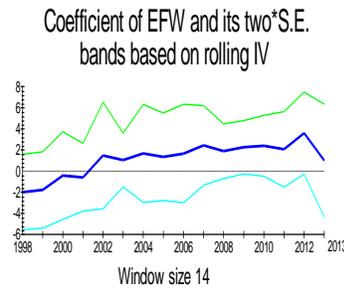
The investment profile (IP) as a confounding variable indicates a growth deterring situation. This means that in the presence of investment risks such as repatriation of profits and payments delays, economic institutions’ strength to persuade economic growth turns to decrease as shown in Figure 13. Moreover, the internal conflict that are responsible for political stability is a vital source that effect the performance of government and consequently, influences the economic growth badly via economic institutions.

The results appeared in Figure 15 and Figure 16 indicate that political stability or the internal conflicts are deterring the economic growth by retracting the role of economic institution in growth process over a period of time. In the same way, in the recent years, the governing stability indicates its falling positive impacts on economic institutions over the time. The less government effectiveness in pursuing its declared development programs causing to decrease economic institutions impact on growth (as Figure 17 and Figure 18 makes the empirical evidences clear).

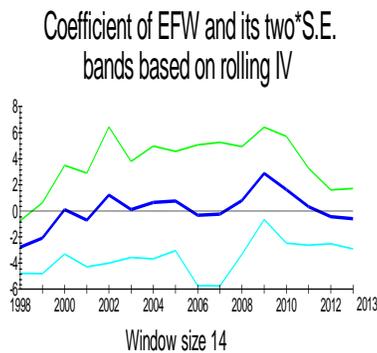
**Fig. 17:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), GSTAB, GSTAB(-1))$



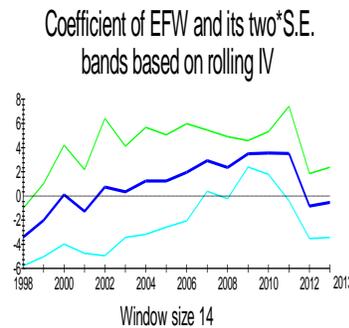
**Fig. 18:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), GSTAB, GSTAB(-1), Time trend)$



**Fig. 19:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), DACC, DACC(-1))$



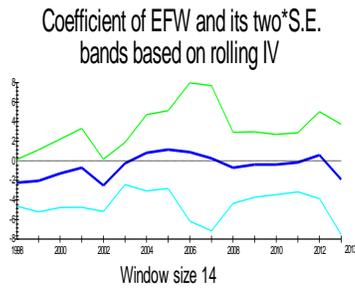
**Fig. 20:**  $y=f(l.k, y(-1), EFW, EFW(-1), Dem, Dem(-1), DACC, DACC(-1), Time Trend)$



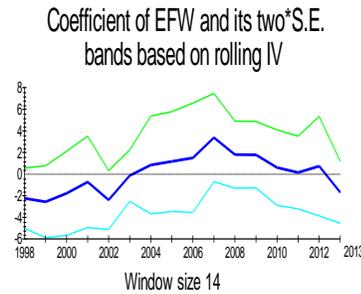
The democratic accountability (DACC) is also considered one of the important dimensions of government quality. Figure 19 and 20 indicated that it is growth promoting if democratic government is more accountable to its people and creates a people's participatory environment. The democratic accountability turns more effective as the time passes, results reveal.

The control over corruption is a major indicator of government quality. In Pakistan, it has been a worsening condition regarding the control over corruption which is making government fail in building quality economic institutions.

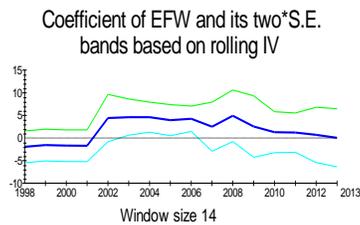
**Fig. 21:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), CORR, CORR(-1)*)



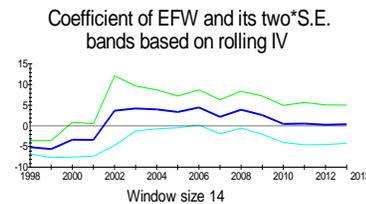
**Fig. 22:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), CORR, CORR(-1), Time*  
*trend)*



**Fig.23:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), AIP, AIP(-1)*)



**Fig. 24:**  $y=f(l.k, y(-1), EFW, EFW(-1),$   
*Dem, Dem(-1), AIP, AIP(-1), Time*  
*Trend)*



Results pointed out that corruption has been a significant element in deteriorating institutions positive effect on economic growth. The reason may be the limited use of public office for the national interest, rather than for the benefits of some dominant coalitions at the cost of national prosperity. The role of military has been positive with growth via improving institutions as represented in Figure 23 and Figure 24.

## 5. CONCLUSIONS

In this study, we have tested our main hypothesis- that is to investigate the different factors that cause to effect economic growth via economic institutions. The study used time series data ranges from 1984-2013 and employed rolling window 2SLS technique in order to gauge time varying relationship among variables. The crux of the study goes over the main points: beyond some traditional growth factors, the performance of economic institutions in encouraging economic growth of Pakistan is very subjective and depends on a number of other confounding factors like governance quality, democratic institutions and time dimensions. Primarily, results suggest that translation of the growth effect of economic institutions from negative to positive require time. Furthermore, democratic institutions (movement from autocratic to democratic regime) are turning to be inclusive by responding to build inclusive economic institutions that lead to high economic growth—but still the impact is very small and requires time to evolve, results reveal.

Moreover, study explores the fact that the quality of governance, along with democracy, is a significant factor that explains the relationship between economic growth and economic institutions. The quality of governance indicators, like maintenance of law and order, good investment profile/ regulatory quality, government stability, democratic accountability, and army political role, are the factors causing to promote economic growth by improving the quality of economic institutions in Pakistan. While government is lacking in controlling over corruption and political violence (internal conflicts) that's why economic institutions are losing its positive impact on economic growth, results reveals. The study recommend a prudent economic policy that government is in sturdy need of controlling corruption, and to resolve the internal conflicts in order to make the quality of government better along with its other components, under a democratic governing system.

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## Corruption, Political Stability and Economic Growth

GHULAM SHABBIR, MUMTAZ ANWAR, and SHAHID ADIL

This paper gives insight of the role of political stability in investigating the two competing hypotheses in Developing Eight Muslim countries, and also investigates whether conditional liaison between corruption and political stability matters or not. The empirical findings indicate that investment, population and political stability play positive role in promoting economic growth. Corruption not only impact growth but also influenced by the institutional quality that a nation experiences. Corruption acts as sands in the wheels in the nations having higher degree of political stability, and greases the wheels in less politically stable countries such as Nigeria and Pakistan. Thus, political stability is conducive to growth, as it reduces the social unrests, political turmoil, and encourages investment, and there by economic growth.

*JEL Classification:* C30, D73, O43, P48

*Keywords:* Corruption, Economic Growth, Political Stability, Conditional Cooperation

### 1. INTRODUCTION

The institutional efficiency played a very significant role in determining the corruption-growth relationship, because corruption phenomenon is a reflection of nation's socioeconomic, cultural and political values, and thereby is product of poor policy decisions. According to Djankov, *et al.* (2003), "corruption can be a result of bad policy options or inefficient institutions that are put in place to collect bribes from individuals seeking to get around them". So, corruption can be defined as, "unfair and illegal activities of a person in power". These activities include bribes, rent seeking or any other one that is associated with the power.

Bribes and rent-seeking are not similar, because second one is the result of government's interference in the economy, and hence become socially costly [Tollison (1997)]. On the other hand, bribes are only money transfers from one person to other. There are many other activities that do not include transfer payments, but are named as acts of illegal activities. For example, a government servant that claims to be a sick but enjoys the vacations. It does not include illegal payment but is a misuse of public office for personal benefits. Similarly, country's president advice to build an airport near to his

Ghulam Shabbir <ghulamshabbir@fccollege.edu.pk> is Assistant Professor, Department of Economics, Forman Christian College (A Chartered University) Lahore. Mumtaz Anwar is Director, Punjab Economic Research Institute (PERI), Lahore. Shahid Adil is PhD Scholar, Department of Economics, University of the Punjab, Lahore.

native residency does not show money transfers but is an abuse of discretionary power. Thus, according to Tanzi (1998), “acts of corruption include bureaucratic (petty) or political (grand), cost-reducing or benefit enhancing, briber-initiated or bribe-initiated, coercive or collusive, centralised or decentralised, predictable or arbitrary and involving cash payments or not. Undoubtedly, other classifications could be added to this list”.

The corrupt acts impacts nation’s socioeconomic and political structure directly and indirectly through institutional setup. It influenced the efficiency of public office bearers, distorted public policies and hindered the execution of law and order. It slowed down the pace of socioeconomic development through resources misallocation. It weakened the national judicial system, denied victims and escorted to the violation of basic human rights in many countries. Consequently, it corroded the transnational community’s abilities to deal with crimes and terrorism. Therefore, estimation of corruption cost and its remedial measures become the top most agenda of many international development organisations. For example, World Bank estimated the figure of bribes about US\$1 trillion in 2004 and African Union estimated the annually corruption cost in Africa about 25 percent. Transparency International (TI) started ranking the world nations on corruption scale in 1995. TI surveys indicate that none of the nation on world globe is free from this social evil and issue is more severe in developing countries as compare to developed ones.

Almost, all developing countries are ranked as most corrupt ones in the world and especially located in Asia and Africa. In Asia twenty-five to forty percent politicians and fifteen to thirty-three percent public office holders are corrupt [(Jain (2001))]. In Egypt, about US\$57.2 billion illegal money were taken out of the country through illegal means during 2000-2008 [Global Financial Integrity Organisation (2011)]. Indonesia paid US\$238.6 million in the form of corruption in 2011 [Ezra (2012)]. Besides, Indonesian people and enterprises made expenditures in the form of illegal payments are about 1 percent and 5percent of their monthly income, respectively. According to Transparency International Pakistan (2012), “Pakistan paid cost of in corruption, tax evasion and bad governance more than US\$94 billion during the last four years of Pakistan People Party (PPP) tenure”. The illegal payments figure reached to Rs.3 trillion during the PPP regime, and it does not include money robbed from mega scandals like Hajj scam, Pakistan Steel mills and Rental Power Plants [Transparency International (2011)]. Country Reports on Human Rights Practices (2012) estimated the government money looted in Nigeria is about US\$6.8 billion due to widespread corruption and entrenched inefficiency. In addition, some governments have resigned in these sub-continent due to corruption allegations e.g. Rajiv Gandhi’s government in India, Chuan Leekpai’s government in Thailand, Suharto and Abdurrahman Wahid’s governments in Indonesia, General Sani Abacha’s administration in Nigeria, Pakistan Muslim League (N) and Pakistan People Party governments in Pakistan.

Developing Eight organisation (D-8) includes all Muslim countries such as Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey. Almost 60 percent population of Muslim world and 13 percent of whole world reside in these countries. Total GDP of these nations is about \$2.88 trillion and workforce is about 385 million. All religions including Islam do not permit the misuse of public funds and office for personal benefits, but corruption level in D-8 countries is very high. Bangladesh,

Indonesia and Nigeria, were ranked the most and Pakistan second most corrupt nations in the world by TI various surveys. Thus, it is very essential to investigate the impact of corruption on economic growth, especially focusing the Muslim world. Corruption-growth debate hypothesised that corruption 'greases-the-wheels' or 'sands-the-wheels' of bureaucracy. Corruption promotes economic growth when it helps to remove the bureaucratic rigidities and illegal small amount of money has much power to overcome administrative barriers and hence encourage growth [Leff (1964)]. This implies that bribes acts as speed money or trouble-saving device, and help to increase investment and growth. Second stream of debate claims that corruption is poisonous to economy's health, as it makes officious procedures sluggish, expensive and unproductive, and slows down the economic growth by redirecting resources to wasteful activities. In addition, it hampered the pace of nations' economic growth facing the problem of political stability.

The empirical research on bureaucratic efficiency provides mixed findings. For example, Acemoglu and Verdier (1998) have justified some forms of corruption that are required to implement property rights. The empirical findings of Knack and Keefer (1995) authenticate that the institutions required to protect property rights are indispensable to investment and growth.

But Ades and Di Tella (1997) documented the results, which support the hypothesis corruption acts as 'sand-in-the-machine'. Mo (2001) empirical findings show that corruption creates socio-political instability and uncertainty, which hurts economic growth. Corruption impacts government projects and thereby economic growth [Mauro (1995)]. Pellegrini and Gerlagh (2004), and Dridi (2013) identified political stability as a transmission channels through which corruption adversely impacts economy's growth.

Thus, we have empirically investigated the impacts of corruption on growth, through political stability in developing eight Muslim countries considering the need of the time.

The rest of the study is organised as follows. Section 2 presents the review of literature. Section 3 theoretical background and model specification. Section 4 gives detail of data description. Section 5 provides empirical findings and discussion. Section 6 deals conclusions and policy implications.

## 2. LITERATURE REVIEW

The number of studies on corruption-growth relationship has significantly increased but their findings are heterogeneous due to differences in measurements of corruption and growth, estimation techniques, country coverage, and sample periods. Some early studies argued that corruption promote economic growth due to its potential to enhance effectiveness. For example, Huntington (1968), considered corruption as the necessary lubricant (grease) required to lubricates the jammed wheels of bureaucracy, which might not be possible due to higher holdups of bureaucracy in highly-regulated economies, as had been observed in the 1870s and 1880s in USA, where railroad, utility and industrial corporations' corruption faster the pace of growth. Corruption promotes growth by removing the bureaucracy's malfunctioning, as Lui (1985) developed a model and argued that corruption reduces time cost efficiently (queue hypothesis), but it is empirically contested by Kaufmann and Wei (1998). In the same wisdom, Acemoglu and Verdier (1998) proved that corruption acts as a piece-rate paid to officials for their speedy

services (speed money hypothesis). Bailey (1966) documented that corruption improves administrative services through enhancement of public officials' quality and thereby, enhance growth. Another established notion among economists is that corruption lead to misallocation of resources and performed as sands in the wheels of bureaucracy. Besides, corruption itself shows the symptoms of basic institutional inadequacies, which provide chances to politician to maximise illegal payments through increasing the administrative bottlenecks [Myrdal (1968)].

Empirically, Ehrlich (1999) documented negative relationship between corruption and per capita income across different stages of economic development. It is argued that relationship between corruption and economic performance is the result of endogenous outcome of competition (between growth-enhancing and socially unproductive investments) and its reaction to exogenous factors (especially public involvement in private economic affairs). A number of studies reported similar findings such as Keefer and Knack (1995), Mauro (1997), Tanzi and Davoodi (1997), Bardhan (1997) Hall and Jones (1999), Sachs and Warner (1997), Wei (2000), Lambsdorff (2003a, 2003b), Khwaja and Mian (2005), Johnson, *et al.* (2011) Ahmad, *et al.* (2012).

However, some researchers put questioned on the robustness this empirical relationship between corruption and economic growth, as findings of a number of studies not reported a significant relationship and is quite sensitive to the inclusion of other factors important to growth. For example, Brunetti, Kisunko, and Weder (1998) failed to discover any significant relationship between corruption and economic growth. Abed and Davoodi (2000) reported that corruption becomes statistically insignificant with inclusion of structural reforms index in the regression. Mo (2001), Pellegrini, and Gerlagh (2004) and Pellegrini (2011) documented similar findings that corruption coefficient become insignificant after controlling the effects of other determinants of growth such as investments, human capital, openness, and political instability.

Economists' recent view on this relationship is that impact of corruption on growth can't be explained without considering the role of nation's institutional framework. Empirical findings of various studies argued that corruption-growth relationship is non-linear and it varies across countries depending on performance of their institutional setting. For example, Scully (1988) documented the role of informal institutions, which are statistically significant to explain the inter-country differences in growth rates. Mendez and Sepulveda (2005) reported a non-monotonic relationship between corruption and economic growth, and dependent on nation's degree of political freedom. Aidt, Dutta, and Sena (2008) documented negative correlation between corruption and growth in countries having higher institutional performance and zero impact where quality of institutions in poor. Méon and Weill (2010) argued that corruption is less harmful in nations exercising less effective institutional structure. This finding is supported by the results of Heckelman and Powell (2010).

Vaal and Ebben (2011) developed a model to incorporate the institutional role in explaining corruption-growth relationship, and reported that relationship becomes ambiguous when institutional variables political stability, property rights and political systems are included in the regression. But, corruption lowers growth, when degree of political stability or property rights protection exceeds some threshold level. Ahmad, *et al.* (2012) examined the corruption-growth relationship using panel data set for 71

countries and GMM. Empirical findings reported that corruption level to be zero is not essential to maximise growth, nature of relationship between corruption and long-run growth is hump-shaped, and public institutions' quality is very important for long run economic growth. Thus, it is acknowledged that the interaction between corruption and institutional factors determine the way corruption impacts growth. The review of the existing theoretical and empirical literature indicates that it is not clear, how corruption-growth relationship is affected by the quality and structure of underlying institutions. It is assumed that corruption influences the effects of institutions on the economy such as burden imposed on the productivity of input provided by the public sector, and hence impacts on economic growth [Acemoglu and Verdier (2000); Aidt (2009); de Vaal and Ebben (2011); Rajkumar and Swaroop (2008)].

The existing literature generally lacks in explaining the explicit role of institutions, especially political stability in corruption-growth relationship, and especially focusing on Muslim world separately. Thus, we have investigated the corruption-growth relationship taking into account the effect of corruption, political stability and interaction of both on economic growth in D-8 countries to fill the existing gap in literature on corruption. Because, by doing so, one will be able to understand the corruption-growth association in existing institutional framework of Muslim World. It is also important, as good understanding of how corruption affects economic performance is very essential to formulate and implement the effective development policies.

### 3. THEORETICAL BACKGROUND AND MODEL SPECIFICATION

Political scientists and economic philosophers have a common opinion that corruption retards growth by misallocation of resources and promotes it through overcoming the administrative rigidities. Last 35 years' theoretical and empirical literature on corruption debate concluded that, on one side corruption reduces the speed of economic growth by diverting the resources from public gains to private ones and consequently deadweight loss to society [Shliefer and Vishny (1993); Mauro (1995); Tanzi (1997)]. Alesina (1992) argued that corruption retards growth by discouraging private investment (as it increases the administration cost), creating social contents and political instability. Ehrlich (1999) documented adverse effect of corruption on per capita income across different stages of economic development. The author argued that corruption-growth relationship is an endogenous effect of competition between growth-enhancing and socially unproductive investments, and its response to exogenous factors (especially government involvement). Keefer and Knack (1995), Sachs and Warner (1997), and Hall and Jones (1999) also reported similar findings. According to Pellegrini and Gerlagh (2004) did not reported direct statistically significant impact of corruption on growth once other relevant factors are controlled, but has indirect effects through investment, schooling, trade policies and political stability. Kaufmann, Kraay, and Zoido-Lobaton (1999b), Neeman, Paserman, and Simhon (2004) and Welsch (2004) also reported similar findings.

On the other hand, corruption also promotes growth by surmounting the government inefficiencies at lower costs [Huntington (1968); Friedrich (1972)]. It is also argued in favor of corruption views bribery that it acts as speed money, illegal payments, which speed up the administrative procedures. Lui (1985) model of corruption minimises

the costs of “standing in line” by using bribes but empirical validity of this hypothesis was contested by Kaufman and Wei (1998). Barreto (2001) found significantly positive impact of corruption and GDP per capita.

North (1990) argued that institutional role (political stability, quality of government, independent judicial system, political rights, property rights etc.) is very essential in determining the nation’s economic performance in the long-run. Many researchers modified the above mentioned growth models to investigate theoretically and empirically impacts of institutional development on economic growth. Some studies uses corruption or corruption control to measure institutional performance. Corruption directly impacts growth through factor productivity and indirectly via physical and capital investment. Swaleheen (2012) investigated the impacts of corruption and political stability on growth using the interaction term between absence of corruption and average of the annual changes in corruption. Ahmad, *et al.* (2012) explored the linear quadratic empirical corruption-growth relationship. Empirical findings show that a reduction in corruption level raises the growth rate in an inverted U-shaped style.

### 3.1. Model Specification

Following Becker (1968), Polinsky and Shavell (1979, 1984) developed a model to analyse the individuals’ behaviour to be a corrupt. They argued that expected gains must be greater than expected cost of corruption for its incidence. Two competing hypotheses whether corruption ‘sands the wheels’ or ‘greases the wheels’ of bureaucracy emerge from the corruption-growth debate. Following Solow (1956) and Mo (2001), we used standard production function to investigate the corruption-growth relationship as follows:

$$Y_{it} = A_{it}F(K_{it}, L_{it}) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where  $Y_{it}$  is the total output,  $T_{it}$  is total factor productivity,  $K_{it}$  is the capital stock and  $L_{it}$  is the total labour in the country  $i$  at time period  $t$ . Adelman (1961), identified two components (growth and development) that influence the development of an economy. Growth components include the growth rates of inputs (capital and labour) and development ones are social and technological changes, which are related to the forces that determine total factor productivity growth. Total factor productivity (TFP) growth measures the variations in output due to technological changes, efficiency improvements, and all other factors’ growth not included in inputs. Therefore, it is rational to assume that corruption adversely effects efficiency achieved from technological and efficiency improvements. Thus, corruption impacts growth through TFP growth and growth rate function becomes as below in Equation (2).

$$GR = F(a_{it}, IY, GL) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where  $GR$  indicates the growth rate of real output,  $a_{it}$  is the total factor productivity,  $IY$  shows the investment-output ratio, and  $GL$  is the growth rate of labour. Levine and Renelt (1992) identify the factors, which are robust in determining the economic growth such as share of investment in GDP, population growth rate, initial level of real GDP per capita, and human capital. The first two factors are considered as growth component, whereas the last two are related to the development component. Ahmad, *et al.* (2012) included a

set of conditioning variables in the model such as government expenditure, external competitiveness, population growth rate, primary school enrolment, secondary school enrolment rate, foreign direct investment and risk-to-investment, corruption, and institutional quality indicators for determining the rate of productivity growth. In addition, they estimate long-run growth as a linear-quadratic function of corruption to capture the growth-enhancing and growth-reducing effects of corruption on growth, instead of using interaction term between corruption and institutional quality indicators in the growth equation. But Meon and Sekkat (2005) argued that two competing corruption hypotheses can only be tested by using interaction term between corruption and institutional quality in the model. Thus, we included the interaction term between corruption and political stability in the model to test the hypotheses whether it promotes or retard the economic growth as below in Equation (3).

$$a_{it} = f(CORR_{it}, X_j, PS, CORR_{it} \times PS) \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

Where  $CORR$  is the level of corruption;  $X_j$  is the  $j$  conditioning variables such as investment-output ratio, Government expenditure, population growth rate and education;  $PS$  is political stability and  $CORR \times PS$  is the interaction term between corruption and political stability. Combining Equation (2) with Equation (4), we get the Equation (4) without interaction term and (5) with interaction term for estimation.

$$GR_{it} = \alpha_0 + \alpha_1 CORR_{it} + \alpha_2 PS_{it} + \sum \beta_j X_{ijt} + \mu_{it} \quad \dots \quad \dots \quad \dots \quad (4)$$

The dependent variable ( $GR_{it}$ ) is the growth rate of GDP per capita, and explanatory variables are corruption ( $CORR_{it}$ ), political stability ( $PS_{it}$ ), and set of control variables ( $X_{ijt}$ ). Following Mo (2001) and Pelligrini and Gerlagh (2004), we used four control variables such as government expenditures, investment-output ratio, population growth rate and education<sup>1</sup> to analyse the effect of corruption on growth, thus:

$$\begin{array}{ll} X_1 = \text{Government expenditure} & X_2 = \text{Share of investment in output} \\ X_3 = \text{Population growth rate} & X_4 = \text{Education} \end{array}$$

Subscript  $i$  is used to present the country ( $i = 1, 2, \dots, n$ ) and  $t$  is used for time ( $t = 1, 2, \dots, T$ ), and  $\mu$  is an error term. The focus of study is on the impact of corruption on growth, so  $\alpha_1$  is the coefficient of main interest in this regression. The positive sign of the coefficient of corruption ( $\alpha_1 > 0$ ) supports the hypothesis that corruption ‘greases the wheels’; whereas its negative sign ( $\alpha_1 < 0$ ) implies that corruption ‘sand the wheels’. The expected sign of the coefficients of political stability is positive ( $\alpha_2 > 0$ ) that implies political stability enhances the economic growth. De Vaal and Ebben (2011) demonstrated that political stability is a very essential element of the institutional framework, which affects production and hence growth. A certain level of political stability is a necessary condition for production and growth; as it encourages trust and confidence required to facilitate investment and production.

The coefficient of population growth captures the impact of demographic growth on economic growth. Empirical literature predicts that effect of demographic growth on growth rate of GDP per capita is negative. This implies that higher population growth

<sup>1</sup>Education is also used as a measure of human capital [see, Mina and Ndikumana (2008)].

rate retards the GDP per capita growth rate. According to Mankiw, *et al.* (1992), the impact of human development measured by the education is positive on growth rate of GDP per capita, and the expected sign of the education coefficient is positive. The expected sign of the investment-output ratio is also positive that implies increase in investment-output ratio promotes economic growth. Lastly, following Mauro (1995) we have control the impact of government expenditure that is expected to be negative.

Following Meon and Sekkat (2005), the study in hand included the interaction term in Equation (4) to test the ‘grease the wheels’ or ‘sand the wheels’ hypotheses.

$$GR_{it} = \alpha_0 + \alpha_1 CORR_{it} + \alpha_2 PS_{it} + \alpha_3 (CORR_{it} \times PS_{it}) + \sum \beta_j X_{ijt} + \mu_{it} \quad \dots \quad (5)$$

The parameters of interest in the regression are  $\alpha_1$  and  $\alpha_3$ . Under ‘grease the wheels’ hypothesis, corruption should have a positive impact on growth if the quality of institution such as political stability is very low. With poor institutional quality  $\alpha_1$  should be positive for corruption to have a positive impact on growth. On the other hand, with higher political stability the impact of corruption should become negative, and it supports the ‘sand the wheels’ hypothesis. In order to get such an impact,  $\alpha_3$  should be negative. Hence to hold the hypothesis i.e., corruption ‘grease the wheels’  $\alpha_1$  should be positive with  $\alpha_3$  should be negative ( $\alpha_1 > 0$  and  $\alpha_3 < 0$ ). So, corruption only affects growth positively in case of lower political stability.

Under the ‘sand the wheels’ hypothesis, corruption retards growth and becomes increasingly detrimental as governance deteriorates. It is argued that corruption affects economic growth adversely if the threshold level of political stability is low enough [Blackburn (2012)]. In this case, the sign of corruption coefficient should be negative ( $\alpha_1 < 0$ ) to still have a negative impact on growth if the quality of institution is very low. Besides, these hypotheses can be tested simply by differentiating Equation (5) with respect to corruption, as shown below.

$$\frac{\partial GR}{\partial CORR} = \alpha_1 + \alpha_3 \times PS \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (6)$$

This indicates that corruption effect on growth depends on the coefficient  $\alpha_3$ .

#### 4. DATA DESCRIPTION

There are various quantitative measures used for corruption that researchers have used for cross-country comparisons. For example, Mauro (1995) used Business International Corporation corruption index, Wei (2000) used World Economic Forum’s Global Competitiveness Report’s index for corruption analysis. Third indicator of corruption is the combination of both such as Corruption Perception Index (CPI), and used by Tanzi and Davoodi (2001), Dreher and Herzfeld (2005), Shabbir and Mumtaz (2007), Evrensel (2010), Kotera, Okada, and Samreth (2012), Pieroni and d’Agostino (2013) etc. CPI is constructed by Transparency International (TI) and is based on a ‘poll of polls’ showing the impressions of business people, the local population of relevant countries, and risk analysts, who have been surveyed. This index scaled the world’s nations from 0 to 10.

The macroeconomic variables are GDP per capita, government expenditures, investment-output ratio, education and population growth rate; first one is used as

dependent variables and remaining are used as control variables. The data concerning GDP per capita, government expenditures, investment-output ratio and population were found in the macroeconomic data series of The World Economic Outlook (WEO) database. GDP per capita is expressed in Purchasing Power Parity (PPP) dollars per person. It is derived by dividing the nation's GDP in PPP dollars by total population. Government expenditure is measured by general government total expenditure as a percentage of GDP. Investment-output is measured by the total investment, which is expressed as a ratio of total investment and GDP. Population has been measured by the total population of the country. We have measured the education level by the total adult literacy rate (% of people ages 15 and above) and data is taken from the World Development Indicators (WDI). Data on political stability is collected from World Bank Governance Indicators Database. World Governance Indicators (WGI) reflects the perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. We used two measures for political stability such as WGI estimate (index) and WGI percentile rank among all countries instead of estimates of governance. The value of index varies between  $-2.5$  to  $2.5$ , and the value of rank ranges between 0 and 100. The lower value of rank indicates more perception of the likelihood that the government will be destabilised or overthrown by means of unconstitutional sources or violent (or lower quality of governance). This implies that a low value of rank shows more political instability and its higher value indicates more political stability.<sup>2</sup>

## 5. EMPIRICAL FINDINGS AND DISCUSSION

We have used panel data set for the cross section of D-8 countries from 1995 to 2013 to test the hypothesis whether corruption 'grease the wheel' or 'sand the wheel'. The correlation coefficients<sup>3</sup> indicate that correlation coefficient between GDP per capita and corruption is negative and significant, which support the hypothesis corruption 'sands the wheels'. This implies that both variables move in opposite direction. For example, Pakistan has high average value of corruption index (7.66) and low average value of GDP per capita (3.86). The correlation coefficient between growth and political stability is positive and significant that implies higher political stability promotes economic growth in the sample nations. These relations are also confirmed by the scatter diagrams and fitted regression line.

Following Mo (2001), Méon and Sekkat (2005) and Ahmad, *et al.* (2012), we have used investment-output ration, population growth rate, government expenditure and human capita (education) as a control variables in the regression to investigate the impact of corruption and political stability on GDP per capita growth rate. We used GMM to estimate the panel data models, fixed effects model and random effects model; as this method tackle the issue of endogeneity, if any exist. We applied the Redundant Fixed Effects tests to check whether intercepts are common or not across the cross-sectional entities. The p-values of cross-section F-statistic and cross-section Chi-square predict that intercepts are not same across all cross-sections.<sup>4</sup> GMM is basically instrumental based

<sup>2</sup>For detail see, Kaufmann, Kraay, and Mastruzzi (2010).

<sup>3</sup>Correlation coefficient table is available at request.

<sup>4</sup>Results are available at request.

method of estimation, thus a selection of suitable instrument is itself an issue. The main characteristics of best instrument are, it should be highly correlated with the endogenous explanatory variable and uncorrelated with the error term. For this purpose, we used Wald test and Hansen J-statistic; p-value of the Wald-test is used to check whether instruments are highly correlated with the endogenous variable or not. In GMM method Hansen J-statistic, is also used as a test of over-identifying moment conditions. We have estimated two models; without and with interaction term to see the impact of corruption and institutions on GDP per capita.

We estimated the regression without interaction term using GMM, which not only addresses the endogeneity issues but also control the unobserved country-specific effects. Besides, it does not need any external information such as a validation or replicate data set in analysing the static panel data model [Wansbessk (2001)]. We used two stage least square (2SLS) weighting matrix and cross-section weights panel corrected standard error (PCSE) robust covariance methodology to address the problem of cross-section correlation (period clustering). The p-value of Hausman test indicates that fixed effects estimates are better than random effects estimates, which are reported in the in the Table 1. The p-value of Wald test and Hansen J-statistic confirm the suitability and validity of instruments. The values of R-square and adjusted R-square are reasonably high, which indicate that explanatory variables have reasonably explained the variations in the dependent variable.

Table 1  
*Corruption, Political Stability and Economic Growth*

| Variable                   | (1)                 | (3)                 | (4)                  |
|----------------------------|---------------------|---------------------|----------------------|
| Constant                   | -0.7666 (-3.317)*** | -1.6196 (-4.566)*** | -5.0458 (-5.60)***   |
| Corruption                 | 0.0563 (1.009)      | 0.0591 (0.975)      | 0.6178 (2.5705)***   |
| Political Stability        | -                   | 0.0148 (1.986)**    | 0.5906 (3.6573)***   |
| Government Expenditure     | 0.0166 (0.599)      | 0.0073 (0.247)      | 0.0579 (1.4184)      |
| Investment                 | 0.0046 (5.376)***   | 0.1224 (5.628)***   | 0.1732 (4.6773)***   |
| Population                 | 0.3686 (4.006)***   | 0.4653 (4.467)***   | 1.6096 (3.8016)***   |
| Education                  | -7.0316 (-0.664)    | 0.0411 (0.675)      | -0.0116 (-0.1457)    |
| GDP per capita (-1)        | 0.8803 (29.505)***  | 0.8583 (25.622)***  | 0.4905 (3.2771)***   |
| Corruption × Pol. St.      | -                   | -                   | -0.2806 (-3.5566)*** |
| R-squared                  | 0.9986              | 0.9987              | 0.9979               |
| Adj. R-squared             | 0.9985              | 0.9985              | 0.9976               |
| J-statistic (p-Value)      | 3.4271 (0.3303)     | 1.6483 (0.1992)     | 3.7193 (0.4453)      |
| Wald Test p-Value          | (0.0000)***         | (0.0000)***         | (0.0000)***          |
| Observations               | 144                 | 136                 | 128                  |
| Hausman T. Stat. (P-Value) | 25.48 (0.0003)***   | 23.32 (0.0015)***   | 1185.7 (0.0000)***   |

The asterisks \*\*\*, \*\*, and \* indicate 1 percent, 5 percent, and 10 percent level of significance, respectively. In parentheses, robust *t*-statistics based on cross-section weights (panel corrected standard error-PCSE) are reported.

Table 1 shows the results of three regressions; regression (1) includes corruption, not political stability in the model, regression (2) includes both corruption and political stability in the model and regression (3) considers both along with interaction term between corruption and political stability<sup>5</sup> in the model. The coefficients of control

<sup>5</sup>Political stability is measured by the WGI index and percentile ranking of the countries. Both measures give almost similar results, so WGI percentile ranking results are discussed here, WGI index results are available at request.

variables have expected signs and are statistically significant except government expenditure and education. The coefficient of investment-output ratio is positive and significant in all three regressions and coefficient value is highest in regression (3). This implies that increase in investment-output ratio promotes economic growth. This result supports the findings of previous studies such as Méon and Sekkat (2005) and Hodge, Shankar, Rao, and Duhs (2011b). The coefficient of population growth rate is positive and significant in all regressions, which indicates that increase in population growth rate increases the economic growth, because population growth is also used as a proxy for labor growth. Similar findings are reported by the Méndez and Sepúlveda (2005), but does not support the findings of Ahmad, *et al.* (2012), because higher population growth may slow down economic growth due to reduction in capital per worker (for a given level of investment).

The coefficients of adult literacy rate and government expenditures remained insignificant showing zero impact on economic growth in the sample countries. The coefficient of corruption is insignificant in regression (1) and (2) but significant in (3). Mo (2001), and Pelligrini and Gerlagh (2004) reported that corruption ceases to be a significant explanatory variable for economic growth when political stability included in the regression, so support the findings of the study. The effect of political stability on growth is positive, i.e., more specifically 10 percent increase in political stability promotes growth by only 0.14 percent. Following Ahmad, *et al.* (2012), We included lag value of GDP per capita by one period in the model, as it affects the speed of convergence at which an economy converges toward its steady state, thereby affecting the growth rate.

Regression (3) results show the mutual effect of corruption and political stability on economic growth, as coefficient of interaction term is negative and significant. The results indicate that the marginal effect of corruption on economic growth depends on the degree of political stability. The corruption promotes growth when a country is facing the problem of political instability, and retards it in case of politically stable nations. We inserted the estimated coefficients of regression (3) in the Equation (6) to calculate marginal effect as below.

$$\frac{\partial GR_i}{\partial CORR_i} = 0.6178 - 0.2806(PS_i) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (7)$$

The sign of the marginal effect of corruption on growth changes at about 9 points of political stability rank. If a country has a political stability ranking above the value of 9, the marginal effect of corruption on growth is negative and significant, which implies that corruption hypothesis ‘sands the wheels’ holds. In our sample countries, all countries’ average political stability rank value exceeds 2.8 except Nigeria and Pakistan, which conclude that corruption lowers the growth of GDP per capita in all sample countries except Nigeria and Pakistan. Thus corruption sands the wheels hypothesis holds in Bangladesh, Indonesia, Iran, Malaysia, Turkey and Egypt. On the other hand, corruption greases the wheels hypothesis holds in Nigeria and Pakistan. Similar findings are reported by a number of studies such as Mauro (1995); Knack and Keefer (1995); Keefer and Knack (1997); Fisman and Gatti (2002); Rauch and Evans (2000); Blackburn and Forgues-Puccio (2007); Haque and Kneller (2009); Ahmad, *et al.* (2012).

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

We have tested two competing hypotheses whether corruption ‘greases the wheels’ or corruption ‘sands the wheels’. The study examined the effect of corruption on growth, and checked whether conditional cooperation between corruption and political stability matters or not in testing the above mentioned two corruption hypotheses. The empirical results indicate that the effect of corruption depends on the political stability, which implies that conditionality matters. The coefficient of corruption become insignificant when political stability variable is included in the regression. Political stability has positive significant impact on growth. The coefficient of interaction term is negative and significant, which implies that corruption promotes growth in the politically instable nation but retards it in politically stable countries. In our sample countries, all nations have the rank value of political stability greater than threshold level except Nigeria and Pakistan. This concludes that corruption ‘sands the wheels’ hypothesis holds in all D-8 countries except Nigeria and Pakistan, where corruption ‘greases the wheels’ hypothesis is established.

The empirical results of the study suggest that caution should be taken in drawing some solid policy implications, as the study used the panel data of only Muslim developing countries. But still, we believe that empirical results of the study suggest some very essential implications for understanding the impacts of corruption on economic growth. Therefore, it is recommended that in order to reduce the effect of corruption on growth the promotion of political stability is indispensable, because political stability reduces social unrest and political turmoil, and encourage investors to invest and thereby promote economic growth. It certainly implies that future studies on corruption-growth relationship and its social effects, should pay careful attention to the governmental sphere.

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## Is Innovation in Pakistan Driven by Specialisation or Diversity?

ADEEL ALI, SYED FAIZAN IFTIKHAR, and SABIHUDDIN BUTT

Innovation is among the main drivers of industrial development leading to economic growth. However, the question triggers that what drives innovation? Is innovation driven by specialisation or diversification? The literature has supported both, the specialisation and diversification as driver of innovation. Therefore, the purpose of this paper is to explore the determinants of innovation in Pakistan with a special emphasis on specialisation and diversity. The analysis is based on the cross sectional data set of 784 firms across 13 different cities of Pakistan, i.e. Investment Climate Survey (ICS) 2007, compiled by the World Bank Enterprise Group. Our findings have showed the positive relation between innovation and diversity i.e. diversity is conducive to innovation. On the other hand, specialisation has a negative effect i.e. it hinders innovation in cities of Pakistan.

*JEL Classification:* C21, C25, O31, O32

*Keywords:* Innovation, Specialisation, Diversity, Logistic Regression

### 1. INTRODUCTION

Cities account for a large share of GDP, where economies of scale, advantages of agglomeration, contribute to innovativeness. The locus of economic development is now firmly believed has been shifted. Moreover, in cities, industrial composition and diversity contributes to growth and in turn reduces the cost of innovation in the region where the economic activity concentrates and boosts growth. [Griffith, *et al.* (2006)] They reported positive correlation between productivity and innovation. Some scholars have argued that most innovations are made in cities [Jacobs (1969); Bairoch (1988)].

Innovation is among the main drivers of industrial development leading to economic growth. However, the question triggers that what drives innovation? Is innovation driven by specialisation or diversification? Glaeser, *et al.* (1992), Daniele and Mario (1994), Franco, *et al.* (1997), Mario and Valentina (1996), Andre (2006), Mancusia (2003), Ludovico and Wilson (1998), Anton (2014) and Altuzarra (2010) provides support for the specialisation—specialisation drives growth. Specialisation/concentration promotes the knowledge spillover and thence innovation. On the contrary, Maryann and David (1999), Jacobs (1969), Sylvia, *et al.* (2013), Donald Fan (2012), Maria (2006), Alison, *et al.* (2011), Robert and Hopkins (1981) are of the view that diversity of economic activity is more conducive to innovation than specialisation.

Adeel Ali <adeelaly@ymail.com> is Project Economist/Research Assistant, Applied Economics Research Centre, University of Karachi, Karachi. Faizan Iftikhar is Assistant Professor, Applied Economics Research Centre, University of Karachi, Karachi. Muhammad Sabihuddin Butt is Associate Professor, Applied Economics Research Centre, University of Karachi, Karachi.

Existing literature provides mixed evidence. The evidence varies by regions and the way innovation is defined. Innovation is itself complex to define. Authors have used different approaches to define innovation. Some have used product advancement as innovation while others have used more complex definition. For example, Maryann and David (1999) are of the view that innovation could be anything if it comes under the umbrella of any one of the four: product is entirely new in the market, a newly introduced product of the same product category, the product is modified/ improved according to the latest technology & lastly, the product design in modest.

Likewise, according to Zemplerová and Hromádková (2012), the firm is innovative if they take any of the following activity; introduced new/ extensively improved product or services, introduced new/ extensively improved production method/ or supporting activities related to production like, logistic, distribution, IT, accounting, or any ongoing innovation activity. Suresh, *et al.* (2009) develops an extended model of innovation. Their model incorporates the role of both owner and firm characteristics, they used this to determine how product, process, marketing and organisational innovations should vary with firm size and competition. The definition given by Suresh, *et al.* (2009) is an extension of the definition provided by Maryann and David (1999) and Zemplerová and Hromádková (2012).

However, the questionnaire remains what drives this innovation? Specifically; is specialisation more important for innovation process or diversification leads to innovation? As indicated earlier literature has provided mixed result. Glaeser, *et al.* (1992) after providing in-depth review of Marshall (1890), Arrow (1962) and Romer (1986) formulated a new model—The Marshall-Arrow-Romer model. This model formalises the insight that the concentration of an industry in a city promotes knowledge spillovers between firms and therefore would facilitate innovation in that city-industry observation. This type of concentration is also known as industry localisation [Loesch (1954)]. However, Jacobs (1969) argues that the most important source of knowledge spillovers is external to the industry in which the firm operates and that cities are the source of innovation because the diversity of these knowledge sources is greatest in cities. Thus, Jacobs develops a theory that emphasises that the variety of industries within a geographic region promotes knowledge externalities and ultimately innovative activity and economic growth.

Further to this the specialisation variable reflects the degree to which a firm is specialised. A higher value of this measure indicates a greater degree of specialisation of the firm in that industry. Thus, a positive coefficient would indicate that increased specialisation within a city is conducive to greater innovative output and would support the Marshall-Arrow-Romer thesis. A negative coefficient would indicate that greater specialisation within a city hinders innovative output and would support Jacobs' theory that diversity of economic activity is more conducive to innovation than is specialisation.

In case of Pakistan, to the best of the knowledge there is no empirical evidence available to date. Therefore, the main purpose of the study is to empirically explore the argument whether innovation in Pakistan is driven by specialisation or diversification across the cities of Pakistan. The empirical analysis is based on the Investment Climate Survey (ICS) of 2007 provided by the World Bank. The study first developed a measure to represent innovation process in a firm, secondly it develops indices to measure the

extent of specialisation and diversification in a firm, finally the determinants of innovation are explored keeping emphasise on specialisation and diversification. The argument is tested by using logit model. Our results provide support for the diversification theory i.e. in case of Pakistan. Diversity is leading to innovation which successively leads to economic development.

The study is organised as follows. In Section 2, the study has discussed the history of innovation in the context of Pakistan. The detailed methodology and data used have been discussed in Section 3. Finally, the empirical results and conclusion are mentioned in last section.

## 2. INNOVATION IN PAKISTAN

Data provides no specific variable that can be used to explain the process of innovation by firms in Pakistan. In order to understand the innovation process in Pakistan, we have used different proxies to explain innovation. These proxies help us in understanding the process of innovation in Pakistan over time. First proxy is high technology export. Kirsty (1986) analysed the causality between exports and innovation and concluded that high-tech exports explain innovation.

As portrayed in Figure 1, there is a very small share of high-technology goods in total manufacturing sector exports. In 90's decade, there is an approximately stagnant trend but since after there is a dramatic increase in high-technology exports. This indicates that in the last 15 years, there is a 15 folds' increase in high-technology exports.

Trademark is another indicator which illustrates the innovation trend. Trademark application is the registration of a distinct sign for a product or service to authorise owner or enterprise an exclusive right to use it. Sandro, *et al.* (2004) defined trademark as the complimentary variable of innovation.

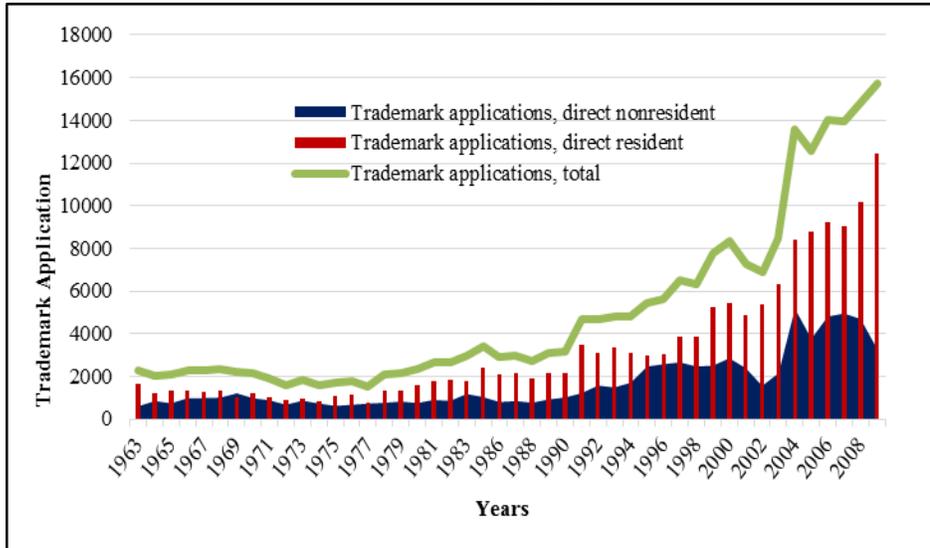
**Fig. 1. High-technology Exports (% of Manufactured Exports)**



Source: Authors Illustration (ICS, 2007).

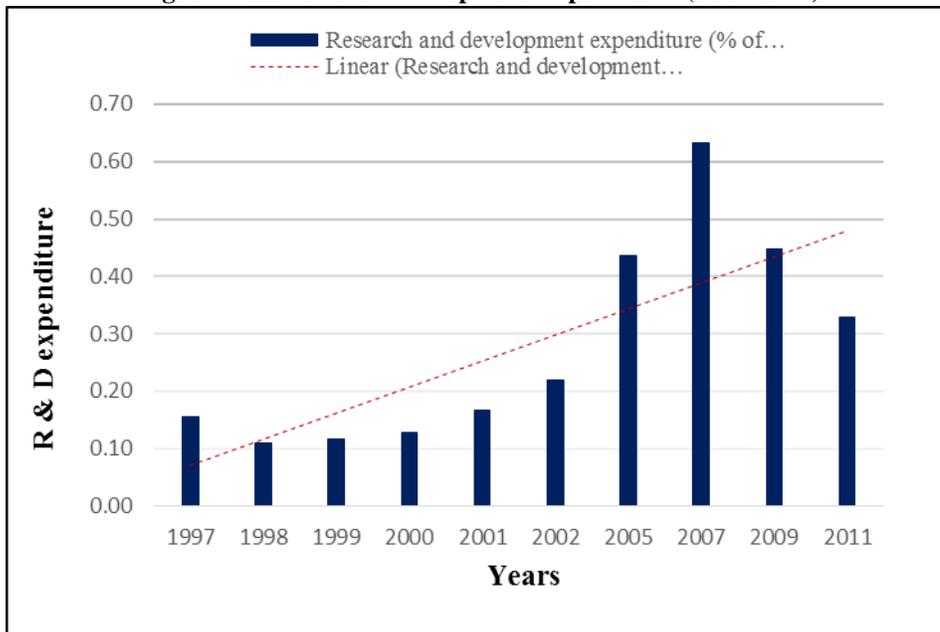
Figure 2 portrays the trademark application taken by both resident and non-resident firms over the period of 1963 to 1990. As depicted in the figure, on average, the application by resident firm is twice as of the non-resident. It can be analysed that trademark has a positive trend over the period. Though, from 1963 to 1990, a fluctuating trend can be observed, but since 1990 there is rigorous boost in trademark application.

**Fig. 2. Trademark Application**



Source: Authors Illustration (ICS, 2007).

**Fig. 3. Research and Development Expenditure (% of GDP)**





Where;

Innov = Reflects both Product and Process Innovation.

Spe = Skilled Workers over total workers.

SBD = whether the firm is science based or not.

Com = Competition, i.e. No. of competitors firm faces.

UB = Urban population over total population of the city in which that specific firm exists.

FP = Female participation in that firm.

ED = Average education level of typical production workers.

TRA = whether permanent or non-permanent employees are given formal training.

ME = Education level of top management.

Generally, definition of innovation can be split into four sub-components, defined in the Bogota and Oslo manuals as: (1) Product innovation: the introduction of a good or service that is new or substantially improved. (2) Process innovation: the introduction of a new or significantly improved production or delivery method. (3) Marketing innovation: the implementation of a new marketing method involving significant changes in product design or packaging, product promotion or pricing. (4) Organisational innovation: involves the creation or alteration of business practices, workplace organisation, or external relations.

Due to data constraint in Pakistan, the study has used product and process innovation as described in Bogota and Oslo manuals as an innovation proxy only. The data for product and process innovation is taken out from ICS 2007. The Product innovation means that the introduction of a good or service that is new or substantially improved. Secondly, the Process innovation which means that the introduction of a new or significantly improved production or delivery method. The product and process innovation are the dummy variable, i.e. if the firm is innovative by product or process then the respective variable will be equal to 1 else 0. Likewise, the innovation variable is the sum of both product and process innovation i.e. if the firm is innovative by product or process or both then the innovation variable is equal to 1 or 0.

Likewise, SPE in the equation represents specialisation. Here two proxies of specialisation have been used: (1) the ratio of total employees in a firm over total employment of that industry. (2) the ratio of skilled workers over total workers in a firm. The ratio ranges from 0 to 1. The higher the ratio, i.e. closes to 1, will represent that the firm is highly specialised and the lower value, i.e. closes to zero, will represent that firm is less specialised. Hence, a higher value of this variable indicates the greater degree of specialisation of the firms. Consequently, a positive sign of coefficient will indicate that specialisation is more beneficial for innovation and would support Marshall-Arrow-Romer model [Glaeser, *et al.* (1992)]. A negative sign will indicate that specialisation hinders innovation and would support Jacob's theory [Jacobs (1969)].

Similarly, SBD represents science-based diversity. The presence of science-based related firms are included in our analysis because science based firms are those who are currently using technology licensed with foreign-owned company. If the firm is using technology licensed from foreign owned company, then SBD will be equal to 1 else 0. The positive sign of science based firm would indicate that firms using foreign

technology are conducive to innovation and would support Jacob's theory [Glaeser, *et al.* (1992)]. On the contrary, the negative coefficient would indicate that greater presence of firms using foreign technology impedes innovation and support Marshall-Arrow-Romer Model [Glaeser, *et al.* (1992)].

COM represents competition in the analyses to show the impact of competition on innovation. In measuring the extent of competition, a variable ranging from 0 to 3 i.e. how many competitors did this establishment's main product/product line faces, has been used. If there is no competitor then will be equal to zero, or if the competitor(s) is 1, between 2–5 or more than 5, then the competition variable will be equal to 1, 2 or 3 respectively. The positive coefficient will indicate that competition is advantageous for innovation and if the coefficient is negative, it indicates that competition hampers innovation.

In addition to these three main variables effect on innovation, the study has also included some control variables in the regression as well. These controls include Female participation in the firm, average education level of employees, whether permanent or non-permanent employees are given formal training and Education level of top-level management. The variable FP represents the female participation in the firm. The variable is formed by the ratio of Female Production workers over total production workers. In the same way, ED characterised by the average education attainment of a typical production worker. The ED is a weighted variable, for example, if the year of education is between 0-3 years than ED would equal to 0.10. Similarly, if the years of education are in between 4-6, 7-12 or 13 years and above then ED would equal to 0.20, 0.50 or 1.0 respectively. Similarly, TRA represents the formal training to permanent and non-permanent workers. The variable again has been given weight of 0.5 each. For example, if a firm is providing formal training to any one, either permanent works or non-permanent workers then TRA would equal to 0.50. Similarly, if the firm is providing training to both, permanent and non-permanent workers, then TRA would equal to 1.0 for that specific firm.

The education level of top management has also been categorised in 8 different ways and each category is weighted accordingly by the degree in possession. The weights are mentioned in Appendix (Table 1A).

The analysis is based on the data set which is constructed from Investment Climate Survey (ICS) 2007, compiled by the World Bank Enterprise Group. The data is a based on cross section of 784 manufacturing firms which are located across 13 different cities of Pakistan. The descriptive analysis is provided in the annexure (Table 2A). Moreover, the correlation matrix has also been provided in annexure (Table 3A).

#### 4. EMPIRICAL RESULTS AND CONCLUSION

The purpose of this paper was to penetrate the black box of geographic space by identifying the extent to which the organisation of economic activity is either concentrated, or alternatively consists of diverse but complementary economic activities, and how this composition influences innovative output.

Table 1 provides the estimates of Equation 1. The model is estimated using logit model. To explore the effects of innovation—both product and process innovation- on specialisation, science based diversification, competitiveness, urban share of the specific firm, female participation, average education level of employees, dummy variable for employees' training and education level of top-level management.

Table 1

*Result of Logistic Regression*  
*Dependent Variable: Innovation*

| Variable              | dy / dx | S.E.   | Z          |
|-----------------------|---------|--------|------------|
| SPE                   | -0.092  | 0.0458 | -2.00**    |
| SBD                   | 0.202   | 0.0829 | 2.44**     |
| COM                   | -0.022  | 0.0063 | -3.48***   |
| UB                    | 0.195   | 0.0450 | 4.34***    |
| FP                    | 0.231   | 0.0876 | 2.64***    |
| ED                    | 0.165   | 0.0603 | 2.73***    |
| TRA                   | 0.179   | 0.0786 | 2.28**     |
| ME                    | 0.124   | 0.0492 | 2.52**     |
| Log Likelihood        |         |        | -230.43464 |
| Number of Observation |         |        | 784        |
| LR Chi2               |         |        | 174.98     |
| Prob > Chi2           |         |        | 0.0000     |

Note: \* denotes level of significance at 1 percent, \*\* denotes at 5 percent & \*\*\* denotes at 10 percent.

Our empirical findings depict that specialisation has negative and significant impact on innovation i.e. the concentration hampers innovation in the country. While, the science based diversify has a significantly positive impact on innovation which shows that diversity contributes towards the innovation. In other words, diversification is the positive driver of innovation in the case of Pakistan. Moreover, our study is consistent with the Jacob's theory i.e. a negative sign indicates that specialisation hinders innovation and the positive sign of science based firms are conducive to innovation [Jacobs (1969)]. Similarly, urban share, female participation, education level of employees, training and top management education has a positive impact on innovation. While competition in the case of Pakistan is an obstacle, i.e. the results show significantly negative impact of competition on innovation.

The objective of this study was to explore that whether innovation in Pakistan driven by specialisation or science based diversity and to explore the determinants of innovative activity among cities of Pakistan using ICS 2007. The results show that in case of Pakistan, innovation is more driven by Science Based Diversify and specialisation hinders innovation. Therefore, innovation is driven by diversity and diversity successively leads to economic development. For the success, firms and industries must continually expenditure on R&D, technological change and innovation. There are clear policy implications of this debate in terms of policies directed towards innovation and technological change. Since in our study, the diversity thesis is correct, therefore a geographic region comprised of a diverse set of economic activities tend to yield greater output in terms of innovative activity. The key policy concerns would identify the commonalties and how to foster such diversity. Since, this research finding can provide significant and essential approach for stakeholders as well as policy makers to imitates the accomplishment of Asian economies.

## APPENDICES

Table 1A

| Level of Education   | Weights |
|--|---------|
| Less than secondary school   | 0.05    |
| Secondary School   | 0.10    |
| Higher Secondary School (Intermediate/A' levels)                             | 0.20    |
| Graduate degree (BA, BSC etc.)   | 0.35    |
| Masters of Business Administration (MBA) from university in this country     | 0.50    |
| Masters of Business Administration (MBA) from university in another country  | 0.65    |
| Other post graduate degree (PhD, Masters) from university in this country    | 0.85    |
| Other post graduate degree (PhD, Masters) from university in another country | 1.0     |

Table 2A

*Descriptive Statistics*

| Variables                              | Obs. | Mean  | Std. Dev. | Min | Max |
|--|------|-------|-----------|-----|-----|
| Innovation                             | 784  | 0.140 | 0.348     | 0.0 | 1.0 |
| Specialisation                         | 784  | 0.618 | 0.212     | 0.0 | 1.3 |
| Diversity                              | 784  | 0.057 | 0.233     | 0.0 | 1.0 |
| Competition                            | 784  | 3.352 | 1.325     | 0.0 | 4.0 |
| Urban Population Share                 | 784  | 0.627 | 0.223     | 0.3 | 0.9 |
| Female Participation                   | 784  | 0.020 | 0.090     | 0.0 | 1.0 |
| Average Education of Production worker | 784  | 0.189 | 0.148     | 0.0 | 1.0 |
| Employees Training                     | 784  | 0.019 | 0.099     | 0.0 | 1.0 |
| Manager Education                      | 784  | 0.267 | 0.205     | 0.0 | 1.0 |

Source: Authors calculations, ICS (2007).

Table 3A

*Correlation Matrix*

|       | Innov   | SPE     | SBD     | COM     | UB     | FP     | ED     | TRA    | ME |
|-------|---------|---------|---------|---------|--------|--------|--------|--------|----|
| Innov | 1       |         |         |         |        |        |        |        |    |
| SPE   | -0.1714 | 1       |         |         |        |        |        |        |    |
| SBD   | 0.3898  | -0.1505 | 1       |         |        |        |        |        |    |
| COM   | -0.1795 | 0.0584  | -0.0656 | 1       |        |        |        |        |    |
| UB    | 0.2774  | -0.0864 | 0.2223  | -0.0233 | 1      |        |        |        |    |
| FP    | 0.1716  | -0.0424 | 0.1213  | 0.0061  | 0.0707 | 1      |        |        |    |
| ED    | 0.3138  | -0.1331 | 0.334   | -0.1186 | 0.2229 | 0.0907 | 1      |        |    |
| TRA   | 0.2738  | -0.1021 | 0.3118  | -0.061  | 0.1561 | 0.0679 | 0.1842 | 1      |    |
| ME    | 0.3446  | -0.2023 | 0.3863  | -0.1738 | 0.2712 | 0.1459 | 0.4468 | 0.2256 | 1  |

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# Factors Explaining the Risk Attitude towards Entrepreneurship in Pakistan: An Exploratory Analysis

MOHAMMED NISHAT and TALHA NADEEM

This study empirically identifies factors which explain the attitude of individuals towards entrepreneurship, and how attitudes toward risk influence the likelihood of a person turning entrepreneur. The variable ‘fear of failing’ serves as a proxy variable reflecting risk aversion, as contained in the dataset compiled by the Global Entrepreneurship Monitor (GEM), through interviews of a sample of 2,007 respondents from Pakistan, in 2010. Given that the dependent variable is of binary nature, the probit model is used to empirically determine as to how various demographic, and perceptual factors influence risk aversion among the country’s citizens, particularly in the context of starting their own businesses. The results suggest that personally knowing other entrepreneurs, who have launched a business in the past two years is the most significant variable affecting risk attitudes among Pakistanis; specifically, those who personally know entrepreneurs are more likely to have a fear of failure, with marginal effects as high as 8 percent. Meanwhile, individuals who feel that society generally approves of entrepreneurship as a career choice are around 5 percent less likely to fear failure, though this is a weak correlation. A number of other variables—which are reported in the literature to have significant correlation with risk attitudes in a global context—are not found to be correlated at traditional significance level for Pakistan. In addition, the study does not reveal systematic differences in the risk attitude of individuals hailing from urban and rural areas, or at provincial level. We suggest some preliminary implications based on the findings, and also identify a potential avenue for follow-up research.

*JEL Classification:* L26; M13; O53

*Keywords:* Entrepreneurship; Emerging Economy; Risk Aversion

## 1. INTRODUCTION

The role of entrepreneurship has remained very limited in developing countries like Pakistan due to challenging business environment and inadequate institutional support. The mean firm entry rate in the country, on a yearly basis, compares poorly with counterparts across the globe [GEM (2010)]. Of late, there has been a recognition that Pakistan needs to promote private sector-led development, and entrepreneurship in particular, to drive economic growth. However, very limited empirical research is conducted at microeconomic level to understand the behaviour of local entrepreneurs—and also those who could potentially start new ventures in the near future—due to non-

Mohammed Nishat <mnishat@iba.edu.pk> is Professor of Economics and Finance, Institute of Business Administration (IBA), Karachi. Talha Nadeem <tnadeem@iba.edu.pk> is Graduate Research Student, Institute of Business Administration (IBA) Karachi.

availability of required data. Only few studies in the area of entrepreneurship are undertaken, relying primarily on case study approach.

This study will fill the aforementioned gap and shed light on risk behaviour of Pakistani entrepreneurs. As Schumpeter (1934) surmised well ahead of his time, entrepreneurs have the vision and courage to take on the risk inherent in new venture formation, which distinguishes them from non-entrepreneurs. In literature, it has been established those who embrace risk are likelier to engage in entrepreneurial activity, while those who are risk averse tend to favour an employee's career instead [Kihlstrom and Laffont (1979) and Kanbur (1979)]. For Knight (1971), risk-friendly attitudes among the population lead to a diffusion of entrepreneurs—or, in the opposite scenario, a limited role if risk aversion dominates.

Extending the view that possessing wealth plays a role in the decision to launch a startup [Evans and Jovanovic (1989)], Cressy (2000) suggests that as an individual's wealth increases, his/her risk aversion correspondingly falls, and this becomes a channel facilitating entrepreneurial activity. There are, however, detractors of the risk aversion hypothesis in the context of entrepreneurial decision-making, with Newman (2007) offering an alternative explanation by endogenising risk-taking.

Our study draws on research conducted by Cramer, *et al.* (2002), Ardagna and Lusardi (2008), Gianetti and Simonov (2009) and Sepúlveda and Bonilla (2011). These studies address social interaction, individual traits, and fear of failure. Our approach differs from prior examinations of risk attitude as a precursor to entrepreneurship [Cressy (2000); Van Praag and Cramer (2001); Newman (2007); Parker (2007)], in the sense that we attempt to take a step further back and reveal the underlying factors influencing risk aversion in the first place.

We focus on Pakistan as a developing economy, characteristically exposed to some degree of political instability and law and order concerns, which impact the ease of doing business. Our research benefits from a review of entrepreneurship dynamics in developing economies, especially, for the case of Pakistan [Mir and Nishat (2007); Nadeem and Nishat (2015); Goheer (2003); Shabbir and Gregorio (1996); Ali, *et al.* (2011); Zaidi (2005); Haque (2007); Husain (1999); Lewis (1969); Roomi and Harrison (2010)]. In our view, the above studies do not comprehensively address risk attitudes at individual level in the country; hence, the motivation for our current research.

The rest of the study takes the following approach: Section 2 gives an overview of the data, theoretical framework and econometrics employed; Section 3 discusses the findings, and Section 4 offers concluding remarks.

## 2. THEORETICAL FRAMEWORK AND EMPIRICAL ESTIMATION

### 2.1. Data

This study uses a sub-sample of the Global Entrepreneurship Monitor (GEM) dataset, specifically Pakistani data for 2,007 respondents during 2010. The GEM project, launched in 1999 by Babson College and London Business School, has two components: the Adult Population Surveys (APS) consist of interviews of at least 2,000 respondents from a given country, whereas the National Experts Surveys (NES) gather responses from a small sample of experts who have a stake in the entrepreneurship ecosystem. We

utilise data from APS surveys in Pakistan, for 2010, in this study. The APS survey employs a standardised questionnaire. One of the questions specially asks respondents if the fear of failing would prevent them from starting a business. We presume that if someone answers in the affirmative, then they can be deemed to be risk averse, in terms of attitude.

## 2.2. Econometric Model

Entrepreneurship activity is theoretically supported and empirically tested through various theories. These range from conventional pure exchange closed system to more dynamic systems which capture the complexity of market-based individual activities [Murphy, Liao, and Walsh (2006)]. Among earlier explanations, the Austrian Market Process focused on three main tenets: arbitrage opportunities in the market, the discovery and exploitation of such openings by entrepreneurs, and that ownership can exist independently of the entrepreneur [Kirzner (1973)].

More recent variations, drawing on psychology, lay greater emphasis on the role of personality; for example, how individuals who believe that they have control over their lives and outcomes are more (or less) inclined to take the risk of launching new ventures. Meanwhile, entrepreneurship theory with sociological underpinnings focuses on social networks and relates to entrepreneurial opportunity. Reynolds (1991) contends that the quest to make a worthwhile contribution to society drives entrepreneurship. This contrasts with explanations that draw on anthropology, in which norms and belief systems take a more central focus. For example, Baskerville (2003) highlights the impact of culture on the individual thought process, while North (1990) and Shane (2000) focus on the same with a more specific take on how culture influences behaviour of would-be entrepreneurs.

On the other hand, Drucker (1985) favours conceptualising the entrepreneur as an individual who actively seeks and takes advantage of change; this forms the basis of opportunity-based theories. The ability to be more resourceful than peers also differentiates entrepreneurs from non-entrepreneurs [Stevenson and Harmelling (1990); Davidson and Honing (2003)]. This includes utilising networks, education and experience to understand and exploit opportunities [Becker (1975); Aldrich and Zimmers (1986); Anderson and Miller (2003)].

Based on above theoretical discussion the following model is identified. In sample survey of 2007 respondents, our dependent variable—the question pertaining to fear of failure/risk aversion—is a yes/no binary response variable.

The model is duly specified as follows:

$$\begin{aligned} frfail_i = & \gamma_0 + \gamma_1 Age_i + \gamma_2 women_i + \gamma_3 educ_i + \gamma_4 work_i + \gamma_5 discontinued_i \\ & + \gamma_6 skill_i + \gamma_7 knowent2_i + \gamma_8 opport2_i + \gamma_9 goodchc_i + \gamma_{10} media_i \\ & + \gamma_{11} Teayyopp_i + \gamma_{12} urban + \gamma_{13} province + \epsilon_i \quad \dots \quad \dots \quad (1) \end{aligned}$$

Where

*frfail* is a yes/no response to the query: “Would fear of failure would prevent you from starting a business?”,

*Age* represents the respondent’s age,

*women* is 1 for female respondents, and 0 for men,

- educ* captures the time respondents have spent acquiring formal education. It consists of the following classifications: no education, some secondary education, secondary degree (base), post-secondary education, and graduate degree,
- work* is a work status dummy, composed of three categories: “full or part-time work” (base), “not working”, and “retired or student”,
- discontinued* dummy takes the value of 1 if the individual has shut down, discontinued or quit a business they owned and managed in the past 12 months,
- skill* contains the yes/no response to the query, “Do you possess the knowledge, skills and experience required to start a new business?” It captures the individual’s self-confidence,
- knowent2* is a yes/no response to the question, “Do you know someone personally who started a business in the past 2 years?”
- opport2* is yes/no response to the question, “In the next six months, will there be good opportunities for starting a business in Pakistan?”
- goodchc* is Yes/no response to the claim, “In Pakistan, most people consider starting a new business a desirable career choice”
- media* is Yes/no response to the statement, “In Pakistan, you will often see stories in the public media about successful new businesses”
- Teayyopp* is a dummy variable which determines whether the respondent is engaged in opportunity early-stage entrepreneurial activity or not,
- urban* dummy equals one if the respondent belongs to urban area, 0 if rural,
- province* dummy represents the five provinces of Pakistan: Balochistan, Gilgit-Baltistan, Khyber-Pakhtunkhwa, Punjab (base), and Sindh,
- $\mathcal{E}$  is a normally distributed disturbance term.

Table 1

*Presents the Data Summary*

| Variable | Observations <sup>1</sup> | Mean     |
|----------|---------------------------|----------|
| frfail   | 1762                      | 0.314983 |
| Age      | 1936                      | 34.11467 |
| women    | 2007                      | 0.489786 |
| skill    | 1901                      | 0.566018 |
| educ     | 1997                      | 0.775664 |
| close    | 1920                      | 0.028646 |
| knowent2 | 1925                      | 0.482078 |
| opport2  | 1726                      | 0.516802 |
| teayyopp | 2007                      | 0.048331 |
| goodchc  | 1805                      | 0.773407 |
| media    | 1751                      | 0.612793 |
| province | 2007                      | 3.990035 |
| urban    | 2007                      | 0.512207 |

<sup>1</sup>The number of observations vary for different variables owing to missing values; only observations with non-missing values for all variables in a given model specification were eventually included in probit estimation.

While the implication of mean value for age is straightforward, the interpretation of means for 0/1 dummy variables is not as intuitive. In general, we interpret mean value below 0.5 to signal that majority of respondents answer “no” to the concerned question, whereas mean above 0.5 indicates a greater tendency among respondents to respond positively.

### 3. DISCUSSION OF RESULTS

First we compute pair-wise correlation matrix for variables of interest (Table 2).

Table 2

#### Correlation Matrix

|          | frfail   | Age      | women    | skill   | educ    | close    | knoent2  | opport2 | Teayyopp | goodchc | media   | province | urban |
|----------|----------|----------|----------|---------|---------|----------|----------|---------|----------|---------|---------|----------|-------|
| frfail   | 1        |          |          |         |         |          |          |         |          |         |         |          |       |
| Age      | 0.0022   | 1        |          |         |         |          |          |         |          |         |         |          |       |
| women    | -0.0183  | -0.1112* | 1        |         |         |          |          |         |          |         |         |          |       |
| skill    | -0.0051  | 0.0017   | -0.1747* | 1       |         |          |          |         |          |         |         |          |       |
| educ     | 0.0219   | -0.1110* | -0.0661* | 0.0473* | 1       |          |          |         |          |         |         |          |       |
| close    | 0.0524*  | 0.0013   | -0.0895* | 0.0642* | 0.0252  | 1        |          |         |          |         |         |          |       |
| knoent2  | 0.0873*  | 0.0604*  | -0.2852* | 0.2474* | 0.0538* | 0.1104*  | 1        |         |          |         |         |          |       |
| opport2  | 0.0373   | -0.0121  | -0.2066* | 0.2945* | 0.013   | 0.0743*  | 0.3201*  | 1       |          |         |         |          |       |
| Teayyopp | 0.0188   | -0.0261  | -0.0888* | 0.0953* | 0.0612* | 0.0523*  | 0.1240*  | 0.0865* | 1        |         |         |          |       |
| goodchc  | -0.0405* | -0.0263  | 0.0590*  | 0.0995* | -0.026  | -0.0366  | 0.0886*  | 0.1657* | -0.023   | 1       |         |          |       |
| media    | 0.038    | -0.0121  | 0.0484*  | 0.0834* | 0.0972* | 0.0069   | 0.0502*  | 0.0412* | 0.0329   | 0.1808* | 1       |          |       |
| province | -0.0396* | 0.0274   | 0.0319   | 0.0490* | 0.001   | -0.0724* | -0.029   | 0.0178  | -0.2127* | 0.1122* | 0.0613* | 1        |       |
| urban    | -0.0257  | -0.0285  | 0.0759*  | 0.0023  | 0.2944* | 0.0410*  | -0.0527* | 0.007   | -0.0729* | 0.0995* | 0.0965* | 0.3269*  | 1     |

We observe that, among the perceptual variables, ‘knowent2’ is positively correlated with the fear of failure, whereas the ‘goodchc’ variable is negatively correlated. Thus, we anticipate that personally knowing other entrepreneurs might increase the fear of failure, while an individual’s belief that wider society approves of entrepreneurship as a career choice would reduce this fear. Prior discontinuation of a startup in the past twelve months also appears to increase the fear of failure/risk aversion.

The result of estimated equation (1) is given in Table 3. Referring to the summary statistics at the bottom of Table 3, we observe that the model accurately classifies nearly 68 percent of observations in each of the four proposed specifications. The first specification is based on demographic variables (Model 1); the second specification includes perceptual variables (Model 2); the third specification includes urban/rural dummy (Model 3); and the fourth specification adds geographical location (provinces) in Model 4.

The standout result of interest across the majority of specifications is that personally knowing entrepreneurs who have launched ventures in the past two years tends to *increase* the likelihood that respondents will identify with a fear of failure, in the context of launching their own start-up. While we anticipated a correlation among these variables from the outset, the direction of correlation is counterintuitive: one expects that personally knowing entrepreneurs would typically provide a role model to look up and emulate, and also the knowledge that these personal connections can be relied on for support and guidance. Perhaps in the case of Pakistanis, respondents personally knew more failed entrepreneurs, rather than successful ones. This would explain a derived fear of failure: respondents may simply be wary of meeting a similar unwanted fate, should they choose to risk launching a start-up of their own. A follow-up study would be required to test this hypothesis, though.

Table 3

*Coefficient and Marginal Effect Estimates of Probit for Pakistan*

|                      | (1)                 | (2)                 | (3)                  | (4)                  | (5)                  | (6)                  | (7)                  | (8)                  |
|----------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Main                 | Model_1             | Margin_<br>fx1      | Model_2              | Margin_<br>fx2       | Model_3              | Margin_<br>fx3       | Model_4              | Margin_<br>fx4       |
| Age                  | 0.00167<br>(0.541)  | 0.00059<br>(0.541)  | -0.00025<br>(0.936)  | -0.00009<br>(0.936)  | -0.00014<br>(0.964)  | -0.00005<br>(0.964)  | -0.00018<br>(0.955)  | -0.00006<br>(0.955)  |
| Women=1              | -0.00347<br>(0.958) | -0.00123<br>(0.958) | 0.03035<br>(0.708)   | 0.01072<br>(0.708)   | 0.03736<br>(0.646)   | 0.01318<br>(0.647)   | 0.03278<br>(0.691)   | 0.01155<br>(0.691)   |
| No educ.             | -0.07055<br>(0.541) | -0.02535<br>(0.545) | -0.15912<br>(0.220)  | -0.05796<br>(0.228)  | -0.18130<br>(0.170)  | -0.06598<br>(0.178)  | -0.16145<br>(0.230)  | -0.05856<br>(0.238)  |
| Some 2ndry           | -0.04869<br>(0.678) | -0.01759<br>(0.680) | -0.18832+<br>(0.149) | -0.06818<br>(0.157)  | -0.19172+<br>(0.142) | -0.06961<br>(0.150)  | -0.17587<br>(0.183)  | -0.06360<br>(0.192)  |
| Post 2ndry           | -0.06162<br>(0.714) | -0.02219<br>(0.713) | -0.17904<br>(0.342)  | -0.06495<br>(0.337)  | -0.16907<br>(0.371)  | -0.06168<br>(0.366)  | -0.15379<br>(0.418)  | -0.05587<br>(0.414)  |
| Grad. degree         | -0.14545<br>(0.502) | -0.05132<br>(0.493) | -0.13481<br>(0.585)  | -0.04935<br>(0.579)  | -0.11724<br>(0.636)  | -0.04321<br>(0.631)  | -0.10115<br>(0.684)  | -0.03713<br>(0.681)  |
| Discontinued=1       |                     |                     | 0.28446+<br>(0.136)  | 0.10560<br>(0.151)   | 0.29315+<br>(0.125)  | 0.10890+<br>(0.140)  | 0.26602<br>(0.169)   | 0.09835<br>(0.185)   |
| S.UP skill=1         |                     |                     | -0.08624<br>(0.278)  | -0.03053<br>(0.280)  | -0.08635<br>(0.278)  | -0.03055<br>(0.280)  | -0.08520<br>(0.286)  | -0.03011<br>(0.288)  |
| Know entrepreneurs=1 |                     |                     | 0.23478*<br>(0.004)  | 0.08243*<br>(0.003)  | 0.23023*<br>(0.004)  | 0.08081*<br>(0.004)  | 0.22937*<br>(0.005)  | 0.08043*<br>(0.004)  |
| Opportunity=1        |                     |                     | 0.06599<br>(0.408)   | 0.02324<br>(0.408)   | 0.06778<br>(0.396)   | 0.02386<br>(0.395)   | 0.07209<br>(0.368)   | 0.02535<br>(0.367)   |
| Good choice=1        |                     |                     | -0.17376^<br>(0.053) | -0.06258^<br>(0.057) | -0.16581^<br>(0.066) | -0.05964^<br>(0.070) | -0.14728+<br>(0.108) | -0.05282+<br>(0.113) |
| Media image=1        |                     |                     | 0.11391+<br>(0.137)  | 0.03992+<br>(0.134)  | 0.11759+<br>(0.126)  | 0.04118+<br>(0.123)  | 0.11264+<br>(0.146)  | 0.03942+<br>(0.143)  |
| teayyopp=1           |                     |                     | 0.02317<br>(0.878)   | 0.00821<br>(0.878)   | 0.01033<br>(0.946)   | 0.00365<br>(0.946)   | -0.02411<br>(0.877)  | -0.00844<br>(0.876)  |
| Urban=1              |                     |                     |                      |                      | -0.07096<br>(0.361)  | -0.02504<br>(0.361)  | -0.05778<br>(0.485)  | -0.02036<br>(0.485)  |
| Balochistan          |                     |                     |                      |                      |                      |                      | 0.21793<br>(0.236)   | 0.07987<br>(0.251)   |
| Gilgit-Balt          |                     |                     |                      |                      |                      |                      | 0.03323<br>(0.965)   | 0.01174<br>(0.966)   |
| Khyber-Pakh          |                     |                     |                      |                      |                      |                      | -0.01921<br>(0.879)  | -0.00670<br>(0.879)  |
| Sindh                |                     |                     |                      |                      |                      |                      | 0.01949<br>(0.825)   | 0.00686<br>(0.825)   |
| Observations         | 1697                | 1697                | 1324                 | 1324                 | 1324                 | 1324                 | 1324                 | 1324                 |
| Pseudo R-squared     | 0.000               |                     | 0.013                |                      | 0.014                |                      | 0.014                |                      |
| Chi-squared          | 0.94093             |                     | 21.57339             |                      | 22.40910             |                      | 23.93904             |                      |
| Deg freedom          | 6.0                 |                     | 13.0                 |                      | 14.0                 |                      | 18.0                 |                      |
| Log LL-hd            | -1057.95            |                     | -818.68              |                      | -818.26              |                      | -817.49              |                      |
| CC proport.          | 68.41               |                     | 68.66                |                      | 68.66                |                      | 68.58                |                      |

Marginal effects; p-values in parentheses  
 Deg freedom = degrees of freedom, Log LL-hd = Log likelihood, CC proport.=correctly classified proportion  
 (d) for discrete change of dummy variable from 0 to 1  
 “+” p<0.15, “^” p<0.10, “\*” p<0.05

Another marginal effect which is borderline significant pertains to the ‘good choice’ variable. Specifically, individuals who feel that entrepreneurship is approved of as a career choice by Pakistani society are around 5 to 6 percent less likely to fear failure (at 10 percent significance level), should they consider launching a new venture. This adds up: societal pressure or acceptance plays a vital role in guiding human behaviour. In some respects, this is reminiscent of the effects of peer pressure.

With respect to the other variables, there is not much to write home about in terms of statistical significance. We are unsure at this point if this is just a peculiar result owing to quality of the data, or whether the dynamics in Pakistan are just systematically different compared to those reported in other countries. As a follow-up to this initial research using data from 2010 (the first year in which Pakistan participated in GEM surveys), we intend to extend the results to GEM 2011 and 2012 surveys as well, in the hope that this would uncover a more robust set of findings.

#### 4. CONCLUDING REMARKS

Given that personally knowing other entrepreneurs has a significant impact on risk aversion, there may be merit in providing more networking opportunities for individuals to meet entrepreneurs, who have recently started up their ventures. Specifically, interaction with more *successful* entrepreneurs might help individuals to revisit their risk averse attitudes to start-up activity.

The finding that societal approval of entrepreneurship (as a viable mode of employment) shapes risk attitudes in Pakistan. It implies that giving recognition and public praise to successful local entrepreneurs might send a strong signal. Essentially, if stakeholders desire to see more entrepreneurs in the long run, they can shape the risk attitude of would-be entrepreneurs to some degree simply by projecting the entrepreneur as a respected, admired citizen, inspiring others to follow suit.

Finally, In terms of the way forward for future research, a value-addition to this current study would be to compare the dynamics of Pakistani entrepreneurs with other countries in South Asia (particularly Bangladesh and India). This would help to tease out both the common ground and the divergence in terms of factors affecting risk attitudes across the region. Also, while this study adopts the cross-sectional approach and is therefore a snapshot at a point in time, it would be informative to employ a pseudo panel approach and observe the dynamics of risk attitude as they evolve over time.

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## **New Direction to Evaluate the Economic Impact of Peace for Bilateral Trade among World Economies**

SAIMA SARWAR, MUHAMMAD WASIF SIDDIQI, ABDUL NASIR, and ZAHOOR AHMED

Earlier researchers have been working to relate globalisation, trade or free trade as an instrument for bringing peace and reducing conflict in the world. But this study attempts to open up a new debate that how social unrest in terms of lack of pace in nations leads to failure of economic policing and outcomes. In past, few researchers have tried to show peaceful environment as a generator for economic progress by building theoretical models, but limited empirical analysis has been conducted so far. This brings a novelty in the present study that for the first time a large set of data covering 155 nations has been used to explore the relationship between these two desired variables i.e. trade related variables and peace, in new direction and employing new indicators defining extent of peace in nations. Panel co-integration technique has been applied along with Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) models to know the parametric and non-parametric point estimates of variables. Data has been extracted from Economic Institute of Peace and World Bank for the time period 2008-2014. Results showed that lesser number of attacks are associated with more volume of trade among nations and better relations with neighbouring countries are linked positively with trade performance of nations. Nations involved more into hostility acts like conflicts are unable to maximise the benefits from bilateral trade.

*JEL Classification:* F10, D74, L33, C23.

*Keywords:* Globalisation, Trade, Conflict, Terrorism, Panel Model.

### **1. INTRODUCTION**

Globalisation has been a source of free flow of capital, information, technology, goods and services, and labour has benefited the greater economies considerably well integrating themselves in economic, political, and social affiliations. Hence, this led to the promotion of peace, liberty, freedom of thoughts and speech among the masses through this interconnectedness. But story does not end here because on the one side where this trans-nationalism has converted the world into ‘global village’ and helped in reducing starvation and improving the living standard of people of the world but on other side this has increased the threats to the security related matters of the nations. Because freedom of expression, easy immigration policies and duty free trade has made it convenient to indulge into

Saima Sarwar <saimasarwar@gu.edu.pk> is Lecturer, Government College University, Lahore. Muhammad Wasif Siddiqi is Senior Visiting Professor, Government College University, Lahore. Abdul Nasir is Graduate Student, Government College University, Lahore. Zahoor Ahmed is Graduate Student, Government College University, Lahore.

malpractices and catastrophic activities. This is the reason that now the world is experiencing conflicts, and violent activities not only at internal level but this has been phrased by world analysts as 'transnational terrorism' which is sabotaging the real essence of globalisation. Disruptions, due to such social cause retard economic activities even being globalised at world level. Developing nations are the evident specimen of such crucial link between integration of economies and increased rate of terrorist activities. All this resulted in less confidence by the investors, and traders to enter into the markets of these nations because of such uncertainties and environmental insecurities. Usual perception is that terrorism increases risks and instils fears among masses, which lessens trade and investment activity through imposing high transaction costs on the targeted nations. Such events also effect capital mobility and expected profit rates in financial markets. And it is being proved that in economies, where such attacks become large in number, then the governments divert its expenditure from development projects towards military and defense which does not help in increasing the GDP size of the economy [Eldor and Melnick (2004)]. Hence peace can be considered as one of the most important driving force for motivating the economic players for starting some activity. Trade is such a dynamic sector of any economy which deals with two major economic actors i.e. exporters and importers. Both are very sensitive to the political and economic security concerns regarding their investment plans. In case of any such issue, both will show reluctance to participate in income generating activities, which will ultimately hinder the economic growth. It is perceived that trade may have a welfare effect for both the exporting and importing nations, through co-operation among them which may lead to more peace and prosperity on both sides. These were the liberals who after WWII actually tried to divert the attention of the world that co-operation among economies bring 'peace' in the world. This co-operation helps to interconnect nations with each other changing the world into more globalised place. However, at present times, world is experiencing again a 'realist's behaviour' from different capitalist nations to influence and extract the resources of poor and underdeveloped economies. On the one side, international regimes like WTO, World Bank and IMF are trying to offer such policies to developing nations, for an easy access to the world markets. But on the other side, different conflicts and wars initiated by developed economies, for their personal interests are creating insecurities in their internal market structures which are proving hazards for their survival. International trade no doubt had surpassed the boundaries of globalisation. It is worth saying that free trade has not only been served as an engine of growth, but it also accelerated the nation's standards of living. Nowadays almost all of world nations are involved in trading goods and services across their boundaries, but also prone to transnational violent activities within the national boundaries. Such contradiction between economic policy and social behaviours has forced the world to make reconciliation. The questions that lie in the heart of that reconciliation is that as to how conflict and economic management of resources are inter-related, and in what ways such activities can be minimised by making regional blocks, so that the reservoirs of such parasites could be destroyed. This study is an attempt towards this thought that how peaceful nations are attracting more traders and investors within the nations. With the

passage of time the direction of the connection between these two variables has changed i.e. now it is from peace to trade not as trade to peace. The reason is at present times the most critical issue for developed and developing nation is not the 'choice of policy', rather it is about the social evils among which 'terrorism' is heightened off late. Conventional perception is that this act infuses 'fear factor' in the minds of economic actors, which ultimately stops them to enter into such environmentally hazardous nation. Hence, this study tries to explore a relationship by using various indicators for measuring the extent of peace among nations and trade volumes and flows. The novelty of this study, is that earlier research have relied on the relations between conflicts and trade for concluding that trade helps in minimising such violence and increase peace within the nation. But for the first time, this study employed a new set of variables for measuring peace which include relations with neighbouring countries, imports of weapons of destruction and reported terrorist attacks per year. Analysis is covering maximum number of nations of the world in general for which data is available.

### 1.2. Objectives

Following are the three main objectives of the study:

- To explore the effects of neighbouring country relations for different dimensions of trade i.e., exports, imports and trade openness.
- To analyse the relationship between terrorist activities, trade volume and trade openness in the world.
- To investigate that how much the extent of conflicts among nations is affecting trade volumes and openness process in world economies.

### 1.3. Hypotheses

- **H<sub>1</sub>**: There is a significant effect of neighbouring relations on trade volumes and trade openness.
- **H<sub>2</sub>**: There is a significant relationship between terrorist activities, trade volumes and trade openness.
- **H<sub>3</sub>**: There is a significant relationship between the conflict, trade volumes and trade openness.

## 2. LITERATURE REVIEW

This research aims at finding out the relationship between trade and peace in a direction different from tradition, one which has been this that more trade connections lead to more peace. This study focuses on how more peaceful environment help in making more trade relations among economies. Much literature exists on the former link, while on the behalf of later, only few attempts have been made which have been discussed below in this section.

Nitsch and Schumacher (2003) observed the effects of violence, terrorism, conflicts, and warfare on bilateral flows at global level. These authors analysed the

relationship by using augmented gravity model for 200 countries for a time period of 1960-1993. Large scale violence, terrorist activities, external conflicts has been taken as independent variable while the effects of these variables were investigated on trade. They investigated that as number of terrorist activities within a nation increases results in decline in bilateral trade flow. While, as we double the number of terrorist activities, the amount or level of bilateral trade decreases by 4 percent.

McKenna (2005) observed short term and long term effect of transnational terrorism on trade and concluded that terrorism acts like a transaction costs upon the economies and leaves a strong negative impact on intra and inter industry trade. And this negative implication of terrorism can be more for South-South trade relative to North-North trade. Moreover author suggested that more liberal and democratic system can be helpful in avoiding deleterious effects of terrorism quickly.

Bandyopadhyay and Sandler (2013) observed the economic burden of terrorism by analysing 78 developing countries for the time period 1984-2008. The authors argued that terrorism could have repercussions in the form national income loses, growth retarding effects, dampened foreign direct investment and disparate effects on international trade. The study also found out that on average a small increase in domestic terrorist incidents per 100,000 reduces net foreign direct investment by a considerable amount. In addition smaller developing economies are more vulnerable to terrorism than rich and diversified economies.

Bandyopadhyay and Sandler (2014) attempted theoretically using factor-supply approach to relate terrorism with trade flows, and concluded that terrorism necessarily affects negatively to the traders and investors. However, this effect can be reduced by introducing effective counter terrorism strategies.

### **3. THE VIRTUOUS CYCLE: A LINK BETWEEN PEACE AND ECONOMIC ACTIVITY**

Bhagwati and Srinivasan (2002) have described that when a nation opens to free trade, it exhibits high growth rate and poverty alleviation measures become the radical standpoint of the government. More peace means less terrorist attacks, more harmonious relationship among neighbouring nations and lesser conflicts. Moreover, economic interdependence greatly reduces the chances of conflicts among states [Oneal, *et al.* (2003). Lee and Pyun (2013) also studied that bi-lateral trade and economic openness among states deters military conflicts. Basing on such findings of different researchers, this study builds its framework which aims to relate various indicators of peace with trade related measures in terms of its volume and flow overall, but in a different direction i.e. peace to trade. The mechanism through which these indicators affect economic activity is trust building and confidence level. These two mediating factors open up the doors for trade and investment activities. And when the environment will be considered safe for doing business, then it will ultimately lead to more employment opportunities, increased foreign direct investment (FDI), more exports, lesser dependence on imports and trade not only inter industry, but intra industry will be boosted up. This can be understood with the help of the diagram given below.

**Fig. 1. Author Own Compilation of Idea: Virtuous Cycle of Trade, Conflict and Peace Level**



Here, trade has been used as economic outcome specifically. The schematic diagram is displaying that how these three factors can contribute in generating economic activities smoothly in the economies. If all these three indicators are moving in the desired direction then size of the economy will start increasing, lesser incidence of poverty and few chances of corruption will be found. When evils like poverty and corruption will start coming to end or at least minimising then the society will enter into its 'Virtuous Circle' where economic activities lead to prosperity in terms of more income levels and this prosperity will again add more to the generation of wealth. This is what the present study intends to find that how peace conditions help nations to come out of their 'Vicious Circle' and prove themselves as the competent one by their sound and satisfactory environment for traders and investors.

#### 4. METHODOLOGY

As the aim of the study is to find that whether conflict, peace and trade are related to each other or not; for this purpose the designed methodology in literature is Panel Co-integration. Using panel of 155 nations of the world and time span ranging from 2008-2014, this study attempts to find not only co-integration among desired variables, but also the nature of the relationship among these variables. For this purpose, parametric and non-parametric techniques fully modified ordinary least squares (FMOLS) and Dynamic ordinary least squares (DOLS) have been employed. Panel unit root test is used to check the stationarity of the data. For this purpose, two types of tests are used i.e. Levin, Lin and Chu (LLC) and Im, Peasran, and Shin (IPS). However, the estimation is done by developing three models in log-linear form. We transformed the dependent variable in to log, because there may be a chance of non-linear relationship among the dependent and independent variables. In addition, a highly skewed variable can easily be transformed in to normal variable with the help of log.

$$\text{Log } T_{i,t} = \alpha + \beta WI_{i,t} + \gamma TA_{i,t} + \lambda NCR_{i,t} + \text{Controls}_{i,t} + e_{i,t}$$

Here  $T$  shows various measures of trade i.e. Exports, Imports and Openness. For measuring Peace three variables have been used which indicates the extent of stable and peaceful environment of an economy. These include Number of terrorist attacks (TA), Weapon imports (WI) and relations with neighbouring country (NCR). Weapon imports also help us in measuring the effect of conflict. Below is given the detailed structured methodology along with sources and definition of variables.

#### 4.1. Panel Unit Root Tests

This is the pre-requisite for applying co-integration techniques. For this purpose various tests have been proposed with varying null hypotheses. But this study employs the following two given below which have the null hypothesis that there does not exist unit roots.

##### 4.1.1. Common Unit Root Process: (LLC)

##### 4.1.2. Im, Peasran, and Shin (IPS)

#### 4.2. Panel Co-integration

Second step is to find the long run co-integration among proposed variables, and for this purpose Pedroni test has been used in this study. It is based on seven statistics, out of which first four are based on within dimension, and last three are grounded on between dimensions. For panel co-integration within dimension, the procedure for testing the null hypothesis of no co-integration test is as follows:

$$H_0 : y_i = 1 \text{ for all } i$$

$$H_1 : y_i = \gamma < 1 \text{ for all } i$$

For between dimensions, no co-integration null hypothesis for panel co-integration test is

$$H_0 : y_i = 1 \text{ for all } i$$

$$H_1 : y_i < 1 \text{ for all } i$$

We compute the residual of regression from the hypothesised regression of co-integration:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \dots + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad t = 1, \dots, T; i = 1, \dots, N \quad (1)$$

$N$  shows number of individual members in panel,  $T$  shows number of observation over time,  $M$  refers to number of regression variables.  $Y$  and  $x$  are considered to be integrated of order 1.

To estimate the residual from Equation 1 Pedroni seven statistics are:

$$1. \text{ Panel } v\text{-statistics: } T^2 N^{3/2} Z_{\hat{\rho}_{N,T}} \equiv T^2 N^{3/2} (\sum_{i=1}^N \cdot \sum_{t=1}^T \cdot L_{11i}^{-2} \hat{e}_{i,t-1}^2)^{-1}$$

#### 2. Panel $\rho$ -statistics

$$T\sqrt{N} Z_{\hat{\rho}_{N,T-1}} \equiv T\sqrt{N} (\sum_{i=1}^N \cdot \sum_{t=1}^T \cdot \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2)^{-1} \sum_{i=1}^N \cdot \sum_{t=1}^T \cdot \hat{L}_{11i}^{-2} (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \hat{\lambda}_i)$$

**3. Panel t-statistics**

$$Z_{t,N,T+1} \equiv (\hat{\sigma}_{N,T}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2)^{-\frac{1}{2}} \sum_{i=1}^N \sum_{t=1}^T L_{11i}^{-2} (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \lambda_i)$$

(Non Parametric)

**4. Panel t-statistics**

$$Z_{t,N,T+1}^* \equiv \tilde{s}_{N,T}^{*2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2)^{-\frac{1}{2}} \sum_{i=1}^N \sum_{t=1}^T L_{11i}^{-2} \hat{e}_{i,t-1}^* \Delta \hat{e}_{i,t}^* \text{(Parametric)}$$

**5. Group p-statistics**

$$TN^{-1/2} \tilde{Z}_{\hat{\rho}_{N,T-1}} \equiv TN^{-\frac{1}{2}} \sum_{i=1}^N (\sum_{t=1}^T \hat{e}_{i,t-1}^2)^{-1} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \lambda_i)$$

**6. Group t-statistics**

$$N^{-1/2} \tilde{Z}_{t,N,T+1} \equiv N^{-\frac{1}{2}} \sum_{i=1}^N (\hat{\sigma}_i^2 \sum_{t=1}^T \hat{e}_{i,t-1}^2)^{-\frac{1}{2}} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \lambda_i)$$

**7. Group t-statistics**

$$N^{-1/2} \tilde{Z}_{t,N,T+1}^* \equiv N^{-1/2} \sum_{i=1}^N (\hat{s}_i^{*2} \sum_{t=1}^T \hat{e}_{i,t-1}^2)^{-1} \sum_{t=1}^T \hat{e}_{i,t-1}^* \Delta \hat{e}_{i,t}^* \text{(Parametric)}$$

Where,

$$\begin{aligned} \hat{\lambda}_i &= \frac{1}{T} \sum_{s=1}^{ki} (1 - \frac{s}{ki+1}) \sum_{t=s+1}^T \hat{\mu}_{i,t} \hat{\mu}_{i,t-s}, \hat{s}_i^2 \equiv \frac{1}{T} \sum_{t=1}^T \hat{\mu}_{i,t}^2, \hat{\sigma}_i^2 = \hat{s}_i^2 + 2\hat{\lambda}_i, \hat{\sigma}_{N,T}^2 \\ &\equiv \frac{1}{N} \sum_{i=1}^N L_{11i}^{-2} \hat{\sigma}_i^2 \\ \hat{s}_i^{*2} &\equiv \frac{1}{T} \sum_{t=1}^T \hat{\mu}_{i,t}^{*2}, \hat{s}_{N,T}^{*2} \equiv \frac{1}{N} \sum_{i=1}^N \hat{s}_i^{*2}, \hat{L}_{11i}^{-2} = \frac{1}{T} \sum_{t=1}^T \hat{\Pi}_{i,t}^2 + \frac{2}{T} \sum_{s=1}^{ki} (1 - \frac{s}{ki+1}) \\ &\sum_{t=s+1}^T \hat{\Pi}_{i,t} \hat{\Pi}_{i,t-s} \end{aligned}$$

Residuals  $\hat{\mu}_i, \hat{\mu}_{i,t}, \hat{\Pi}_{i,t}$  are found from the following:

$$\begin{aligned} \hat{e}_{i,t} &= \hat{y}_i \hat{e}_{i,t-1} + \hat{\mu}_{i,t} \hat{e}_{i,t} = \hat{y}_i \hat{e}_{i,t-1} + \sum_{k=1}^{Ki} \hat{\rho}_{i,k} \Delta \hat{e}_{i,t-k} + \hat{\mu}_{i,t}^* \Delta y_{i,t} \\ &= \sum_{m=1}^M \hat{b}_{mi} \Delta x_{mi,t} + \hat{\Pi}_{i,t} \end{aligned}$$

The first statistics of panel co-integration is a form of non-parametric variance ratio statistics. The second is non-parametric statistics, Phillips Peron rho statistics. The third one statistics is non-parametric, Phillips and Peron t-statistics. The fourth one is statistics of simple panel co-integration, corresponding to Aug- dickey-fuller t-statistics and the remaining three are based on group mean approach.

**4.3. Variables and Data Sources**

The following list of variables has been used in this study where the data has been collected thereby from the world bank and vision of humanity.

**4.3.1. Variables for Measuring Extent of Peace**

- Weapons Imports (WI)

It is defined as the transfer of equipment or technology from a country’s rebel force or organisation to another country. This may include aircraft, armoured vehicles, radar system, missiles and engines. Source: Vision of humanity (2014).

- Terrorist Activities (TA)

It is being calculated by using weighted average of last five years of number of properties damaged, number of fatalities, and number of injuries from such attacks. Source: Vision of humanity (2014).

- Neighbouring Country Relation (NCR)

This variable is measured as the qualitative assessment of countries relationship with one another. They are ranked qualitatively as (1-5) very low and very high respectively. This ranking has been done by the Economists Intelligent Unit. Source: Vision of humanity (2014).

#### 4.3.2. Variables for Trade

- Trade (T)

It is defined as the trade in goods and services i.e. exports and imports of these goods and services as a percentage of GDP. Source: World Bank Indicators (2013).

- Imports (M)

Imports of goods and services have been selected from WB dataset. It can be illustrated as inflow of goods and services from other countries to one's own country. Imports may be comprises of merchandises, transport, freight, license fees, and other services like financial, business, and government. Source: World Bank Indicators (2013).

- Exports (X)

It is defined as outflow of goods and services from own country to other countries. Source: World Bank Indicators (2013).

#### 4.3.3. Control Variables

Following variables have been used as control variables in the designed model specification.

- Foreign Direct Investment (FDI)

It is defined as: "Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP". Source: World Bank Indicators (2013).

- Real Effective Exchange Rate (RER)

It is defined as: "Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs". Source: World Bank Indicators (2013).

- Country Size (CS)

Population has been used to measure the size of nation. It is defined as: “total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship—except for refugees not permanently settled in the country of asylum—which are generally considered part of the population of their country of origin”. *Source:* World Bank Indicators (2013).

- Growth Rate of GDP (GGDP)

It is defined as: “annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources”. *Source:* World Bank Indicators (2013).

## 5. ESTIMATION

Now after discussing in detail the methodology and variables, this section covers the estimation results. For this purpose, following procedure has been made stepwise.

### 5.1. Panel Unit Root Tests

In the first stage, we applied tests to observe the stationarity of the selected desired variables. This has been done by employing those two test discussed with detail in above section. For applying co-integration technique, all variables are supposed to be stationary at first difference. However, the results for both cases i.e. at level and first difference of the variables have been reported. Table 1 shows the stationarity of variables both at level

Table 1

*Panel Unit Root Test at Level*

| Variable                        | Situation     | Level           |                 | First Difference |                 |
|---------------------------------|---------------|-----------------|-----------------|------------------|-----------------|
|                                 |               | Common Unit     | Individual Unit | Common Unit      | Individual Unit |
|                                 |               | Root<br>LLC-ADF | Root<br>ADF-IPS | Root<br>LLC-ADF  | Root<br>ADF-IPS |
| Imports (M)                     | Individual    | -0.4850         | 195.2991        | -54.9195***      | 1660.0190***    |
|                                 | Intercept     | (0.3137)        | (1.0000)        | (0.0000)         | (0.0000)        |
| Exports (X)                     | Individual    | 0.5146          | 196.4134        | -47.2243***      | 1484.5817***    |
|                                 | Intercept     | (0.6966)        | (1.0000)        | (0.0000)         | (0.0000)        |
| Trade (T)                       | Individual    | -0.1478         | 199.2712        | -52.6197***      | 1599.5312***    |
|                                 | Intercept     | (0.4409)        | (1.0000)        | (0.0000)         | (0.0000)        |
| Weapons Imports (WI)            | Individual    | 0.1356          | 44.0612         | -8.8298***       | 135.5839***     |
|                                 | Intercept     | (0.5540)        | (0.9730)        | (0.0000)         | (0.0000)        |
| Terrorist Activities (TA)       | Individual    | 2.9783          | 90.0167         | -22.4995***      | 507.6310***     |
|                                 | Intercept     | (0.9986)        | (1.0000)        | (0.0000)         | (0.0000)        |
| Neighboring relation (NCR)      | Individual    | -1.9037         | 104.4610        | -18.7120***      | 200.8471***     |
|                                 | Intercept     | (0.1280)        | (1.0000)        | (0.0000)         | (0.0000)        |
| Foreign Direct investment (FDI) | Intercept and | 3.7645          | 12.0074         | -27.8810***      | -33.8610***     |
|                                 | Trend         | 1.0000          | 1.0000          | 0.0000           | 0.0000          |
| Growth of GDP (GGDP)            | Intercept and | 7.0303          | 10.7221         | -11.4130***      | -16.8456***     |
|                                 | Trend         | 1.0000          | 1.0000          | 0.0000           | 0.0000          |
| Country Size (CS)               | Intercept and | 13.0975         | 11.9553         | -50.0974***      | -69.0710***     |
|                                 | Trend         | 1.0000          | 1.0000          | 0.0000           | 0.0000          |
| Real Exchange rate (RER)        | Individual    | 5.8864          | 17.6621         | -17.8542***      | -23.6210***     |
|                                 | Intercept     | 1.0000          | 1.0000          | 0.0000           | 0.0000          |

and at first difference. Probabilities of proposed tests at level are unable to reject null hypothesis of the test and confirming that there exists unit roots in each case. While in the last columns on very right the P-values are supporting the alternative hypothesis of the tests and conclude that all series are stationary at first difference.

## 5.2. Panel Co-integration

After evaluating whether the series are stationary of one order, the next step is to analyse, whether variables are integrated with each other or not; so that we could move on to observe the nature of relationship among these as well. For this purpose, two type of tests have been applied i.e. Pedroni co-integration test and Kao test with the null hypothesis i.e. Series have no co-integration. The result can be shown in a tabulated form as follows:

Table 2

*Imports with Peace Indicators*

| Within-Dimension         | Imports                 | Between-Dimension        | Imports                |
|--------------------------|-------------------------|--------------------------|------------------------|
| Panel v-statistics       | -160.0578<br>(1.0000)   | Group $\rho$ -statistics | 2.1174<br>(0.7620)     |
| Panel $\rho$ -statistics | -10.0061***<br>(0.0000) | Group pp-statistics      | -7.7441***<br>(0.0000) |
| Panel pp-statistics      | -9.6648***<br>(0.0000)  | Group ADF-statistics     | -8.0096***<br>(0.0000) |
| Panel ADF-statistics     | -11.9865***<br>(0.0000) |                          |                        |

\*\*\*, \*\*, \*Shows level of significance at 1 percent, 5 percent, 10 percent respectively.

Results from the Table 2 shows that imports are co-integrated with the peace indicators of any nation which have been measured through a nation's relationship with its neighbouring nation, its terrorism activities and conflict ideology rejecting the null hypothesis of the test.

Table 3

*Exports with Peace Indicators*

| Within-Dimension         | Exports                | Between-Dimension        | Exports                |
|--------------------------|------------------------|--------------------------|------------------------|
| Panel v-statistics       | -127.8756<br>(1.0000)  | Group $\rho$ -statistics | -7.0412***<br>(0.0000) |
| Panel $\rho$ -statistics | 4.3655<br>(1.0000)     | Group pp-statistics      | -8.0007***<br>(0.0000) |
| Panel pp-statistics      | -9.8456***<br>(0.0000) | Group ADF-statistics     | -3.7106**<br>(0.0006)  |
| Panel ADF-statistics     | -7.0875***<br>(0.0000) |                          |                        |

\*\*\*, \*\*, \* Shows level of significance at 1 percent, 5 percent, 10 percent respectively.

Similarly Table 3 shows that exports are also co-integrated with peace and conflict indicator at 1 percent level of significance.

Table 4

*Trade Openness with Peace Indicators*

| Within-Dimension         | Trade openness          | Between-Dimension        | Trade Openness         |
|--------------------------|-------------------------|--------------------------|------------------------|
| Panel v-statistics       | -100.9602<br>(1.0000)   | Group $\rho$ -statistics | -5.0980***<br>(0.0000) |
| Panel $\rho$ -statistics | -10.8660***<br>(0.0000) | Group pp-statistics      | -3.0006***<br>(0.0034) |
| Panel pp-statistics      | -9.0079***<br>(0.0000)  | Group ADF-statistics     | -7.6890***<br>(0.0000) |
| Panel ADF-statistics     | -3.8096***<br>(0.0045)  |                          |                        |

\*\*\*, \*\*, \* Shows level of significance at 1 percent, 5 percent, 10 percent respectively.

Table 4 explains the same tests statistics, but for evaluating the co-integrating level between trade openness and many variables related to peace level, conflict intensity and terrorist activities. Results again reject the null hypothesis of the test and confirm that there exists co-integration among the specified variables at 1 percent level of significance.

**Table 5.3. Kao Test**

This is also one of the tests to confirm that whether these variables imports, exports, and trade openness are co-integrated with peace, terrorism and conflict intensity or not? Results from Table 5 again prove the existence of long run relationship among these variables i.e. exports and imports and trade openness are related to peace, terrorism and conflict. Table given below shows these results and statistics help to reject the null hypothesis at 1 percent level of significance.

Table 5

*Results from Kao Test*

| Null Hypothesis   | Exports                 | Imports                 | Trade Openness          |
|-------------------|-------------------------|-------------------------|-------------------------|
| No Co-integration | -19.5720***<br>(0.0000) | -17.4500***<br>(0.0000) | -22.8645***<br>(0.0000) |

\*\*\*, \*\*, \* Shows level of significance at 1 percent, 5 percent, 10 percent respectively.

**5.4. Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) Estimation Techniques**

Technically, it is believed that when long run association is found among desired variables then we can work on finding the strength and nature of those variables in terms of long run coefficients. For this purpose, literature suggests two approaches; out of which one is parametric and the other is non-parametric. Non-parametric is called Fully Modified OLS developed by Pedroni (1996, 2000) and parametric is Dynamic OLS

developed by Kao and Chiang (1999). The imperative advantage of these panel group estimators is that these allow the pooling of data in the presence of heterogeneity of co-integrating vectors. Results from both of these models are reported in Tables given below.

#### 5.4.1. Estimates Using Fully Modified OLS (FMOLS) Model

Table 6

*Results with FMOLS Model for All Three Dependent and Independent Variables*

| Variables                       | Exports<br>Volume<br>(Model 1)      | Imports<br>Volume<br>(Model 2)      | Total Trade<br>Flow<br>(Model 3)    |
|---------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Intercept                       | 1.6590***<br>[22.7710]<br>(0.0000)  | 1.2297***<br>[21.0956]<br>(0.0000)  | 2.6109***<br>[19.9961]<br>(0.0000)  |
| Weapons Imports (WI)            | -0.0928***<br>[2.6219]<br>(0.0007)  | -0.0601<br>[1.5109]<br>(0.1109)     | -0.0719***<br>[4.8916]<br>(0.0000)  |
| Neighbouring Relation (NCR)     | 0.5018***<br>[-5.6729]<br>(0.0000)  | 0.3710***<br>[-3.8819]<br>(0.0000)  | 0.6291***<br>[-9.9120]<br>(0.0000)  |
| Terrorist Activities (TA)       | -0.6209***<br>[-3.7109]<br>(0.0000) | -0.4390***<br>[-7.8185]<br>(0.0000) | -0.5721***<br>[-8.9018]<br>(0.0000) |
| Foreign Direct Investment (FDI) | 0.4543***<br>[11.0097]<br>(0.0000)  | -0.5765***<br>[-4.9110]<br>(0.0000) | 0.6096***<br>[3.9412]<br>(0.0003)   |
| Growth of GDP (GGDP)            | 0.2908***<br>[3.9567]<br>(0.0000)   | 0.6654*<br>[2.7129]<br>(0.0598)     | 1.7021***<br>[4.9123]<br>(0.0000)   |
| Country Size (CS)               | 1.9970***<br>[4.7756]<br>(0.0000)   | -0.7865***<br>[-2.8196]<br>(0.0030) | 0.6104*<br>[1.7009]<br>(0.0891)     |
| Real Exchange Rate (RER)        | 0.1357***<br>[7.7869]<br>(0.0000)   | -0.4508***<br>[-2.9012]<br>(0.0021) | 0.8104***<br>[3.0111]<br>(0.0054)   |

\*\*\*, \*\*, \* Shows level of significance at 1 percent, 5 percent, 10 percent respectively. [ ] shows t-statistics while ( ) shows their respective probabilities.

Table 6 shows three models with respect to independent variables, i.e. model for exports, imports and total trade flow in terms of openness. In all the models main focused variables and controls have been kept same. For measuring peace among nations, three indicators have been employed i.e. import of weapons from a country's rebel force or organisation, relations with neighbouring countries and number of terrorist attacks reported per year. Expected relationship between these variables with respect to

dependent variables is that nations having more import of such weapons, will be considered less peaceful and its impact will be negative on each variable of trade dimension. Similarly, increasing better ties among world nation will bring more interconnectedness and harmonised relation with each other and this will lead to more peace. Therefore, its impact is expected to be positive for all three dimensions of the trade related variables. Likewise, for the last indicator number of terrorist activities measuring the peace extent among world economies, the expected nature of the relation is negative i.e. more activities reported lesser will be trade activity due to reduced security and confidence for investor and trader to visit the accused nation. In case of control variables being used in all three models, the anticipated relationship between FDI, growth of GDP and population with respect to trade volumes and flows is positive, while, for real exchange rate it is conditioned as to whether we could consider it for imports or exports. Most developing nations (which are larger part of dataset chosen for this study) are experiencing continuous depreciation of their currencies in exchange of foreign currencies, that is why, in this case this foreign exchange variable can have positive effect on exports and negative on imports, and this can lead to improve current account balance by increasing overall trade flows.

Now relating the estimated results with expected ones, it can be examined that signs of all three indicators measuring peace extent are in line with expectations. Variables Imports of weapons which are indicating the conflict situation of nations as well and terrorist activities are showing negative impact on both trade volumes and trade flows overall. Results suggests that one unit in the imports of destructive weapons affects exports negatively by 9 percent, imports by 6 percent and overall trade openness by 7 percent. It means that if nations are involved more in such exchange of such weapons, which disrupts the peace environment of the economies, then in such nations exporters are affected more, because they lose confidence of their foreign trading partners due to insecurities. Likewise, 1 unit change in terrorist activities is affecting 62 percent exports, 43 percent imports and 57 percent overall trade openness. While on the other side, the indicator measuring peace through relations with neighbouring nations is showing positive impact on each dependent variable confirming that harmonised relationships among nations region-wise can help them to increase their trade volumes and flows easily. Here 1 unit change in this variable is contributing directly to exports, imports and trade flow overall by 50 percent, 37 percent and 62 percent respectively. From the results, it can be concluded that the positive impact of this variable is quite high as compared to negative influence of earlier discussed two variables. It also shows the dire importance of developing such regional relations for improving conditions of the economies. In case of control variables for all models results are again supporting the theory that more FDI, GDP and population, can be helpful in increasing trade activities within the nations, but among all the more positive impact on exports and overall trade is of population. Similarly this factor is also affection most negatively on imports out of these three variables. Which informs that increasing population can also result in increasing demand, and which ultimately leads to have more burden on the current account of the BOP of nations. Impact of real exchange rate is found to be positive both for exports and overall trade flows, but negative for imports. As this study is using the data for all those nations for which, we could have the opportunity to extract peace related data, not focusing

specifically on developing of developed nations' scenario. But the number of developing nations is large in the selected panel, which are actually involved the persuasion of devaluation for correcting their disequilibrium in balance of payments. That is why the consequence of their exchange rate policy outweighs the other policy effects. Hence, basing upon this perception it can be concluded that these results are confirming the theory that devaluation makes exports cheaper and imports dearer. Moreover, mostly coefficients are found significant at 1 percent level of significant. All these results supports the three hypotheses of the study that peace related indicators have significant impact on trade volumes and total trade flows.

#### 5.4.2. Estimates Using Dynamic OLS model (DOLS) Model

Now to check the robustness of the estimates, a different panel data model technique has been applied on the same model specification. Reported coefficients for all variables are having the same signs as in case of above non-parametric technique FMOLS rather the significance has been improved of many variables in this model. Table 8 reports the results from the Dynamic OLS model (DOLS):

Table 7

#### *Results with DOLS Model for all Three Dependent and Independent Variables*

| Variables                       | Exports<br>Volume<br>(Model 1)      | Imports<br>Volume<br>(Model 2)      | Total Trade<br>Flow<br>(Model 3)    |
|---------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Intercept                       | 1.0960***<br>[26.6998]<br>(0.0000)  | 2.2118***<br>[22.9719]<br>(0.0000)  | 2.0012***<br>[30.7109]<br>(0.0000)  |
| Weapons Imports (WI)            | -0.0893***<br>[4.6610]<br>(0.0000)  | -0.06290***<br>[3.0930]<br>(0.0000) | -0.0719***<br>[3.9041]<br>(0.0000)  |
| Neighbouring Relation (NCR)     | 0.5209***<br>[-7.8910]<br>(0.0000)  | 0.4310***<br>[-5.9180]<br>(0.0000)  | 0.6317***<br>[-4.1940]<br>(0.0000)  |
| Terrorist Activities (TA)       | -0.6190***<br>[-5.1901]<br>(0.0000) | -0.4470***<br>[-3.3021]<br>(0.0000) | -0.5729***<br>[-3.1983]<br>(0.0000) |
| Foreign Direct Investment (FDI) | 0.4590***<br>[9.9854]<br>(0.0000)   | -0.5990***<br>[-6.5109]<br>(0.0000) | 0.6190<br>[7.5110]<br>(0.0000)***   |
| Growth of GDP (GGDP)            | 0.2919***<br>[5.0912]<br>(0.0000)   | 0.6781***<br>[5.5289]<br>(0.0000)   | 1.7310***<br>[2.6728]<br>(0.0005)   |
| Country Size (CS)               | 1.9871***<br>[4.4567]<br>(0.0000)   | -0.7509<br>[-1.5197]<br>(0.2870)    | 0.6298*<br>[1.6810]<br>(0.0980)     |
| Real Exchange Rate (RER)        | 0.1489***<br>[6.7209]<br>(0.0000)   | -0.5064***<br>[-4.6718]<br>(0.0000) | 0.8123***<br>[-5.7719]<br>(0.0000)  |

\*\*\*, \*\*, \*Shows level of significance at 1 percent, 5 percent, 10 percent respectively. [ ] shows t-statistics while ( ) indicates their probabilities.

Overall from the results given in Table 7, it can be concluded from all three models that those nations, where peace is being observed as a consequence of minimum terrorist activities, good relations with neighbours, and less conflicted nations, there will be high volume and flow of trade leading towards more economic prosperity. Hence on the basis of these findings, the study confirms all of three alternative hypotheses that there exists significant relationship between peace measuring indicators and trade volumes and trade openness.

## 6. CONCLUSIONS

This study has tried to analyse that how at present times, the effect peace-related indicators which have been captured through terrorist activities, interdependence of neighbouring countries, and intensity of conflict among nations is contributing to economic outcomes like trade volumes and flows. Employing the dataset of 155 nations for the time period 2008-14 and using the technique of panel co-integration along with FMOLS and DOLS models, the study reports that there exists long run co-integration between peace indicators and trade generation process. Moreover, the nations with more number of terrorist attacks, and those involved in imports of weapons of mass destruction are affecting negatively both to the trade volumes and trade flows of the economies of world. But on the other side, the effect of relations with neighbouring countries is showing very optimistic scenario, and indicating that the positive impact of this variable is more on the trade outcomes as compared to negative effect of other two variables measuring the extent of peace in the economies confirming the beggar-thy-neighbour argument in case of trade. Furthermore, the findings proved that in case of all three indicators measuring level of peace in a nation, impact on export volumes is more as compared to import volume and overall trade openness.

## 7. RECOMMENDATIONS

On the basis these findings, this study endeavours to give few suggestions for overall economies of the World that:

- Firstly these should try to avoid internal and external turbulence, and conflicts so that investors could find these nations more secure for realising their investment plans.
- Secondly all nations should also try to improve their relations with their neighbouring nations because this can help in building confidence among traders and investors.

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# Fiscal Decentralisation, Provincial Economic Growth and Spillover Effects: A Spatial Panel Data Analysis

QASIM RAZA and HAFSA HINA

This study examines the spatial dependence, direct and indirect effects of fiscal decentralisation on the provincial economic growth of Pakistan. Due to spatial dependence, spatial econometric technique is applied on the augmented growth of Mankiw, *et al.* (1992) by incorporating the fiscal decentralisation variable in the theoretical framework. The empirical analysis is based on the spatial panel data set, which is used from 1990 to 2011 of provinces. Model is selected on basis of specific to general and general to specific approach, and decided two-way fixed effects Spatial Durbin model (SDM) is appropriate for our data. We have estimated the SDM by maximum likelihood (bias corrected and random effect) estimation technique, otherwise, if we applied OLS and ignore the spillover effect which makes our estimated parameters biased and inconsistent. Results show that revenue decentralisation has positive, while expenditure decentralisation has negative effect to provincial economic growth. Spillover effects are found to be significant in case of revenue decentralisation and insignificant in case of expenditure. Negative and insignificant spillover effect of expenditure decentralisation is due to weak institutions, lack of intra governmental competition, and absence of political vision which may increase the level of corruption and less accountability.

On the basis of econometric analysis, it may be suggested that federal government should transfer the resources to provinces as determined in the 18th amendment, and it is the responsibility of provincial government to train their officials in the area of professional ethics, technical and administrative skills by different programmes.

*JEL Classification:* C31, C33, H3, H50

*Keywords:* Fiscal Decentralisation, Spatial Econometrics, Revenue, Expenditure

## 1. INTRODUCTION

Fiscal decentralisation is the transfer of fiscal responsibilities from central to sub-central governments in devolving its functions of taxes and expenditures. It is considered as a sign of efficiency from few decades. Owing to this approach the local governments can independently figure out their problems, rather consulting to federal government [Oates (1972, 1999)]. This is the basic logic behind the Tiebout hypothesis (1956).

Pakistan has a federal government structure, in which the resources are distributed among the provinces which have a significant impact on income, and living standard of the people. The NFC (National Finance Commission) award is considered as a step toward

Qasim Raza <qasimraza\_12@pide.edu.pk> is PhD Student, Pakistan Institute of Development Economics (PIDE), Islamabad. Hafsa Hina <hafсахina@pide.org.pk> is Assistant Professor, Pakistan Institute of Development Economics (PIDE), Islamabad.

federalism [Mustafa (2011)], which makes mechanism to distribute resources from center to the provinces, and Provinces Finance Commission (PFC) for distribution of resources from provinces to district level. The 7th NFC award is the gesture of hope and sacrifice which strengthen federation, and realising the people that other provinces are equally caring about their development [Mustafa (2011)]. In this award provinces are granted more financial resources not based on population only but also on the regional backwardness.

*Fiscal Share of Provinces, by 1995–2010*

| Provinces   | Ratio of Revenue and Expenditure to Total |  | 1995    | 2000    | 2005    | 2010    |
|-------------|---|--|---------|---------|---------|---------|
|             | Share                                     |  |         |         |         |         |
| Punjab      | Rev                                       |  | 0.13115 | 0.14463 | 0.1504  | 0.15876 |
|             | Exp                                       |  | 0.13253 | 0.13325 | 0.12939 | 0.15264 |
| Sindh       | Rev                                       |  | 0.06516 | 0.07906 | 0.07059 | 0.07241 |
|             | Exp                                       |  | 0.06754 | 0.07284 | 0.8399  | 0.08554 |
| KPK         | Rev                                       |  | 0.04499 | 0.05027 | 0.04347 | 0.04157 |
|             | Exp                                       |  | 0.04803 | 0.04871 | 0.0229  | 0.04465 |
| Balochistan | Rev                                       |  | 0.02587 | 0.02621 | 0.02846 | 0.02956 |
|             | Exp                                       |  | 0.02322 | 0.02297 | 0.01778 | 0.01923 |

Punjab has more revenue and expenditure share than any other provinces, which have an upward trend from 1995 to 2010. In addition 18th amendment has been done to bridge the gap between provinces and federation disparities. In this amendment provinces are given more autonomy, and financial resources are devolved by some more extent, which will strengthen the process of decentralisation in Pakistan.

Fiscal decentralisation results in stronger intergovernmental competition due to spatial dependence one region's government policy may affect the other regions [Crowley and Sobel (2011)]. Moreover, each province provides the local public good in his jurisdiction. The public goods benefit to those citizen in which province they are located, but may also have favourable spillover to the other provinces. Therefore, the spillover effects among the provinces motivate us to check the direct and spillover effect of fiscal decentralisation on provincial economic growth in Pakistan.

Objective of this study is to answer the following questions:

- (1) Is spatial dependence (spatial interaction effect) exist among the provinces of Pakistan?
- (2) What is the direct and indirect (spillover) effects of fiscal decentralisation on provincial economic growth (real per capita income).
- (3) Are these effects (direct and spillover) exist, significantly or not?

This study is organised as: Section 2, reviews theoretical and empirical literature on decentralisation and economic growth in case of spatial and non-spatial econometrics. Section 3, discusses the empirical model, econometrics methodology and data. Section 4, empirically examines the role of fiscal decentralisation, and provinces economic growth and discusses the findings. Section 5 concludes the results, gives policy implementation, limitation and way forward of the study.

## 2. REVIEW OF LITERATURE

### Empirical Review of Decentralisation and Economic Growth

On the relationship between fiscal decentralisation and economic growth from cross country level to group of countries, there is extensive literature. World is divided into two groups, high income industrialised countries and developing countries, and different empirical studies in both group found different results.

Zhang and Zou (1998) used methodology of Barro (1990), Lvine and Renelt (1992) and Davoodi and Zou (1998) to find the relationship between decentralisation and economic growth for China, they estimated panel data fixed effect model of 28 provinces (from 1980-1992) by using the estimation technique generalised least square. They find negative and significant impact of the fiscal decentralisation on the economic growth.

Jin, *et al.* (2005) re-examine the study of Zhang and Zou (1998) including the variable of volatility, they extended the empirical methodology of Zhang and Zou (1998) by including (data from 1982 to 1992 of 29 provinces of China) the variable of dummy that capture the effect of a national macroeconomics fluctuations. They conclude that the fiscal decentralisation promotes economic growth of Chinese provinces.

Xie, *et al.* (1999) used the theoretical model for decentralisation that is elaborated in Davoodi and Zou (1998) for 50 American states (from time period 1948-1994), empirically they applied time series methodology by OLS estimation. They concluded that existing expenditure share for local and state governments in USA are consistent with the objective of maximising the growth of the economy, the effect of decentralisation is highly insignificant.

Lin and Liu (2000) used the methodology of Mankiw, *et al.* (1992) and they specify a model of growth of Solow (1956). They used data of 28 provinces of China for the time period 1970-1993, their empirically analysis based on provinces panel data, with two way (provinces and time dummies) fixed effects. They found, the fiscal decentralisation contributes economic growth in China, significantly, which is consistent with the hypothesis that fiscal decentralisation can enhance economic efficiency.

Zhang and Zou (2001) developed a new model with accordance Barro (1990) and Zhang and Zou (1998) that connects the different public spending categories in the diverse government levels with the economic growth of the region. They selected 28 provinces of China (from 1987-1993) and 16 major states of India (from 1970-1994). In empirical analysis, they applied provincial fixed effect model (in case of China) and regression analysis based on panel data, with estimation a five year forward-moving average of real per capita income growth (in case of India). They concluded, in case of China, as in Zhang and Zou (1998), a negative and significant association between province economic growth and fiscal decentralisation. However, in case of India, they found a positive and significant association between fiscal decentralisation and economic growth.

Behnisch, *et al.* (2003) conducted a study in Germany (from time period 1950-1990), but they did not make any reference to their theoretical model. They applied linear and time series regression analysis (further details are not available). The analysis shows an inverse significance of state expenditure, and therefore, indicates polices among state level governments as part of cooperative federalism is not efficient with regard of productivity growth.

Vazquez and McNab (2003) used panel data set (from 1972-1997) for 52 transitional countries. They examined direct and indirect relationship among fiscal decentralisation and economic growth and macroeconomic stability. They concluded that decentralisation leads to reduce the rate of inflation, and positively effect on economic growth through its positive impact on macroeconomic stability.

Desai, *et al.* (2003) used the regression analysis of (80 Russian) regions and average data with time specific effects as a base of simultaneous regression models. They applied three stage least squares (3SLS) and OLS with panel-corrected standard error estimation. They do not mention the reference of any theoretical pattern. Thus, the proxy for sub-national (tax retention) fiscal autonomy has a positive impact on the output regaining of regions since the break-up of the Soviet Union.

Feld, *et al.* (2004) used the methodology of neoclassical growth model of Mankiw, *et al.* (1992) on panel data for the 26 Swiss cantons from 1980 to 1998. In their empirical study the effect of diverse instruments of fiscal federalism on economic performance measured by GDP per capita. The results concluded that matching grants have a negative impact on economic performance, while tax competition is not least harmful to economic performance, competition among the different sub-national governments enhance efficiency.

Akai, *et al.* (2004) provided the theory (from Barro (1990) analytical framework) that describes how to decentralisation effect economic growth under different structure of regional complementary. They estimated panel data model with time and state fixed effects of fifty states of USA over the period of 1992-1997, which support the theoretical specification of the production function, by using the technique of maximum likelihood estimation. They observed the “hump-shaped” association between fiscal decentralisation and economic growth.

Jin and Zou (2005) applied the methodology of Barro (1990) and Davoodi and Zou (1998) in a panel dataset for 30 provinces in China to examine the association between fiscal decentralisation and economic growth over two stages of fiscal decentralisation in China: first, 1979–1993 under the fiscal contract system, and second, 1994–1999 under the tax assignment system. In their empirical analysis, they estimated the coefficients with fixed-effects with correction for panel heteroskedasticity and panel serial correlation. They concluded, for time period 1979 to 1993, results suggest, that revenue decentralisation encourage revenue mobilisation from local sources, expenditure centralisation enhance growth, because the central government spends more efficiently than the provinces, and for second time period from 1994 to 1999, results suggest that at a certain level of expenditure decentralisation, more revenue centralisation promotes economic growth in China.

Carrion-i-Silvestre, *et al.* (2006) analysed the influence of the Spanish fiscal decentralisation on economic growth at aggregate and regional level. They followed the methodology of Xie, *et al.* (1999) based on Davoodi and Zou (1998), take the data set of aggregate and regional level of 17 Autonomous Communities from 1980 to 1998 and 1991 to 1996 respectively. On their panel data estimation they conclude that the Spanish decentralisation process has a positive effect on both aggregate and regional economic growth.

Akai and Sakata (2007) used same theoretical model applied by Xie, *et al.* (1999), based on the pattern of Davoodi and Zou (1998). They applied OLS and Fixed Effect Model with time dummies, on the panel data of 50 states of USA (from 1992 to 1997), their estimated coefficients on fiscal decentralisation is significant and have a positive effect on economic growth.

Rodríguez-Pose, *et al.* (2009), used the regression model based on methodology of Levine and Renelt (1992) to investigate the significance of fiscal decentralisation in sixteen Central and Eastern European countries. They applied panel data approach with dynamic effects over the 1990–2004 period of time, findings says expenditure decentralisation has a negative effect on economic growth due to the weak institution structure in many of countries and in case of decentralisation of revenues, they investigated that if revenues are decentralised at sub-national level their own revenue source behave better to local public demands and promote economic efficiency.

### **Empirical Review in Case of Pakistan**

Malik, *et al.* (2006) investigated the positive association between fiscal decentralisation and economic growth, they use time series data from 1972 to 2005 and Ordinary Least Square estimation method is applied.

Iqbal (2013) analysed the effect of fiscal decentralisation on economic growth and macroeconomic stability by using the endogenous growth model. In his analysis time series data is used from 1972-2010 and Generalise Method of Moment technique is applied. It is concluded by him that revenue and expenditure decentralisation has positive and negative effect on economic growth respectively. The reason of negative effect of expenditure decentralisation is weak institution and administrative framework at provinces level.

### **Decentralisation, Economic Growth, Spillover Effects and Spatial Econometrics**

Spatial econometrics is the advancement in econometrics literature which captures the spatial effect due to spatial autocorrelation [Yang and Zheng (2010)].

Yamoah (2007) used the growth model of Carlino and Mills (1987) to check the effect of decentralisation on economic growth in three thousand counties of forty six states of USA. In her study she take cross sectional data, and result indicate that fiscal decentralisation have negative effect on economic growth, spatial spillovers in county government decision making does not investigate and this limitation is acknowledge by her, and give way forward of new research in the area of spatial econometrics.

Tosun and Yilmaz (2010) applied the panel data (1976-2001) and cross-sectional spatial regression analysis in 67 and 81 provinces in Turkey respectively. In cross sectional regression analysis there exists spatial correlation among the contiguous provinces (spatial effect incorporate in regression analysis due to this reason) and the model of spatial dependence account for any direct effect of spatial neighbour and spillover effects, hence, it is concluded that decentralisation contracting positive effect on economic growth through greater degree of competition among the provinces government.

Hammond and Tosun (2011) investigated the impact of fiscal decentralisation on economic growth in counties of USA. Their sample size divide into metropolitan counties and non-metropolitan counties (period from 1970 to 2000). Since they use county-level data then spatial spill-overs across counties exist, and these spill-over effects which imply that growth shocks to one county may be transferred feedback effect to other counties nearby, and will basis the residual variance in an OLS regression to be non-spherical. To correct this problem they used spatial error model in order to distinguish between metropolitan and nonmetropolitan impacts. They estimates that 10 percent increase in revenue centralisation in metropolitan counties causes the decrease in long run per capita income growth of 0.28 percent, and no correlation between decentralisation and non-metropolitan economic growth exist. This recommends that metropolitan fiscal decentralisation benefits long-run income growth. It also advises that generating revenue in a decentralised way makes the county a more attractive. Therefore, they examine significant positive spillover growth shocks to other counties, which suggests that counties whose neighbour grow faster than expected, to grow faster than expected.

Zheng, *et al.* (2013) took 21 province data (from time period 1994-2006) to investigate the supply of healthcare expenditures, which causes to slow down economic growth from last two decades. They use spatial panel data econometrics and find that the supply of healthcare resources is negatively related to the degree of decentralisation. It is credited to the presence of strategic alternatives (spillover) in healthcare spending across city governments.

### Conclusion

Effect of decentralisation on economic growth is diverse in different regions. This difference exist on some extent due to misspecification of the model, because regional governments are interlinked on base of strategies and borders, the act of one government have feedback effect (spillover effect) to another. If spatial dependence and spillover effect are not account for then they could lead to biased and inconsistent parameter estimates [LeSage (1998)]. In case of Pakistan there is not conducted the study of fiscal decentralisation and its effect on economic growth at provinces level, where provinces effect their neighbours significantly.

### 3. DATA AND ECONOMETRICS METHODOLOGY

Due to spatial dependence, spatial panel data econometric will be applied on the modified theoretical framework of Mankiw, *et al.* (1992) by incorporating the decentralisation variable. Estimation is performed by employing maximum likelihood technique instead of OLS method to obtain unbiased and consistent parameters in the presence of spillover effect. Therefore, specified Spatial Durbin Model (SDM) is:

$$y_{it} = \delta \sum_{j=1}^N W_{ij} y_{jt} + \alpha + x_{it} \beta + \sum_{j=1}^N W_{ij} x_{jt} \theta + \mu_i (\text{optional}) + \tau_t (\text{optional}) + \varepsilon_{it} \quad \dots \quad (1)$$

or in matrix form

$$y_t = \delta W Y_t + \alpha + X_t \beta + W X_t \theta + \mu_t + \tau_t + \varepsilon_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (1a)$$

Where,  $W$  is weight matrix, and is coefficients of spatial interaction effect of dependent and independent variables, respectively.

### W Matrix and Normalising W Matrix

$W$  representing an  $n \times n$  spatial weight matrix (in case of cross sectional data) of binary numbers, in which one is assign for neighbour, and zero is assign to prevent a region to the neighbor of itself [LeSage and Pace (2009)], in our case study (of Pakistan) we have four regions (Punjab, Sind, KPK and Balochistan). Where each column represent one region, 1st for Punjab, 2nd for Sindh, 3rd for KPK and 4th for Balochistan.

$$W = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \quad W_{RN} = \begin{bmatrix} 0 & 0.33 & 0.33 & 0.33 \\ 0.5 & 0 & 0 & 0.5 \\ 0.5 & 0 & 0 & 0.5 \\ 0.33 & 0.33 & 0.33 & 0 \end{bmatrix}$$

As another way,  $W$  might be normalised in such a way that the elements of each column sum to one. There is a point that the column elements of a spatial  $W$  matrix show the impact of a particular unit on all other units, while the row elements of spatial  $W$  matrix display the on a specific unit by all other units. Therefore, column normalisation has the effect, the impact of each region on all other regions is equalised, while row normalisation ( $W_{RN}$ ) has the effect, the impact of a particular region on all other regions [Elhorst (2014)].

### Data Description and Variable Construction

Data which used in this study is at provinces level (from 1990 to 2011) of Pakistan.

Table 3.1

| <i>Data Description</i>           |   |
|-----------------------------------|---|
| Variable                          | Definition  |
| Dependent Variable (y)            | <i>Real per capita income of provinces (base = 1999-00)</i>                     |
| Revenue Decentralisation (rd)     | $\frac{\text{Provinces Revenue}}{\text{Total Revenue (including federal)}}$     |
| Expenditure Decentralisation (ed) | $\frac{\text{Provinces Expenditure}}{\text{Total Revenue (including federal)}}$ |
| Human Capital (h)                 | <i>Per capita health and education expenditure of provinces</i>                 |
| Capital (k)                       | <i>Per capita capital expenditure of provinces</i>                              |

Data of provincial GDP is estimated and disaggregated by Shaheen Malik (Research Analyst at unit SASEP) for World Bank. He used three traditional approaches (to estimate GDP), production, expenditure, and income. More specifically, where detail provincial data were available, i.e. agriculture, mining and quarrying, whole sale and retail trade and manufacturing, sectorial value added were estimated using the production approach. The expenditure approach was used to compute value added of construction, electricity and gas distribution, ownership of dwellings, defence subsectors and public admiration. Moreover, the income approach was applied to value added to transport, communication and storage, banking and insurance, and services sub-sectors. The

analysis of estimation has been applied to facilitate the economic assessment for two provinces reports: Development Issue and Prospect of Balochistan and Public Expenditure Review for Khyber Pakhtunkhwa.

We are also using the education and health expenditures as proxy of human capital and the capital expenditure of provincial governments as a proxy for capital, data on variables are taken from annual Pakistan Statistical Year Book. For transforming the data into per unit form, provinces population has been used, which is collected from the Labour Force Survey, published by Pakistan Bureau of Statistics (PBS). In addition, data of provincial revenue and expenditure is also taken from annual Pakistan Statistical Year Book, and the calculation of decentralisation (revenue and expenditure) variables, obtain by the ratio of provinces revenue and expenditure to total revenues and expenditures of the provincial government (including federal) respectively [Oates (1972)].

#### 4. EMPIRICAL RESULTS

In this section, we empirically analyse the different spatial econometrics models, by using the spatial panel data that explain the provincial economics performance and decentralisation in Pakistan (from 1990 to 2011). The dependent variable is real per capita income and explanatory variables are decentralisation (revenue or expenditure), capital and human capital. All variables are in log form, so our specified SDM is equation (1 or 1a), which we can convert to non-spatial models easily by eliminating the spatial interaction effects, with spatial effect or/and time period fixed effects, and estimation is done in Matlab software.

#### Results of Revenue Decentralisation

Table 4.1.1

*Estimation Results of Revenue Decentralisation Using Panel Data Models  
without Spatial Interaction Effects*

| Determinants            | (1)<br>Pooled<br>OLS | (2)<br>Spatial fixed<br>Effects | (3)<br>Time-period<br>Fixed Effects | (4)<br>Spatial and Time-<br>period Fixed Effects |
|-------------------------|----------------------|---------------------------------|-------------------------------------|--|
| Log( <i>rd</i> )        | 0.085<br>(1.407)     | -0.032<br>(-0.260)              | 0.162<br>(2.638)                    | 0.144<br>(1.065)                                 |
| Log( <i>h</i> )         | 0.062<br>(1.176)     | 0.039<br>(0.817)                | 0.025<br>(0.325)                    | 0.045<br>(0.655)                                 |
| Log( <i>k</i> )         | 0.222<br>(7.165)     | 0.186<br>(6.39)                 | 0.332<br>(5.57)                     | 0.180<br>(2.558)                                 |
| Intercept               | 8.637<br>(27.58)     |                                 |                                     |  |
|                         | 0.111<br>0.428       | 0.081<br>0.578                  | 0.092<br>0.517                      | 0.071<br>0.631                                   |
| LogL                    | -24.905              | -12.118                         | -17.758                             | -6.499   |
| LM Spatial lag          | 5.669                | 4.96                            | 7.684                               | 14.565   |
| LM Spatial error        | 3.517                | 5.596                           | 12.650                              | 17.140   |
| Robust LM Spatial lag   | 2.346                | 0.009                           | 7.386                               | 8.557  |
| Robust LM Spatial error | 0.194                | 0.638                           | 12.352                              | 11.13  |

Note: *t*-value in parentheses.

Table 4.1.1 accounts the estimation results of revenue decentralisation on economic growth when adopting a non-spatial panel data model. To check which specific effect should include in model (spatial or/and time), we use likelihood ratio test. Therefore, the null hypothesis, the spatial fixed effects are jointly non-significant, the result ( $LR=25.57$ , with 4 degrees of freedom [df],) indicate that null hypothesis is rejected and we should extend our model by including spatial specific effects. Similarly, the hypothesis that the spatial and time period fixed effects are jointly insignificant must be rejected ( $LR=37.00$ , 25 df). Results of these tests justify the extension of the model with spatial and time period fixed effects that is also known as the two ways fixed effects model [Baltagi (2008)].

Therefore, inclusion of spatial and time-period fixed effects, our next step is to determine whether the spatial lag model or the spatial error model is more suitable. For the inclusion of spatial interaction effects we are using classic LM tests, and both the hypothesis of no spatially serial correlated error term and the hypothesis of no spatially lagged dependent variable must be significant at 5 percent and 1 percent level of significance. When using the robust LM tests, the hypothesis of no spatially lagged dependent variable may not be rejected at 5 percent as well as 1 percent significance. However, hypothesis of no spatially serial correlated error term must still be rejected at 5 percent and 1 percent level of significance.

Up to now, our test results point to the spatial error specification of the two-way fixed effect model because LM spatial error test is more significant than LM spatial lag test. But there is ambiguity to selection of the model because both tests reject their null hypotheses in favour of their alternatives. Nevertheless, if a non-spatial model on the basis of robust LM tests is rejected in favour of spatial error model or the spatial lag model, we should be careful to select one of these two models [Elhorst (2014)]. The LeSage and Pace (2009) recommend to consider the spatial Durbin model when this situation exist. The first hypothesis whether the spatial Durbin model can be simplified to the spatial lag model, and the second examines whether it simplified to the spatial error model [Elhorst (2014)]. The test statistics of both models follow Chi squared distribution with  $K$  degree of freedom.

The spatial Durbin model best describes the data if both hypotheses and are rejected. On the other hand, if the first hypothesis not able to be rejected, the spatial lag model then best specify the data, the robust LM tests also specify the spatial lag model. Similarly, if second hypothesis can't be rejected, the spatial error model the best describes the data, provided that robust LM tests also specify the spatial error model. Therefore, one of these conditions is not satisfied, i.e. if the robust LM tests point to another model than the LR/Wald test, the Spatial Durbin model should be adopted [Elhorst (2014)]. Because, this (SDM) model generalises both the spatial lag and the spatial error model. In model specification criteria, the spatial econometric literature is divided regarding to apply specific-to-general or general-to-specific approach [Elhorst (2014)].

Table 4.1.2

*Estimation Results of Revenue Decentralisation: Spatial Durbin Model  
Specification with Spatial and Time-period Specific Effects*

|                           | (1)   | (2)  | (3)  |
|---------------------------|---|--|--|
| Determinants              | Spatial and<br>Time-period<br>Fixed effects | Spatial and Time-<br>period<br>Fixed effects<br>bias-corrected | Random Spatial<br>effects, fixed<br>time-period<br>effects |
| W*log(y)                  | -0.913<br>(-10.69)                          | -0.769<br>(-7.659)   | -0.673<br>(-6.47)  |
| Log(rd)                   | 0.744<br>(9.110)                            | 0.741<br>(7.570)   | 0.724<br>(8.30)  |
| Log(h)                    | 0.072<br>(1.691)                            | 0.074<br>(1.433)   | 0.076<br>(1.503)   |
| Log(k)                    | 0.162<br>(3.608)                            | 0.168<br>(3.112)   | 0.163<br>(3.137)   |
| W*Log(rd)                 | 2.264<br>(8.896)                            | 2.49<br>(8.235)  | 2.493<br>(8.634)   |
| W*Log(h)                  | 0.147<br>(1.520)                            | 0.159<br>(1.367)   | 0.173<br>(1.508)   |
| W*Log(k)                  | 0.598<br>(4.282)                            | 0.655<br>(3.936)   | 0.557<br>(3.636)   |
| Phi                       |   |  | 0.209<br>(2.039)   |
|                           | 0.013                                       | 0.018  | 0.018  |
| Corrected R <sup>2</sup>  | 0.929                                       | 0.919  | 0.870  |
| LogL                      | 0.537                                       | 0.562  | 0.436  |
| Wald Test Spatial lag     | 39.518                                      | 39.518   | NA   |
|                           | 84.276<br>(p=0.0000)                        | 72.322<br>(p=0.0000)   | 81.10<br>(p=0.0000)  |
| LR Test Spatial lag       | 64.027<br>(p=0.0000)                        | 64.027<br>(p=0.0000)   | NA   |
| Wald Test Spatial error   | 33.993<br>(p=0.0000)                        | 35.356<br>(p=0.0000)   | 43.522<br>(p=0.0000)                                       |
| LR Test Spatial lag error | 46.774<br>(p=0.0000)                        | 46.774<br>(p=0.0000)   | NA   |

Note: t-value in parenthesis. Hausman test-statistic, degrees of freedom and probability = 2.987, 7, 0.8862.

In above testing procedure we mix both approaches. Firstly, we estimate non-spatial model to test it's against spatial lag and spatial error model (specific to general approach). In case of non-spatial model is rejected then spatial Durbin model is estimated, and this can test to simplified to the spatial lag or spatial error model (general to specific approach). If both approaches identify same model either spatial lag or spatial error model, it is safe to select this one which model describes best to data. In other hand that is the best to adopt more general model (SDM), when non-spatial model is specified in favour of spatial lag or spatial error model and spatial Durbin model not identify it. The results which we are obtained by estimating the Spatial Durbin Model (SDM) are reported in Table 4.1.2. The first column indicates the results when model is estimated by using direct approach and the second column shows the bias corrected coefficient. These

results show that the difference between parameters estimate of independent variable ( $X$ ) and are small through bias corrected estimation. But on another hand, the coefficient of the independent variables ( $WX$ ) and the spatially lagged dependent variables ( $WY$ ) seem quite sensitive to bias correction procedure [Elhorst (2014)].

We have estimated three models (SDM) by different technique (in three columns), first we check which model specification is the best our data set, either fixed effect model is appropriated or random effect. Hausman's specification test can use to test the random effects against fixed effects model. The results ( $h=2.987$ , 7 df,  $p > 0.05$  and 0.10) indicate that random effects model does not rejected against fixed effect.

The Wald test (43.52,  $p=0.000$ ) indicate that the hypothesis whether spatial Durbin model (SDM) can be simplified to the spatial error model (SEM), must be rejected, similarly the hypothesis that SDM can be simplified to SAR model, must be rejected (Wald test: 81.10,  $p=0.0000$ ). This indicates that both the SEM and the SAR must be rejected in favour of the spatial Durbin model.

In this study we concentrate on decentralisation variable as a direct and indirect effect. The coefficient of revenue decentralisation in the non-spatial model is insignificant but has an expected sign. In the two-way fixed effects form of this model (the last column of Table 4.1.1), higher revenue decentralisation increase regional income positively but effect again is insignificant. In other way, we have discussed (specification procedure of model) that spatial and time period specific effects are not correlate to explanatory variables, and these effects are consider as random (reason to specifying random effect model). However, due to spatial interaction (both in dependent and independent variables) the specification of spatial Durbin random effects model is found to be more appropriate, and the elasticity's in non-spatial and two-way fixed effect SDM consider as biased (due to acceptance of the null hypothesis of Hausman test). In the third column of the estimation results of SDM, the elasticity of revenue decentralisation is 0.724 which is significantly overestimated as we compare it to non-spatial fixed effects models. Whereas, the coefficient estimates in the non-spatial model represent the marginal effect of a change in revenue decentralisation on provincial per capita income (economic growth) but the coefficients of spatial Durbin model (SDM) do not.

Table 4.1.3

*Direct and Indirect (Spillover) Effects Estimates Based on the Parameter Estimates of the Spatial Durbin Model Reported in Table 4.1.2.*

|                                  | (1)                                   | (2)  | (3)   |
|----------------------------------|---------------------------------------|--|---|
| Determinants                     | Spatial and Time-Period Fixed Effects | Spatial and Time-Period Fixed Effects Bias-corrected | Random Spatial Effects, Fixed Time-period Effects |
| Direct Effect $\text{Log}(rd)$   | 0.087<br>(0.810)                      | 0.145<br>(1.269)                                     | 0.203<br>(2.027)                                  |
| Indirect Effect $\text{Log}(rd)$ | 1.495<br>(7.264)                      | 1.70<br>(6.928)                                      | 1.732<br>(7.087)                                  |
| Total Effect $\text{Log}(rd)$    | 1.583<br>(7.970)                      | 1.845<br>(7.052)                                     | 1.935<br>(6.914)                                  |

Notes: t-values in parentheses. Direct and indirect (spillover) effects:  $(I^{-1})$  are calculated.

For this reason, we should use the direct and indirect effects of estimates and these effects are reported in above Table 4.1.3. The logic that the direct effects of the independent variables are different from their parameter estimates is due to feedback, which arises in response of impacts passing through neighbouring provinces and back to the provinces themselves. These feedback effects are relatively due to parameter of spatial lagged dependent variable  $[W*\log(y)]$  that turns out to be negative and significant, and partially in result of the parameter of the spatially lagged of the independent variable itself. The coefficient of latter turns out to be positive and significant for the revenue decentralisation  $[W*\log(rd)]$ . The direct and indirect (spillover) effects estimates are obtained by computing  $(I-)^{-1}$ .

In random effects spatial Durbin model (column (3) of Table 4.1.2) the direct effect of the revenue decentralisation variable appears to be 0.724. This means that the revenue decentralisation elasticity is 0.144 in the non-spatial model that is underestimating by 80 percent. Since, the direct effect of the revenue decentralisation is 0.237 and its coefficient estimate is 0.724 its feedback amount represents the direct effect. Therefore, this feedback effects turn out relatively small. In another hand, the indirect (spillover) effects in non-spatial model are equate to zero, the indirect effect of due to change in the explanatory variables in the spatial Durbin model appears to be 853.2 percent of the direct effect in case of revenue decentralisation, and this indirect effect is statistically significant on base of t-statistics which calculated from a set of 1000 simulation parameter values. In other words, if the revenue decentralisation in a particular provinces changes, not only per capita income of that province itself, but also in that of its neighbouring provinces will change. Now move to the estimation results of expenditure decentralisation.

## Results of Expenditure Decentralisation

Table 4.2.1

*Estimation Results of Expenditure Decentralisation Using Panel Data  
Models without Spatial Interaction Effects*

|                         | (1)<br>Pooled<br>OLS | (2)<br>Spatial<br>fixed<br>Effects | (3)<br>Time-period<br>Fixed Effects | (4)<br>Spatial and Time-<br>Period Fixed Effects |
|-------------------------|----------------------|------------------------------------|-------------------------------------|--|
| Determinants            |                      |                                    |                                     |  |
| Log( <i>ed</i> )        | 0.088 (1.389)        | -0.246<br>(0.1641)                 | 0.141<br>(2.179)                    | -0.434<br>(-1.711)                               |
| Log( <i>h</i> )         | 0.067 (1.220)        | -1.080<br>(0.873)                  | 0.009<br>(0.127)                    | 0.092<br>(1.278)                                 |
| Log( <i>k</i> )         | 0.230<br>(7.04)      | 0.174<br>(5.706)                   | 0.348<br>(5.438)                    | 0.130<br>(1.733)                                 |
| Intercept               | 8.576 (27.26)        |                                    |                                     |  |
|                         | 0.111                | 0.079                              | 0.095                               | 0.069  |
|                         | 0.428                | 0.584                              | 0.505                               | 0.639  |
| LogL                    | -24.930              | -11.553                            | -18.829                             | -5.591   |
| LM Spatial Lag          | 5.533                | 5.815                              | 6.423                               | 13.501   |
| LM Spatial Error        | 3.409                | 5.409                              | 9.731                               | 14.636   |
| Robust LM Spatial Lag   | 2.315                | 0.538                              | 16.366                              | 3.281  |
| Robust LM Spatial Error | 0.191                | 0.132                              | 19.674                              | 4.416  |

Note: t-value in parentheses.

Table 4.2.1 accounts the estimation results (of expenditure decentralisation), when adopting a non-spatial panel data model. To check which specific effects should include in model (spatial or/and time), we again use likelihood ratio test as we have used in case of revenue decentralisation. Thus, the null hypothesis, the spatial and time period fixed effects are jointly non-significant is rejected because  $LR=38.68$  (with 25 df.) and we extend our model by including spatial and time specific effects.

Our next step is to check the spatial interaction effects for specification of the model. The procedure of the selection of the model is also the same as we have discussed (in case of revenue decentralisation). For inclusion of spatial interaction effects, both hypotheses, no spatially serial correlated error term and the hypothesis of no spatially lagged dependent variable are significant at 5 percent and 1 percent level of significance because statistics of LM spatial lag and LM spatial error (see in fourth column of Table 4.2.1) are greater than the critical value (which is  $Chi(1) .01 value = 6.64$ ). Therefore, we have applied both techniques specific to general and general to specific (as in revenue decentralisation is applied), and conclude that our specify model is Spatial Durbin Model (SDM).

Table 4.2.2

*Estimation Results of Expenditure Decentralisation: Spatial Durbin Model  
Specification with Spatial and Time-Period Specific Effects*

|                           | (1)<br>Spatial and Time-<br>period<br>Fixed Effects | (2)<br>Spatial and Time-<br>period<br>Fixed Effects<br>Bias-corrected | (3)<br>Random Spatial<br>Effects, Fixed<br>Time-period<br>Effects |
|---------------------------|---|---|---|
| Determinants              |   |   |   |
| W*log(y)                  | -0.864<br>(-8.894)                                  | -0.683<br>(-5.992)  | -0.706<br>(-6.377)  |
| Log(ed)                   | -0.482<br>(-1.906)                                  | -0.473<br>(-1.550)  | 0.531<br>(5.283)  |
| Log(h)                    | 0.202<br>(2.841)                                    | 0.202<br>(2.356)  | 0.073<br>(0.952)  |
| Log(k)                    | 0.131<br>(1.505)                                    | 0.134<br>(1.280)  | 0.397<br>(5.782)  |
| W*Log(ed)                 | -0.540<br>(-0.824)                                  | -0.484<br>(-0.611)  | 1.509<br>(4.387)  |
| W*Log(h)                  | 0.331<br>(2.051)                                    | 0.339<br>(1.738)  | 0.113<br>(0.640)  |
| W*Log(k)                  | 0.183<br>(0.855)                                    | 0.179<br>(0.696)  | 0.603<br>(3.709)  |
| Phi                       |   |   | 0.996<br>(2.753)  |
|                           | 0.042   | 0.047   | 0.047   |
| Corrected R <sup>2</sup>  | 0.824   | 0.796   | 0.675   |
| LogL                      | 8.980   | 8.979   | NA  |
| Wald Test Spatial Lag     | 10.301<br>(p=0.0162)                                | 7.098<br>(p=0.0688)   | 38.995<br>(p=0.0000)  |
| LR Test Spatial Lag       | 6.846<br>(p=0.0769)                                 | 6.846<br>(p=0.0769)   | NA  |
| Wald Test Spatial Error   | 2.871<br>(p=0.4120)                                 | 2.974<br>(p=0.3956)   | 18.720 (p=0.0000)   |
| LR Test Spatial Lag Error | 1.1596<br>(p=0.7627)                                | 1.159<br>(p=0.7627)   | NA  |

In Table 4.2.2 we again estimate three models (SDM) in case of expenditure decentralisation by different specification and technique (see column of Table 4.2.2). We check first, which model specification is the best describes our data set, either fixed effect model is appropriated or random effect. For this we apply the Hausman's specification test to check either random effects model is appropriate or fixed effects. The result ( $h=16.18$ , 7 df,  $p < 0.05$ ) indicate that random effects model is rejected in favor of fixed effects, as a result we ignore the third column. Expenditure decentralisation in specification of random effect model, positively affect the real per capita income of the provinces, but these results are biased due to misspecification of the model, in other hand, the correct specification of the model, expenditure decentralisation effect negatively to provinces economic growth.

The coefficient of expenditure decentralisation in the non-spatial (two-way fixed effects) model (see the last column of Table 4.2.1) show the negative association to provinces income, it indicates that if higher expenditure are decentralised it will decrease the regional income, but this effect is insignificant. However, due to spatial interaction (both in dependent and independent variables) the spatial Durbin fixed effects model is found to be more appropriate, and the elasticity in non-spatial and random effects SDM consider are biased (due to reject the null hypothesis of Hausman test).

We are using bias corrected estimates for interpretation and the reason to chosen the bias correction estimates have been given in section of revenue decentralisation. In the second column of the estimation results of SDM, the elasticity of expenditure decentralisation is  $-0.472$  which is insignificant, it is overestimate if we compare it to the elasticity coefficient of non-spatial two way-fixed effects model.

Table 4.2.3

*Direct and Indirect (Spillover) Effects Estimates Based on the Parameter Estimates of the Spatial Durbin Model Reported in Table 4.2.2*

|                                  | (1)                                   | (2)  | (3)   |
|----------------------------------|---------------------------------------|--|---|
|                                  | Spatial and Time-period Fixed Effects | Spatial and Time-period Fixed Effects Bias-corrected | Random Spatial Effects, Fixed Time-period Effects |
| Determinants                     |                                       |  |   |
| Direct Effect $\text{Log}(ed)$   | -0.440<br>(-1.731)                    | -0.423<br>(-1.506)                                   | 0.216<br>(2.89)                                   |
| Indirect Effect $\text{Log}(ed)$ | -0.132<br>(-0.267)                    | -0.133<br>(-0.232)                                   | 0.989<br>(4.036)                                  |
| Total Effect $\text{Log}(ed)$    | - 0.572<br>(-1.234)                   | -0.556<br>(-0.930)                                   | 1.206<br>(4.578)                                  |

Notes: t-values in parentheses. Direct and indirect (spillover) effects:  $(I^{-1})$  are calculated.

In addition to find the direct and indirect effects we only concern the expenditure decentralisation variable. In expenditure decentralisation, the direct (feedback) and indirect effects (see Table 4.2.3) are not exist, because the t-value are insignificant respectively. The reason of insignificant direct and spillover effects is weak institutions and less administrative and political autonomy among the government of the provinces, and that is also a reason of negative effect of expenditure decentralisation [Rodríguez-Pose, *et al.* (2009) and Iqbal (2013)].

## 5. CONCLUSION AND POLICY RECOMMENDATIONS

Given study analysed the spatial (correlation) interaction effects, the effect of fiscal decentralisation on the provinces economic growth, and also analysed the direct and spillover effects. The estimated result in case of revenue decentralisation showed that there exist spatial interaction effects, positive effect of revenue decentralisation on provincial economic growth and found significant direct (feedback) and indirect (spillover) effects, due to heterogeneous governments in the provinces<sup>1</sup> (from 1990 to 2011), because revenue decentralisation generates positive externalities<sup>2</sup> and further in case of human capital and capital labour ratio have positive association to provincial economic growth respectively. On the other hand, the result indicates (in case of expenditure decentralisation) that there exist spatial interaction effects, but has negative association with the provincial economic growth. In addition there exist no direct (feedback) and indirect (spillover) effects due to weak institutions<sup>3</sup> and lack of intra governmental competition which may increase the level of corruption, less accountability and lack of political vision of the people. In expenditure decentralisation human capital and capital labour ratio have positive association to provincial economic growth. The coefficient of spatial lag of dependent variable has negative association to economic growth (due to boarder effect), when one province income increase it may affect the income of other provinces negatively because investment and business activity move to that province which is economically grow and in this case economic growth in other provinces may fall.

There are few policy implications which construct from this study:

- (1) As our empirical results reveal that revenue decentralisation have positive direct and spillover effect on economic growth due to competition among the provincial government in given circumstances. Because by giving discretion to provincial government (in revenue generation) will increase the pace of economic growth in their region. Unfortunately, in 18th constitutional amendment many funds are move to provincial government but they are still in control of federal government. The Punjab government complaint against the federal government in Supreme Court that federal government is unwilling to handover its share.<sup>4</sup> 18th amendment gives the more autonomy to the provinces, which will leads to competition among the sub-national governments and this competition will leads to positive spillover. Therefore, it is the responsibility of federal government to move the resources to provinces, as determined under 18th amendment.
- (2) In case of expenditure decentralisation, it will be only effective when provinces have strong institutions, in which they have more administrative and accountability authority which leads to transparency, as a result, expenditure decentralisation can contribute positively to economic growth. Hence, Provinces government should take steps to teach and giving the training to

<sup>1</sup>Not concern either there is democratic or dictatorship in centre.

<sup>2</sup>Iqbal, *et al.* (2013) "Decentralisation of revenue generation responsibilities generates positive externalities which increase the per capita income of the country".

<sup>3</sup>Findings of Rodríguez-Pose, *et al.* (2009) and Iqbal (2013).

<sup>4</sup>*Dawn News* (02/April/2015) News link: <http://www.dawn.com/news/1173391>.

public officials in professional ethics, technical and administrative skills by different programs in order to get the significant positive impact of expenditure decentralisation on their economic growth.

### Limitation and Way Forward of the Study

Due to unavailability of data we are not able to extend our study at district level, in which more spatial variation can be captured and results would be become more versatile. In this study we used fiscal decentralisation as a proxy of decentralisation by ignoring the political and administrative decentralisation. In addition, data of provincial GDP is not collected officially at the provincial government<sup>5</sup> level, which is again an issue of reliability of data.

The research can be extended to find the spatial effect of fiscal decentralisation on health sector, poverty and income inequality.

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<sup>5</sup>Dawn News (04/Aug/2013) News link: <http://www.dawn.com/news/1033968>.

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## From Fiscal Decentralisation to Economic Growth: The Role of Complementary Institutions

IFTIKHAR AHMAD, MUHAMMAD ZEESHAN ARIF, and MAHMOOD KHALID

Decentralisation is theoretically expected to be a platform towards efficient provision of the local public goods and services. This is expected to boost economic growth due to efficient and effective utilisation of scarce fiscal resources. Nevertheless, the existing empirical studies present mixed results on this expected positive relationship among decentralisation and economic growth. Recently, the theories of fiscal federalism have also pressed upon the enabling environment for effective decentralisation; talking explicitly, an enabling institutional setup is required. The current study explores the complementarity between fiscal decentralisation and other institutions for stimulating growth and the study uses rich cross-country panel data for the period 1984 to 2012, covering both the developing and developed countries of the world. The results suggest that positive relationship exist between fiscal decentralisation and economic growth for the developed countries while evidence was not found in the case of developing countries. Further, it was found that fiscal decentralisation and quality institutions are complementary for economic growth.

*JEL Classification:* C22, H11, H77, O40

*Keywords:* Fiscal Decentralisation, Institutions, Economic Growth, Panel Data, unequally spaced panel data

### 1. INTRODUCTION

Over the past few decades, there is an increasing trend towards decentralisation. Federal system provides the working environment to both the federal and lower tiers of the government (i.e. sub-national governments) to function within their domain for the betterment of their people. The history of federalism relates back to the American state and after World War II this debate became even more popular around the world. Federalism was basically looked upon as a replacement for the Imperial system that was prevalent till early 19th century. Linking the history, 13 states of the US felt weaker to the British Empire after the World War II, hence joined hands as a federation to achieve the common goal i.e. independence from foreign occupation [Khalid (2013)]. This provided the world with a new system, where the responsibilities are shared among different tiers of government and the nation stands united.

The division of functions among different levels of government seems justified because the federal government bears the responsibility for issues that have a national

Iftikhar Ahmad <iftikhar@pide.org.pk> is Assistant Professor, Pakistan Institute of Development Economics (PIDE), Islamabad . Muhammad Zeeshan Arif is MPhil scholar, Pakistan Institute of Development Economics (PIDE), Islamabad. Mahmood Khalid <mahmood.khalid@pide.org.pk> is Research Economist, Pakistan Institute of Development Economics (PIDE), Islamabad

domain, while the lower tiers of government can focus mainly on her service provision role. Nevertheless, in many countries, the sub-national revenue sources are not sufficient to undertake the desired public services. Therefore, resource transfer from the top tier of government to lower tiers is essential for the increase in the welfare of the people at grass root level. In economic terms the national government is unable to achieve Pareto efficiency directly; instead the lower tiers of governments are the source of such efficiency because representatives are located near to their domain people and are cognizant of local preferences and needs. Thus decentralisation facilitates efficient resource allocation, thus leading to much bigger local participation, faster market development and this in turn improves economic growth.

Studying the literature of fiscal decentralisation, it is built on two important assumptions: (1) local governments are better placed than the national government to deliver community services as a result of information advantages regarding local preferences; through this, decentralisation will enhance economic efficiency (2) competition and population mobility among local governments in favour of better community services will ensure the convergence of preferences of local communities [Tiebout (1956)].

In terms of the First Generation (FG) Theory of fiscal decentralisation, it can enhance economic performance by ensuring economic proficiency regarding delivery of public services. These theories are based on different assumptions which favour local government for an optimal public financial system. The one presented by Hayek (1945) states that local government is in the better position to match the preferences of the local citizen. Similarly the idea of stabilisation, redistribution of income and efficient provision of public good has been given by Musgrave (1959). On the other hand, Olson (1969) gave the concept of "Fiscal Equivalence" in the process of fiscal decentralisation. Making a significant contribution, Oates (1972) supported the argument that the subnational government is in the position to deliver goods and services to local community according to their preferences. Hence, the FG theories discuss the positive implication of decentralisation and suggest that it will further enhance competition, efficiency and resultantly will promote economic growth.

Nevertheless, existing empirical studies present mixed effects of fiscal decentralisation (FD) on economic growth both in developing and developed countries. There are a number of studies indicating a positive relation between FD and economic growth [Martinez-Vazquez and McNab (2003); Malik, *et al.* (2006); Oates (1993); Oates (1995); Yilmaz (1999) and Thiessen (2003)] *inter alia*. Still there are many studies which have found insignificant or in certain cases even negative relationship between FD and economic growth.<sup>1</sup>

However, this gap between the theoretical and empirical results can still be explained from the literature. The SG theories are the extension of the FG theories of fiscal federalism that focus on the behaviour of the political agents in the political process. This work required to model the political institutions within the theories of fiscal decentralisation and also expands the literature on the problem like the asymmetric information, incentives and limitations of political processes [Vo. (2009)]. SG theories

<sup>1</sup>See for example Oates (1972); Oates (1985); Davoodi and Zou (1998); Baskaran and Feld (2009); Akai and Sakata (2002); Rahman, *et al.* (2012); Tanzi (1996).

also focused on many economic rationales like principal-agent problem, theory of contract, theory of firms [Oates (2005)]. Thus the SG theories explain that difference in results can emerge for even a similar policy undertaken in different political scenarios.

Further, there is a need to examine the role of relevant institutions and the presence of asymmetric information related to the success of the decentralisation process. Hence, well-managed institutions are the major policy handles through which decentralisation can influence long run economic growth objectives. In the words of Acemoglu and Robinson, “nations sometimes adopt inefficient institutions and achieve poverty”. Similarly North (1990) mentioned that “institutions are generally defined as the constraint that human beings impose on themselves”. Though, talking specifically of institutions; plethora of literature on the institutional mechanism is available that tried to explore the direct relationship between institutions and economic growth.<sup>2</sup> Yet very few studies have linked institutions with decentralisation and thus this study will make a contribution to the literature in this context.

### 1.1. Motivation of the Study

There is huge literature available on the fiscal decentralisation, as well as institutions for their impact on economic growth, only a few studies<sup>3</sup> have looked at their interaction and the corresponding impact on economic growth. Thus there is a need to analyse the situation for the fact that whether it is the ‘fiscal decentralisation’ or ‘institutions’ in isolation for considering the impact on the economic growth or these are complements to each other. Hence, there is need to contribute to the existing literature by providing evidence about the role of institutions in the effectiveness of the fiscal decentralisation process.

This study tries to explore the effectiveness of fiscal decentralisation, while relating it to the quality of institutions. Main questions that this study seeks to find answers are: Does fiscal decentralisation attains the objective of enhancing economic growth? Does the role of complementary institutions matter to enhance the economic growth of the country? Does incorporating the role of other institutions into the model help us find explanation for otherwise unexpected results?

Overall, the contribution of this study is in finding out the empirical relationship regarding the effectiveness of fiscal decentralisation considering the role of other<sup>4</sup> complementary institutions in developing and developed countries. Complementary institution, i.e. quality of governance is considered for this study and two proxies including “control over corruption” and “democratic accountability” are used to represent it. This study targets to find out that whether or not the differences in institutional quality has resulted in differing results related to the effect of fiscal decentralisation on economic growth. Thus, this study will examine the role of fiscal decentralisation and complementary institution in achieving higher economic growth.

<sup>2</sup>See for example Acemoglu, *et al.* (2006); Rodrik, *et al.* (2004); Sarwar, *et al.* (2013); Vijayaraghavan and Ward; Kalonda, *et al.* (2014); Potrafke (2011); Knack and Keefer (1995); Nawaz (2015); Ahmad and Hall (2012).

<sup>3</sup>Like, Iqbal, *et al.* (2013) focused on the role of democratic institution on the process of FD in single country case. Iimi (2005) also tested the hypothesis with international cross sectional data that political freedom and fiscal decentralisation are complementary.

<sup>4</sup>Because decentralised set up, too, represent a specific institution.

Specifically, the objectives of this study are:

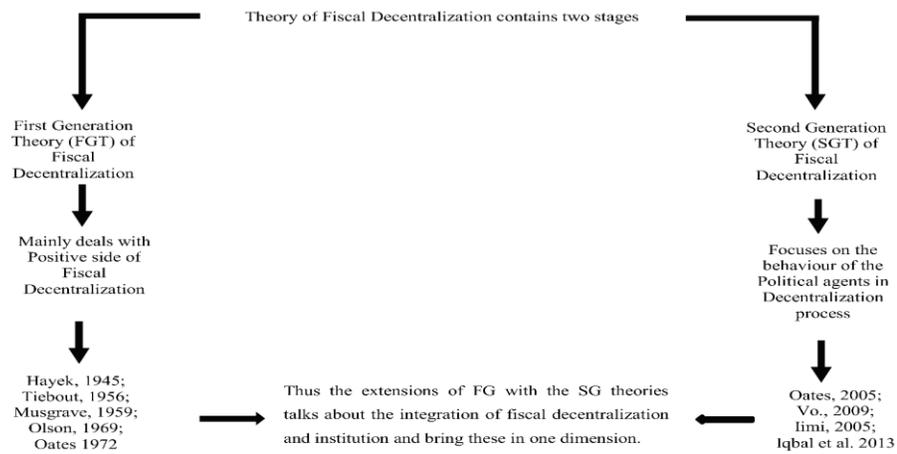
- (i) To investigate the relationships between the fiscal decentralisation and economic growth using the recently available rich cross country panel data.<sup>5</sup>
- (ii) To analyse the role of complementary institutions in materialising the link between fiscal decentralisation and economic growth.

This study improves onto the existing literature by analysing the role of institutions in the effectiveness of fiscal decentralisation, which, ultimately is believed to lead towards economic growth. Current study takes benefit from World Bank's panel data regarding the fiscal decentralisation indicators that is recently made available. Given study is based upon the endogenous growth model and used appropriate econometric technique like Baltagi and Wu (1999) that especially deals with unequally spaced panel data. In addition, this study also yield some policy suggestions on the basis of the results analysing that whether fiscal decentralisation and quality of governance are complementary so as to bring better economic growth.

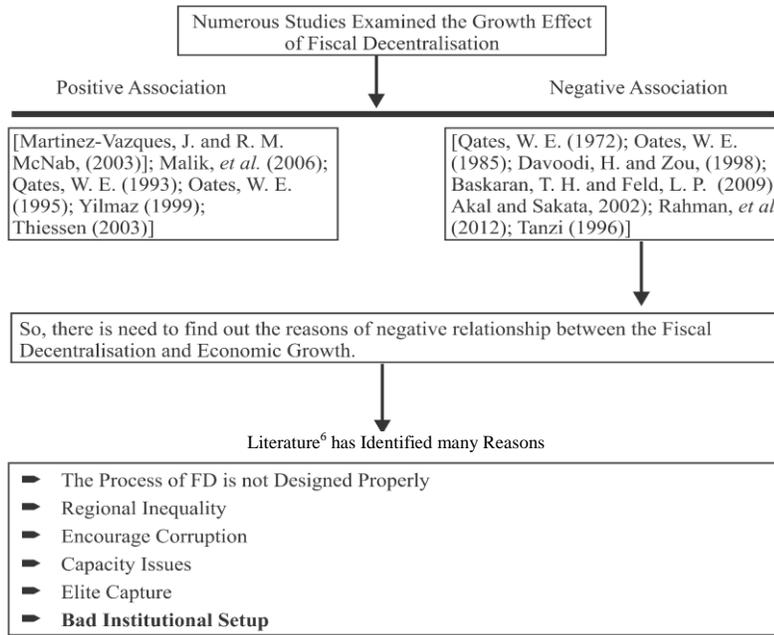
The rest of the paper is organised as follows: Section 2 summarises the literature concerned with the growth effect of Fiscal Decentralisation and Institutions. The 3<sup>rd</sup> section of this study presents the theoretical link. Section 4 contains econometric model, empirical methodology and data. Section 5 includes result and discussion, while, Section 6 contains conclusion of the study and presents the major policy implications.

## 2. LITERATURE REVIEW

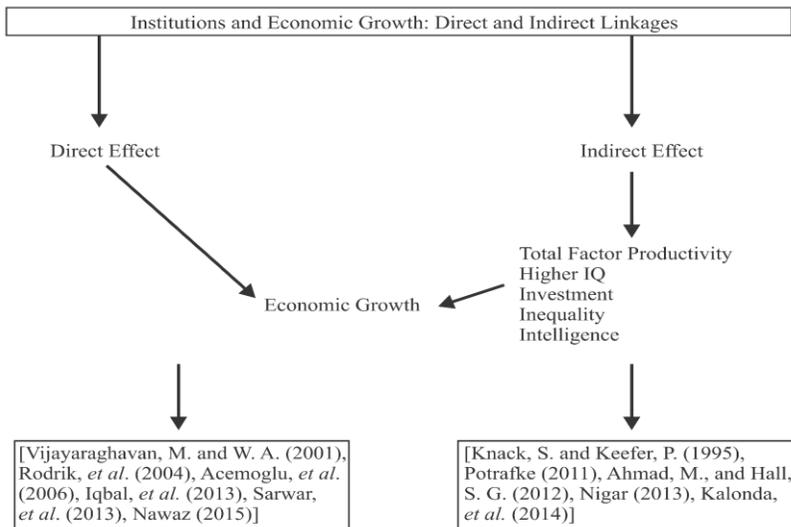
In recent decades, the rapid rise in the sovereignty and responsibilities of sub-national government tiers are one of the most notable trends in governance, especially in emerging and transition economies. There is decent literature available examining the growth effects for different countries emerging through fiscal decentralisation. The overtime development suggested in the literature can be summarised in figure as below:



<sup>5</sup>The previous version of the GFS was contained the data from 1972 to 2012 but current study is using rich cross country data from the period 1972 to 2014. As this study incorporates institutions and the data on institutions is available from 1984 to 2012 for this reason current study is using same time period.



All these risks are discussed in the Second Generation Theories (SG) of fiscal federalism that has emerged as the sufficient condition for the success of fiscal decentralisation process. It is obvious that Institutions play vital role on the domestic economic environment ensuring political stability, high stock of social capital, protection of property rights, well-organised judiciary system, low risk of expropriation [Jutting (2003)]. So the body of literature determined the economic growth-institutions nexus directly and indirectly.



<sup>6</sup>[Oates, W. E (1972); Oates, W. E (1985); Davoodi, H. and H. Zou (1998); Baskaran, T. H. and Feld, L. P. (2009); Akai and Sakata (2002); Rahman, et al. (2012); Tanzi (1996); Iqbal, et al. (2013)].

On the basis of presented literature review, this section come up with the conclusion that the under lying causes of the weak or no relationship between FD and economic growth are imbedded in weak economic, cultural, geographical and institutional setup. Hence, one of the major constraints in the FD process to promote economic growth is weak institutions. Without effective institutions, growth process of the country is difficult to run in the way desired. Therefore, current study incorporates institutions in the growth enhancing process of the fiscal decentralisation and tries to fill the missing gap.

### 3. THEORETICAL MODEL

The discussion in the previous section shows that the fiscal decentralisation and economic growth nexus needs more effort to get explained. The growth effect of fiscal decentralisation can realise from both the direct and indirect channels. So, on the basis of the previous section, a theoretical model is developed here to conceptualise the relationship between the fiscal decentralisation and economic growth, incorporating the role of complementary institutions in the process.

#### 3.1. Decentralisation Categories

Decentralisation is the process of transfer of authorities and responsibilities from national to sub-national government. According to the definition, there are three categories of decentralisation.

(i) Political decentralisation, (ii) Administrative decentralisation, (iii) Fiscal decentralisation

Political decentralisation is how opinion of citizens is unified into policy decision, and how civil society can hold powers and officials to account at the different levels of the government. Similarly, administrative decentralisation is how responsibilities and authorities for policies and decisions are shared among different level of the government. While, fiscal decentralisation is how expenditure, revenues and borrowing shared among different level of the government. To keep the comparison with other studies simple, this study uses the 3rd definition namely fiscal decentralisation and theoretical model is presented as below.

#### 3.2. Theoretical Explanation

In this study, endogenous growth model has been used to capture the impact of fiscal decentralisation and economic growth. Davoodi and Zou (1998) explained how fiscal decentralisation can be instrumental for economic growth. By using the same model, the said study extended Barro's (1990) endogenous growth model by assuming that public spending is carried out by three level of government: federal, local and state. The level of fiscal decentralisation is defined as the ratio of spending by the subnational government to total government spending i.e. Fiscal decentralisation increases if spending by state and local government rises relative to spending by the federal government [Davoodi and Zou (1998)]. Current study further extends the Davoodi and Zou (1998) model by including other institutions in the productions function, assuming that fiscal decentralisation and institutions are complementary. If institutional quality is better than the process of fiscal decentralisation can be effective and ultimately promote growth.

#### 4. EMPIRICAL METHODOLOGY AND DATA

The objective of this section is to design the econometric model which is based on the theoretical model. Moreover, an empirical methodology is used to test the hypotheses of the model developed to examine the relationship between fiscal decentralisation and economic growth.

##### 4.1. Estimation Model

The relationship between fiscal decentralisation and economic growth elaborated in the last section helps us to develop the empirical version of the model. It is noteworthy that the contribution of this study is that it introduces institutional quality to the Davoodi and Zou (1998) model in judging the enabling environment for fiscal decentralisation for it being effective. The main assumption of this study is that without the role of institution, the benefits of the fiscal decentralisation will remain limited. So, to capture the true impact of fiscal decentralisation, this study will incorporate the quality institutions playing a complementary role in the process of fiscal decentralisation using data from developed and developing countries.

It is important to note here that Iimi (2005) have used this framework by using the interactive term of fiscal decentralisation and political freedom in the model. This study will instead use the two main variants of the existence of good institutions (i.e. Control over corruption, Democratic accountability) and accordingly their interaction term with fiscal decentralisation will be considered to analyse the effectiveness of fiscal decentralisation for better economic growth. The empirical equation to analyse the model for fiscal decentralisation, institution and economic growth can be defined as:

$$g_{it} = \beta_0 + \beta_1 GE_{it} + \beta_2 FD_{it} + \beta_3 INS_{ikt} + \beta_4 FD_{it} * INS_{ikt} + \beta_5 X_{it} + u_{it} \quad \dots \quad (4.1)$$

Where  $i$  ( $=1 \dots I$ ) and  $t$  ( $=1 \dots N$ ) refers to the country  $i$  at time  $t$ ;  $I$  denotes the number of the countries while  $N$  represents the time period;  $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  are the scalar parameters;  $g_{it}$  is the GDP per capita growth rate for country  $i$  at time  $t$ ,  $GE$  is the government expenditure as percentage of GDP.  $FD_{it}$  represent the measures of fiscal decentralisation,  $INS_{ikt}$  represents variables for institutional quality ( $k$  indicates the above mentioned two distinct variables) and lastly  $X$  indicates the vector of other key control variables affecting growth.  $U_{it}$  is the error term while  $X$  consists of the variables i.e. *trade openness, human capital, physical capital, inflation, growth rate of population and urbanisation*. In this model the interaction term  $FD*INS$  is the focus of attention and allow us to test the hypothesis that whether or not fiscal decentralisation and institution are complementary. So, this study ends up with given equation for the analysis. Further, the control variables included in this model are those that have been used in the literature as identified by Mankiw, *et al.* (1992), Levine and Renelt (1992), Barro and Lee (1996) Nawaz (2015) Martinez-Vazquez and McNab (2001).

Table 4.1 provides basic definitions for each variable alongside the sources of data. While expected relationship of explanatory variables with economic growth are elaborated in Section 4.2.

## 4.2. Relationship of Explanatory Variables with Economic Growth

### Fiscal Decentralisation

In this current study, our main variable of interest is fiscal decentralisation. When policy regarding the resource allocation is better it will positively affect the GDP per capita. Current study has used Expenditure approach (ED) to measure fiscal decentralisation which is captured as a ratio of sub-national government share of expenditure to total government expenditure (national plus sub-national). This indicator has been used in multiple studies to quantify the effect of FD.<sup>7</sup>

### Government Expenditure

Government expenditure is the basic explanatory variable of the FD model. Government expenditure is measured as the percentage of GDP and the expected sign is positive.

### Institutional Quality

Institutional quality is expected to positively affect economic growth. This is our main variable and it is considered as the powerful tool behind the economic growth. Better institutional quality helps the country to catch the path of the economic development. Current study used two proxies to capture the true picture of institutional quality. These proxies are 'control over corruption' and 'democratic accountability'. Multiple studies have found and confirmed the positive relationship.<sup>8</sup> Jointly these proxies are expected to give us an appropriate environment for growth and stability of the country.

### FD\*INS

The interaction term will show the complementarity between the institutions, and FD. FD, if combined with better institutions is expected to deliver better results and hence the interaction term will capture the effect of this interaction on the economic growth. However the positive relationship depends both on FD and IQ measures. If institutional quality is low it will worsen the impact on the economic growth and vice versa. On the other side, due to the issues in the FD, economic growth may not get improved. Therefore, it is necessary to look at the interaction / joint impact of (FD x INS) on the economic growth.

The vector  $X_{it}$  consists of a set of independent variables which is identified by many authors<sup>9</sup> as the important control variables for the cross country growth regression.

### Inflation

Inflation can bring both the negative and positive influence on the economic growth. There are two schools of thought on the relationship between inflation and economic growth. One argues that there is negative relationship between the two on the basis of Real Business Cycle (RBC) theories. Kydland and Prescott (1990) argued that supply shocks are responsible for the negative relationship rather the demand shocks and

<sup>7</sup>See for example Davoodi and Zou (1998); Iimi (2005); Rodríguez-pose and Krøijer (2009).

<sup>8</sup>See for example Acemoglu, *et al.* (2004); Hall and Jones (1999); Knack and Keefer (1995); Rodrik, *et al.* (2004); Nawaz (2015); Nigar (2013).

<sup>9</sup>See for example Levine and Renelt (1992); Davoodi and Zou (1998); Iimi (2005); Iqbal, *et al.* (2013); Nawaz (2015); Martinez-Vazquez and McNab (2001).

argued that after the certain threshold level, inflation is harmful for the growth. While the other school of thought, argues that inflation can influence positive on the economic growth the said positive relationship is based on the Philips curve [see e.g. Paul, *et al.* (1997) and Mallik and Chowdhury (2001)]. So, the study will reveal whether inflation causes positive or negative effect on the economic growth.

### Human Capital

Human capital is measured by using secondary school enrolment gross percentage without using age and gender configuration and expected sign of the human capital is positive.

### Physical Capital

Physical capital is measured by gross fixed capital formation as percentage of GDP and expected sign is positive. Thus, the physical capital promotes economic growth.

Table 4.1

*Variables Names, Definition and Sources of Data*

| Variable  | Names      | Definition   | Source  |
|---|------------|--|---|
| Dependent Variable                                  | $g_u$      | GDP per capita growth rate (annual %)  | World Development Indicator (WDI)                 |
| <b>List of independent Variable</b>                 |            |  |   |
| Expenditure Decentralisation Government Expenditure | $fd_{exp}$ | Percentage of Sub-National Expenditure/ Expenditure(National plus sub-national)  | Total IMF- Government Financial Statistics        |
| Trade Openness                                      | $Ge$       | Government expenditure as % of GDP   | World Development Indicator (WDI)                 |
| Human Capital                                       | $Op$       | (Imports plus Exports) as % of GDP   | World Development Indicator (WDI)                 |
| Physical Capital                                    | $Hc$       | School enrolment, secondary (% gross)  | World Development Indicator (WDI)                 |
| Inflation   | $K$        | Gross fixed capital formation as % of GDP  | World Development Indicator (WDI)                 |
| Growth rate of population                           | $Inf$      | % change in CPI (consumer price index) annual  | World Development Indicator (WDI)                 |
| Urbanisation  | $pgr$      | Population growth % (annual)   | World Development Indicator (WDI)                 |
| Control Corruption                                  | $urb$      | Urban population as % of total   | World Development Indicator (WDI)                 |
| Over Cc   |            | <i>"This is an assessment of corruption within the political system that causes distortion in the economic and financial system, reduces the efficiency of public as well as private sector by enabling the people to hold positions of power through patronage rather than ability and creates instability in political system. Ranges between 0 (very high risk) and 6 (very low risk)".</i> ICRG Definition | PRS Group International Country Risk Guide (ICRG) |
| Democratic accountability                           | $Da$       | <i>This is an assessment of how responsive government is to its people, by assuming that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. Ranges between 0 (very high risk) and 6 (very low risk).</i> ICRG Definition  | PRS Group International Country Risk Guide (ICRG) |

**Openness**

Trade openness is defined as the total trade (i.e. sum of the Import and Export) as percentage of GDP and it is expected that due to the trade openness economic growth will stimulate.

**Urbanisation**

Urban population enjoy better infrastructure and facilities as compared to rural population. Urbanisation is defined as the urban population as percentage total population and it is expected to have positive effect on the GDP growth rate per capita.

**Population Growth Rate**

Population growth rate is also used in the regression equation to find its effects on the GDP growth.

**4.3. Data**

For the sample selection at cross country level, data availability played an important role. In year 2014 the World Bank launched a rich cross country data of the fiscal decentralisation indicators providing observations from 1972-2014; however, the data coverage is not universal. However, as discussed earlier, this study also incorporates institutions in the process of the FD as suggested by the SG theory of fiscal federalism. But the data for institutions is available for countries ranging from 1984 to 2012 therefore, the same data range to be used for this study's. On the progressive sideway, the availability of new rich cross country panel data provides a chance to outspread research on this topic and helps in re-estimating the evidence with upgraded data.

The updated fiscal decentralisation dataset gives the information for 96 countries. However, due to the unavailability of data for other indicators, current study end up with 43 countries which includes 29 developed counties and 14 developing countries. The list of the sample countries included in the Table A1, at Appendix. The sample countries are not the same but nearly similar to that used by the prior studies [Davoodi and Zou (1998); Iimi (2005)]. Current study combined the two groups (lower middle income and upper middle income) countries into one sub-group i.e. "Developing Countries". The other group contained the High income OECD countries refer to as "Developed Countries".

This study has used unbalanced panel data set because for some countries there were gaps within the series. The main variable (i.e. Fiscal Decentralisation) has gaps within the series, though rest of the indicators are complete/balanced including the dependent variable. Missing values within the fiscal decentralisation indicator leaves us with the unbalanced panel data. The data sources for variables are the World development indicators published by the World Bank. To measure the quality of institution, this study uses different indicators of the institution from the ICRG data set and Government Financial Statistics (GFS).

**4.4. Estimation Methodology**

Using extensive data set for this study have both benefits and risks. Benefits can be mentioned as the rich and improved data coverage across the countries and time while

issue can be highlighted as the missing observations in the series resulting in unbalanced panel for available countries. Moreover, the differences exist in the countries due to level of; basic infrastructure, development, endowments, public preferences, governance etc. However, panel data methodology is able to cater with these kinds of issues and is used universally to conduct the policy analyses.

There are number of the estimation methods available to calculate the panel data sets which can handle the cross country heterogeneity. As highlighted by Akai and Sakata (2002), a critical problem with panel data is that it is difficult to measure the cultural and institutional differences among countries. Evidently, high income countries have higher degree of development and governance than low income countries while growth rate in developed countries is also relatively high as compare to developing countries. What is right between “Fixed effect” and “Random effect” model, the Hausman Specification Test was conducted and the evidence suggested that result of fixed effects model is consistent and efficient. So, the current study uses “Fixed effect” to capture the individual cross country differences.

There are many methods with balanced panel to capture the growth effect of fiscal decentralisation with different scenario but based on the given information to tackle the unbalanced panel data, which has missing observation issue, the one to fit best can be pointed out as the Baltagi and Wu (1999) method for the analysis. The Baltagi and Wu (1999) method is specially designed for the unbalanced panel. This method can give better results when disturbance term is first order autoregressive and can estimate both the fixed effects and random effects models. The estimator also account for the panel heteroscedasticity and for the panel specific error autocorrelation. Therefore, the Baltagi and Wu (1999) model suites this data set the best.

## 5. RESULTS AND DISCUSSION

Empirical results for the estimation of the different institutional indicators and fiscal decentralisation measures on the GDP per capita growth rate are shown in the Tables 5.1 and 5.2. The discussion about the Baltagi and Wu (1999) models with FE and AR 1 disturbance are in more detail below.

### 5.1. Fixed Effect Estimation Result

The results for the effect of the Fiscal Decentralisation indicator with institutions indicators on the economic growth are discussed as under. The main focus remains on the variables of interest, while the set of the other explanatory variables are discussed at the end. For the analysis, two regression models are run for the each set of the FD and institutions measures. The models 1, 3 include two indicators (FD and Institutions) separately while the others models 2, 4 include the relevant interaction terms to check the complementarities between the two for economic growth.

#### 5.1.1. Estimation Result with Control over Corruption

Tables (5.1) and (5.2) report the empirical result of the Fiscal decentralisation with control over corruption on the economic growth. The impact of the fiscal decentralisation on the economic growth is captured by using FD measure both on developing and developed communities. Empirical evidence in Table (5.1) presents the expenditure

decentralisation with control over corruption. Result showed that expenditure decentralisation as well as control over corruption is positively and significantly related with the growth rate of per capita GDP in developed countries.

The findings suggest that control over corruption i.e. better institutional framework scales up the economic events. When the corruption is minimum, the political and bureaucratic system helps in economic growth. Our findings are in conformity with the literature e.g. Mauro, (1995) and Podobnik, *et al.* (2008). Adding interaction term in model 2 of expenditure decentralisation, the coefficient of this interaction term has positive and significant effect. This indication is in the favour of the developed countries and also supported the proposition that fiscal decentralisation and control over corruption are complementary. This shows that the process of fiscal decentralisation is effective when control over corruption is high in the economies.

Talking about the developing countries, the results seem different. Expenditure decentralisation has significantly negative impact on the EG. This negative association implies that the expenditure decentralisation has growth retarding impact in the developing countries. This result is divergent to what was expected from the expenditure decentralisation theory. However, Davoodi and Zou (1998) found similar results for the emerging economies. Control over corruption indicator shows the positive and significant result on the economic growth separately. By adding, the interaction term in the model 2, Table (5.2), show that there is negative association between the interaction term and economic growth. This negative association tells us that in the developing expenditure decentralisation and control over corruption are not complementary and not helping each other. The reason of this negative relationship is that the developing countries have less control over corruption and officials are involved in the rent seeking activities.

### **5.1.2. Estimation Result with Democratic Accountability**

With strong democratic institutions, fiscal decentralisation can positively affect the economic growth. Current study find the interactive term of FD with democratic accountability. The estimation results indicate that expenditure decentralisation has positive and significant impact on the economic growth for the developed countries. Democratic accountability also showed positive and significant association with the growth rate of per capita GDP in Table 5.1, model 3 and 4. This positive result indicates that those countries with strong democratic institutions are performing well. Helliwell, (1994), Nawaz (2015) and Rodrik, (2000) have found same result as this study found. Rodrik, (2000) argued that presence of strong democratic institutions the countries can stimulate economic growth by allowing accountability and stability in the system. However, the coefficient of the interactive term shows negative result when added the interaction term in the model. Therefore, the result is not supportive of the expectation that democratic accountability as being significantly complementary in catalysing the growth effect of fiscal decentralisation.

The estimation result for the developing countries in the expenditure decentralisation model 3 showed that expenditure decentralisation and democratic accountability have negative and significant association with the economic growth rate, without adding the interaction term in the model. With the weak democratic institutions, the officials and the politicians have lesser checks on their authority and through this

these officials and politicians can easily engage in the rent seeking activities. By addition the interaction term of FD and DA in the model 4 the result seems to be different. The coefficient of the interaction term becomes negative and insignificant.

### **5.1.3. Reasons of the negative effect of the Expenditure Decentralisation and Democratic Accountability on the Economic Growth**

The reasons of the negative sign of the expenditure decentralisation are that in the developing countries the provincial governments allocates excessive amount to the current expenditure instead of the capital and infrastructure outlay. Secondly, the decision of the provincial government about the spending does not always ensure efficiency and this result in unproductive outcomes. Third, there is the lack of the commitment in the both the governments (national and sub-national) about the expenditure. Fourth, provincial governments may have inefficient policies about the administrative training programs and also lack of the appropriate physical and human resources. Fifth, inappropriate revenue transfer is carried out among sub-national tiers of the government by using the central government tax instrument. Finally, the sub-national tiers of the governments have lack of the institutional infrastructure and they often lack the institutional setup to control corruption, ensure accountability and rent seeking activities which negatively impacts the economic growth.

There are other angles of the analysis as well. The negative effect of the democratic accountability can be interpreted as the excessive liberty of the people makes it harder for the sub-national tiers to internalise the economies of scale in local public goods provisions. Further, the elected office-holders are more accountable for the local population; this might hamper the policy coordination and collaboration among the office holders. Iimi (2005) found similar result of interaction of FD and Political freedom and concluded that FD and political freedom are not complementary. It is noteworthy that Iimi (2005) showed the political freedom in term of accountability. This is the reason of the non-complementarity between the fiscal decentralisation and democratic accountability.

After discussing the main variables of concern, the other control variables are also explained here. An increase in the public spending slows the economic growth both in developed and emerging economies. Iimi, (2005) showed similar result with tax to GDP ratio and conclude that higher tax to GDP ratio slows down the economic growth. Moreover, it is showed in the basic growth theory that higher population leads to lower GDP growth rate of per capita. So, current study also showed negative impact of the population growth rate on GDP per capita growth rate for the developed countries. Mahyudin and Hall (2012), Iimi (2005) and Davoodi and Zou, (1998) showed same result of negative relationship between the two. Physical capital is positively associated with growth rate of per capita. The current study also showed positive result between physical capital and GDP growth rate of per capita in the developed communities, implying that the countries can increase GDP per capita growth rate by investing more in the physical capital. Iqbal, *et al.* (2013) and Nawaz (2015) also presented similar impact on the GDP growth rate of per capita. For the developing countries, physical capital has negative significant impact on the growth rate per capita. This is the indication that the developing countries have less attention on the physical capital. The trade openness has significant

and positive impact on the economic growth rate per capita implying that trade is beneficial for the economies. This positive relation is associated with the benefits evolving from competition, economies of scale and specialisation. Multiple studies provided same result of this positive relationship [Iqbal, *et al.* (2013), Iqbal and Zaid (1998)]. Human capital is the determinant of the economic growth and theoretically have positive association between the two but current study found significant negative relationship between human capital and economic growth in the developing countries and insignificant for the developed countries. Rest of the independent variables i.e. (inflation and urbanisation) were found insignificant result.

Table 5.1  
Result for the Effect of Fiscal Decentralisation on Economic  
Growth in Developed Countries

| Dependent Variable: GDP per<br>capita Growth Rate (annual %)<br>Variables | Control Over<br>Corruption |            | Democratic<br>Accountability |            |
|---|----------------------------|------------|------------------------------|------------|
|   | Model 1                    | Model 2    | Model 3                      | Model 4    |
| <i>Fdexp</i>  | 0.0719*                    | 0.0063**   | 0.0531                       | 0.7982***  |
| <i>Cc</i>   | 0.3634*                    | 0.1070*    |                              |            |
| <i>fdexp*cc</i>   |                            | 0.0221*    |                              |            |
| <i>Da</i>   |                            |            | 0.8732*                      | 3.7915***  |
| <i>fdexp*da</i>   |                            |            |                              | -0.1265*** |
| <i>Ge</i>   | -1.0116***                 | -1.0086*** | -1.0751***                   | -1.1874*** |
| <i>K</i>  | 0.4225***                  | 0.4337***  | 0.4197***                    | 0.3396***  |
| <i>Op</i>   | 0.0569***                  | 0.0575***  | 0.0494***                    | 0.0439***  |
| <i>Pgr</i>  | -2.4752***                 | -2.4749*** | -2.5203***                   | -2.4842*** |
| <i>Hc</i>   | 0.0265                     | 0.0258     | 0.0253                       | 0.0062     |
| <i>Inf</i>  | -0.0303                    | -0.0300    | -0.0162                      | -0.0393    |
| <i>Urb</i>  | -0.0429                    | -0.0415    | -0.0543                      | -0.1493*   |
| <i>Constant</i>   | 5.5091**                   | 6.5693**   | 5.3302**                     | 0.4894     |
| <i>Total Obs.</i>   | 376                        | 376        | 376                          | 376        |
| <i>Countries</i>  | 29                         | 29         | 29                           | 29         |
| <i>Minimum Obs.</i>   | 5                          | 5          | 5                            | 5          |
| <i>Average Obs.</i>   | 12.9655                    | 12.9655    | 12.9655                      | 12.9655    |
| <i>Maximum Obs.</i>   | 16                         | 16         | 16                           | 16         |
| <i>R-Square</i>   | 0.32                       | 0.33       | 0.33                         | 0.34       |
| <i>Hausman test</i>   | 100.40                     | 113.83     | 130.46                       | 143.73     |
| <i>chi2 (P-value)</i>   | 0.0000                     | 0.0000     | 0.0000                       | 0.0000     |

legend: \*p<.1; \*\*p<.05;\*\*\*p<.01

#Fixed effects model estimated with Baltagi and Wu (1999), between cluster robust standard errors along with AR1 errors.

Table 5.2  
 Result for the Effect of Fiscal Decentralisation on Economic  
 Growth in Developing Countries

| Dependent Variable: GDP per<br>capita Growth Rate (%) | Control Over<br>Corruption |            | Democratic<br>Accountability |            |
|---|----------------------------|------------|------------------------------|------------|
|   | Model 1                    | Model 2    | Model 3                      | Model 4    |
| <i>Fdexp</i>  | 0.0244                     | -0.6662**  | -0.0003*                     | 0.0362     |
| <i>Cc</i>   | 0.9680**                   | 0.0856***  |                              |            |
| <i>fdexp*cc</i>                                       |                            | -0.2344*   |                              |            |
| <i>Da</i>   |                            |            | -3.4498*                     | -3.2422    |
| <i>fdexp*da</i>                                       |                            |            |                              | -0.0081    |
| <i>Ge</i>   | -1.8286***                 | -1.7658*** | -1.9840***                   | -1.9939*** |
| <i>K</i>  | 0.0661                     | 0.0267     | -0.1213*                     | -0.1207*   |
| <i>Op</i>   | 0.1553**                   | 0.1641**   | 0.1815**                     | 0.1825**   |
| <i>Pgr</i>  | -2.2528                    | -3.1478    | -1.3791                      | -1.3862    |
| <i>Hc</i>   | -0.1433                    | -0.1316    | -0.3360**                    | -0.3359**  |
| <i>Inf</i>  | -0.1928                    | -0.1899    | -0.0256                      | -0.0314    |
| <i>Urb</i>  | -0.1535                    | -0.1803    | 0.6661                       | 0.6495     |
| <i>Constant</i>                                       | 30.1426                    | 13.9130    | 25.0961*                     | 25.2585*   |
| <i>Total Obs.</i>                                     | 75                         | 75         | 75                           | 75         |
| <i>Countries</i>                                      | 14                         | 14         | 14                           | 14         |
| <i>Minimum Obs.</i>                                   | 1                          | 1          | 1                            | 1          |
| <i>Average Obs.</i>                                   | 6.25                       | 6.25       | 6.25                         | 6.25       |
| <i>Maximum Obs.</i>                                   | 12                         | 12         | 12                           | 12         |
| <i>R-Square</i>                                       | 0.39                       | 0.41       | 0.37                         | 0.37       |
| <i>Hausman test</i>                                   | 21.88                      | 25.65      | 18.35                        | 15.25      |
| <i>chi2 (P-value)</i>                                 | 0.0093                     | 0.0042     | 0.0313                       | 0.0844     |

legend: \*p<.1; \*\*p<.05; \*\*\*p<.01

#Fixed effects model estimated with Baltagi and Wu (1999), between cluster robust standard errors along with AR1 error.

## 6. CONCLUSION AND POLICY IMPLICATIONS

The relationship between the fiscal decentralisation and economic growth has significant consideration from the previous years. Multiple studies have shown positive as well as negative impact of the fiscal decentralisation on the economic growth. Therefore, current study examined the growth effect of fiscal by using endogenous growth model.

Institutions plays significant role in the way of development corridor. Thus, current study incorporates different institutional measures in the process of fiscal decentralisation as suggested by SG theories of fiscal federalism and these measures are: control over corruption and democratic accountability. Current study used rich cross country panel data of 43 countries including 29 developed and 14 developing countries over the period 1984-2012, using unbalanced panel method given by Baltagi and Wu (1999) to investigate whether fiscal decentralisation has any growth impact and whether fiscal decentralisation and institutions are complementary.

The empirical examination shows that expenditure decentralisation is growth enhancing for the developed country but has no effect for the developing world. Decentralisation in responsibilities creates positive externalities and due to this positive externalities per capita income of the countries increases. It is concluded that fiscal decentralisation are instrumental in promoting economic growth for the developed countries. Furthermore, the analysis reveals that the impact of control over corruption on the economic growth is significantly positive both for the transition and developed economies while democratic accountability has positive association with economic growth for the developed countries and support for the growth enhancing strategies but not for the developing countries.

Moreover, analysis shows that the process of fiscal decentralisation effective in the development process if it is complemented with institutions. Therefore, it is showed that the control over corruption and fiscal decentralisation both are complementary for the developed countries not for the developing countries and non-complementarity exists between fiscal decentralisation and democratic accountability.

Furthermore, current study want to draw attention for the policy implication and the policy implication are: First, Developing countries should allocate excessive amount to the development and infrastructure project instead of the current expenditure. Therefore, the benefit of the fiscal decentralisation can achieve for the long term economic growth. Secondly, for the high and sustainable development of the developing the institutional quality needs to be strengthened. Thirdly, countries should make officials accountable without bargaining their ability to work and should focus on attention for the stable government policies. Fourth, Developing countries should specially focus on the corruption and should take step to control over corruption. Fifth, developing countries should broaden the tax base, due to this the capacity of revenue generation increase and it will also help to increase the documentation process in the country.

## APPENDIX

Table-A1

## List of Sample Countries

| Sr. No. | Name of the Countries | Sr. No. | Name of the Countries |
|---------|-----------------------|---------|-----------------------|
| 1       | Argentina             | 23      | Italy                 |
| 2       | Australia             | 24      | Jamaica               |
| 3       | Austria               | 25      | Japan                 |
| 4       | Belgium               | 26      | Lithuania             |
| 5       | Bolivia               | 27      | Luxembourg            |
| 6       | Canada                | 28      | Malta                 |
| 7       | Chile                 | 29      | Morocco               |
| 8       | Columbia              | 30      | Netherlands           |
| 9       | Congo, Rep.           | 31      | New Zealand           |
| 10      | Cyprus                | 32      | Norway                |
| 11      | Denmark               | 33      | Poland                |
| 12      | El Salvador           | 34      | Portugal              |
| 13      | Estonia               | 35      | Romania               |
| 14      | Finland               | 36      | Russian Federation    |
| 15      | France                | 37      | South Africa          |
| 16      | Germany               | 38      | Spain                 |
| 17      | Greece                | 39      | Sweden                |
| 18      | Honduras              | 40      | Switzerland           |
| 19      | Hungary               | 41      | Turkey                |
| 20      | Iceland               | 42      | United Kingdom        |
| 21      | Ireland               | 43      | United States         |
| 22      | Israel                |         |                       |

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## Does Fiscal Decentralisation Matter for Poverty and Income Inequality in Pakistan?

SEHRISH SHAHZAD and BUSHRA YASMIN

This study endeavours to investigate the impact of fiscal decentralisation on the welfare concerns of poverty, and income inequality in Pakistan for the time period 1972 to 2013. In order to capture the multi-dimensional nature of fiscal decentralisation, three indicators are used namely; revenue decentralisation, expenditure decentralisation and composite decentralisation. Further, the role of institutional quality is also incorporated in apprehending the responsiveness of welfare issues towards the process of fiscal decentralisation. The estimation technique of Generalised Method of Moments (GMM) is employed for estimating the impact of fiscal decentralisation on poverty and income inequality. The empirical findings suggest that fiscal decentralisation has discretely resulted in increasing poverty and income inequality in Pakistan, but the presence of better institutional quality along with fiscal decentralisation can promise to mitigate the negative consequences of fiscal decentralisation for poverty and income inequality in Pakistan. Although, the indirect effect of fiscal decentralisation on welfare concerns, through institutional quality exhibits a fluctuating trend over time, but its average marginal effect is lower than the direct effect of fiscal decentralisation on welfare concerns. Hence, it can be perceived that the log-run welfare issues can be tackled effectively in the presence of institutional quality with a rational level of fiscal decentralisation. Also in order to reap the potential benefits of fiscal decentralisation for poverty and income inequality that has remained a catastrophe in case of Pakistan.

*JEL Classification:* I3, O23 H53

*Keywords:* Fiscal Decentralisation, Welfare

### 1. INTRODUCTION

The welfare issues like poverty and income inequality have remained the key objectives of policy makers and it has regained the attention, since the adoption of Millennium Development Goals (MDG) (2000). In order to combat poverty and income inequality, a reasonable progress has been made in devising the development policies. Yet, almost a billion people in the world continue to be in miserable poverty, and are facing severe income disparities. In order to improve the living conditions of the poor, the nature, causes and consequences of poverty and income inequality has become an overwhelming matter of concern and a priority research area.

Sehrish Shahzad is M.Phil. Graduate, Department of Economics, Fatima Jinnah Women University, Rawalpindi. Bushra Yasmin <bushrayasmin@yahoo.com> is Associate Professor/Chairperson, Department of Economics, Fatima Jinnah Women University, Rawalpindi, respectively.

Poverty and income inequality is considered as complex issues in South Asian countries like Pakistan. Approximately 40 percent of people in Pakistan are living below the poverty line and are facing severe imbalances in income distribution. They are even at the dearth of basic needs like food, clothing, shelter, education and health facilities. Rapid growth of population, high inflation, unemployment and lack of effective labour force has remained the major causes of rising poverty and income inequality in Pakistan [Faridi and Nazar (2013)].

The welfare issues are inherently linked with each other and inclined to the same public policies. Specifically, the poverty ailment in the economy can be improved through equitable distributional policies [Jamal (2006)]. Pertaining to the eradication of poverty and income inequality, the redistribution of revenues and expenditures can be considered as an important policy tool. Fiscal decentralisation has gained momentum as a major contributing factor to deal with these issues and to ensure effective governance through financial autonomy of provincial governments.

According to Rondinelli (1981), fiscal decentralisation is a process through which powers over revenues collection and expenditures are transferred from the national government to the sub-national levels of government. It makes the contribution of the smaller units of federation in economic development possible and provides an opportunity to the central government to accomplish the national level tasks more efficiently. More precisely, the devolution of fiscal responsibilities both in terms of revenues generation and expenditures is expected to enhance the public sector efficiency, through healthy competition across the provinces in the provision of public utilities and by the development of transparency in the institutional mechanism. Henceforth, this can enter into the poverty and income inequality debate through its channel of accountability and transparency and the resource re-allocation among the poor, keeping in view the pro-poor growth aspect.

However, the role of institutional quality matters in regulating this channel. Literature postulates both positive and negative effects of fiscal decentralisation for economic growth, poverty and income inequality with a varied context for developed and developing countries [Prud'homme (1995), Tanzi (1996), Rodríguez-Pose and Gill (2004), Arze, *et al.* (2005), Rodríguez-Pose and Ezcurra (2009), Sepulveda and Martínez-Vazquez (2010) and Tselios, *et al.* (2011)]. The literature on fiscal decentralisation emerged from the traditional 'Theory of Fiscal Federalism' which put forward a normative framework regarding the assignment of responsibilities and functions to the different levels of government. According to Baratheen (2008) and Ezcurra and Pascual (2008), fiscal decentralisation is a success for major welfare measures as it results in human capital development, resource mobilisation and pro-poor service delivery.

Conversely, low institutional quality, poor governance and corrupt policies leads to unfair revenue sharing and reduces the potential of fiscal decentralisation process to combat poverty and income inequality [Bonet (2006) and Dyah (2012)]. The inbuilt supposition behind the optimistic contribution of fiscal decentralisation is inclined with an effective institutional mechanism. Institutional quality promotes the accountability and transparency in the fiscal system and can lower the corruption. This eventually results in proficient distribution of public resources and can reduce poverty and income inequality [Limi (2005) and Neyapti (2006)].

### 1.1. Objectives of the Study

Keeping in view, the growing stance for fiscal decentralisation with the policy target of tackling socio-economic problems at grass-root level in Pakistan, this study endeavours to work out possible link of fiscal decentralisation with poverty and income inequality, controlling for the institutional quality. This study covers the time period from 1972–2013 that encounters all NFC awards and earlier settlements on the adjustment of federal-provincial resource distribution mechanism.

### 1.2. Organisation of the Study

The rest of the paper is organised as follows. Second section deals with the literature review. Third part discusses the evolution of fiscal decentralisation in Pakistan. The fourth section discusses methodology and the fifth section reports and interprets the empirical findings. Final section concludes the paper with policy implications.

## 2. REVIEW OF LITERATURE

Given the lack of consensus on the impact of fiscal decentralisation, a number of studies have empirically examined the impact of fiscal decentralisation on poverty. Many studies, found a positively significant relationship between fiscal decentralisation and poverty [Bossuyt and Gould (2000), Vedeld (2003), Steiner (2007) and Banwo (2012)] with the perception of weak financial and administrative support to the decentralised governments, vulnerable institutions and fiscal indiscipline at sub-national level. However, some other studies found the said relationship to be negative implying reduction in poverty as a result of fiscal decentralisation [Barathen (2008) and Faridi and Nazar (2013)]. Such relationship is mostly justified on the basis of efficient service delivery, increased participation of poor, resource mobilisation and financial transfer to the sub-national governments.

Similarly, existing literature on the impact of fiscal decentralisation on income inequality provides mix evidence. Ezcurra and Pascual (2008), and Tselios, *et al.* (2011) provided the evidence for negative association between fiscal decentralisation and income inequality for the developed countries. Notwithstanding, the developed countries have well-established institutional framework and good governance in carrying out such practices. Alternatively, it appears to be reversed for the developing countries, as put forth by Neyapti (2006), Bonet (2006) and Dyah (2012). The factors working behind are low infrastructure investment, lack of adequate redistributive element in national transfer and weak institutional arrangements at sub-national level.

The literature for Pakistan is mostly focused on economic growth, and employment relationship with fiscal decentralisation and portrays a positive association between these variables [Malik, Hassan, and Hussain (2006), Khattak, Ahmad, and Khan (2010), Faridi (2011) and Faridi, Chauhdhry, and Ansari (2012)]. The justification of the findings mostly rely on the ‘theorem of decentralisation’, discussed earlier. Another study by Faridi and Nazar (2013) focused on the relationship between fiscal decentralisation and poverty in Pakistan using Ordinary Least Square (OLS) technique for the time period 1972-2010. Their results reported negative effect of expenditures and revenue decentralisation for poverty. However, the results are to be taken with cautious due to possible endogeneity in

the model, which is not addressed in the respective study. No study is available though, for measuring the direct link between fiscal decentralisation and income inequality for Pakistan. This completes the discussion on existing literature for the implications of fiscal decentralisation. The next section deals with the historical trends in the process of fiscal decentralisation, and welfare indicators in Pakistan from 1972–2013.

### **3. FISCAL DECENTRALISATION AND WELFARE ISSUES IN PAKISTAN: A HISTORICAL OUTLOOK**

#### **3.1. Experience of Resource Distribution Mechanism**

In order to strengthen the process of fiscal decentralisation in Pakistan, government has undertaken various measures. Since independence, the transfer of revenues from national to sub-national level has been carried out through the Niemeyer Award 1947, the Raisman Award 1952, the One Unit Scheme 1961 and 1965 and National Finance Commission (NFC) awards.<sup>1</sup> By the time, seven NFC awards have been formulated under the 1973 constitution and only three awards (1974, 1991 and 2010) have made certain advancement in revenue sharing between federation and provinces. The remaining four awards (1979, 1985 1996 and 2000) remained inconclusive due to conflict among the stakeholders of the commission.

The population has remained the sole criteria for resource distribution among provinces in all NFC awards and mostly goes in favour of province Punjab except seventh NFC (2010) that was more comprehensive and taken into account the other indicators as well. The earlier awards depict the lack of policy coordination as Sindh, KPK and Baluchistan always stressed on the equitable and diversified revenue sharing formula, based on the inclusion of other indicators like poverty, revenue collection and inverse population density along with population, but to no avail. Later, the implementation of 7th NFC award brought about improvement in the condition of relatively backward provinces of KPK and Baluchistan as compared to Sindh and Punjab.

Admittedly, the 7th NFC award along with 18<sup>th</sup> amendment can lead towards the significant transfer of rights and responsibilities to the provincial governments. More recently, the government of Pakistan signed 18<sup>th</sup> constitutional amendment as a step towards the broader agenda of reforms in establishing multi-order government structure in Pakistan. It is aimed to strengthen the local governments, through uplifting local economies and ensuring social welfare for its local communities. Although, the provinces are able to attain improved fiscal and administrative powers but due to lack of effective local institutions and strong background of central government, the provinces have remained deprived of legitimate autonomy.<sup>2</sup> The provinces have been demanding higher share from the divisible pool whereas, centre argued for joint sharing of the responsibilities of war against terrorism, natural disasters and the needs of special areas like Azad Jammu and Kashmir, Gilgit Baltistan and the federally administered Tribal areas. Hence, new NFC without any national consensus would be meaningless.

<sup>1</sup>National Finance Commission (NFC) is an autonomous body established under Article 160 of Constitution of Pakistan (1973), for the re-distribution of resources from federal government to provincial governments.

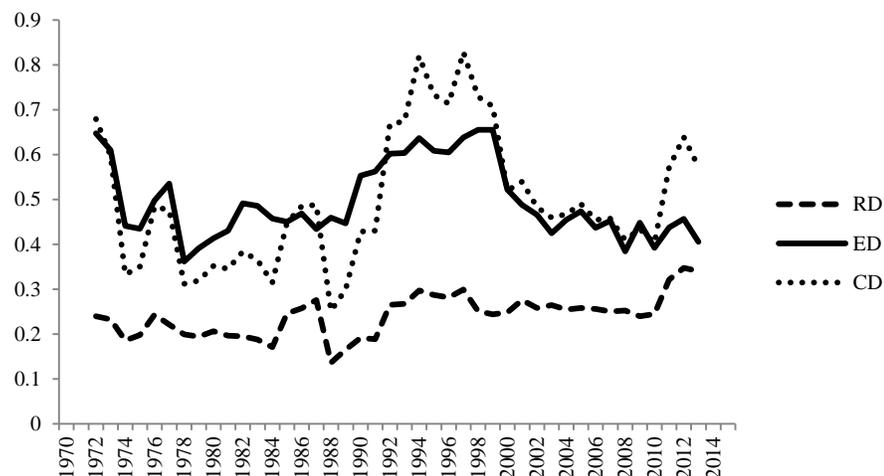
<sup>2</sup>See for reference, *The Daily Dawn*, May 4, 2015.

Now, we will move to the trend analysis of distribution of resources between federal and provincial governments over the time period 1972–2013.

### 3.2. Trends in Resources Re-allocation between Federal and Provincial Governments

Three indicators namely revenue decentralisation, expenditure decentralisation and composite decentralisation have been used to measure the level of fiscal decentralisation in Pakistan and are provided as trends in Figure 3.1.<sup>3</sup>

**Fig. 3.1. Revenue, Expenditure and Composite Decentralisation in Pakistan**



Source: author's own calculations from Pakistan, Govt. of (various issues).

As depicted by Figure 3.1, trends in revenues and expenditure decentralisation depict the similar fluctuations but with a wide margin. The expenditure decentralisation has remained more than the revenue decentralisation throughout the years. While, the trend in composite decentralisation reflects the combination of the two. Precisely, the share of provincial revenue in total revenue remained between 13 percent to 35 percent during the time period from 1972 to 2013. In 1988, the share of provincial revenues was quite low at 13 percent. However, it tend to be increased later. It remained relatively flat in 2000s with a gradual jump in the year 2013 that observed the revenue decentralisation standing at 35 percent.

Regarding the expenditure decentralisation, measured as the ratio of provincial government expenditure to the total government expenditure; share varying from 35 percent to 65 percent during 1972 to 2013 in Pakistan. The provincial expenditure's share drastically declined from 53 percent to 37 percent over the time period of three years only (1976-1979). However, later it gradually increased and touched its peak in the year 2000. The share of provincial expenditure in total government expenditure remained relatively stable and ranged between 43 percent to 49 percent after year 2000. From 2010 onward,

<sup>3</sup>The trends are based on author's own calculations, following Iqbal, Din and Ghani (2013) for three fiscal decentralisation formulas.

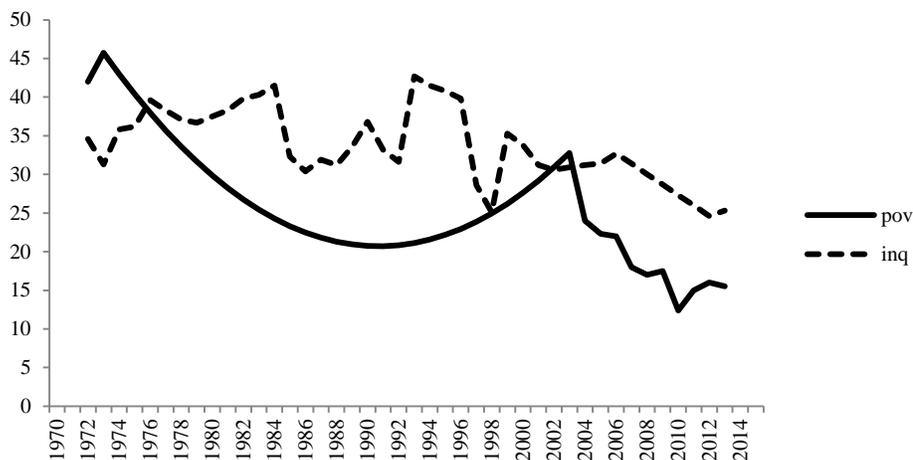
the provinces are indicating around 44 percent expenditure share in the total government expenditure.

Composite decentralisation index is the combination of both revenue decentralisation and expenditure decentralisation and ranges between 25 percent to 83 percent during 1972-2013. During 1975-1985, the combined provincial share of revenues and expenditures as percentage of total varies between 35 percent to 45 percent. Composite decentralisation index indicated a sharp decline up to 25 percent in the year 1988. Later on, the index rose sharply and reached 82 percent in 1997. From 2002 to 2010, the composite decentralisation index has been following a declining trend and reached 40 percent in 2010 with an upsurge in the year 2012.

### 3.3. Trends in Poverty and Income Inequality

Figure 3.2 shows the trend in poverty and income inequality in Pakistan from 1972-2013. The head count ratio measuring the poverty in Pakistan ranges from 12 percent to 46 percent, over the time period 1972 to 2013. Overall, the poverty incidence showed a gradually declining path during 1980s. This decreased from 36 percent in 1977 to almost 24 percent in 1984.

**Fig. 3.2. Poverty and Income inequality in Pakistan**



Source: World Income Inequality Database (2013), Jamal (2006) and Economic Survey of Pakistan (Various Issues).

According to Irfan and Amjad (1984), the reduction in poverty was mainly attributed to the high growth rate of per capita GDP in 1980s that was recorded at 3.8 percent per annum as compared to 1.8 percent in 1970s. However, an increase in poverty is observed from 1997 to 2003, followed by declining trend again. The rise in poverty ratio can be explained by the incidence of low GDP growth rate, lack in employment opportunities and rise in food prices [Miankhail (2009)]. However, the HCR declined to 12.4 percent in 2010. Arif and Farooq (2011) associated this decline with a number of factors including increased allocations to the social safety net programs like Benazir Income Support Program and better support prices of agriculture etc.

The GINI coefficient, measure of income-inequality, ranges from 24 percent to 42 percent for the time period 1972-2013. Initially, income inequality in Pakistan showed an increasing trend from 34.6 percent in 1972 to 37.5 percent in 1980. It further increased and reached at 41.5 percent in 1984. Later, the income inequality attained the highest peak and reached at 42 percent in 1993. According to Haq (1999), rising trend in income inequality is mainly due to high inflation, regressive tax system, high unemployment rate and sticky wages. During 1997-1998, there was a sharp decline in GINI coefficient up to 26 percent. This improvement in income distribution may have been due to increase in wages and employment opportunities in agriculture and manufacturing sectors over the said time period [Kemal (2006)]. The later trend in income inequality is again followed by the sharp fluctuations. This is pertinent to mention that the measure of income-inequality has appeared to be more volatile as compared with poverty.

#### **4. METHODOLOGY AND DATA DESCRIPTION**

##### **4.1. Theoretical Framework**

‘Theorem of Fiscal Decentralisation’ by Oates (1972) holds importance in explaining the link between fiscal decentralisation and its welfare gains. This theorem strongly justifies the case for fiscal decentralisation and states that the individual as well as regions have different preferences for public goods and services. Sub-national governments take into account the preferences of local communities and work efficiently in providing public goods and services according to the needs of mass.

Secondly, fiscal decentralisation deals with poverty and income inequality through resource mobilisation that can result in the transfer of power over funds to the local government and hence, empowering sub-national governments in decision making process. In this way, resource mobilisation through fiscal decentralisation leads to greater economic efficiency, better distribution of income and welfare gains in the economy [Steiner (2007)]. Moreover, fiscal decentralisation can enhance the competition among jurisdictions for mitigating inefficiency, rent-seeking and corrupt practices as well [Ebel and Yilmaz (2002)].

Relatively, the favourable implications of fiscal decentralisation for poverty and income inequality have been criticised by Prud’homme (1995), Rodríguez-Pose and Gill (2004) and Tanzi (1996). In this context, Prud’homme (1995) put a question on the validity of ‘fiscal decentralisation theorem’ and argued that needs do not differ significantly across the provinces. He suggested that in order to reduce poverty and income inequality, it is better to satisfy the needs instead of focusing on the preferences as the needs are universal and do not vary significantly across regions. Hence, the central government will be more suitable for the provision of these goods as compared to local government. Even if differences in needs are realised across the regions, yet the sub-national governments may not have the power to take into account the needs and preferences of local population, precisely. It is because the local authorities are considered to be weak and inefficient in developing countries and lack relevant expertise to implement the desired policies and strategies for human development [Tanzi (1996)]. The criticism on fiscal decentralisation is also grounded on the quality of institutional factors involved in the process of fiscal decentralisation.

#### 4.2. Model Specification and Data Description

The empirical models to measure the impact of various measures of fiscal decentralisation on poverty in Pakistan over the time span of 1972-2013 are specified as below:<sup>4</sup>

$$LPOV_t = \alpha_0 + \alpha_1 RD_t + \alpha_2 RD_t * INS_t + \alpha_3 LPOV_{t-1} + \alpha_4 LINQ_t + \alpha_5 LPGDP_t + \alpha_6 HK_t + \alpha_7 LCPI_t + \mu_{1t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$LPOV_t = \beta_0 + \beta_1 ED_t + \beta_2 ED_t * INS_t + \beta_3 LPOV_{t-1} + \beta_4 LINQ_t + \beta_5 LPGDP_t + \beta_6 HK_t + \beta_7 LCPI_t + \mu_{2t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

$$LPOV_t = \gamma_0 + \gamma_1 CD_t + \gamma_2 CD_t * INS_t + \gamma_3 LPOV_{t-1} + \gamma_4 LINQ_t + \gamma_5 LPGDP_t + \gamma_6 HK_t + \gamma_7 LCPI_t + \mu_{3t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

The above specified equations measure the impact of revenue, expenditures and composite decentralisation, respectively.

Similarly, the empirical models for income inequality are specified as below:<sup>5</sup>

$$LINQ_t = \alpha_0 + \alpha_1 RD_t + \alpha_2 RD_t * INS_t + \alpha_3 LINQ_{t-1} + \alpha_4 LPGDP_t + \alpha_5 SLPGDP_t + \alpha_6 HK_t + \alpha_7 LCPI_t + \mu_{1t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

$$LINQ_t = \beta_0 + \beta_1 ED_t + \beta_2 ED_t * INS_t + \beta_3 LINQ_{t-1} + \beta_4 LPGDP_t + \beta_5 SLPGDP_t + \beta_6 HK_t + \beta_7 LCPI_t + \mu_{2t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

$$LINQ_t = \gamma_0 + \gamma_1 CD_t + \gamma_2 CD_t * INS_t + \gamma_3 LINQ_{t-1} + \gamma_4 LPGDP_t + \gamma_5 SLPGDP_t + \gamma_6 HK_t + \gamma_7 LCPI_t + \mu_{3t} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (6)$$

The variables used in the model are described as below:

##### **Measures for Fiscal Decentralisation**

In order to estimate the impact of fiscal decentralisation on poverty and income inequality, the available literature put forward two measures, namely revenue decentralisation and expenditure decentralisation. Woller and Phillips (1998) made some adjustments in these measures to avoid double counting. The factors defense expenditure and interest payment on debt are subtracted from total government expenditure in the measurement of expenditure decentralisation.<sup>6</sup>

In contrast, Martinez-Vazquez and McNab (2003) and Martinez-Vazquez and Timofeev (2010) provided a more comprehensive measure, keeping in view the

<sup>4</sup>It is pertinent to mention that each specified equation is estimated with three alternatives. First, by adding fiscal decentralisation indicator along with other standard variables to poverty. Second, by adding institutional quality (INS) along with the variables used in first equation. In third alternative, an interaction term of institutional quality and fiscal decentralisation measure is included to test the hypothesis of fiscal decentralisation and institutional quality being complementary to reduce poverty, as shown in Equations (1), (2) and (3).

<sup>5</sup>Each equation is estimated with three alternatives like the poverty equations.

<sup>6</sup>This exclusion was justified because the defense expenditures and interest payments are mainly considered as the part of centralised government expenditure.

multidimensional aspect of fiscal decentralisation. They introduced the composite decentralisation index by combining both the expenditure and revenue decentralisation. Later, Iqbal, Din and Ghani (2013) used all three indicators to measure the fiscal decentralisation; expenditure decentralisation, revenue decentralisation and the composite index of decentralisation. The present study also used these measures of fiscal decentralisation as defined below.

#### *Revenue Decentralisation (RD)*

Revenue decentralisation (RD) is calculated as the ratio of provincial government revenue less grant in aid to the total government revenue that includes federal government (FR) revenue plus provincial government revenue (PR). The formula for RD is given as below:

$$RD = \frac{PR - \text{Grant in Aid}}{PR + FR}$$

#### *Expenditure Decentralisation (ED)*

Expenditure decentralisation (ED) is measured as the ratio of provincial government expenditures (OE) to the total government expenditures less the defense spending (DE) and payment of interest on debt (IE). The formula for ED is given as below:

$$ED = \frac{PE}{PE + FE - (DE + IE)}$$

#### *Composite Decentralisation (CD)*

Composite decentralisation (CD) is computed using both revenue decentralisation and expenditure decentralisation. The formula for CD is given as below:

$$CD = \frac{RD}{1 - ED}$$

Table 4.1 displays the description of all variables and their data sources.

### **4.3. Justification of Variables**

The revenue and expenditure decentralisation is expected to have positive/negative effect on poverty and income inequality. Whereas, the impact of composite decentralisation is contingent on the revenue and expenditure decentralisation consequences for poverty and income inequality. Taking into account the role of institutions in determining the welfare measures, it is expected that the impact of institutional quality will be negative implying a decline in poverty and income inequality due to higher institutional quality. The evidence for such outcome of institutional quality has been provided by Barro (1999) and Ismail and Rizvi (2000). Regarding the interaction term of fiscal decentralisation indicators with institutional quality, it is expected that fiscal decentralisation helps in reducing poverty and income inequality when institutional quality is ensured [Lessmann (2011)].

Regarding other control measures, it is expected that lagged poverty and income inequality will have positive association with current level of poverty and income inequality, respectively. This expectation is due to the dynamic nature of the phenomenon and is consistent with the findings of Chaudhry and Imran (2013). The expected

Table 4.1

*Variables Description and Data Sources*

| Variables                 | Description   | Source   |
|---------------------------|---|--|
| <b>LPOV</b>               | Natural log of Head Count Ratio (HCR) is used as a measure of poverty. (HCR) is calculated by using a calorie-based approach that takes expenditure as a welfare indicator to estimate the poverty line.  | Jamal (2006) and Economic Survey of Pakistan (Various Issues)                        |
| <b>LINQ</b>               | Natural log of GINI coefficient is used as a measure of income inequality. GINI coefficient is calculated as the mean of difference between every possible pair of individuals, divided by the mean size. It lies between 0 and 100 because the coefficient is usually expressed in percentage.   | World Income Inequality Database (2013)  |
| <b>RD</b>                 | The revenue decentralisation (RD) is calculated as the ratio of the provincial government revenue less grant in aid to the total government revenue.  | Author's own calculation from data of Pakistan Statistical Yearbook (Various Issues) |
| <b>ED</b>                 | The expenditure decentralisation (ED) is measured as the ratio of provincial government expenditures to the total government expenditures less the defense spending and payment of interest on debt.  | Author's own calculation from data of Pakistan Statistical Yearbook (Various Issues) |
| <b>CD</b>                 | Composite decentralisation is the combination of both revenue decentralisation and expenditure decentralisation.  | Author's own calculation from data of Pakistan Statistical Yearbook (Various Issues) |
| <b>LPOV<sub>t-1</sub></b> | Lag of natural log of Head Count Ratio (HCR).   | –  |
| <b>LINQ<sub>t-1</sub></b> | Lag of natural log of GINI Coefficient.   | –  |
| <b>LPGDP</b>              | Natural log of per capita GDP, measured in million Rupees.  | Handbook of Statistics on Pakistan Economy (2010).                                   |
| <b>SLPGDP</b>             | Squared per capita GDP in logarithmic form, measured in million rupees.   | –  |
| <b>HK</b>                 | Index of Human Capital, based on years of schooling (Barro/Lee 2012) and returns to education (Psacharopoulos 1994).  | Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2013).                     |
| <b>LCPI</b>               | Inflation measured as natural log of Consumer Price Index.  | Handbook of Statistics on Pakistan Economy (2010).                                   |
| <b>INS</b>                | Democracy is used as a proxy for measuring the quality of institutions in Pakistan. The democracy index is measured on an additive eleven point scale ranging from 0 to 10 for Pakistan. As the democratic governments are expected to perform better on the institutional quality front, higher the value of index the higher will be the quality. | Polity IV Dataset [Marshall and Jaggers (2014)].                                     |

relationship between income inequality and poverty is positive. The higher the level of income inequality, the fewer will be the gains from growth shared by the poor and the poverty will likely to be increased [Ali and Tahir (1999) and Jamal (2009)]. GDP per capita is an essential measure for poverty reduction and is expected to have negative effect on the poverty [Cheema and Sial (2012)]. However, the expected relationship between GDP per capita and income inequality is positive. It is because with the economic development, there is a prospect shift from primary (agriculture) to secondary (industry and services) sectors of the economy along with the adoption of new technologies. Such development initially benefits the capitalist class only and tends to generate gaps in income distribution. However, with the passage of time the benefits of technological improvements are expected to be shared among all economic agents and higher per capita GDP tends to reduce inequality [Barro (1999)]. Conclusively, a negative relationship is expected between squared GDP per capita and income inequality as proposed by Kuznet's Hypothesis. Human capital is expected to be negatively associated with poverty and income inequality, as the educational attainment is expected to imply better employment opportunities and improvement in living standard [Shirazi (1995)]. Inflation is expected to increase poverty and income inequality. It is because the low income households are observed to be relatively more vulnerable to inflation as compared with high income households [Pervez and Rizvi (2014)].

#### **4.4. Estimation Technique: Generalised Method of Moments (GMM)**

The current study employs first the 'Dickey fuller (min-t) break-point' unit root test to check the order of integration. The basic insight of Dickey Fuller (min-t) test is that it is adjusted for the structural breaks in the model. Later, the Generalised Method of Moments (GMM) estimation technique will be applied in order to measure the impact of fiscal decentralisation on poverty and income inequality in Pakistan over the time period 1972 to 2013.

Generalised Method of Moments (GMM), formalised by Hansen (1982) and further developed by Arellano and bond (1991), take into account the endogeneity problem between explanatory variables and the instruments [Vdovichenko and Voronina (2006)]. GMM estimation is based on the assumption of no correlation between the disturbances with the set of instrumental variables in the model and provides more consistent and efficient estimates in presence of endogeneity in the model. The J-test serves to check whether over identifying restrictions are satisfied. In order to test the validity of instruments used in GMM estimation, instrument Orthogonality (C) test will be applied.

## **5. RESULTS AND DISCUSSION**

This section deals with the results and discussion of the estimated models.

### **5.1. Stationarity Test Results**

The results for Dickey-Fuller (min-t) unit root test are reported in Table 5.1. The results suggest that per capita GDP and squared per capita GDP are stationary at level, whereas, all the other variables are non-stationary at level but they become stationary at their first difference.

Overall, the diagnostic tests under GMM technique indicate that the models are well specified. The J-test and C-test indicates that the over-identified restriction is satisfied and the selected instruments fulfil the orthogonality condition, respectively.<sup>7</sup> This implies that the results obtained from Generalised Method of Moments (GMM) technique are robust to the model choice as checked from the instrumental's validity test.<sup>8</sup>

Table 5.1

*Unit Root Test with Innovative Outlier*

| Variables | Level    |              | Difference |              | Decision |
|-----------|----------|--------------|------------|--------------|----------|
|           | Rho      | Break (Year) | Rho        | Break (Year) |          |
| LPOV      | -3.84    | 2003         | -8.88**    | 2004         | I(1)     |
| LINQ      | -4.02    | 2000         | -7.41**    | 1997         | I(1)     |
| RD        | -4.14    | 1991         | -8.46**    | 1988         | I(1)     |
| ED        | -3.18    | 1999         | -7.02**    | 2000         | I(1)     |
| CD        | -3.57    | 1991         | -6.68**    | 1988         | I(1)     |
| LPGDP     | -34.29** | 1999         | -8.85**    | 2000         | I(0)     |
| SLPGDP    | -34.05** | 1999         | -10.17**   | 2000         | I(0)     |
| LCPI      | -2.66    | 2004         | -4.83**    | 1997         | I(1)     |
| HK        | -2.17    | 2012         | -4.67**    | 2002         | I(1)     |
| INS       | -2.34    | 1987         | -7.27**    | 1988         | I(1)     |

Note: 1. Critical value at 5 percent level of significance is -4.44.

2. \*\* denotes rejection of stationarity at 5 percent level of significance.

The results for instrument orthogonality C-test are reported in Table 5.2. The p-values of C-test indicate that the over-identifying restriction/orthogonality condition is valid at 5 percent level of significance.

Table 5.2

*Instruments Orthogonality C-test*

| Ho: The specified variable is a proper instrument. |                       |         |            |                       |         |            |                       |         |
|--|-----------------------|---------|------------|-----------------------|---------|------------|-----------------------|---------|
| Instrument   | RD                    |         | ED         |                       |         |            | CD                    |         |
|  | Difference in J-stats |         | Instrument | Difference in J-stats |         | Instrument | Difference in J-stats |         |
|  | Value                 | p-value |            | value                 | p-value |            | Value                 | p-value |
| RD(-1)   | 0.349                 | 0.554   | ED(-1)     | 0.037                 | 0.846   | CD(-1)     | 0.505                 | 0.477   |
| RD(-2)   | 0.693                 | 0.405   | ED(-2)     | 0.080                 | 0.776   | CD(-2)     | 0.270                 | 0.603   |
| HK(-1)   | 0.999                 | 0.317   | HK(-1)     | 1.087                 | 0.297   | CD(-3)     | 0.395                 | 0.529   |
| HK(-2)   | 0.857                 | 0.354   | HK(-2)     | 1.215                 | 0.270   | HK(-1)     | 0.767                 | 0.381   |
| LINQ(-1)   | 0.913                 | 0.339   | LINQ(-1)   | 1.227                 | 0.267   | HK(-2)     | 0.671                 | 0.412   |
| LINQ(-2)   | 0.062                 | 0.803   | LINQ(-2)   | 0.910                 | 0.339   | HK(-3)     | 0.593                 | 0.441   |
| LINQ(-3)   | 0.249                 | 0.617   | LINQ(-3)   | 0.002                 | 0.960   | LINQ(-2)   | 0.639                 | 0.423   |
| LCPI(-3)   | 1.046                 | 0.306   | LCPI(-3)   | 0.965                 | 0.325   | LINQ(-3)   | 0.141                 | 0.706   |
| FDI  | 0.803                 | 0.370   | FDI        | 0.373                 | 0.541   | LPGDP(-1)  | 0.342                 | 0.558   |
|  |                       |         |            |                       |         | FDI        | 0.001                 | 0.982   |

Note: P-values indicate the non-rejection of null hypothesis at 5 percent level of significance.

<sup>7</sup>Eichenbaum, *et al.* (1988) named the "difference in Sargan" test as C-test.

<sup>8</sup>The underlying instruments for measuring the impact of revenue decentralisation on poverty include RD (-1 to -2), HK (-1 to -2), LINQ (-1 to -3), LCPI (-3) and FDI. Whereas, ED (-1 to -2), HK (-1 to -2), LINQ (-1 to -3), LCPI (-3) and FDI are employed as instruments for expenditure decentralization's poverty equation. For composite decentralization's poverty equation the instruments are CD (-1 to -3), HK (-1 to -3), LINQ (-2 to -3), LPGDP (-1) and FDI.

## 5.2. Results for Fiscal Decentralisation and Poverty

The results for measuring the impact of fiscal decentralisation on poverty are reported in Table 5.3. The results for the impact of revenue decentralisation, expenditure decentralisation and the composite decentralisation index on poverty are reported in column (2), (3) and (4), respectively.

Table 5.3  
*Poverty Equation Estimates*

| Variable     | Dependent Variable: Poverty |          |           |                              |          |          |                            |          |           |
|--------------|-----------------------------|----------|-----------|------------------------------|----------|----------|----------------------------|----------|-----------|
|              | Revenue Decentralisation    |          |           | Expenditure Decentralisation |          |          | Composite Decentralisation |          |           |
|              | (1)                         | (2)      | (3)       | (1)                          | (2)      | (3)      | (1)                        | (2)      | (3)       |
| C            | 1.185*                      | 1.186*   | 1.143*    | 1.106*                       | -0.022   | 0.169    | 2.268*                     | 1.231*   | 1.277*    |
|              | (0.233)                     | (0.288)  | (0.424)   | (0.093)                      | (0.593)  | (0.702)  | (0.439)                    | (0.349)  | (0.353)   |
| RD           | 0.883*                      | 0.990*   | 0.795***  | -                            | -        | -        | -                          | -        | -         |
|              | (0.288)                     | (0.282)  | (0.422)   |                              |          |          |                            |          |           |
| ED           | -                           | -        | -         | 0.243***                     | 2.367*   | 2.707*   | -                          | -        | -         |
|              |                             |          |           | (0.142)                      | (0.625)  | (0.798)  |                            |          |           |
| CD           | -                           | -        | -         | -                            | -        | -        | 0.278*                     | 0.284*   | 0.191*    |
|              |                             |          |           |                              |          |          | (0.069)                    | (0.066)  | (0.048)   |
| INS          | -                           | -0.004** | -         | -                            | -0.025*  | -        | -                          | -0.005*  | -         |
|              |                             | (0.002)  |           |                              | (0.005)  |          |                            | (0.001)  |           |
| RD*INS       | -                           | -        | -0.029**  | -                            | -        | -        | -                          | -        | -         |
|              |                             |          | (0.014)   |                              |          |          |                            |          |           |
| ED*INS       | -                           | -        | -         | -                            | -        | -0.052*  | -                          | -        | -         |
|              |                             |          |           |                              |          | (0.013)  |                            |          |           |
| CD*INS       | -                           | -        | -         | -                            | -        | -        | -                          | -        | -0.009*   |
|              |                             |          |           |                              |          |          |                            |          | (0.002)   |
| $LPOV_{t-1}$ | 0.897*                      | 0.986*   | 1.028*    | 1.029*                       | 1.515*   | 1.532*   | 1.011*                     | 1.047*   | 1.047*    |
|              | (0.086)                     | (0.055)  | (0.052)   | (0.013)                      | (0.104)  | (0.132)  | (0.044)                    | (0.022)  | (0.026)   |
| LINQ         | 0.131***                    | 0.224*   | 0.261*    | 0.211*                       | 0.327**  | 0.320*** | 0.526*                     | 0.340*   | 0.311*    |
|              | (0.064)                     | (0.055)  | (0.077)   | (0.027)                      | (0.152)  | (0.177)  | (0.124)                    | (0.091)  | (0.017)   |
| LPGDP        | -0.023**                    | -0.038** | -0.040*** | -0.052*                      | -0.088** | -0.100*  | -0.023**                   | -0.018** | -0.012*** |
|              | (0.010)                     | (0.016)  | (0.022)   | (0.015)                      | (0.036)  | (0.030)  | (0.010)                    | (0.009)  | (0.007)   |
| HK           | -0.615*                     | -0.882*  | -0.912*   | -0.769*                      | -3.872*  | -3.956*  | -0.718*                    | -0.484*  | -0.675*   |
|              | (0.207)                     | (0.133)  | (0.155)   | (0.108)                      | (0.869)  | (1.019)  | (0.199)                    | (0.118)  | (0.121)   |
| LCPI         | 0.124**                     | 0.147*   | 0.136*    | 0.272*                       | 1.314*   | 1.359*   | 0.108**                    | 0.143*   | 0.124*    |
|              | (0.057)                     | (0.038)  | (0.040)   | (0.051)                      | (0.306)  | (0.347)  | (0.054)                    | (0.027)  | (0.037)   |
|              |                             |          |           | Diagnostic Tests             |          |          |                            |          |           |
| $R^2$        | 0.883                       | 0.875    | 0.871     | 0.864                        | 0.652    | 0.621    | 0.847                      | 0.858    | 0.863     |
| J-stat       | 1.610                       | 1.450    | 1.856     | 3.951                        | 1.096    | 1.250    | 3.390                      | 1.999    | 2.176     |
| (p-value)    | (0.446)                     | (0.484)  | (0.359)   | (0.266)                      | (0.577)  | (0.535)  | (0.335)                    | (0.572)  | (0.536)   |

Note: 1. \*, \*\* and \*\*\* represents significance at 1 percent, 5 percent and 10 percent respectively.

2. Standard error in parenthesis of coefficients.

### 5.2.1. Revenue Decentralisation and Poverty

For the impact of revenue decentralisation on poverty, three equations are estimated under various specifications including institutional quality variable and its interaction with decentralisation, respectively as shown in the alternate equations in Table 5.3.<sup>9</sup>

<sup>9</sup> As the equation (3) is complete in all aspects so the coefficients for this equation are interpreted.

The coefficient of revenue decentralisation in Equation (3) indicates that one unit increase in revenue decentralisation leads to 0.795 percent increase in poverty. The findings are in line with the criticism on fiscal decentralisation process in Pakistan. This indicates that as a result of revenues transfer to the provincial governments, central government is left with relatively less resources and such resources' shortage at central level put a constraint in financing long term development projects needed for poverty [Bossuyt and Gould (2000)]. Controlling the model for institutional quality, the effect of RD on poverty does not revert and remains positive but the coefficient for institutional quality index appeared itself as negative (-0.004) implying that the increase in transparency and accountability in governance through freedom of press, an indication of good institutional quality, helps in reducing corruption and arbitrary use of power and hence increases the prospective to meet the needs of poor that ultimately addresses the issue of poverty [Ismail and Rizvi (2000)].

Subsequently, the interaction term of revenue decentralisation and institutional quality in Equation (3) indicates the effect of revenue decentralisation through institutional quality on poverty and implies that increase in revenue decentralisation will lead to mitigate the negative impact of decentralisation on poverty. The findings are consistent with that of Boex, *et al.* (2006). On the average value of institutional quality i.e., 3.075 the marginal effect of revenue decentralisation on poverty reduced from 0.795 to 0.676. This implies that better institutional quality can moderate the negative effects of revenue decentralisation on poverty by making the decentralisation process fair. However, it will reverse the negative effects of decentralisation on poverty only after meeting a certain level of, not only, institutional quality but also the decentralisation. This is perceived from the findings that Pakistan is lying below that threshold level where fiscal decentralisation starts to repress the poverty in the economy.

### **5.2.2. Expenditure Decentralisation and Poverty**

Similarly, the impact of expenditure decentralisation on poverty is analysed by estimating three equations as reported in Table 5.3. According to equation (3), one unit increase in expenditure decentralisation leads to increase poverty by 2.707 percent. The coefficient of institutional quality is negative and statistically significant in equation (2) implying one unit increase in institutional quality brings about 0.025 percent reduction in poverty. More specifically, on the average value of institutional quality (3.075) the indirect effect of expenditure decentralisation on poverty, through institutional quality, declined to 2.54 from the direct effect weighing 2.70, as reported in Table 5.3. However, the impact of expenditure decentralisation is still increasing for poverty as was the case for revenue decentralisation.<sup>10</sup> The results are consistent with the findings of Iqbal, Din and Ghani (2013) for economic growth, bearing similar explanation.

### **5.2.3. Composite Decentralisation and Poverty**

The composite decentralisation index has also positive and significant effect on poverty in all specifications, implying 0.191 percent increase in poverty brought about by one unit change in CD according to Equation (3). In contrast, the coefficient for

<sup>10</sup>The same justification stands for expenditure decentralization as was for the revenue decentralisation.

institutional quality yields negative effect on poverty ( $-0.005$ ). This implies that effective institutions lessen the poverty level in Pakistan. The role of institutional quality is constructive here as it tends to mitigate the positive impact of fiscal decentralisation on poverty. The average institutional quality lowers down the said effect by 0.0276 units (the difference between direct and indirect effect of fiscal decentralisation on poverty). Comparatively, the effect of expenditure decentralisation in interaction with institutional quality is statistically significantly higher than the composite decentralisation measure for poverty. While, there is no statistically significant difference across expenditure and revenue decentralisation's impact on poverty as measured by the test of equality.<sup>11</sup>

### 5.3. Results for Fiscal Decentralisation and Income Inequality

The results for income-inequality are reported for three indicators of fiscal decentralisation in Table 5.5. The diagnostic test results indicate the goodness of fit of the models and satisfaction of over identified restrictions by J-statistics. Moreover, the result obtained from C-test implies that there is no endogeneity of instruments used in estimation.<sup>12</sup> The results for Instrument orthogonality C-test are reported in Table 5.4.

#### 5.3.1 Revenue Decentralisation and Income Inequality

According to the results reported in Table 5.5, revenue decentralisation appears to be positively significantly associated with income inequality in all specifications. One unit increase in revenue decentralisation worsens the income distribution by 0.651 percent according to equation (3). The justification behind; the sub-national governments are expected to be less efficient in collection of tax as compared to national government in Pakistan and are not capable of providing public goods efficiently [Faridi, Chaudhry, and Ansari (2012)].

Table 5.4

#### *Instrument Orthogonality C-test*

| Ho: The Specified Variable is a Proper Instrument. |                       |         |            |                       |         |            |                       |         |
|--|-----------------------|---------|------------|-----------------------|---------|------------|-----------------------|---------|
| Instrument   | RD                    |         | Instrument | ED                    |         | Instrument | CD                    |         |
|  | Difference in J-stats |         |            | Difference in J-stats |         |            | Difference in J-stats |         |
|  | Value                 | p-value |            | Value                 | p-value |            | Value                 | p-value |
| RD(-1)   | 0.748                 | 0.386   | ED(-2)     | 0.026                 | 0.871   | CD(-1)     | 0.854                 | 0.355   |
| RD(-2)   | 0.733                 | 0.391   | ED(-3)     | 0.001                 | 0.990   | CD(-2)     | 0.495                 | 0.481   |
| RD(-3)   | 0.671                 | 0.412   | HK(-1)     | 1.396                 | 0.237   | CD(-3)     | 0.059                 | 0.806   |
| HK(-1)   | 0.135                 | 0.712   | HK(-2)     | 1.401                 | 0.236   | HK(-2)     | 0.200                 | 0.654   |
| HK(-2)   | 0.195                 | 0.658   | HK(-3)     | 1.397                 | 0.237   | HK(-3)     | 0.407                 | 0.523   |
| HK(-3)   | 0.278                 | 0.597   | LINQ(-2)   | 1.514                 | 0.218   | LINQ(-2)   | 0.499                 | 0.479   |
| LINQ(-2)   | 0.739                 | 0.389   | LINQ(-3)   | 1.059                 | 0.303   | LINQ(-3)   | 0.244                 | 0.621   |
| LINQ(-3)   | 0.685                 | 0.407   | LCPI(-2)   | 0.586                 | 0.443   | LCPI(-1)   | 0.159                 | 0.689   |
| FDI  | 0.653                 | 0.418   | FDI        | 0.652                 | 0.419   | FDI        | 0.112                 | 0.731   |

Note: P-values indicate the non-rejection of null hypothesis at 5 percent level of significance.

<sup>11</sup>The results for test of equality are reported as appendix Table A.1.

<sup>12</sup>The instruments used for measuring the impact of revenue decentralization on income inequality include RD(-1 to -3), HK(-1 to -3), LINQ(-2 to -3) and FDI, while the instruments used for estimating the impact of expenditure decentralization on income inequality are ED(-2 to -3), HK(-1 to -3), LINQ(-2 to -3), LCPI(-2) and FDI. However, the instruments used for evaluating the impact of composite decentralization on income inequality are CD(-1 TO -3), HK(-2 to -3), LINQ(-2 to -3), LCPI(-1) and FDI.

Whereas, a one unit increase in the institutional quality brings about 0.012 percent decline in income inequality. The findings suggest that the mechanism for distribution of income is relatively more equitable once controlled for institutional quality. Successively, the coefficient for the interaction term of revenue decentralisation and institutional quality highlights the mitigating role of institutional quality for the channel under investigation. Precisely, the indirect effect of revenue decentralisation on income inequality through institutional quality yields that a unit increase in expenditure decentralisation brings about 0.598 unit increase in income inequality that is precisely lower than the direct effect of expenditure decentralisation on income distribution (0.651 units) where the institutional quality was not controlled. Albeit, the link established between the income inequality and decentralisation is yet positive.

Table 5.6  
*Income-Inequality Equation Estimates*

| Variable         | Dependent Variable: Income Inequality |          |           |                              |          |         |                            |           |           |
|------------------|---------------------------------------|----------|-----------|------------------------------|----------|---------|----------------------------|-----------|-----------|
|                  | Revenue Decentralisation              |          |           | Expenditure Decentralisation |          |         | Composite Decentralisation |           |           |
|                  | (1)                                   | (2)      | (3)       | (1)                          | (2)      | (3)     | (1)                        | (2)       | (3)       |
| C                | 7.208*                                | 6.624*   | 6.978*    | 0.870                        | 0.409    | 0.197   | -0.834                     | -1.836    | -1.503    |
|                  | (0.997)                               | (0.845)  | (0.433)   | (0.851)                      | (0.553)  | (0.368) | (1.683)                    | (1.204)   | (1.648)   |
| RD               | 0.364*                                | 0.230**  | 0.651**   | -                            | -        | -       | -                          | -         | -         |
|                  | (0.091)                               | (0.098)  | (0.290)   |                              |          |         |                            |           |           |
| ED               | -                                     | -        | -         | 0.946*                       | 1.030*   | 1.035*  | -                          | -         | -         |
|                  |                                       |          |           | (0.205)                      | (0.194)  | (0.180) |                            |           |           |
| CD               | -                                     | -        | -         | -                            | -        | -       | 0.652***                   | 0.434*    | 0.571*    |
|                  |                                       |          |           |                              |          |         | (0.376)                    | (0.166)   | (0.222)   |
| INS              | -                                     | -0.012** | -         | -                            | -0.005** | -       | -                          | -0.016*** | -         |
|                  |                                       | (0.006)  |           |                              | (0.002)  |         |                            | (0.008)   |           |
| RD*INS           | -                                     | -        | -0.017*** | -                            | -        | -       | -                          | -         | -         |
|                  |                                       |          | (0.009)   |                              |          |         |                            |           |           |
| ED*INS           | -                                     | -        | -         | -                            | -        | -0.009* | -                          | -         | -         |
|                  |                                       |          |           |                              |          | (0.003) |                            |           |           |
| CD*INS           | -                                     | -        | -         | -                            | -        | -       | -                          | -         | -0.029*   |
|                  |                                       |          |           |                              |          |         |                            |           | (0.007)   |
| $LINQ_{t-1}$     | 0.102*                                | 0.099*   | 0.067***  | 0.289*                       | 0.389*   | 0.424*  | 0.423**                    | 0.478*    | 0.510*    |
|                  | (0.033)                               | (0.027)  | (0.035)   | (0.086)                      | (0.071)  | (0.062) | (0.195)                    | (0.112)   | (0.118)   |
| LPGDP            | 0.469*                                | 0.419*   | 0.472*    | 0.228***                     | 0.228**  | 0.245*  | 0.642***                   | 0.596**   | 0.527***  |
|                  | (0.167)                               | (0.128)  | (0.078)   | (0.129)                      | (0.095)  | (0.061) | (0.335)                    | (0.283)   | (0.284)   |
| SLPGDP           | 0.033*                                | 0.029*   | 0.032*    | 0.012***                     | 0.013*   | 0.014*  | 0.033***                   | 0.040*    | 0.034**   |
|                  | (0.010)                               | (0.008)  | (0.005)   | (0.007)                      | (0.005)  | (0.003) | (0.019)                    | (0.013)   | (0.017)   |
| HK               | -2.059*                               | -2.099*  | -2.104*   | -1.011*                      | -1.045*  | -1.058* | -1.827**                   | -2.188*   | -1.845*** |
|                  | (0.639)                               | (0.557)  | (0.395)   | (0.310)                      | (0.243)  | (0.199) | (0.889)                    | (0.615)   | (0.949)   |
| LCPI             | 0.288***                              | 0.338*   | 0.351*    | 0.372*                       | 0.334*   | 0.340*  | 0.704**                    | 0.510**   | 0.461***  |
|                  | (0.153)                               | (0.113)  | (0.075)   | (0.081)                      | (0.071)  | (0.056) | (0.310)                    | (0.248)   | (0.258)   |
| Diagnostic Tests |                                       |          |           |                              |          |         |                            |           |           |
| $R^2$            | 0.271                                 | 0.266    | 0.233     | 0.530                        | 0.510    | 0.521   | 0.405                      | 0.336     | 0.412     |
| J-stat           | 1.177                                 | 0.843    | 0.753     | 2.567                        | 1.693    | 1.770   | 0.831                      | 0.294     | 0.077     |
| (p-value)        | (0.758)                               | (0.656)  | (0.686)   | (0.463)                      | (0.428)  | (0.412) | (0.659)                    | (0.587)   | (0.781)   |

Note: 1. \*, \*\* and \*\*\* represents significance at 1 percent, 5 percent and 10 percent respectively.

2. Standard error in parenthesis of coefficients.

### 5.3.2. Expenditure Decentralisation and Income Inequality

Similar to the revenue decentralisation, the impact of expenditure decentralisation on income inequality in Pakistan is provided under different specifications as shown in Table 5.6. Expenditure decentralisation has a statistically positively significant impact on income inequality in all specifications. With one unit increase in expenditure decentralisation, income inequality increases by 1.035 percent according to Equation (3). The findings implied that due to lack of proper institutional framework, the negative distributional effect of fiscal decentralisation results in increasing income inequality [Rodriguez-Pose and Gill (2004)].

Moreover, a one unit increase in institutional quality leads to the reduction in income inequality by 0.005 percent. The result for interaction term is statistically negatively significant implying the mitigating role of institutional quality in addressing income inequality through expenditure decentralisation. The results postulate that the effect of expenditure decentralisation declined to 1.007 from 1.035 units in the presence of institutional quality.

### 5.3.3. Composite Decentralisation and Income Inequality

The coefficient of composite decentralisation index in Equation (3) implies that one unit increase in composite decentralisation leads to increase income inequality by 0.571 percent. According to Lessmann (2011) and Tselios, *et al.* (2011), fiscal decentralisation is associated with significant rise in income inequality due to weak institutional and redistributive abilities in the developing countries. Notwithstanding, the individual impact of institutional quality in the composite decentralisation model is statistically significantly negative.

The interaction term indicates that on the average value of institutional quality, the effect of fiscal decentralisation on income inequality tends to decline from the direct effect of 0.571 units to 0.481 units. Overall, findings from the composite decentralisation index in interaction with institutional quality appears to be more effective in influencing the income inequality than expenditure decentralisation but no statistically significant difference is observed across the impact of expenditure and revenue decentralisation on income inequality.<sup>13</sup>

## 5.4. Discussion of other Control Variables

A number of relevant variables were controlled in the specified equations for poverty and income inequality. The lagged poverty and income inequality appears to be positively affecting the current level of poverty and income inequality, respectively, due mainly to its dynamic pull over effects. The income inequality has positively significant impact on poverty as also supported by Ali and Tahir (1999). Similarly, per capita GDP has statistically significantly declining impact on poverty. Comparatively, for income inequality the per capita GDP has increasing effect. These results are consistent with the development theories that while transition from agricultural economy to the industrial economy; increase in per capita income is accompanied by higher inequality [Jamal (2009)]. However, the findings for squared per capita GDP also appeared as positive, not

<sup>13</sup>The results for test of equality are reported in appendix as Table A.2 for parsimony.

negative as expected. This implies that at the later stage of development per capita income yet leads toward the more inequality. According to Khasru and Jalil (2004), the developing economies are unable to curtail income inequality because of their structural deficiencies. And the income inequality is not of transitory nature in Pakistan when encountered with doubled GDP growth rate. The institutional quality along with fiscal decentralisation can perform better in this regard.

The impact of human capital is statistically significantly negative on poverty and income inequality. Improvement in school enrolment ratios and overall literacy rates results in better job opportunities for the masses and can improve income distribution. The findings are consistent with the study by Kemal (2006). Inflation has positive and significant impact on poverty and income inequality, implying that inflation tends to increase both poverty and income inequality as evident by Jamal (2009).

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

This study attempted to measure the impact of fiscal decentralisation, through revenue decentralisation, expenditure decentralisation and composite decentralisation index, on poverty and income inequality in Pakistan over the time period 1972 to 2013. The estimation technique Generalised Method of Moments (GMM) was employed for estimation.

According to the findings of study, all variables including fiscal decentralisation, lagged poverty, income inequality, per capita GDP, human capital and inflation have significant impact on poverty in Pakistan. The focus variable, fiscal decentralisation appears to be positively significant identifying an increase in poverty due to fiscal decentralisation in Pakistan. It can be perceived that provincial level governments are less efficient in collection of taxes and the resource distribution as compared with the central government. Moreover, re-allocation of resources from federal to provincial level deprives the central government from a marginal share and put a constraint on funding the long term development projects designed for poverty reduction.

Similarly, the results for income inequality equation identify that fiscal decentralisation, lag of income inequality, per capita GDP, squared per capita GDP, human capital and inflation are the significant determinants of income inequality in Pakistan. The indicators for fiscal decentralisation appears to be positively associated with income inequality in the country. The lack of effective institutions, poor governance and weak redistributive abilities results in increasing income inequality due to fiscal decentralisation. As the welfare issues are to be dealt at the national level the promotion of fiscal decentralisation demands fiscal equalisation among the provinces to deal with the welfare issues at sub-national level effectively.

With respect to the role of institutional quality in interaction with fiscal decentralisation process, the results show that better institutional quality mitigates, though remains positive, the negative effect of fiscal decentralisation on poverty and income inequality in Pakistan over the selected time period. The quality institutions increase the efficiency of factors of production by granting proper checks and balance on the fiscal actions. It can reduce the extent of corruption and ensures the accountability and transparency of the government's initiatives. Besides, as the fiscal measures for revenue generation and expenditures are to be initiated by the federal government, its

favourable and equitable consequences can be promised only if fiscal equalisation among the provinces is ensured.

Moreover, the threshold level of fiscal decentralisation is required to be known in order to have long-run favourable effects for the welfare issues. Provincial governments should be given fiscal autonomy to reach the targeted level of fiscal decentralisation on the one hand and standings of all provinces per their preferences must be accredited, on the other. Additionally, in order to curtail poverty and income inequality government's policy should be focused on effective policies to address inflation and development of human capital.

## APPENDICES

Table A.1

### *Test of Equality*

| <b>Poverty Equation</b> |                   |
|-------------------------|-------------------|
| ED*INS vs. CD*INS       | 0.043*<br>(0.013) |
| ED*INS vs. RD*INS       | 0.023<br>(0.019)  |

Table A.2

### *Test of Equality*

| <b>Income Inequality Equation</b> |                  |
|-----------------------------------|------------------|
| CD*INS vs. ED*INS                 | 0.02*<br>(0.007) |
| ED*INS vs. RD*INS                 | 0.012<br>(0.011) |

*Note:* 1. \* indicates significant difference across the Equations (3) for ED, RD and CD at one percent level of significance.  
2. Standard error in parenthesis of coefficients.

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## **Hello Folk: We Are Responsible for What We Will Face in 2025; Evidence from Philosophical Underpinnings of Social Capital**

GUL EJAZ and MARYUM BIBI

Social capital is a very important facet of society and has strong relevance to economic landscape of a country. There are different theories about the nature, accumulation, growth and validity of social capital as an instrument of economy. This paper explains the philosophical context of social capital and validate through a model using Berg, Dickhaut and McCabe trust game that we all transfer a set of values to our next generation, which ultimately manifest as social capital in the real world. The transferred values affects each agent' decision whether to trust other members of the society and participate in a socio-economic exchange or not. If he trusts, he reaps substantial gains from exchange, and ultimately social capital will be concentered. But if he does not, he will face a major loss and overall social capital will be dented. A distrustful ancestor will further induce agents to withdraw from the market and not to invest. This will lead a society to an overall mistrust paradigm and eventual downfall. On the other hand, the level of cooperation in the members of society increases as the good experience is transferred across generations. Economic impacts of social capital have been elucidated using Leonhard Euler function and Newton Leibniz integration processes. The ethical framework for society and role of literature in transfer of beliefs, values and culture from one generation to other has also been discussed at length. The paper is a unique study of how we all will be responsible for the kind of social capital will have in 2025.

*JEL Classification:* D71, D72, Z11, Z12, Z13

*Keywords:* Social, Capital, Model, Transfer, Generations, Values, Trust, Beliefs, Cooperation, Ethics, Literature

### **1. INTRODUCTION**

Why we always remember our ancestors? If we think we remember them because they left junk of wealth for us when they passed away then why we have regards for those who have left nothing back? Surely, it is not the wealth. Unintentionally we refer their talk and actions more often when confronted with a situation which was experienced by them. Kids learn from their parents. Mother is the first cradle of learning for the infant. In our personalities, we carry a reflection of how have we been brought up? Lessons learnt from the parents and ancestors are never forgotten. We normally speak of family values and traditions, which are uphold by us as a holy duty and taken as core of loyalty to our ancestors. These traditions and values

Gul Ejaz <Gulenla@yahoo.com> is Former Staff Researcher, Economics, Nature and Leadership Academy (ENLA), Peshawar. Maryum Bibi <MBBenla@yahoo.com> is Philanthropist and Social Worker, Economics, Nature and Leadership Academy (ENLA), Peshawar.

are passed from one generation to other, and we never let them die down. Psychologically, an infant at the time of birth is always neutral, but then after birth values and beliefs are transferred to him, which he carries throughout his life. This set of values and beliefs has mark influence on his interaction with other people in society. He either becomes a cooperative optimist who participates in socio-economic exchanges or an unwilling pessimist who refuses socio-economic interaction. In either case he impacts the socio-economic life of society.

In this paper, we build a simple model based on transfer of beliefs and values from one generation to another. Transfer of beliefs and values from one generation to other plays a vital role in socio-economic life of nations. To analyse the possible variations in this process, we build a generation model where children absorb the prior from their parents and after experiencing the real world, they update it and transfer to their children. This transfer of priors in the form of beliefs, values and traditions affects each individual decision to trust other members of the society and participate in an exchange. If he trusts, an individual is optimist and he will reap substantial gains from exchange. But if he does not, he is pessimist and will face a major loss. As a result, a pessimistic prior will persuade agents to withdraw from the market and not to invest. It will result into socio-economic decline of society. It was shown in the paper that a small optimistic change can have lasting effects on the behaviour of society. In the same context, it has been described that there is a link between parents and children beliefs and values. It was concluded that economic growth trend generally confirms to behaviour curve of society. A thorough elucidation of ethical framework for a society with strong social capital has been given in the paper. It was also corroborated that culture plays a big role in transfer ring of beliefs across the generations based on comparison of two novels; "The Kidnapping" and "Sparly Ba Zaroor Raze". The two novels differ in optimism and trust placed in others. Results of the paper suggest that if we define social capital as the set of beliefs and values that increases cooperation, social capital can indeed enhance socio-economic well-being of the nation.

## 2. LITERATURE REVIEW

Traditionally, economic growth depends on three types of capitals; natural capital, physical capital, and human capital. However, it has been noted by Coleman that these three types of capitals overlook the way in which the economic agents interact and participate in economic activities to generate growth and development. This process of interaction and participation by economic agents is called social capital which is hitherto a missing linkage [Coleman (1988)]. Krugman has investigated that countries with similar stocks of natural, physical, and human capital have achieved different levels of economic performance due social capital [Krugman (1994)]. Rice has explained that there are many examples from the history where quantity and quality of social capital has made the difference. The high growth rates of the East Asian miracle economies were due to enabling policies and environment, characterised by institutional measures and organisational strategies that enhanced efficiency and cooperation between government and industry [Rice (1997)]. Putnam has argued that more voluntary associations among people in northern Italy explain the region's economic success relative to southern Italy, where such associations are less frequent [Putnam (1993)].

Francois has explained that concept of social capital has gained wide acceptance in social sciences and most recently, in economics [Francois (2002)]. Wool has investigated the relationship between economic growth and social capital and concluded that social capital acts as catalyst to economic growth [Wool (1998)]. Scully has explored linkage between social capital and institutions' design and performance and inferred that social capital improves the performance of institution and organisations manifold [Scully (1988)]. Akerlof has found that crime rate reduces with increase in social capital [Akerlof (1976)]. Philip has elucidated that social capital promotes innovation which in turn promotes economic development [Philip (1997)].

Social capital shapes economic and the political environment of a country. This is because we define social capital as a set of beliefs and values transferred from one generation to other that facilitate cooperation among the members of a community. Putnam in his works construed that social capital can be the result of historical experiences transferred from generation to another [Putnam (1993)]. Taking lead from Putnam theory, Tabellini builds a very interesting model of cultural transmission of values of cooperation. He argues that parents optimally choose what values to pass onto their children, but in doing so they evaluate their children's welfare with their own values [Tabellini (2007)]. Cipriani has investigated that in Tabellini's model there is a linkage between norms and behaviour. If more people cooperate, the cooperation increases and this expands the scope of cooperation. An expansion in the scope of cooperation makes it easier for the parents to transfer good values to their children [Cipriani (2007)]. Bisin, Alberto, and Verdier have narrated that when individuals are allowed to choose their institutions through political voting, the behaviour is always dependent on the values and beliefs of the voters: voters with positive attributes will choose positive leaders fostering cooperation and performance; voters with negative attributes will opt for negative leaders [Bisin, Alberto, and Verdier (2001)].

Williamson has investigated in his works that economic literature on the role of institutions is especially relevant in the context of social capital. The focus on institutions in institutional economics literature has regenerated interest in social linkages which provide strength to these institutions [Williamson (2000)]. Tabellini has very clearly indicated that in the political science, sociological, and anthropological literature social capital generally refers to the set of norms, networks, and organisations through which people gain access to power and resources, and through which decision-making and policy formulation occur [Tabellini (2005)]. Later, economists focused their research efforts on the contribution of social capital to economic growth. North has extensively investigated that at the microeconomic level social capital improves interaction and participation of economic actors and the functioning of markets [North (1990)]. Similarly, Glaeser has explored that at the macroeconomic level social capital has strong linkage to institutions, legal frameworks, and the government's role in production affecting overall macroeconomic performance [Glaeser (2002)].

Researchers like Sobel views social capital as a set of associations between people [Sobel (2002)]. In the same context Guiso has empirically inferred that social capital consists of social networks of social interactions and associated norms that have an effect

on the social efficiency of the community and these have important economic consequences [Guiso (2004)]. According to Goldin, the main feature of social capital is that it enables harmonisation and cooperation of the different actors for the mutual benefits and overall welfare of society [Goldin (2001)]. This concept has matured over the years and has attained a considerable level of quantification. According to Glaeser the measurement of social capital is fairly straight forward to count social and communal associations, their membership, and the frequency of meeting [Glaeser (2000)]. However, Alesina has brought out another angle to the measurement of social capital by theorising that if social associations are only considered as social capital, then there has to be agreement on what constitutes desirable outcomes from these social associations. In practice there may be involvement of value judgment and consensus building on the nature of desirable outcomes [Alesina (2002)].

A broader concept of social capital was enunciated by Fukuyama, who defined social capital as mixture of two elements; social structure to interact and actions of actors within the structure [Fukuyama (2000)]. This conjuncture broadened the concept of social capital. Many researchers around the globe started work on social capital as a platform for interaction between social agents and the behaviour among other entities such as firms. According to Eldgridge this wide concept of social capital covered a wide range of human behaviours; positive as well as negative received as priors [Eldgridge (1995)]. This sparked another dimension of the social capital and raised many related questions. Gambetta is explicit about this by explaining that depending on the behaviour of agents, social capital may be valuable or may be useless or even harmful for others. This view of social capital arrests norms governing interpersonal behaviour [Gambetta (1988)].

Another view of social capital by Fisman emphasises political environment that enables norms to develop and shapes social structure, as the most important ingredient of social capital [Fisman (2001)]. Similarly, Klitgaard explicitly elucidated that social capital includes institutional relationships and structures, such as government, the political environment, the rule of law, the court system, and civil and political liberties [Klitgaard 1995)]. Olson has argued that institutions have a significant effect on the degree of economic development of the nations. According to him political environment and institutions have greater role in the rise and decline of nations [Olson (1982)]. According to Guiso, there is empirical evidence that social capital can have an impact on development outcomes growth, equity, and poverty alleviation. Associations and institutions provide an informal framework to organise information sharing, coordination of activities, and collective decision making [Guiso (2006)].

Sapienza has elucidated that social interactions reduce negative behaviour by creating repeated interaction among agents, which enhances trust and cooperation [Sapienza (2007)]. Berg has brought that there are two perceptions of trust; the recessive and progressive, both depending on the values, beliefs and culture transferred from one generation to another. This basis for trust has been the subject of game theory [Berg (1995)]. La Porta has concluded that a cohesive social and communal association creates trust and utility of the group is maximised by the process of interaction between agents [La Porta (1997)]. Ruben has very explicitly elucidated that trust has linkage with the

values, beliefs and traditions transferred from one generation to other. If the positive values are transferred, agents will trust each other and society will prosper. If negative values are transferred, agents will mistrust each other and will withdraw from exchange which will deteriorate the society [Ruben (2007)]. Narayan has investigated that social capital based on trust paradigm has very strong influence on per capita income and standard of life of households [Narayan (1999)].

Recently researchers have worked on social capital as set of beliefs, values and ethics transferred from one generation to other. According to Bisin social cooperation and interaction by agents depends on the cultural trait of the agents. If they are culturally groomed by parenthood, they will cooperate and integrate, if not they will resist and differentiate [Bisin (2004)]. Dohmen has investigated that good and bad, trust and mistrust, optimism and pessimism are not instantaneous, rather, these are acquired from the priors [Dohmen (2007)]. Gul has indicated that good social conduct, values and beliefs acquired as priors have greater influence on the utility maximisation of agents and society as a whole [Gul (2013)]. Eric has very fantastically explained the essence of social capital as set of values, beliefs and culture acquired from the priors a phorising that where we stand today depends upon where our grandparents sat yesterday [Eric (2007)].

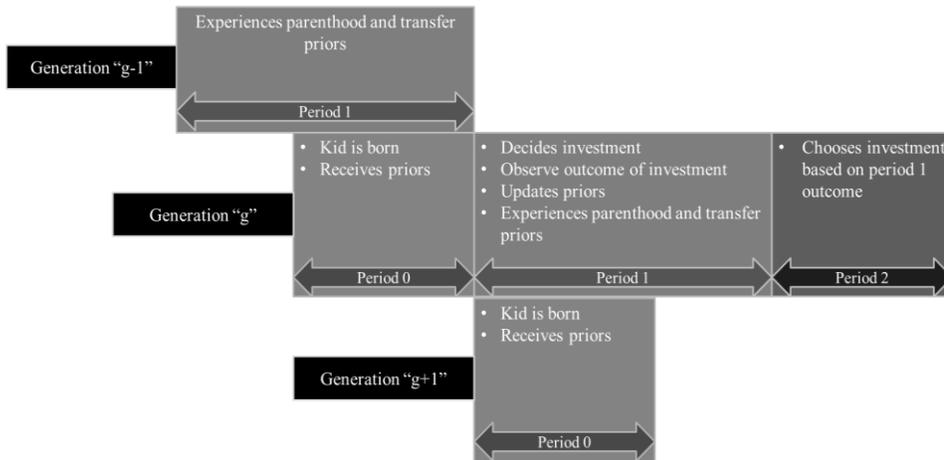
It needs to be pointed out that the existence per se of a group does not imply social capital. Like Jarga culture in the tribal areas of Pakistan does not mean social capital. It is the mechanism underlying the group's ability to enforce positive norms that constitutes the social capital in that setting.

### 3. CONCEPTUAL STRUCTURE

Psychologically, there is a difference between parents and children in the way they weigh future and current benefits. This is because parents want to save their children from costly mistakes. However, to protect children from costly mistakes, parents naturally transmit them excessively conservative priors from social point of view. Moreover, value of children learning through experiences not fully plugged in by the parents in the priors they transfer to children. Therefore, if the net benefits of social interaction and cooperation are not sufficiently high, a society starting with conservative priors will be trapped in mistrust paradigm. Starting from this situation, a positive shock to prevailing behaviour can permanently shift the equilibrium to a cooperative and optimist one even when the shock is temporary.

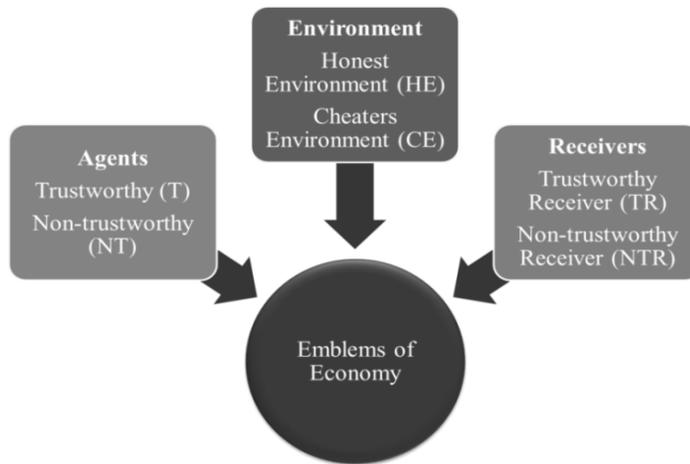
To see the effects of beliefs, values and culture, we build a generation model of prior transfer from one generation to other. Each agent 'i' lives for three periods each spanning over 25 to 30 years and starts as a child in period zero and acquires its prior from the parents. In period 1, each child become an adult, decides whether to invest an amount 'a' in an exchange that has the characteristics of the Berg, Dickhaut, and McCabe trust game. After investing, each agent updates his prior and transfers it to his children. In the period 2, the agent, now mature, has another chance to play a trust game based on experience in the last period. At the end of this period each agent dies. This process is diagrammatically explained in Figure 1.

**Fig. 1. Diagrammatic Layout of the Generational Model**



The economy has two types of agents, trustworthy (T) and non-trustworthy (NT). The proportion of the two types in society is uncertain. In one environment (the honest environment, HE) the trustworthy type are more while in the other environment (the non-honest or cheaters environment, CE) the cheaters are in a bulk. As in a standard trust game, each agent receives an amount ‘a’ and he can choose whether to invest it or not. When he invests it, the sum becomes ‘ka’,  $k \gg 1$ , but the amount returned to the investor is determined by the receiver who can send back whatever he wants. Therefore, as per the trust game, we assume that there are two types of receivers: a trustworthy receiver (TR), who sends back ‘Ra’,  $k \geq R \gg 1$  and a non-trustworthy receiver (NTR), who sends back ‘La’,  $0 \leq L \ll 1$  (where R and L represent return and loss respectively). Alternatively, the investor can keep his amount and avoid the risk of being cheated. If he does not invest at the end of the period he is left with ‘a’. The ingredients of economy for the proposed model are shown in Figure 2.

**Fig. 2. Emblems of Economy**



By investing an agent gets more information which helps him in his subsequent decision and he can transmit the same to his children. This is called updating of prior. It was assumed that if an agent does not invest, he will not learn although people do learn from the experience of others. However, learning from others' experience is generally weaker and particularly so when people lack trust. So, it is not irrational to assume that non-trusting agents find it hard to learn from the outside milieu. Based on the emblems of economy, different combinations of prior probability distribution were worked out as shown in Table 1. It was assumed that an individual who invests will perfectly learn whether the fraction of trustworthy people in the population is  $S_1$  or  $S_2$ .

Table 1  
 Combination of Probability Distribution of Priors

| Environment              | Probabilities | Share of Trustworthy Individual (T) | Share of Non-trustworthy Individual (NT) |
|--------------------------|---------------|-------------------------------------|--|
| Honest Environment, HE   | P             | $S_1$                               | $1-S_1$                                  |
| Cheaters Environment, CE | $1-P$         | $S_2$                               | $1-S_2$                                  |

If an agent has not invested in period 1, he will not invest in the period 2 as no new information is accrued from the experience of period 1. Thus, the only stimulating case is the one where an agent has invested in the period 1. Since investing allows the investors to learn from experience, the expected return in the period 2 will only depend on 'R', 'L' and the true share of trustworthy individuals. Let  $X = S_1R + (1 - S_1)L$  represents the expected return if receiver is from 'HE' and  $Y = S_2R + (1 - S_2)L$  represents the expected return if receiver is from 'CE'. We assume that  $X > 1$  and  $Y < 1$ , so that the expected return is positive if the receiver is from 'HE' and negative if he is from 'CE'.

Here the important fact is that an agent who lives in 'HE' in period 1 will always invest in period 2 since he obtains  $X > a$ . But if he finds out that he lives in 'CE' he will never invest in period 2, since  $a > Y$ .

Moreover, an agent expects to observe ' $S_1$ ' with probability 'P' and ' $S_2$ ' with probability of  $(1-P)$ . Hence, at beginning of period 1 the expected period 2 return will be  $PXa + (1 - P)a$ . Consequently, the agent perceives payoff ( $O_1$ ) for period 1 which is given by Equation (1).

$$\begin{aligned}
 O_1 &= P[S_1R + (1 - S_1)L]a + (1 - P)[S_2R + (1 - S_2)L]a \\
 O_1 &= PXa + (1 - P)Ya \quad \dots \quad (1)
 \end{aligned}$$

Thus, the net expected payoff ( $O_T$ ) over the two periods will be given as Equation (2).

$$\begin{aligned}
 O_T &= (P, R, L, S_1, S_2) = PXa + (1 - P)Ya + PXa + (1 - P)a - 2a \\
 O_T &= (P, R, L, S_1, S_2) = 2PXa + (1 - P)[Y + 1]a - 2a \quad \dots \quad \dots \quad \dots \quad (2)
 \end{aligned}$$

In Equation (2) ' $2a$ ' is the lifetime value of his asset if an agent does not invest in either period. Clearly, in the first period an agent will invest if and only if  $O_T \geq 0$ . However, the decision to participate in socio-economic exchange depends on acquired prior which an

agent received in period zero. Therefore, it is prudent to keep a threshold ‘m’ such that it is optimal to invest if and only if the received prior is above this threshold.

**4. TRANSFER OF VALUES FROM PARENTS TO CHILDREN**

After mathematical model of investment behaviour of agents based on the set of values they received in period zero, the optimum prior that parents want to inculcate in their children was as curtained. This optimum obviously depends upon the parents’ perception of what they think is best for the children. But the problem is that parents do not weigh future and current benefits exactly the same way as children do. This is because parents bother excessively more about the cost of their children’s mistakes and they suffer more if their children get into trouble when they are still alive. To simplify the issue it was assumed that parents care about their children’s utility in period 1. But when parents assess the value of investment in period 1, children will use their own experience of period 1 to decide what to do in period 2.

Let ‘Q’ denote the belief based on acquired priors that share of honest in the population is  $S_1$ . The net expected utility ‘ $O_p$ ’ of the child in period 1 from investing ‘a’, as perceived by his parent is given by Equation (3).

$$O_p = (Q, R, L, S_1, S_2) = PXa + (1 - P)a - 2a$$

$$O_p = (Q, R, L, S_1, S_2) = a[PX + (1 - P)Y - 1] \quad \dots \quad \dots \quad \dots \quad (3)$$

The parent will be indifferent between the child investing ‘a’ and not investing if his prior is such that  $O_p(Q, R, L, S_1, S_2) = 0$ . Therefore, the threshold for indifference of parents is as given in Equation (4).

$$m_p = (1 - Y)/(X - Y) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

For meaningful results, it must be that threshold set by parents higher than the normal threshold ‘m’ i.e.  $m_p > m$ . The parent will then choose what prior to transmit to their children and their teaching strategy will then be as under.

$$P \geq m_p \text{ if } Q > m_p$$

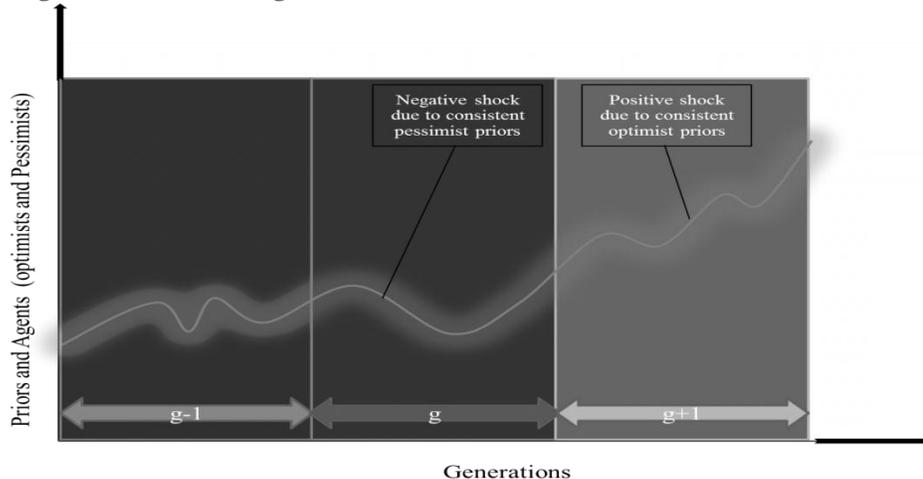
$$P < m \text{ if } Q < m_p$$

If parents have a sufficiently optimistic prior ( $Q \geq m_p$ ) they will transmit optimistic prior to their children. As a result, children will invest and if the population is an honest one will continue to transmit their optimistic priors to next generation and so on. If parents have a sufficiently pessimistic prior (that is  $Q \leq m$ ), they will transmit pessimistic prior to children, who will choose not to invest. Since the no-investment strategy does not allow for any learning, the same pessimistic prior will be transmitted from generation to generation unchanged. This pessimism will trap society in a no-trust-no-trade (NTNT) paradigm and will result into ultimate decline of the society. However, there can be positive shock to the behaviour of agents at any point of time. For example, consider the extreme case where the share of trustworthy people is 1 in ‘HE’ and 0 in the ‘CE’, that is  $S_1 = 1, S_2 = 0$ . In this case the thresholds will be as under.

$$m_p = (1 - L)/(R - L) > m = (1 - L)/2R - (1 + L)$$

If prior is such that it exceeds  $m_p = (1-L)/(R-L)$  which will be the case if  $R > 2 - L$ , then there will be positive shock and agents will invest and trust from then on. If on the contrary, the prior is below the threshold, there will be negative shock and no one would invest and will continue to do so. The graph between generations and priors is shown in Figure 3. The behaviour curve in the graph keeps on receiving positive and negative shocks across the generations.

**Fig. 3. Positive and Negative Shocks to Behaviour Curve Across the Generations**



If prior is below  $m_p$ , parents will not invest and may transmit an even more pessimist prior to their children who will not trade themselves and will transmit mistrust to the subsequent generation and so on. Marginal changes in the return to investment or to the share of trustworthy individuals will have no impact on individual decisions. Suppose, if  $R=1.3$ ,  $L=0.2$  then  $m = 0.53 < m_p = 0.73$  and thus with a pessimist conservative prior parents will not trade and will induce a no-trade prior in their kids. A small increase in  $R$  will cause no positive shock. A positive shock caused by major increase in  $R$  will change the course of transfer of beliefs and values to next generation and the economy will get free from NTNT trap. The information so acquired will be transferred to next generation which will be gifted with an optimist prior and the positive trend will continue. If the prior received by the informed generation and transferred to the subsequent one is sufficiently optimistic, agents will continue to invest.

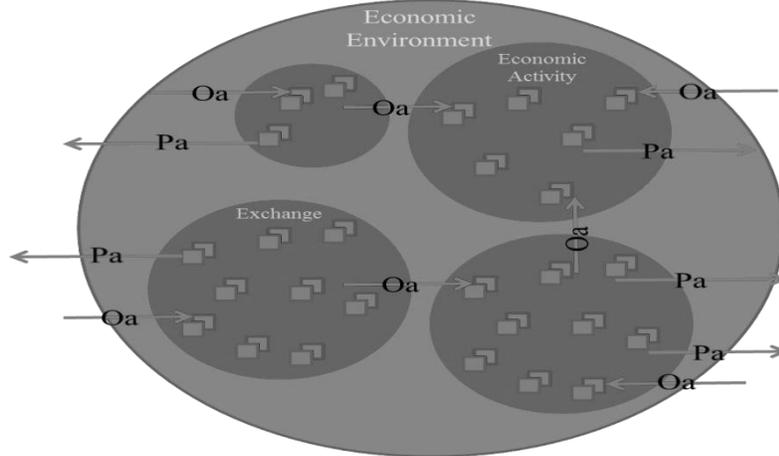
## 5. ECONOMIC AMBIENCE

The values, beliefs and culture that are shifted by priors from one generation to another have significant effect on the socio-economic landscape of the nation. It is by this updating and transfer of set of values and beliefs by our priors to us that we participate in different activities of society including economic activities. If the priors are optimists and they shift set of values and beliefs that make the next generation majority optimists, the people will participate in exchange, but if the priors are pessimists then the values they will transfer will make the next generation as majority pessimists and consequently most of the people will withdraw from exchange thereby declining the economic activities.

In an economic environment, economic activities take place in which the economic agents exchange with one another through social interactions and participation. The more is the exchange between economic agents, the more the economic activity. The overall results of economic activities depends whether the agents participating in the activity are optimists (positive) or pessimists (negative). If the optimists are more, the economic activities will boost as more and more agents will join the activities on the other hand if pessimists are more the economic activities will decline as more and more agents will leave the environment. Therefore, an economic environment shaped up by optimists will have greater economic growth while the growth will decline in case of environment shaped up by pessimist agents.

Figure 4 explains the phenomenon very clearly. An economic environment is shown in blue colour in which different economic activities are taking place as shown in maroon colour. In these activities agents participate and interact to exchange making this whole environment as a social capital. There are two kinds of agents; the optimist agents 'O<sub>a</sub>' are shown in green colour while the pessimist agents 'P<sub>a</sub>' are shown in red colour. It is clearly shown that optimists join the environment while pessimists leave and withdraw from exchange.

**Fig. 4. Optimist and Pessimist Agents in an Economic Environment**



Considering the preceding discussion let the economic growth be represented by 'G' and economic activity by 'A', then using the Leonhard Euler function economic growth index (G) can be represented as a function of economic activities (A) as under.

$$G = f(A) \text{ where } A > 0 \text{ if } O_a > P_a \text{ and } A \leq 0 \text{ if } P_a > O_a$$

Now, economic activities depend on economic exchanges 'E<sub>x</sub>' by agents. Therefore economic activity (A) is a function of economic exchange (E<sub>x</sub>),

$$A = f(E_x) \text{ where } E_x > 0 \text{ if } O_a > P_a \text{ and } E_x \leq 0 \text{ if } P_a > O_a$$

This implies

$$G = f(A) = f(E_x)$$

Now, economic exchanges are due to participation and interaction of optimist agents ‘O<sub>a</sub>’ and pessimist agents ‘P<sub>a</sub>’ in these exchanges. Therefore,

$$E_x = f(O_a) \text{ where } O_a > 0 \text{ and } E_x = f(P_a) \text{ where } P_a \leq 0$$

This implies that economic growth index is a function of participation by optimists and pessimists in economic exchanges as shown in equation (5).

$$G = f(A) = f(E_x) = f(O_a - P_a) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

Consider that hypothetically a generation ‘g’ has 100 individuals with 75 people as optimists (O<sub>a</sub>) and 25 people as pessimists (P<sub>a</sub>). Then the numerical value of economic growth index of this generation at any time ‘t’ can be calculated by using Newton-Leibniz integration process as under.

$$G = f(O_a - P_a)$$

Let O<sub>a</sub> = x and P<sub>a</sub> = y, then

$$G = \int_0^{75} x dx - \int_0^{25} y dy$$

$$G = \text{Limit } 0 \text{ to } 75 \left[ \frac{x^2}{2} + C \right] - \text{Limit } 0 \text{ to } 25 \left[ \frac{y^2}{2} + C \right]$$

Inserting the limits, we get

$$G = \left[ \frac{(75)^2 - 0}{2} + C \right] - \left[ \frac{(25)^2 - 0}{2} + C \right]$$

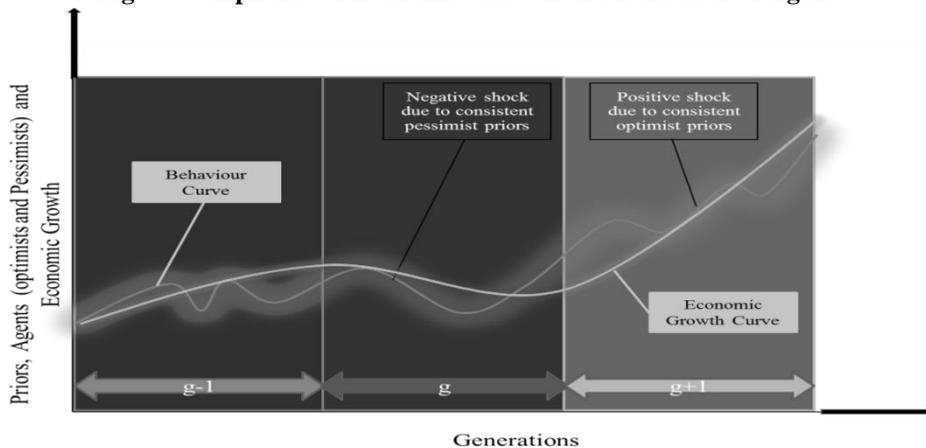
$$G = \left[ \frac{5625}{2} + C \right] - \left[ \frac{625}{2} + C \right]$$

$$G = [2812.5 - 312.5 + C - C]$$

$$\text{Economic Growth Index, } G = 2500$$

So, this generation has an economic growth index value of 2500 at time ‘t’. Similar values can be found for other segments of time and finally a curve can be super imposed on the generation behaviour curve as shown in Figure 5. It can be seen that economic growth curve across the generations generally comply with the behaviour curve of agents across the same generations.

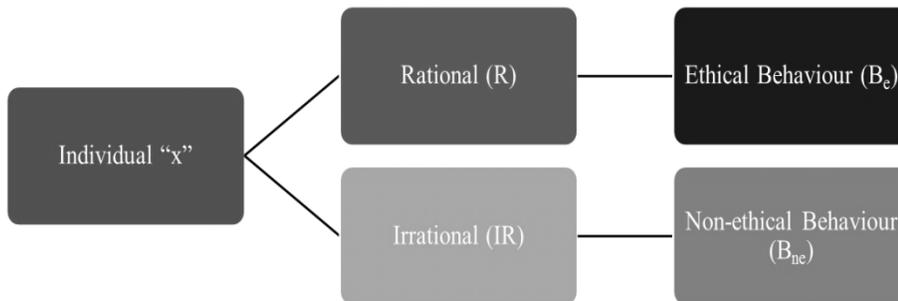
**Fig. 5. Compliance of Economic Growth and Behaviour of Agents**



## 6. ETHICAL SILHOUETTE

In a society having majority of negative and pessimist agents, people are self-interested maximising their utilities, and hence the decisions by agents lack ethical considerations as the consequences faced by others, as a result of the choice made by the agents, are generally not considered. In such a society the agents are motivated only by self-interest and are not motivated by ethical considerations, such as altruism, sympathy, fairness or moral and religious values. This is vice versa in case of society having majority of positive and optimist agents. Philosophically, in social setting members of society while choosing a desirable alternative may resort to variety of behaviours, from pure ethical to pure non-ethical depending on the kind of prior they acquired. Let us consider that from economics point of view behaviour of agents can be grouped into two types; ethical behaviour ( $B_e$ ) and non-ethical behaviour ( $B_{ne}$ ). ' $B_e$ ' is choosing a choice with full ethical considerations and have regards for the rights, social and ethical obligations. ' $B_{ne}$ ' is a total self-interested framework in which agents are only interested in maximising their utilities without any consideration for social and ethical obligations. Furthermore, human behaviour can either be rational (R) or irrational (IR). In a society based on optimism, rationality (R) is not restricted to maximise personal advantage, rather, it is considered as the foundation of societal values as when the agents are rationale they are ethical by default. This means that if an agent is rational (R) he will be ethical ( $B_e$ ) and if he is irrational (IR) he will be non-ethical ( $B_{ne}$ ) as shown in Figure 6.

**Fig. 6. Rationality and Behavioural Trends in a Social Setting**

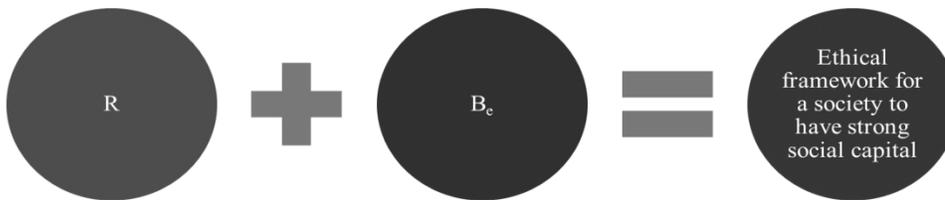


Let us now explain Gul's conception of ethics based on the transfer of beliefs, values and tradition. For a little while we ignore this self-interest and concentrate on rationality (R) and irrationality (IR). What is this rationality in realm? We take refuge in the game theory to answer this question. Suppose there is a commodity 'k' and two agents 'x' and 'y' that are in need of commodity 'k' (there is always scarcity of resources versus needs). Suppose commodity 'k' belongs to agent 'x'. Now, 'x' has two choices; if he has acquired a positive and optimist prior he will rationalise commodity 'k' in a way to use commodity 'k' as per his need while taking care of the needs of agent 'y', in this case agent 'x' will be rational (R). On the other hand, if agent 'x' has acquired a negative and pessimist prior he may use whole of commodity 'k' disregarding needs of agent 'y', in that case agent 'x' will be irrational (IR). If agent 'x' is rational (R) then he may give part of commodity 'k' to individual 'y' in that case his behaviour will be ethical ( $B_e$ ) as

agent ‘x’ is self plus social interested. Ethical behaviour of part of ‘y’ will be to remain contented with the share he receives from ‘x’ and not to indulge in lawless activities. Generally, ‘B<sub>e</sub>’ is the most likely behaviour in a society with strong social capital based on acquisition of positive and optimist prior. If agent ‘x’ uses whole of the commodity ‘k’ to fulfil his needs and does not share it with ‘y’, then behaviour of individual ‘x’ will be unethical ‘B<sub>ne</sub>’ as in this case agent ‘x’ is only self-interested. ‘B<sub>ne</sub>’ is the most likely behaviour for society with weak social capital based on acquisition of negative or pessimist prior.

A look on the Gul’s conception of ethics gives an impression as if the utility aspect is ignored in the framework, but it is not the case. For example when agent ‘x’ is ‘B<sub>e</sub>’ then he is interested in his own as well as society’s utility maximisation. If agent ‘x’ is ‘B<sub>ne</sub>’ then he is irrational and total self-interested in maximising his own utility disregarding the needs of society. This kind of behaviour, though possible from economics point of view, but highly undesirable from ethical point view as it leads to decline of society. Thus, we conclude that to have strong social capital it is required that majority of the agents should be ‘R’ and ‘B<sub>e</sub>’. This is shown in Figure 7.

**Fig. 7. Ethical Framework for a Society to have Strong Social Capital**



Now let us define the economic advantage of proposed ethical framework of society. This is pretty straight forward. We say that if individual is IR he gets a value of zero and if he is R he gets value greater than zero up to and including 1. Mathematically, the range of R can be given as  $1 \leq R \leq 0$ . By same analogy, the range of ‘B’ can be defined as  $1 \leq B \leq 0$ , where B = 0 means that individual is unethical (B<sub>ne</sub>) and ‘B’ other than 0 means that individual is ethical (B<sub>e</sub>) of varying degree depending on the value.

Clearly the existing social welfare equation requires amendment to include the ethical considerations. A simple welfare function ‘S’ for agent ‘x’ can be written as shown in equation (6).

$$S = R. B. U^x \quad \dots \quad (6)$$

Where

- ‘S’ denotes social welfare function.
- ‘R’ denotes rationality of individual ‘x’ where  $1 \leq R \leq 0$ .
- ‘B’ denotes that behaviour of individual ‘x’.
- ‘U<sup>x</sup>’ denotes utility of individual ‘x’.

For the complete society with ‘n’ agents we can take the sum of ‘S’ for all agents. This is shown in (7).

$$\sum_{x=1}^n S = \sum_{x=1}^n R.B.U^x \quad \dots \quad (7)$$

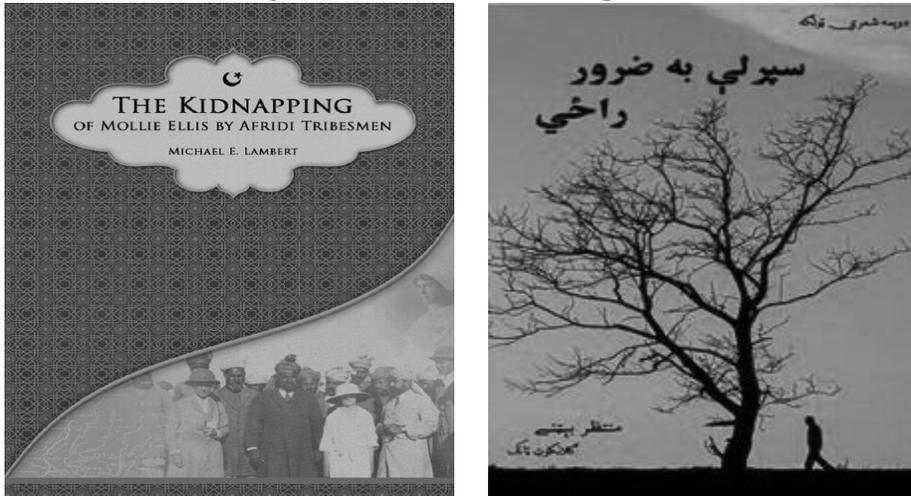
This is a simple but very useful equation to gauge how agents in a society are ethical while they are self plus social interested and desires to achieve maximum utility for self and society. Equation (7) thus, gives a wholesome ethical profile of the society.

## 7. LITERATURE AND SOCIAL CAPITAL

Culture plays significant role in development and persistence of social capital. Since, we cannot observe the beliefs of populations four or five hundred years ago we cannot document status of social capital directly. Instead, we study it from the material contained in the poems and novels of different cultures across the generations. Culture is the vehicle through which values, beliefs and traditions are transmitted over centuries and this is adequately reflected in literature of those times.

The obvious example is the Tribal Areas and urban Khyber Pakhtunkhwa (KPK) of Pakistan. There is a great difference in the stock of social capital between these two parts and also in the beliefs and norms that the populations in the two areas entail. For this purpose we take the two most important novels: “The Kidnapping” by Michael E. Lambert and “Sparly Ba Zaroor Razee” by Muntazir Betany as shown in Figure 8.

**Fig. 8. Selected Novels for Comparison**



In the “The Kidnapping”, the author has explained that a tribesman Ajab Khan Afridi abducted Miss Mollie Ellis in 1923 and took her to far flung tribal area for ransom and release of his co-gangsters. The current law and order situation can be explained in relation to this old incident. Lack of trust in people and the state, poverty and lawlessness all lead to pessimism that springs everywhere from the story. The Ajab Khan’s attitude towards other people is the same attitude that indicates a culture of mistrust towards the society, perceived as unjustified, and the reliance on the closed and narrow isolated venture for personal gains rather than society at large.

Of completely different nature are the attitudes and values conveyed in “Sparly Ba Zaroor Raze” which means “spring will definitely come”. This novel describes the story of young couple Spogmay and Fawad who live in Sardaryab, a small village near Peshawar. They fight against a cruel, powerful and dreadful feudal lord, Suhrab, who forcefully prevents the young couple from getting married because he is interested in Spogmay. While the difference in power between the couple and Suhrab is massive, Fawad and Spogmay have the confidence of fighting Suhrab and, at the end, prevail through social campaign and common voice. The novel is marked by a strong sense of optimism; optimism about the future and optimism to help others in the difficult times.

While both novels focus on the opposing themes, in “The Kidnapping” the hero used personalised venture for achieving personal gains, mistrusting the society. In “Sparly Ba Zaroor Raze”, the couple had a trust on society to fight against the oppressor. The view they transmit is completely different. “The Kidnapping” transfers a prior of lawlessness and mistrust instilling a negative sense in the readers while “Sparly Ba Zaroor Raze” radiates a message of hope and trust based on societal power, generating a positive sense in the readers.

Similarly, poetry and other forms of literature play very important role in transmitting the beliefs, values and culture across the generations. The poetry of great eastern poet Allama Muhammad Iqbal has always been inspiring the youth and has since been transmitting positivity and optimism across the generations.

## **8. PHILOSOPHICAL OUTCOMES**

From our model and underlying theory, following interesting glaring philosophical strands can be deduced.

- Social capital is not mere the number of social organisations, its participants and frequency of its meetings. In essence, it is the set of values, beliefs and ethics that is transferred across generations which either acts as binding force or repulsive force amongst the agents of socio-economic organisations.
- Transfer of positivity and optimism to next generation will create a social structure based on trust and optimism where agents willingly participate and cooperate. This has been the case in most of the developed countries of the world. Transfer of negativity and pessimism to next generation will create an environment of mistrust and pessimism where agents will decline to participate and cooperate in a socio-economic exchange. This has been the case in most of the underdeveloped and deprived countries of the world.
- Trust breeds trust and mistrust breeds mistrust. Trust generates positive participation in economic exchange resulting into economic growth. Mistrust leads to withdrawal from the exchange and not to invest resulting into economic decline.
- Generations face both positive and negative shocks of behaviour based on their experience and effort to update their priors. It is not true to say that we suffer because of our ancestors as we have ample chance to update our priors and give a positive shock to behaviour curve thereby emerging as a strong and prosperous nation. If we don't do that we shall be responsible for further intensifying the current negative trend of socio-economic behaviour curve.

- The trend of economic growth across the generations generally confirms to the trend of behaviour curve across the same generational time period. Economic growth receives negative and positive shock as is received by the generational behaviour curve.
- Positive ethics help in prosperity of society. However, positive ethics are acquired from positive priors. Therefore, we must concentrate on the ethical grooming of our children.
- Literature is vehicle on which culture travels from generation to generation. Writers and poets play significant role in transfer of beliefs, values, ethics and culture across the generations. Good literature and poetry helps in shaping of positive social environment.
- Social capital has strong relevance to socio-economic life of the nations. On the globe, nations with strong and healthy social capital are prosperous more than those with weak and declining social capital.
- The children of today will be the youth of 2025. We need to groom them and transfer them positive and optimist prior after necessary pragmatic updation as we shall be responsible for the kind of social capital that we will face in 2025.

## 9. CONCLUSION

In this paper a model of social capital based on transfer of beliefs, ethics, values and culture from one generation to other was proposed. In the process it was validated that social capital is in fact a set of beliefs and values that creates willing cooperation and harmony amongst the agents of society. This characterisation makes social capital easy to measure. We proved that it is the responsibility of parents to transfer positive and optimist behaviour to their children. It has also been explained that it is our duty to update our prior and convert societal behaviour from negative to positive. The positive ethics foster cooperation and institute willing regards for social rights and obligations. The economic ambience of social capital showed that behaviour curve across the generations confirms to economic growth curve across the same generations. It has also been indicated that positive literature, poetry and novels play vital role in transfer of ethics, values, and beliefs from one generation to other. Overall paper presents unique study on philosophical underpinnings of social capital.

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## Indebtedness and Poverty: The Case of Pakistan

JAVERIA NAEEM and SADIA SHERBAZ

Since the advent of Neoliberalism, debt has been construed as means of policy reforms to achieve stability, liberalisation and recovery from shocks. However, the other side of the picture has been either ignored or underappreciated. That is the human cost of indebtedness. Whether internal or external, indebtedness may have significant implications for the living conditions of the masses, as it leads to substantial deviation of resources towards debt management. This paper attempts to assess the impact of indebtedness on poverty for Pakistan. The impact of total, internal and external debt on poverty has been evaluated separately. Using the data from 1973 to 2013, Johansen Co-integration test reveals long run relationship between debt and poverty. The results remain consistent when domestic and external debt is taken separately. The long run impact of total, internal and external debt on poverty is positive. Which means that for Pakistan debt leads to increase in poverty. Further, it is evident that domestic debt has more severe poverty implications as compared to external debt. These results have two important policy implications; firstly, the overall levels of debt have to be reduced and secondly, the issue of domestic debt reduction takes priority.

*JEL Classification:* I30, I38, F34, H36

*Keywords:* External Debt, Domestic Debt, Poverty, Johanson Cointegration

### I. INTRODUCTION

The imperative of borrowing by a nation was originally defined in context of external and internal gaps of the economy. In developing countries, in order to boost the savings to the desired level of investment, foreign capital is required. This makes room and justification of borrowing by the governments. The two-gap model explains that the shortage of foreign exchange adversely affects economic growth by constraining savings as well as imports. The solution posits relying on foreign aid or capital inflows. However, both these sources of development finance cannot be readily accessed [Chenry and Strout (1966)]. That leaves external debt as a viable way of filling the internal and external resource gaps.

For a developing country, however, owing to poor international credit ratings even unconditional external debt is not obtainable on manageable terms. Hence, many developing countries have to bank on domestic debt for filling the internal and external resource gap. The impact debt has on the economy remains ambiguous despite being thoroughly investigated. The overwhelming evidence indicates, however, that for

Javeria Naeem <naeem.javeria@yahoo.com> is Student, Department of Economics, Fatima Jinnah Women University, Rawalpindi. Saadia Sherbaz <kyra0011@yahoo.com> is Lecturer, Department of Economics, Fatima Jinnah Women University, Rawalpindi.

developing countries debt tends to have an adverse impact on growth [Atique and Malik (2012); Sheikh, *et al.* (2010); Akram (2011); Kumar and Woo (2010)].

A relatively less explored issue happens to be the human cost of debt accumulation i.e. how the masses are affected by accumulation of debt. Kemal (2001) was of the view that debt is positively linked with poverty i.e. an increase in total debt stock will lead to a rise in the proportion of people lying below the poverty line.

World Bank has defined poverty as “*the multidimensional phenomenon, encompassing inability to satisfy basic needs, lack of control of resources, lack of education and shocks, violence and crime, lack of political freedom and voice.*” While this definition is comprehensive and all-encompassing, empirically all the aspect given cannot be tested and some are even difficult to measure. One important aspect of poverty is income poverty. While there are other indicators of poverty like infant mortality or illiteracy, associating them theoretically and directly with debt is a bit problematic. Income poverty is a common and simple measure, in addition to this, income is the tool through which we can gain access to necessities and comforts of life. This makes income instrumental in alleviating other forms of deprivations.

This work is an attempt to explore the long run relationship between poverty and public debt for Pakistan. Most evidence pertaining to developing countries indicate that this relationship is positive. Further, in order to conduct a more meaningful analysis, the effects external and domestic debt have been assessed and compared. The study is divided into six sections. The first section presents the theoretical and empirical literature on the subject. The second section deals with the situation of debt and poverty in Pakistan. The third and fourth sections present with model and data used for estimation. The discussion of results is carried out in the fifth section and the last section presents conclusion of the study.

## II. LITERATURE REVIEW

Kemal (2001) explained the relationship of debt accumulation and poverty. The paper gives the theoretical underpinnings of the relationship between the debt and poverty. He gave three channels from which the government finances the servicing of debt. They are the taxation of the investment, taxation on the consumption and reduction in government expenditure on social sector. Taxation of the investment, as suggested by Rogoff (1992) would result in capital flight which means repayment of the debt is a tax on the new investment. Thus fall in investment, according to Okun’s law, would cause a fall in employment. This fall in employment will lead to decline in personal income and thus will lead to increase in poverty.

In case of consumption taxation i.e. taxes on the consumer goods, this would again affect the poor. This strategy involves expansion of tax base, many a times through indirect taxation. The regressive nature of indirect taxes will ensure a greater adverse impact on the people in the lower income strata, leading to increase in poverty.

Further, if the spending on education, health and sanitation are curtailed to finance the debt repayment, as is the case with many indebted developing countries, then it will result in increased incidence of poverty. As explained by Handa and King (1997), a cut in government expenditure to reduce budget deficit is mainly attained by reducing the expenditure in social and public sector along with privatisation. Johnsan and Salop

(1980) found that government decreases public sector employment, which will result in a rapid increase in unemployment accompanied by lower wages. This in turn will increase the incidence of poverty, as lower wages impair the purchasing power of the poor. The aforementioned channels, formulate the theoretical basis for our analysis. The empirical evidence on the issue has also been rare.

Shiekh and Alam (2013) studied the impact of external debt on incidence of poverty for Pakistan from 1985 to 2010. Main findings of the study are that external debt and external debt servicing are significantly increasing incidence of poverty in Pakistan. Similarly, Saungweme and Shylet (2012) explored the effects of external indebtedness on the poverty indicators of Zimbabwe for 1980 to 2010 using the OLS technique. In their study they used three indicators for measuring poverty. To evaluate the liquidity and ability of Zimbabwean economy to fulfill foreign commitments, external debt is taken twice one as a ratio of exports and second as a ratio of GDP. Both variables of external debt and the external debt servicing affect the income indicators of poverty significantly and positively. External debt and its servicing have also an adverse impact non-income indicators of poverty i.e. life expectancy rate and mortality rate.

Oyedele, *et al.* (2013) analysed the impact of external debt and external debt servicing on poverty reduction in Nigeria empirically using the co-integration technique for 1980 to 2010. Poverty reduction was measured by public expenditure on social goods and services as ratio of GDP. Debt is taken as the ratio to GDP whereas debt servicing is measured by the debt service payment as ratio of exports. The study confirmed the long run relationship among the variables. OLS regression estimates concluded that debt income ratio and debt services ratio are negatively associated with poverty reduction. This implies that external debt and debt servicing increase the poverty in Nigeria.

Ngerebo (2014) confirmed the existence of long term relationship between poverty and domestic debt for Nigeria for time period of 1986 to 2012 by applying Johnson cointegration test. Results show that domestic debt has a significant and positive effect on real GDP and GDP per capita, hence, playing a important role in eradicating poverty in Nigeria.

In a penal study of 67 low income countries from 1985 to 1999, Loko, *et al.* (2003) investigated the relationship between poverty and external debt for low income countries. Using the non-income indicators like life expectancy at birth, infant mortality rate and primary enrolment rate, results of the paper reveal that external debt has limited but significant effect. The coefficients of debt variables conclude that increase in external debt stock worsens the poverty situation in country.

Oberdabernig (2010) inspected the Structural Adjustment Programme (SAP) by International Monetary Fund (IMF) on the poverty and income distribution of those countries which entered into the programme and compared it with the situation prevailing in the countries that did not. Poverty was measured by different indicators and income inequality by Gini coefficients. The paper considered four basic programme of SAP in which one is Poverty Reduction and Growth Facility, which is the mostly used by the low income countries to get the loan. Heckman regression has been employed to estimate the relationship of different poverty indicators of the countries who participated into the programme. Headcount ratio, poverty gaps, Gini coefficients and decentile share were used for 210 countries. Results show a positive impact of Structural Adjustment

Programme on poverty. The situation of poverty and income inequality in participating countries was worsening after entering in the programme than to those who did not.

Maier (2005) revealed the consequences of external indebtedness on the income poverty for the 58 developing and transitional countries. The study used the data from 1970 to 1999 to analyse the distributional and total effect of debt on the Poorest 20 and 20 to 40 percent of the countries. In cross country approach, empirical findings had shown an adverse effect of external debt on the poorest 40 percent without any noteworthy improvement in growth rates. The study finds out that due to its more negative than positive effect, debt should be managed properly. Other conclusion of the study is that it may be the bad governance which hinders the policy tools to give debt relief to poor.

### III. POVERTY AND DEBT IN PAKISTAN

As consequences of partition Pakistan inherited rural poverty and regional disparities. Rehabilitation of migrant, setting up new economy, tackling with the massive unemployment took enormous resources and attention of policy makers. In 1950's Pakistan entered in a Mutual defense agreement with US which opened the way of debt in Pakistan. Till 1958 Pakistan debt was \$500 million which was about 2.8 percent of total GDP at that time.

First time due attention was given to the structure of Pakistan economy in the 1960s. It was a labelled as golden era of Pakistan economy due to remarkable performance in both industrial and agriculture sector. Although, debt increased from \$1 billion in 1965 to \$2 billion in 1968 but this debt was so well managed and properly utilised that repaying capacity of economy also raised with same pace.<sup>1</sup> Pakistan achieved highest growth rate in South Asia. In the same time, poverty increased with much higher speed. The rural poverty increased from 40 percent in 1963 to 51 percent in 1969.

The decade of seventies was the first democratic era with pro poor policies. If we look at the figure of poverty in figure III-1 we can see that poverty reduced from 45 percent in 1973 to 29 percent in 1980. However, the policies of nationalisation gave too much authority to bureaucracy in decision making in the economy. This caused a loss of investors' confidence. Pakistan was considered to be in the socialist block by the international community. Due to this external debt was not readily available and the government had to turn to the internal sources of financing i.e. domestic debt.

In 1980s Zia ul Haq tried to revive the confidence of investors. However, this decade was mainly lacking any coherent long term planning. After the invasion of Soviet Union in Afghanistan, the greater US' interest in Pakistan eased availability of debt which added into existing debt stock, thus external debt exceeded the domestic, debt (See Figure 2). Thus total debt stock was rising enormously, whereas Pakistan was relatively showing a notable decline in poverty.

The decade of 1990s was marked by the democratic forces quarrelling for power and governance. The successive governments of Pakistan People's Party (PPP) and Pakistan Muslim League (N) took opposite steps and further destabilised the economy. This increased from debt of \$20 billion in 1990 debt rose to \$43 billion, more than double

<sup>1</sup>See Hussain (1985).

in 1998. In second government of Prime Minister Nawaz Shareef, Pakistan had to face large economic sanctions due to the nuclear tests. The famous scheme “*Qarz Utaro Mulk Sanwaro*” was also initiated in the same regime which aimed at repaying the existing loans and borrows less in future.

During the decade Pakistan showed poor performance in controlling poverty. As a result poverty which was having a downward trend from previous 30 years started increasing. From 20 percent in the beginning of the decade, poverty increased to 27 percent by the end.

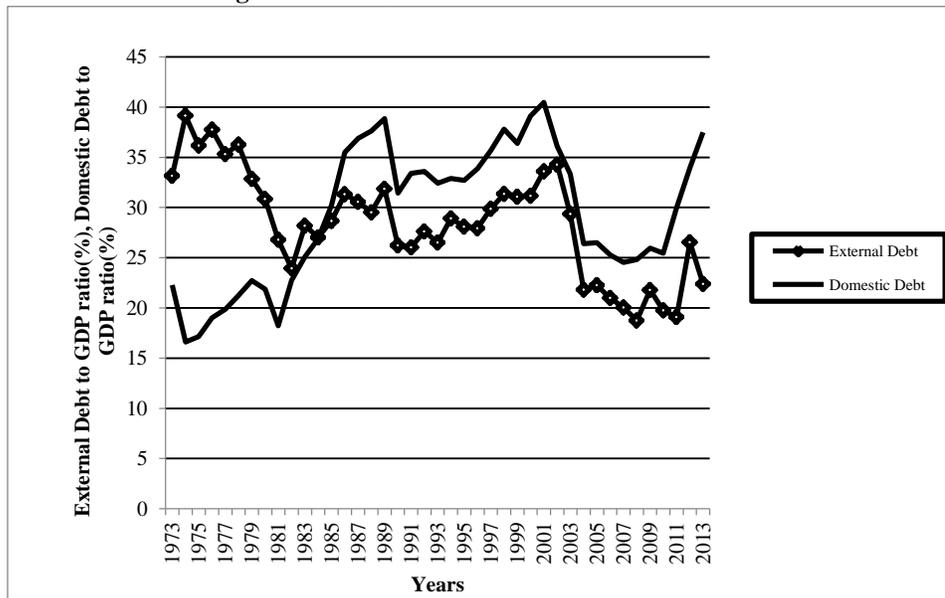
**Fig. 1. Poverty (Head Count Ratio) in Pakistan**



Source: Jamal (2006) and various edition of Pakistan Economic Survey.

The country’s economy showed an impressive performance in the first half of the decade ending 2010. Poverty that had increased to 32 percent in the initial year i.e. 2000, started decreasing after 2004. At the same time, total debt stock has reached about 70 percent of the total GDP. If we look at the trend of external debt and domestic debt, external debt tends to have a down trend after 2003 (see, Figure 2).

In 2007 election PPP held government, which was a democratic one after nine years. Poverty headcount showed a negative trend in this period as well, probably owing to schemes like Benazir Income Support Programme. The situation of debt just got worse. Trend in domestic debt is showing a rapid increase. Pakistan’s domestic debt has witnessed a tremendous rise of Rs 1.9 trillion from 2012 to 2013. Short term domestic debt constitutes around 36 percent of the total public debt in Pakistan which is alarming due to roll over problem. Another reason for the rapid intensification of domestic debt may be the large subsidy to energy sector. Trend of external borrowing indicates a decline.

**Fig. II. External and Domestic Debt in Pakistan**

Source: Handbook of Statistics on Pakistan Economy 2010 and State Bank of Pakistan Annual Reports.

**Fig. III. Debt in Pakistan (Debt to GDP ratio)**

Source: Handbook of Statistics on Pakistan Economy 2010 and State Bank of Pakistan Annual Reports.

Pakistan's public debt during fiscal year 2013 peaked at 63.3 percent of the GDP. According to Fiscal Responsibility and Debt Limitation Act of 2005 ceiling for the debt was 60 percent of GDP. Pakistan public debt has broken the ceiling. Total stock of public debt that in 60 years (1947-2007) stood at Rs 4802 billion has risen to Rs 9466 billion in just six years (2008-13) (Ministry of Finance). Looking at the trends the total debt, from 2000 to 2008, it is experiencing a down, whereas afterwards total debt is rising just like external and domestic debt.

#### IV. THE MODEL

Authors have attempted to assess that impact of debt on poverty. To further elucidate the situation, the impact of internal and external debt has been assessed along with that of debt servicing. Poverty, thus, is expressed as a function of debt variables.

$$Pov_t = f(X_{it}), \text{ where } i=1, 2, 3, 4 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$X_{1t}$  is external debt,  $X_{2t}$  is domestic debt,  $X_{3t}$  is total debt and  $X_{4t}$  is debt servicing. Four separate models have been estimated for each debt variable. Beside the focus variables other explanatory variables are public Health Expenditures (HE), real Per Capita Income (PCI), Trade Openness (TO) and Unemployment (UE). The variables have been selected on the basis of available literature. The final model is given below:

$$Pov_t = \alpha_0 + \alpha_1 X_{it} + \alpha_2 PCI_t + \alpha_3 UE_t + \alpha_4 TO_t + \alpha_5 HE_t + \varepsilon_t \quad \dots \quad \dots \quad (2)$$

Debt is likely to increase the poverty. The burden of servicing of debt is critical for the economy. The sign of all types of debt is expected to be positive which implies that with increase in debt, incidence of poverty increases. When debt is not allocated wasted on filling the fiscal and current account gap, it adds nothing in the economy but more burden of servicing. The funds for the development are eaten by debt servicing.<sup>2</sup> Impact of debt can be negative when domestic debt is spent on development projects and infrastructure. It can relieve the poor and reduce the incidence of poverty.<sup>3</sup> It is also understandable that the impact of external and domestic debt will differ. The few researches conducted on the relationship depict that domestic debt may lead to a decline in poverty.<sup>4</sup> However, Pakistan's situation may be much different.

With an increase in real per capita income poverty is likely to decline. Trade openness is likely to decrease the poverty. However, the possibility of increase in trade deficit may also depict a positive relationship between poverty and trade openness. The expected relation between poverty and unemployment is positive.<sup>5</sup> The sign of health expenditure is expected to be negative; which implies that with the increase in health expenditure by government, reduction of poverty is possible. In a Report of Working Group 1 of the Commission on Macroeconomics and Health, relationship between poverty and ill health is discussed. The report concludes that health pattern show that poor are at disadvantage. They face a serious dearth of resources to spend on health. Therefore if the public expenditure on health increases, good health of the poor can be ensured. With increase in health expenditure poverty is likely to be reduce.

#### V. DATA

Data for poverty is in form of head count ratio. Data of poverty is mainly accessed from Jamal (2006). For last of the 10 years, data was accessed from various editions of Pakistan Economic Survey. Missing values for the some years have been interpolated and extrapolated. Data for debt, per capita GDP have been accessed from Handbook of Statistics on Pakistan Economy 2010 published by the State Bank of Pakistan. Onwards

<sup>2</sup>See Kemal (2001).

<sup>3</sup>See Ngerebo (2014).

<sup>4</sup>See Ngerebo (2014).

<sup>5</sup>See Gillani, *et al.* (2009).

values have been accessed from annual reports of State Bank of Pakistan. Debt is in form of percent of total GDP. Data for trade openness is calculated by dividing the sum of export and import by total GDP. Data on unemployment rate is taken from various issues of *Pakistan Economic Survey*.

### (1) Results and Discussion

In this section of the study, results of all tests are presented. Johansen Cointegration technique is employed in the study to assess the relationship between debt and poverty in the long run. Cointegration technique is generally applied for the data encompassing 60 years or more. However, the issue of data availability has prevented us from doing so. However, there are studies that carried out cointegration analysis on fewer years [Akram (2011); Ngerebo (2014); Atique and Malik (2012)]. There are three steps involved in estimating the relationship between poverty and debt. Unit root test is used to check the order of integration whereas lag length criteria is employed to check the optimal lag length. Results of each test will be presented in detail.

#### *Unit Root Test*

A series of Augmented Dickey-Fuller unit root test is performed to determine the order of integration of the variables. Table.IV-1 shows the ADF test results for both at the level and the first difference on intercept and trend. The reported result in table reveals that the hypothesis of a unit root can't be rejected in all variables in levels. That means all the variables achieve stationarity only after first difference.

Table I

#### *Augmented Dickey Fuller Unit Root Test*

| Variables      | Level  | First Differences | Decision   | Order of Integration |
|----------------|--------|-------------------|--|----------------------|
| POV            | -1.808 | -4.226***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| X <sub>1</sub> | -1.008 | -6.289***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| X <sub>2</sub> | 0.508  | -5.546***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| X <sub>3</sub> | -0.417 | -5.403***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| X <sub>4</sub> | 0.484  | -6.676***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| PCI            | 0.685  | -7.348***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| UE             | -0.201 | -7.218***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| TO             | 2.168  | -5.964***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |
| HE             | -0.499 | -5.370***         | Non Stationary<br>at level but stationary<br>at first difference | I(1)                 |

\*\*\* 1 percent critical value = -2.625606.

**Lag Length Selection**

Prior to Johansen co-integration Test, another important step is to choose an optimal lag length. For this purpose, we have used the Hannan-Quinn information criterion and Shwartz Information criterion. As we will be applying Johnsen Coitegration test on four models, therefore four lag lengths will be presented for each regression.

Table 2

*Lag Order Selection*

| lags | Modell<br>( $Pov_t=f(X_{1t}, Z_{it})$ ) |         | Model 2<br>( $Pov_t=f(X_{2t}, Z_{it})$ ) |         | Model 3<br>( $Pov_t=f(X_{3t}, Z_{it})$ ) |         | Model 4<br>( $Pov_t=f(X_{4t}, Z_{it})$ ) |         |
|------|---|---------|--|---------|--|---------|--|---------|
|      | SC                                      | HQ      | SC                                       | HQ      | SC                                       | HQ      | SC                                       | HQ      |
| 1    | -8.897*                                 | -9.912* | -9.632*                                  | -10.64* | -9.636*                                  | -10.65* | -7.740*                                  | -8.755* |
| 2    | -7.684                                  | -9.714  | -8.291                                   | -10.32  | -8.257                                   | -10.286 | -6.684                                   | -8.713  |
| 3    | -6.162                                  | -9.206  | -6.947                                   | -9.991  | -6.531                                   | -9.576  | -5.131                                   | -8.17   |

\* indicates lag order selected.  
 SC: Schwarz information criterion.  
 HQ: Hannan-Quinn information criterion.

As Hannan-Quinn Information criterion and Schwarz information criterion are two criterions for optimal lag length. For all the 4 regression, both the information criterions are recommending a lag length of 1.

**Johansen Co-integration Test**

The results of Johansen cointegration test has been presented in Table IV-3. For determining the number of cointegrating vectors, Johansen (1988) has introduced two tests named as Trace and Max eigen value test. At none, the null hypothesis of both the test is the there is no cointegrating vector among the variables. And alternative hypothesis is there exists at least one cointegrating vectors. Both tests give evidences for a long run relationship among the variables.

Table 3

*Johansen's Cointegration Test*

| Model | No. of CE's      | Trace<br>Statistic | Critical<br>Value | Max-Eigen<br>Value | Critical<br>Value | Conclusion   |
|-------|------------------|--------------------|-------------------|--------------------|-------------------|--------------|
| 1     | $H_0$ :None      | 148.204*           | 103.847           | 57.298*            | 40.956            | Cointegrated |
|       | $H_1$ :At most 1 | 90.906*            | 76.972            | 29.193             | 34.805            |              |
| 2     | $H_0$ :None      | 143.972*           | 95.753            | 64.190*            | 40.077            | Cointegrated |
|       | $H_1$ :At most 1 | 79.776*            | 69.818            | 29.716             | 33.876            |              |
| 3     | $H_0$ :None      | 135.643*           | 95.753            | 56.529*            | 40.077            | Cointegrated |
|       | $H_1$ :At most 1 | 79.113*            | 69.818            | 27.451             | 33.876            |              |
| 4     | $H_0$ :None      | 155.709*           | 117.708           | 57.952*            | 44.497            | Cointegrated |
|       | $H_1$ :At most 1 | 97.756*            | 88.803            | 37.314             | 38.331            |              |

\*Indicates the rejection of null hypothesis at 10 percent significance level.

Table 3 is showing that for all the four models Max Eigenvalue test is suggesting the existence of at most one cointegrating vector among the variables by rejecting the null hypothesis at None. Whereas, Trace test is suggesting more than one cointegrating vectors. Although, evidence from Max eigenvalue test are preferred in case of small sample, however what really important is that both tests are indicating presence of at least one cointegrating vector.<sup>6</sup>

The cointegrating coefficients reflect the long run impact of the regressors on poverty. The estimates are given in Table 4.

Table 4  
*Summary Results*

| Variable                  | Model 1              | Model 2             | Model 3             | Model 4             |
|---------------------------|----------------------|---------------------|---------------------|---------------------|
| <i>External debt</i>      | 0.504***<br>(0.16)   | -                   | -                   | -                   |
| <i>Domestic debt</i>      | -                    | 1.526***<br>(0.28)  | -                   | -                   |
| <i>Total debt</i>         | -                    | -                   | 0.985***<br>(0.23)  | -                   |
| <i>Debt Servicing</i>     | -                    | -                   | -                   | 0.282**<br>(0.12)   |
| <i>Per Capita Income</i>  | -0.684***<br>(0.122) | -1.961***<br>(0.28) | -1.124***<br>(0.16) | -1.706***<br>(0.33) |
| <i>Unemployment</i>       | 0.652***<br>(0.09)   | 0.995***<br>(0.13)  | 0.796***<br>(0.10)  | 0.731***<br>(0.13)  |
| <i>Trade Openness</i>     | -2.352***<br>(0.31)  | -3.502***<br>(0.40) | -2.363***<br>(0.36) | -3.785***<br>(0.37) |
| <i>Health Expenditure</i> | -0.007<br>(0.00)     | -0.809***<br>(0.24) | -0.179<br>(0.12)    | 0.024<br>(0.15)     |
| <i>Constant</i>           | 0.76                 | -1.93               | -0.597              | -5.225              |
| <i>Ect(-1)</i>            | -0.20***<br>(0.05)   | -0.13***<br>(0.03)  | -0.20***<br>(0.04)  | -0.09**<br>(0.04)   |
| <i>R-squared</i>          | 0.482                | 0.555               | 0.574               | 0.582               |
| <i>Adj. R-squared</i>     | 0.382                | 0.451               | 0.475               | 0.485               |

Standard error given in parenthesis.

\*\*\*, \*\*, \*, indicate significance at 1 percent, 5 percent and 10 percent significance level respectively.

External debt significantly and positively affects the poverty, where 1 percent increase in external debt, leads to increase in the poverty by 0.504 percent. This result confirms that external debt is harmful for poor as it increases the incidence of poverty. Sheikh and Alam (2013) have reported similar results in their study that external debt causes an increase in the incidence of poverty. Unfortunately, government finds it a convenient method of financing its expenditure. There is a serious dearth of policy and planning to properly manage the incoming foreign capital in order to pass the fruits of debt stocks to the poor. Furthermore, new loans should be avoided or at least be taken

<sup>6</sup>See Dutta and Ahmed (1997), and Odhiambo (2005).

considering the repaying capacity. Accumulation of debt stock without growth in the repaying ability may push economy into debt trap and debt overhang. Any external debt in this situation comes with a series of strict conditions. Removal of subsidies is one of the strictest conditions for external debt sometimes. Poor suffer due to these harsh terms as when subsidies are removed, cost of production goes up and prices of consumer goods rise.

Domestic debt also exerts a positive and significant effect on poverty. These results are contrary to the existing literature. Therefore it is not advisable for the policy makers to rely on domestic debt. Domestic debt in Pakistan has seen a tremendous increase in last five years and it is increasing at a greater pace than external debt. Furthermore a large proportion of domestic debt is composed of short term loans. This further magnifies the problem of servicing as short term loans require rollover after maturity of one year. Our results are depicting that domestic debt is even more damaging than external debt. Domestic debt reallocates the resources within a country. This also involves the evaporation of funds from the money market leading to unavailability of credit for the domestic investors. In the light of these results the recent hike in domestic debt becomes highly disputed and troubling.

The result shows that total debt significantly affects the poverty. There exists a positive relationship between these two variables where one percent increase in total debt lead to increase in poverty by 0.98 percent. Total debt servicing increases the incidence of poverty by 0.28 percent. Each and every variable of debt is worsening the situation of poverty in Pakistan. When a country keeps on taking loans from the other countries and international organisation its credibility gets damage in the international market. Furthermore, servicing of both external and internal debt is an enormous burden on the national exchequer. Government has to compromise on important development projects to service the debt. In case of Pakistan, this compromise is reflected in lower spending in education, health and other development related projects. Hence, the positive and significant impact of debt on poverty in Pakistan is tragically understandable.

The results for the other variables depict that an increase in per capita income can be effective in reducing poverty in Pakistan, while unemployment shows a positive effect on poverty. Trade openness contributes to reduction in poverty. As public health expenditure was found to be insignificant. Public health expenditures are vital in alleviating various undesirable outcomes of poverty like, infant and maternal mortality and morbidity or mortality caused by preventable or treatable diseases. Government should provide the good health facilities in rural areas and subsidise the health sector. However, in order for health expenditures to matter, it is absolutely vital that the government of Pakistan should increase the expenditure on public provision of health services significantly, as the levels of allocation to health in Pakistan are too low to matter i.e. less than one percent of national income.

## VI. CONCLUSION

Increase in debt leads to increased burden of its servicing, which is generally met by cutting off the social sector expenditure like health, education and sanitation etc. Like other developing nations, Pakistan also borrows both internally and externally. Growth in

debt stock is alarming as it is injurious to growth. Rising level of debt not only dries up funds from market for private investor but also discourages the foreign investor. In case of Pakistan, domestic debt has more destructive effect on poverty than external debt. With increase in domestic debt by 1 percent, poverty rises by 1.52 percent as compared to external debt which causes poverty to increase by .504 percent.

Government should consider its repayment capacity before taking additional loans. Further, the level of domestic debt needs to be brought down. That may involve measures like increasing the tax base and lowering government expenditures. However, the government would have to make sure that the burden of tax is not increased on poor; a progressive direct tax may be more effective in this regard. Similarly, while curtailing spending the government will have to ensure that the allocations to social sector development and services provisions are not significantly affected. Considering the situation in Pakistan the need to reduce the debt burden is not just an imperative for ensuring sustainable growth but also, as the results depict, for bettering the quality of life for the masses.

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## **Analysing Econometric Bias and Non-linearity in Returns to Education of Pakistan**

MUHAMMAD NAUMAN MALIK and MASOOD SARWAR AWAN

This study estimates the returns to education while controlling endogeneity and sample selection biases in Pakistan, over a time period using Ordinary Least Square (OLS), simultaneous approach using both Heckman Sample Selection and Instrumental Variable, and Fixed Effect techniques. Household Integrated Economic Survey (HIES) data for 2004-05 and 2011-12 time periods have been used in this study. The returns to education have been found downward biased in OLS estimates for both time periods. The unbiased real returns to education have increased on average for wage workers over time period. Landholding and Non-earned income have been used as exclusion restrictions to control for sample selection bias in the Heckman Sample Selection technique. The endogeneity bias has been controlled for with the help of parental education as instrument in Instrumental Variable technique. Both techniques have also been used collectively or simultaneously to get more efficient estimate in simultaneous approach. Household Fixed Effect technique has also been used with the assumption that ability and family characteristics largely remain same within family or household. The increase in the unbiased and real returns to education shows that profitability still exists in investing in education whereas experience via skill enhancement reinforces this rise in wage. Sadly, the historic gender and regional discriminations persist or aggravate in wage market. Married persons are getting more in returns relative to the unmarried individuals. Having negative implications for income inequality, Convexity in education-earning relationship in Pakistan has been confirmed by Indicator Function technique for both time periods. Low education prompt low-earning workers who would be unable to bear the schooling cost of their children. This seriously inhibits earning potential making income inequality worse.

*JEL Classification:* I26, I24, J24

*Keywords:* Returns to Education, Human Capital

### **1. INTRODUCTION**

The prominent place of education in Millennium Development Goals (MDGs) and the proposed Sustainable Development Goals (SDGs) is suffice to believe that there has been a global consensus over the countless linkages of education to socio-economic development. Education is a major part of human capital which primarily comprised of education, health and vocational training leading to the rise of labour productivity and earning potential. It is admitted that investment in education can be taken as capital investment with positive implications of human capital over the earnings/wages of

Muhammad Nauman Malik <nauman.malik@uos.edu.pk> is Lecturer in Economics, University of Sargodha, Sargodha. Masood Sarwar Awan <awan811@hotmail.com> is Professor of Economics, University of Sargodha, Sargodha.

individuals. Schooling and training being the human capital inputs from labour are important determinants of earnings/wages therefore the education-wage relationship can be useful in the measurement of the returns to schooling. The significance of returns to education/schooling as an important economic indicator in the context of economic growth and development has been widely accepted and the same has been the continued area of interest of economists for more than fifty years [Heckman, Lochner, and Todd (2003)].

The positive association between education and earnings has been proved by various studies in Pakistan<sup>1</sup>. Under the ideals of Free Market Economy, incentives are always preferred for the inducement of any task. Returns (or private returns) to education means wages of individuals against their education in the wage sector. In this way, the paper analyse incentives in terms of returns to education (wages) in Pakistan's Labour market for getting more education.

In the context of Pakistan, however, it has been seen that there are some earlier studies which have mixed the private returns to education with returns to capital by including all earners i.e.; taking wage workers with self-employed and employers [Montenegro and Patrinos (2014)]. Some studies used too much control variables which forcefully converted the returns to education regression in to econometric earning modeling [Pareira and Martins (2004)].

The concave relationship between earnings and education shows relatively more returns, at lower levels as compared to higher ones and convexity is an opposite phenomenon having more returns at higher levels of education than at lower levels [Psacharopoulos (1994)]. It is important to assess the country-specific relationship, because of its implications upon income/earning inequality.

This paper intends to purge the returns to education estimate of econometric biases, (endogeneity and sample selection) simultaneously, [Wooldridge (2013)] and also through Household Fixed Effect technique [Aslam and Kingdon (2009); Aslam, Kingdon, and Kumar, (2010) and Kingdon and Soderbom (2007)] in order to get more valid, efficient, reliable and consistent estimate for returns to education in Pakistan. Moreover, this study would also identify the relationship of education and wage earnings in Pakistan [Crespo Cuaresma and Raggi (2014)].

Further, the introduction section is followed by Section 2 dealing with the review of earlier studies; Section 3 describing the data and methodology; Section 4 holding the results and the discussion in the light of our priori expectations, estimations and literature review; and lastly, the study would be concluded with some relevant policy suggestions.

## 2. LITERATURE REVIEW

After the revolutionary work of Mincer (1974), the estimation of returns to education gets prominence in every sphere of the world. Countless studies have been done by the research community to identify the private returns to education because of its simplicity in understanding and efficacy for economic development [Psacharopoulos

<sup>1</sup> See Ali, Ramay, and Nas (2013); Ali and Akhtar (2014); Afzal (2011, 2014); Aslam, Kingdon, De, and Kumar (2010); Aslam and Kingdon (2009); Awan and Hussain (2007); Aslam (2006); Guisinger, Henderson, and Scully (1984); Haque (1977); Hyder (2007); Khan and Irfan (1985); Nasir (1999, 2000, 2002); Nazli (2004); Qureshi (2012); Shabbir (1994); Sial and Sarwar (2013); Sarwar, Sial, and Hashmi (2014).

(1994); Psacharopoulos and Patrinos (2004)]. In the basic Mincerian function, the log of earnings is regressed on the years of education and the experience which measure accumulation of human capital of an individual. The estimate of years of education would tell us the marginal rate of return as percentage change in earnings due to an additional year of schooling or education.

Card (1999, 2001) discussed the issue related to the endogeneity bias in returns to education estimation and preferred to go for Instrumental Variable (IV) technique to have unbiased results. The instrument should be correlated with the endogenous schooling variable, but unrelated with the earnings. Trostel, Walker, and Woolley (2002) used the education of father, mother and spouse; Dickson (2013) used smoking behaviour; and Soderbom, Teal, Wambugu, and Kahyarara (2006) used distance from school as instruments to control for the endogeneity. The IV estimates are expected to be above the Ordinary Least Square (OLS) estimates approving the downward bias in OLS estimates. While recognising the issue of endogeneity due to variable omission, such as unobserved ability and family characteristics which may cause inconsistency and bias in OLS results, an innovative solution was developed by Ashenfelter and Krueger (1994) who consider twins data. Here, we can difference out or control for the family effects and unobserved ability (owing to the same biological and family characteristics) using fixed effect technique.<sup>2</sup>

Sample selection bias due to non-random selection also arises in returns to education estimation. The returns to education estimate may be biased because we take only those individuals who are getting wage or on-job among those who have received an education. The Two Step procedure of Heckman (1979) helps to cope with this problem [Crespo Cuaresma and Raggl (2014); Kavuma, Morrissey, and Upward (2015)].

Wooldridge (2013) stated that if the model description is such in which both endogeneity and sample selection issues exist than in order to simultaneously control for both biases, we should first estimate the selection hazard or Inverse Mills Ratio (IMR) due to non-random sample selection using the Heckman (1979) two-step method and then explicitly include the IMR into the Instrumental Variable (IV) estimation.<sup>3</sup> Using Pseudo-panel data approach, Warunsiri and McNown (2010), and Himaz and Aturupane (2015) also showed that if we did not control for the unobservables like ability and household characteristics, it would create bias in our estimates. For Proxy method, personal characteristics like age, colour, father's education and occupation and area of upbringing are used as a proxy of unobserved family characteristics which may become a source of bias in OLS results and introduced directly in the wage equation as regressors [Griliches and Mason (1972)]. Scores of intelligence test and the knowledge of labour market test [Blackburn and Neumark (1992, 1995)] whereas job stress and job complication [Peng Yu (2004)] are used as proxies for unobserved ability.

Up till 1994, studies in Pakistan like Guisinger, *et al.* (1984), Haque (1977) and Khan, *et al.* (1985) related with the Mincerian earning function had a drawback that education was taken as dichotomous variable due to data constraints of surveyed data in Pakistan. Shabbir (1994) made the first attempt in this regard and two modules of Pakistan Labour Force and Migration Survey (PLMS) entitled as Household Income and

<sup>2</sup>See also Isacsson (1999, 2004).

<sup>3</sup>See also Arabsheibani and Mussurov (2007), and Foltz and Gajigo (2012).

Expenditure Survey (HIES) and the Migration Survey were merged together to get the first Mincerian Earning Function with 'continuous years of schooling' as a variable. In this shape, this was the first national representative estimation that was done where 'continuous years of education' was taken from Migration Survey and other information was provided by the Household Income and Expenditure Survey (HIES). The study showed the positive relationship of education and experience with the earnings of individuals. The private marginal return to education appears 5 percent to an additional year of schooling and then it went to 8 percent when experience and experience-square variables were introduced.<sup>4</sup>

To ascertain the differences in earnings because of differences in public and private schooling of individuals, Nasir (1999) concluded that private schools imparts quality education relative to public schools as the private schooling provides more earnings to the individuals relative to that of those with public schooling. In case of private education, we see little discrimination in earnings based upon gender differences as compared to the case of public education. The extended Mincerian earning function was estimated by Nasir (2000) with the introduction of different educational level (Primary, Middle, Matric, Intermediate, Bachelors and Professional) dummy variables along with the usual potential experience, regions and provincial control variables. Education increases the earning of the wage sector employees. The status of being male and urban resident has a positive impact upon earnings of individuals. Nasir (2002) used technical training, literacy and school quality variables along with usual education and experience and introduced splines of education levels. Each year of education brings 8 percent wage rise for individuals on average whereas for 'splines of education' ranging from primary education to professional education showed that each year of education at different levels are significantly and positively related with the wages with consistent increase. Moreover, it has been observed that women are earning fewer wages as compared to their male counterparts. Nazli (2004) observed that education has positive effect on earnings and when separate regressions have been run for different experience group.

Aslam (2006) used Heckman's two step procedure,<sup>5</sup> Two Stage Least Square (2SLS) and Household fixed effects<sup>6</sup> along with OLS as separate regressions for Pakistan using Pakistan Integrated Household Survey (PIHS). The estimated return to education was 7 percent to 11 percent for males and 13 to 18 for females. Aslam, *et al.* (2009) used same techniques on Pakistan Social and Living Standard Measurement (PSLM) 2005 and observed positive relation of earnings with education in both male and female regressions and as well as private and public sector regressions. For the decomposition of wage differential between public and private sector wage the Oxaca-Blinder technique was used. It showed that for men the differences in public-private worker characteristics explained about 66 percent of difference in log of wages whereas for female it was at 40 percent. These results were in line with the conclusion made by Hyder (2007) while using Labour Force Survey (LFS) 2001-02 data of Pakistan.

<sup>4</sup>Also see Ali, *et al.* (2013) and Awan, *et al.* (2007).

<sup>5</sup>Aslam, *et al.* (2010) compared Pakistan and India in estimation of returns to education after controlling for the sample selection bias.

<sup>6</sup>Qureshi (2012) compared OLS and Fixed Effect estimates using PSLM 2010-11 dataset and found OLS estimates biased.

Similarly, quantile regression was run by Kingdon et al. (2007) using PIHS for the years 1998-99 and 2001-02 and observed that in wage employment the education is inequality-reducing for women as lower ability women's returns to education is more as compared to the higher ability women<sup>7</sup>. Recently, Sial, *et al.* (2013) and Sarwar, *et al.* (2014) using the same econometric technique, observed that human capital in the form of education is increasing the dispersion of earnings in Pakistan. Education differently impacts the earning distribution as higher quantiles are more affected as compared to the lower quantiles, showing the complementarity between ability and education whereas the same situation appeared in the form of experience.

The Proxy Method has also been used recently by Afzal (2011, 2014) where the supposedly proxy variables are directly included in the Mincerian equation. The study used the Mincerian framework while taking father's education as a proxy for family background and ownership of car as a proxy for family status in the specific socio-economic context of Pakistan. The proxies remain significant in their impact upon earnings.

Summing up, it has been established that returns to education are of prime importance whose continued assessment tells us about the incentive or the profitability of investing in education. It has to be seen that the estimates of returns to education must be cleaned of econometric biases to be valid, efficient and reliable. Assessment of education earning relationship further makes the returns to education studies more relevant in terms of inequality related policies.

### 3. DATA AND METHODOLOGY

Household Integrated Economic Survey (HIES) is the most credible source of detailed information in Pakistan about the earnings/income and expenditure of individuals in Pakistan. It is periodically conducted across Pakistan by Pakistan Bureau of Statistics (PBS). This data is representative for provincial and regional analysis in Pakistan. For the purpose of this study, we have used the data sets of 2004-05 and 2011-12 years in order to observe the change over time period. The basic objective of the study is to estimate the returns to education in Pakistan while discussing the econometric biases issues with it. Montenegro, *et al.* (2014) mentioned that it is not possible to separate the returns to education and the returns to capital using the Living Standard Measurement Surveys (LSMS). Therefore, it is pertinent to use only wage employees for the assessment of true returns to education as they are employees against their wages and are giving their human services only. We can say that they are getting wages against their human capital (education and skill). Hence, earners like self-employed, employers, etc. would be excluded as their earnings include both the returns to education and the returns to capital. Moreover, individuals like unpaid/paid family workers and apprentices would also be excluded as their wages do not show market productivity. Hence, we will take only wage employees so that the true assessment is done for returns to education. The World Bank stated that the population of age 15 to 64 could potentially be economically active<sup>8</sup> and the same age limit would be used here. We will use real wage returns which

<sup>7</sup>Jaffry, *et al.* (2007) compared the real returns to education estimates using quantile regression and eight Pakistan's Labour Force Survey datasets from 1990 to 2003.

<sup>8</sup><http://data.worldbank.org/indicator/SP.POP.1564.TO.ZS> retrieved on 03-07-2015.

would be more valid for comparison over time period. This study used the Consumer Price Index<sup>9</sup> values with the base year 2000-01 to get real wage returns for 2004-05 and 2011-12.<sup>10</sup> In order to have a proper understanding of the variables used in the estimation we have given variable description in Table 1.

Wage earning is used as the dependent variable in the Mincerian earning function. The rationale is to check out how the labour market is rewarding individuals for their education. Potential experience is calculated: Age-Years of Education-6, where 6 is the school starting age for everyone [Awan, *et al.* (2007); Bhatti, Bourdon, and Aslam (2013); Fersterer, *et al.* (2003); Heckman, *et al.* (2003); Mincer (1974)]. Owing to the pervasive regional inequalities in Pakistan, the rural dummy variable is incorporated [Khan, *et al.* (1985) and Shabbir (1994)]. In order to see the gender discrimination in the labour market, we used female as a dummy variable. For Instrumental Variable estimation, the study will use the mean of father's and mother's years of education to form parental education.

Table 1

*Variable Description*

| Variables                    | Description   |
|------------------------------|---|
| Dependent Variable (Wage)    | Log of wage has been taken and it is the dependent Variable in our Mincerian model. Wages are monthly and only Paid wage employees have been considered for it. |
| Education/Years of Schooling | Total years of education attained by a wage worker/employee   |
| Experience                   | Experience (Potential) = Age – Years of Schooling - 6   |
| Experience Square            | Experience * Experience   |
| Female                       | Female = 1; Male = 0 (Reference Category)   |
| Rural                        | Rural = 1; Urban = 0 (Reference Category)   |
| Married                      | Married/Widow/Divorcee = 1<br>Never Married = 0 (Reference Category)  |
| Dependency Ratio (DR)        | Sum of Number of children (1 to 14 age) and Number of Old (65 +) divided by Active Working Age Persons (15 to 64) for each household                            |
| Landholding (in acres)       |   |
| Landless                     | (0= $\leq$ Land < 0.05) Reference Category  |
| Land_49                      | Dummy = 1 if (0.05= $\leq$ Land $\leq$ 0.49); otherwise = 0   |
| Land_149                     | Dummy = 1 if (0.50= $\leq$ Land $\leq$ 1.49); otherwise = 0   |
| Land_249                     | Dummy = 1 if (1.50= $\leq$ Land $\leq$ 2.49); otherwise = 0   |
| Land_25                      | Dummy = 1 if (2.50= $\leq$ Land so on); otherwise = 0   |
| Non Earned Income (Rs.)      |   |
| Non_earned~1                 | Sale of Assets/lands/Jewellery and Stones/ Securities   |
| Non_earned~2                 | Profits/Rents/Transfer Payments including Remittances   |
| Parental Education           | Mean mother's and father's education  |

<sup>9</sup>Economic Survey of Pakistan 2014-15, Statistical Appendices, Inflation, Table 7.1 (A).

<sup>10</sup>Jaffry, Ghulam, and Shah (2007).

In the context of Heckman's two step method, sample selection variables (Exclusion Restrictions) are believed to determine the participation in work but do not directly affect the wages [Lopez Boo (2010)]. Here, we use two non-earned income variables which can influence the decision of participation in the wage market [Duraisamy (2002); Asadullah (2006); Aslam (2006)]. The basic objective of taking number of children / old persons (dependents) in model is to see how the dependents would work to push or pull the working age individuals against wage market [Aslam (2006); Aslam, *et al.* (2009); Khitarishvili (2010)]. In this scenario, we have used the dependency ratio as exclusion restriction. It is pertinent to mention here that the indirect influence on wage market participation is captured by above mentioned exclusion restrictions and the direct influence is undoubtedly the wage incentive in market which would be accommodated by including the determinants of wage in probit regression of Heckman two step procedure which are the Mincerian model explanatory variables i.e., education, experience, marital status, region and gender.

This study employs the conventional Mincerian earning function [Mincer (1974)] for the estimation of returns to education in Pakistan. This function is semi-logarithmic in nature with dependent variable is in log form. The basic Mincerian function can be described as:

$$\ln Y_i = \beta_0 + \beta_1 s_i + \beta_3 x_i^2 + \varepsilon_i$$

Where  $s_i$  stands for Years of Schooling of wage workers,  $x_i$  stands for Experience of an individual and  $x_i^2$  is its quadratic term (Square of Experience) to incorporate the non-linear earnings-experience relationship. Studies also consider various types of control variables like occupational, Industrial etc. However, it has been discouraged as they greatly mutilate the true returns to education by forcefully converting parsimonious returns to education model into an econometric model of earnings [Montenegro, *et al.* (2014); Pereira, *et al.* (2004)]. We will take up the further discussion with a parsimonious Mincerian model with just three more variables as compared to considering the social circumstances of Pakistan and to remain within the objective of this study.

$$\ln Y_i = \beta_0 + \beta_1 s_i + \beta_2 x_i + \beta_3 x_i^2 + \beta_4 \text{female} + \beta_5 \text{rural} + \beta_6 \text{married} + \varepsilon_i$$

where female, rural and marital status are dummy variables. According to the socioeconomic circumstances, these three additional variables are inevitable to be included in the estimation to assess the possible inequalities within the wage market of Pakistan. The basic OLS technique would be used for the estimation of the above model. Sample selection bias arises when non-random selection occurs in this study if we deliberately consider only those cases in Mincerian regression whose labour market wages (actual) are given excluding all others who possess the potential working age but not participating in labour market i.e.; women working at home, retired persons etc. whereas endogeneity occurs due to unobserved ability and family characteristics.

Simultaneous Approach [Wooldridge (2013)] states that analysis having issues like sample selection bias along with explanatory endogenous variable bias should be treated in such a way to control for both biases simultaneously instead of separate regressions for sample selection (Heckman) and endogeneity bias (IV). The basic advantage is that the

resultant estimates of simultaneous approach would be free of both biases otherwise, Heckman estimate would contain endogeneity bias and 2SLS estimate would contain sample selection bias. We basically combine both strategies to get our results in an efficient manner. We must have separate selection explanatory variables and Instrument variables to be used in the selection equation of Heckman (1979) Two Step procedure and 2SLS technique respectively. The selection equation as explained earlier is the dichotomous probit model equation whose explanatory variables (Selection Variables) would determine the participation in wage market. Using this probit regression, we will construct the Inverse Mills Ratio (IMR) for each individual and then we will introduce the IMR as an explanatory variable in 2SLS regression while instrumenting endogenous education with parental education.

Fixed Effect technique (Household Fixed Effect) would be used to analyse returns to education while controlling for the impact of personality/ability traits and family features of household members with the assumption that largely the family demographic features and ability traits would be same within household or family [Aslam, *et al.* (2009); Aslam, *et al.* (2010) and Kingdon, *et al.* (2007)]. Here, we will use households having two or more wage workers so that the common effect between or among wage workers within household could be fixed.

For the relationship of wage earnings and education, the study would use a more flexible approach in which we are not going to take any predetermined form for the relationship [Crespo Cuaresma, *et al.* (2014)].

$$\ln w_i = a + \psi(ed_i) + v_i$$

where  $\psi(ed_i) = \sum_g \beta_g I(ed_i = g)$

$$g = 1, \dots, G$$

$I(\cdot)$  is an indicator function

The indicator function  $I(\cdot)$  would get value one if the argument is true and zero otherwise whereas  $g$  is every possible value of years of education. Plotting of estimates would figuratively describe us convexity or concavity of earning-education relationship.

#### 4. RESULTS AND DISCUSSION

The returns to education in Pakistan has been estimated in this study with the help of Mincerian earning function specification using the HIES dataset of 2004-05 and 2011-12 years (Table 2). Our results show that it is much better, efficient, consistent and reliable to simultaneously control for both these biases instead of separate regressions for Sample selection correction (Heckman Two Step) and endogeneity correction (Instrumental Variable [IV]). Our prime focus is upon the returns to education. In both years, the simultaneous result is more than the OLS results. Hence, in both years the OLS estimates were downward biased as we corrected for both biases, the returns to education improved. Arabsheibani, *et al.* (2007) and Foltz, *et al.* (2012) observed also the rising trend in returns after correction of both biases and concluded that separate regressions would be misleading owing to the presence of one bias or the other. We can see that for both for 2004-05 and 2011-12, the significance of the Inverse Mills Ratio (IMR) and the

endogeneity tests (Wu Hausman) scores confirm the existence of sample selection bias and endogeneity bias. Hence, Simultaneous regression results are valid instead of OLS, Heckman and IV estimates.

Using the bias-free simultaneous results, the returns to education for national sample shows that there has been an increase of 2 percent in the returns to education of wage employees in the span of seven years during 2004-05 to 2011-12 in Pakistan. Hence, profitability in investing in education increases over time even after the simultaneous control of bias. Further elaborating the results (Table 2) of other variables in Simultaneous approach estimates; we have observed that the impact of experience increases as an additional year of experience enhance the wage benefit from 8 percent to 10 percent. Moreover, the negative sign of experience square and positive sign of experience established the fact of concavity in earning experience for both years [Afzal (2014); Sial, *et al.* (2013)].

Table 2  
*OLS, Heckman, IV and Simultaneous Approach*

|                     | OLS      | Heckman  | IV       | Simultaneous |
|---------------------|----------|----------|----------|--------------|
|                     | 2004-05  |          |          |              |
| Years of Education  | 0.08*    | 0.08*    | 0.14*    | 0.13*        |
| Experience          | 0.05*    | 0.05*    | 0.08*    | 0.08*        |
| Experience-sq       | -0.0008* | -0.0008* | -0.0010* | -0.0009*     |
| Female              | -0.60*   | -0.56*   | -0.55*   | -1.18*       |
| Rural               | -0.18*   | -0.18*   | -0.04    | -0.13*       |
| Married             | 0.16*    | 0.16*    | 0.13***  | 0.07*        |
| Inverse Mills Ratio |          | -0.03*** |          | 0.50*        |
| Wu-Hausman Test     |          |          | 24.15*   | 25.18*       |
|                     | 2011-12  |          |          |              |
| Years of Education  | 0.10*    | 0.10*    | 0.15*    | 0.15*        |
| Experience          | 0.07*    | 0.07*    | 0.10*    | 0.10*        |
| Experience-sq       | -0.0008* | -0.0008* | -0.001*  | -0.001*      |
| Female              | -1.29*   | -1.45*   | -1.18*   | -1.18*       |
| Rural               | -0.18*   | -0.18*   | -0.01    | -0.01        |
| Married             | 0.09*    | 0.13*    | 0.18*    | 0.18*        |
| Inverse Mills Ratio |          | 0.16*    |          | -0.01        |
| Wu-Hausman Test     |          |          | 124.82*  | 124.06*      |

Note: (\*), (\*\*) and (\*\*\*) stands for significance at 1 percent, 5 percent and 10 percent level. We have summarised all technique results in this table. The results are for national level sample.

Gender discrimination persists against females over the time period as shown by the negative sign of female dummy variable in both years [Aslam, *et al.* (2009); Ali, *et al.* (2013); Hyder (2007); Jaffry, *et al.* (2007); Nasir (1999)]. Marital status has been associated with positive impact on earnings [Aslam, *et al.* (2009); Ali, *et al.* (2014)] across years. Regional Discrimination owing to the negative sign of rural variable is quite evident in both time periods [Hyder (2007); Qureshi (2012)]. However, there has been reduction in it over time period.

Table 3 shows the Household Fixed Effect technique [Aslam, *et al.* (2009); Kingdon, *et al.* (2007)] results while controlling for the household and ability factors within household. Households having two or more wage workers have been used. The fixed effect regression vehemently supports the result of positive and increasing benefit of acquiring education over time period that we got in Table 2 results. The incentive to invest in education on average, increased by four percentage points. In the same way, experience contributes further in returns to education over time period.

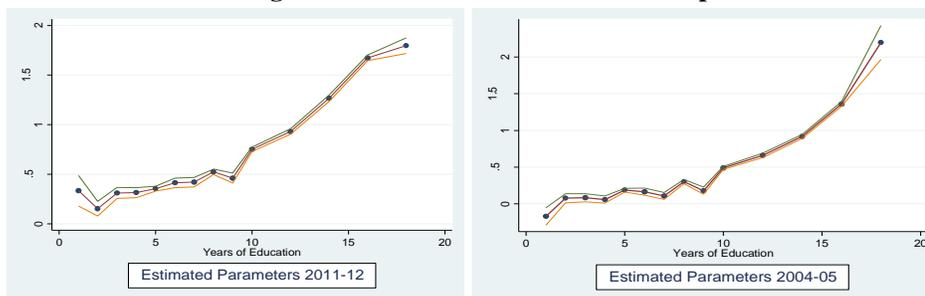
Table 3

*Household Fixed Effect*

|                     | 2004-05 | 2011-12 |
|---------------------|---------|---------|
| Years of education  | 0.05*   | 0.09*   |
| Experience          | 0.01*   | 0.02*   |
| No. of Observations | 5737    | 10749   |
| No. of Households   | 2362    | 4114    |

Note. (\*), (\*\*) and (\*\*\*) stands for significance at 1 percent, 5 percent and 10 percent level. We have summarised all technique results in this table. The results are for national level sample. The regression intentionally does not include dummy variables.

In Figure 1, we have plotted the estimated parameters (using indicator function approach) of each year of schooling along with their corresponding standard errors for both years without taking any pre-determined form of between education and wage earnings. This more flexible approach is easily and figuratively depicts us the convex between wage earnings and years of education for both 2004-05 and 2011-12 in Pakistan. Convexity interprets as higher returns for increasingly higher levels of education. Our convexity result is in line with the findings of Aslam, *et al.* (2009), Guisingeret, *et al.* (1984), Haque (1977), Khan, *et al.* (1985), Nasir (1998), Nasir (2002) and Shabbir (1994)].

**Fig. 1. Returns—Education Relationship**

Note: Relationship shows that returns are relatively lower in initial years of education and consistently increase with more education. It shows the prevalence of convexity in both years.

The convexity has been explained by RECOUP (2009) who stated that both demand-side and supply-side factors emerged in the last three to four decades which contributed in the lower returns to initial or primary education. Supply-side factor works as the supply of workers having primary education has increased. On the other hand,

Demand-side factor works as the demand for workers having low skills/education reduced. The joint interaction of both demand and supply forces depress the returns to education at lower education level in most of the developing countries. Moreover, Qureshi (2012) mentioned for convexity that there is hunger for higher educated/skilled workers in various sectors of Pakistan economy as higher education is being rewarded in higher monetary values. This logic is quite plausible for the support of our consistent convexity results for both 2004-05 and 2011-12. Convexity perpetuates the educational and the consequent income inequality. It means that poorer families would not be able to educate their children for higher levels hence, they will command low returns in wage market. On the other hand, richer families would be able to educate their children for higher levels and get higher earnings. In this scenario, poorer families would have little incentive to go for even low levels of education and their earnings would remain depress relative to richer families and as a result of it income or earnings inequality would increase along with educational inequality. This is the educational and income inequality across (inter) families. But even within families educational inequality would also increase because low incentive (Low returns to Lower levels of education) and low resources (lack of resources to educate all children and for higher levels) would compel families to choose the child having more ability for education. In the backdrop of gender discrimination, girls' education would suffer in poorer families due to the preference of boys' education. Hence, both intra and inter family inequality worsens [Qureshi (2012)]. Based upon this reasoning, we can also say that educational inequality constitutes a significant component of inequality of circumstances (counterpart to the inequality of efforts) which results in Inequality of Outcomes whereas wage earning is one of the outcomes [World Bank (2009)].

## **5. CONCLUSION**

Returns to education have been the common interest of education economists and labour economists for a long time. The continued investigation of it is premised over how education is being rewarded. This study after the careful adjustment of all those factors inevitably for private and unbiased returns to education observed that returns increase in the time period from 2004-05 to 2011-12. Other results include the observance of concavity in earning-experience, gender discrimination against the status of female, regional inequality with lower wage earnings for rural side workers and wage premia advantage for ever-married as compared to never married individuals over time period. Consequent upon the unfolding of above mentioned results, this study prescribes an active labour management policy from the government for the proper and adequate absorption of educated workers in the labour market. Education expansion is on the way but labour market's hunger exists for educated workers that may aggravate as a consequence of possible job-less growth. Returns to education may also increase due to the shortage of more skill-oriented educated workers. This is of keen interest for employers who knew that newer technology continuously demand labour which is more adaptive to the newer technological production functions. Hence, policy should focus more upon expansion of education which is more skill-oriented and quality-oriented. Support mechanism for the poor households is required in order to spread more equitable access to education which is effective against poverty and inequality. Incentive schemes

for poorer households who are eager to send their children to schools and Scholarship schemes with maximum coverage especially for deprived regions etc. are the policies which can minimise the detrimental impacts of educational inequality.

## APPENDIX

Table A1

*Estimates of Probit Regression in Simultaneous Approach (2004-05)*

| <b>Probit Regression</b>    |              | Number of obs | 59862    |       |                      |           |
|-----------------------------|--------------|---------------|----------|-------|----------------------|-----------|
| Log likelihood = -27687.824 |              | LR chi2(12)   | 14351.28 |       |                      |           |
|                             |              | Prob > chi2   | 0.0000   |       |                      |           |
|                             |              | Pseudo R2     | 0.2058   |       |                      |           |
| Variables                   | Coefficients | Std. Err.     | z        | P>z   | [95% Conf. Interval] |           |
| Year of Education           | .0057026     | .0014701      | 3.88     | 0.000 | .0028214             | .0085839  |
| Experience                  | -.0002633    | .0006283      | -0.42    | 0.675 | -.0014948            | .0009682  |
| Female                      | -1.309034    | .0134947      | -97.00   | 0.000 | -1.335483            | -1.282585 |
| Rural                       | .0352129     | .0135055      | 2.61     | 0.009 | .0087427             | .0616832  |
| Married                     | .3534576     | .01837        | 19.24    | 0.000 | .3174531             | .3894621  |
| Land_49                     | -.4510216    | .0853688      | -5.28    | 0.000 | -.6183415            | -.2837018 |
| Land_149                    | -.5425274    | .0403645      | -13.44   | 0.000 | -.6216402            | -.4634145 |
| Land_249                    | -.6723232    | .0437411      | -15.37   | 0.000 | -.7580541            | -.5865923 |
| Land_25                     | -.9314893    | .0262892      | -35.43   | 0.000 | -.9830152            | -.8799634 |
| Non_earned~1                | -4.60e-07    | 1.45e-07      | -3.17    | 0.002 | -7.45e-07            | -1.75e-07 |
| Non_earned~2                | -1.43e-06    | 6.38e-08      | -22.36   | 0.000 | -1.55e-06            | -1.30e-06 |
| DR                          | .0345524     | .0087192      | 3.96     | 0.000 | .017463              | .0516418  |
| _cons                       | -.2314482    | .0215473      | -10.74   | 0.000 | -.2736801            | -.1892163 |

Table A2

*Estimates of Probit Regression in Simultaneous Approach (2011-12)*

| <b>Probit regression</b>    |              | Number of obs | 54862    |       |                      |           |
|-----------------------------|--------------|---------------|----------|-------|----------------------|-----------|
| Log likelihood = -21773.555 |              | LR chi2(12)   | 10897.33 |       |                      |           |
|                             |              | Prob > chi2   | 0.0000   |       |                      |           |
|                             |              | Pseudo R2     | 0.2002   |       |                      |           |
| Variables                   | Coefficients | Std. Err.     | z        | P>z   | [95% Conf. Interval] |           |
| Year of Education           | .0309953     | .0017087      | 18.14    | 0.000 | .0276463             | .0343444  |
| Experience                  | .0003459     | .0007214      | 0.48     | 0.632 | -.0010681            | .0017598  |
| Female                      | -1.295631    | .0162939      | -79.52   | 0.000 | -1.327566            | -1.263695 |
| Rural                       | -.0209138    | .0157888      | -1.32    | 0.185 | -.0518591            | .0100316  |
| Married                     | .3063452     | .0205028      | 14.94    | 0.000 | .2661604             | .3465299  |
| Land_49                     | -.3888892    | .0318539      | -12.21   | 0.000 | -.4513218            | -.3264566 |
| Land_149                    | -.4689868    | .0266273      | -17.61   | 0.000 | -.5211754            | -.4167982 |
| Land_249                    | -.4294069    | .0359974      | -11.93   | 0.000 | -.4999605            | -.3588532 |
| Land_25                     | -.6387796    | .0235253      | -27.15   | 0.000 | -.6848884            | -.5926708 |
| Non_earned~1                | -6.30e-07    | 3.47e-07      | -1.82    | 0.069 | -1.31e-06            | 4.95e-08  |
| Non_earned~2                | -4.87e-07    | 8.16e-08      | -5.97    | 0.000 | -6.47e-07            | -3.27e-07 |
| DR                          | .055753      | .0094514      | 5.90     | 0.000 | .0372287             | .0742774  |
| _cons                       | -.6285794    | .0232522      | -27.03   | 0.000 | -.6741528            | -.583006  |

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## Impact of Credit on Education and Healthcare Spending in Rural Pakistan

ABID HUSSAIN, MUHAMMAD JEHangIR KHAN and IFTIKHAR AHMAD

It is to access that the microcredit has a positive impact on education and healthcare spending of the borrowed households is controversial in developing countries literature or not. This study reports evidence, from Pakistan for this debate, while utilising data from PPHS-2010 (Pakistan Panel Household Survey). Propensity score matching (PSM) has been used to investigate the impact of household credit on healthcare and education spending by the poor. In addition to matching statistically identical borrowers with non-borrowers, the method controls for household pre-treatment assets and income. These may be correlated with unobservable factors affecting credit participation as well as outcomes of interest. The estimates from binary as well as multiple ordered treatment effect show insignificant impact of borrowing on education and significant and positive impact on healthcare spending.

*JEL Classification:* D13, C14

*Keyword:* Matching; Household Credit; Per-capita Income; Education and Healthcare Spending.

### 1. INTRODUCTION

Microcredit has increasingly attracted attention from the global development community because it is considered a powerful tool in poverty alleviation strategies in developing countries [Microcredit Summit (2009)]. A common argument for microcredits that it may help in keeping household production stable and mitigate adverse shocks, thus it helps to prevent school dropout and reduction in spending on healthcare [Armendariz and Morduch (2005)]. The effects on education and health are critical to sustainable poverty reduction since it affects the quality of human capital formation and thus productivity of future generations.

But there is a debate about the impact of microcredit on education and healthcare of borrowing of household [Cull, Kunt, and Morduch (2009)]. For example, access to credit may raises female economic activity which in turn lead to children may begin taken out of school to replace maternal inputs in the care of young siblings or work in expanded household businesses. The debate has resulted from mixed evidence on microcredit impacts.

Positive impact of microcredit on education has also been reported. For example, Pitt and Khandker (1998) find that girls receive more schooling if household borrow from

Abid Hussain is MPhil Research Scholar, Pakistan Institute of Development Economics, Islamabad. Muhammad Jehangir Khan <jehangir@pide.org.pk> is Assistant Professor, Pakistan Institute of Development Economics, Islamabad. Iftikhar Ahmad <iftikhar@pide.org.pk> is Assistant Professor, Pakistan Institute of Development Economics, Islamabad.

the Grameen Bank (GB). On the other hand, some studies find no effects or adverse effects on child education [Islam and Choe (2009)]. Coleman (1999, 2002, and 2006) finds negative impact of microcredit on healthcare spending by household in Northeast Thailand. Household credit can be useful tool to fill the gap created by the shocks thus, in urban areas credit may be used to support consumption expenditure on healthcare, school fees and food rather than production expenses (wages of labours) as found in rural areas [Barslund and Tarp (2008)]. Healthcare services such as pasteurisation, health insurance, family planning and pregnant-mother care are observed to be consumed more by microcredit clients than non-clients [CGAP (2003)]. Moreover, developing countries not only face poor education but also face poor health. In developing countries health of the children are very poor and the enrolment of the children is lower due to poor health. Children remain stay longer in the school if they are healthy. Poor children in developing countries have deprived sanitation condition and undesired housing, food and water scarcity which expose them to a high probability of illness.

The recent propagation of advanced microfinance plans, has been mainly encouraged through the confidence that such programmes cover the poor and improves many dimensions of their welfare, including economic events (e.g., wealth and income) social position (e.g., educational achievement and health position), and less tangible event such as empowerment. Moreover, the contribution of microcredit providers to their customer's access to health products is negligible. However, some customers are better off in a cost effective way if they receive more access/information to products that are helpful to family health (such as medicines, verbal rehydration salts, parasite nets, paracetamol, de-worming pills, antiseptic oil, spoken contraceptive pills) or even lifesaving, such as insecticide-treated bed nets [Leatherman, *et al.* (2011)].

Microcredit loan affect the poor household in different aspect of life like health, women empowerment, education, livestock, income and consumption. Education and healthcare negatively affect poverty; results in human capital formation increased production of future generation. This is one channel through which researchers claim microcredit may influence children's educational attainment and therefore, human capital formation.

It has been argued that the impact of microcredit on education and healthcare spending is insignificant in Thailand [Coleman, (1999, 2006)]. While other studies reported positive impact on healthcare expenditure [Doan, *et al.* (2011)]. Studies exist, which provide mix evidence for the impact of microcredit on health care expenditure [Setboonsarng and Parpiev (2008)].

One estimation approach that may better suit this problem is Propensity Score Matching (PSM) where treatment effects are estimated by simulating a randomised experiment, matching household in the treatment group with households in the control set that are as identical as possible based on noticeable factors. It is then supposed that the matched (control) households would have no systematic difference in comparison to the treated households, so they deliver a valid counterfactual [Dehejia and Wahba (1999)].

This study investigated the effect of household credit on education and healthcare spending in rural areas of Pakistan. It uses information on both formal and informal credit available in the dataset. Evidence on informal credit is not available for Pakistan in the literature. So this study attempts to report results on informal credit as a major portion of the households rely on informal credit sources in rural Pakistan.

The remainder paper is organised as: the review of the related literature will be discussed in Section 2. Section 3 presents the data and methodology, Section 4 reports empirical result and concluding remarks are presented in the final section.

## 2. LITERATURE REVIEW

Credit may affect household's demand for education and health in two ways [Armendariz and Morduch (2005)]. On the one hand, credit may help household earn higher income, which raises consumption and increases the demand for healthcare and children's education. On the other hand, if microcredit causes higher female employment, it then may decrease children's schooling if children have to replace mothers input into the care of younger siblings or work in enlarged household businesses [Basu and Van (1998)].

Impact on health and education may also interact. For example, if borrowing enables parents to provide medicines promptly once children are sick, then it may shorten sickness time and keep children at school. Healthier children may have better school performance, which helps keep children at school longer so they are more productive when adults. Lower school achievement and attendance are associated with child malnutrition [Glewwe, *et al.* (2000)].

Glewwe and Jacoby (2004) credit boost-up child school enrolment and household wealth even if we control other factors like improving quality of education, change in opportunity cost and return to education. A study on Gujrat shows that microcredit has positive impact on the awareness level of women and affects their participation in child education, healthcare utilisation, self-identity, and literacy level, visiting relatives and shopping and involvement in family budgeting [Khan, *et al.* (2011)].

Another study from rural China uses quasi-experimental technique which reports that static investigation reveals the importance of microcredit for child schooling but performance of children remained unaffected. The dynamic investigation showed significant impact of microcredit on both long spans of child schooling years and higher average score. The long term prospects for improved education in comparison to the short term results decline in poverty in the long run [You and Annim (2013)]. Doan, *et al.* (2011) use the sample of 411 household and employ the PSM method to estimate the results and showed that only formal credit have significant impact on household education and healthcare spending while informal credit, showed insignificant effect on education and healthcare spending.

Tinh and Doan (2011) uses panel data and give some interesting results that short term loan have no effect on schooling. Female education is positively affected by credit whereas male education is negatively affected. These results are contrary against the existing literature on gender gap in South Asia. They also reported that formal credit has positive impact on child schooling whereas informal credit has insignificant impact on child schooling.

Jamal (2008) used a sample of 3400 households and use DID (Difference-In-Difference) method and revealed that microcredit involvement possibly helps in smoothing consumption particularly in urban areas and producing income. The borrower's children (boys) got enrolled in school and their enrolment coefficient is positive and significant.

Some studies show that microcredit does not affect education. Banerjee, *et al.* (2013, 2014) found that access to microcredit did not help improve education, health and empower women. The empirical study investigated by Jacoby (1994) demonstrated the effect of household borrowing constraints by analysing how rapidly children with different family background, progress through the primary school system in Peru. He also argued that the children from high income households stay fulltime in school with small opportunity cost and children of lower income households spend less time in school with high opportunity cost. Inadequate schooling in poor countries is often due to lack of access to credit since households facing adverse shocks and having insufficient access to credit may pull children out of school to reduce household expenditure and increase labour income by increasing working hour, including child labour [Jacoby and Skoufias (1997)].

Microcredit positively affect child schooling when parental income is more than a certain threshold. It is showed that microcredit increases income and schooling expenditures. When parental income is under the given threshold, then children are not allowed to go to school [Zaman (1999)].

It has also been reported that microcredit increases child labour [Choe (2009)]. Child schooling is lower in microcredit receiving households; especially for girls. Younger children are more badly affected than their older siblings and children of poor household are more affected than educated household.

Credit receiving households may prefer allowing their children to work in household enterprise. A study on Malawi by [Hazarika and Sarangi (2008)] uses a sample of 404 household and reported that microcredit access lead to child work and does not affect school attendance. The increase in child work leads to decrease in leisure while school attendances remain the same. Hence, decrease in leisure time and increase in work time will eventually reduce the time for study outside of the school hours.

Another study by Fuwa (2009) on the child labour, while describing the child time period allocations as a preference of the household. The results explained that child schooling time decreases in credit receiving households, whereas child labour time increases.

Credit access has limited role in declining child labour despite the fact it increases the income level of the borrowers. Montgomery (2005) reports from Pakistan that credit have insignificant effect on household expenditure on food and child education but expenditure on healthcare is significant. Setboonsarng, *et al.* (2008) reports, in case of Pakistan, that credit does not affect child education and its impact on child labour and healthcare expenditure are mixed.

In a nutshell, evidence regarding the impact of credit on education and healthcare spending is inconclusive in the empirical literature. This paper attempts to investigate the same phenomena while utilising a nationally represented data on both formal and informal credit from rural Pakistan.

### 3. METHODOLOGY

Discussion on source of data is furnished with in Section 3.1, impact evaluation problem is presented in Section 3.2, and method of experiment and Propensity Score Matching method (PSM) is presented in the final section.

### 3.1. Data

This paper uses the Pakistan Panel Household Survey (PPHS) 2010. The survey contains information on household and individual Characteristics; such as household durable and fix asset, child schooling and their educational spending, health, food and non-food items, housing expenditure and borrowing. In PPHS 2800 rural household were surveyed from all four provinces in Pakistan. Nearly, 1801 rural household did not received credit from any source while 115 household get credit from formal source. Only 582 household get credit from informal source. We drop the 302 household who have no children's in the household because we check the impact of credit on child schooling and health expenditure. The eligibility criteria for loan are that only those people are eligible whose per-capita income is less than 5172 rupees. According to definition of modern poverty line a person is poor whose income is less than 2\$ [World Bank (2010)].<sup>(a)</sup> So only 110 observations are drop and 113 formal borrower and 1693 are non-borrower are below the poverty line. So the total sample 1806 is probable to be demonstrative for the poor set whose early income per-capita is under the poverty line.

### 3.2. Impact Evaluation Problem

In impact evaluation studies, bias creates from three sources (i) selection bias (Bank selected itself or giving credit to specific district or town) (ii) self-selection (Selection on the basis of entrepreneurial ability, reference, business, skills and knowledge) (iii) difference in observable characteristics [Siddiqui (2013)]. The most difficult part of credit impact evaluation is to separate the causal effect of credit from selection and reverse causation biases which are very common to nearly all statistical evaluation [Armendariz and Morduch (2010)]. Earnings from microfinance membership are used for funding new houses, more new savings, new saving account, education for children and new business. We try to dig, whether these variations have additional extraordinary benefits, than those who have not availed microfinance. We know that rich household can get greater loan. We have to find out whether the microcredit can make the households richer or not.

To check the impact of credit participation; the difference in the outcome between target and control group is measured, that is:

$$ATT = E(Y \mid D=1) - E(Y \mid D=0)$$

$ATT$  = Estimated Average Treatment-on-Treated effect.

$Y$  = is the outcome.

$D=1$  if individual are participating in credit programme or receiving treatment.

$D=0$  if the individual are not participating in credit programme.

If we does not control observable characteristics that may lead to bias 'Overt bias' which arise when observable characteristics are different. It can be eliminated by controlling observable ( $X_i$ ) characteristics in estimating models [Lee (2005)], so the impact evaluation is now

$$ATT = E(Y \mid D=1, X_i) - E(Y \mid D=0, X_i)$$

Mosely (1997) showed that there may present hidden bias between the treatment group and control group. But in design based studies such those with a randomised

selection of treatment and control groups randomisation enables us to remove the hidden bias by cancel out the unobservable characteristics of both control group and target group. In credit impact evaluation it is difficult to conduct randomization methods due to motivational problem (the control group may refuse to reply) and may result in non-random placement.

The common problem arises during the impact evaluation in non-experimental data is non-random placement of credit programme and self-selection bias into credit participation programme. The outcome is also affected if credit participation is correlated with unobserved characteristics. For instance, those people who are more concerned about children education may demand more credit. Without a suitable measure of motivation, this eliminated factor may make an observed relationship between credit and schooling like a causal effect.

Non-random placement is not a big issue as most credit programmes are randomly placed but self-selection bias may be an issue as it may occur due to entrepreneurial ability skills and knowledge and may create bias in results [Tinh and Doan (2011)]. When informal lender selected credit borrowing due to unobservable factors (entrepreneurial ability, skills, knowledge), so this may cause self-selection biasness.

Researcher may examine differences in these variables in order to see whether there is positive or negative selection on unobserved characteristics, conditional on the observable characteristics if pre-treatment data of variables are available.

The outcome for treated and control group  $Y_{t0}$  and  $Y_{c0}$  at the time 0 (before the treatment) and after controlling for the observable characteristics, the result is as.

$$E(Y_{t0} \setminus D = 1, X_i) \neq E(Y_{c0} \setminus D = 0, X_i)$$

One can suspect that unobservable characteristics are affecting the outcome and treatment. It means hidden ‘bias’ exists between output and treatment confounders. Lee (2005, p. 125) suggest that controlling both outcome ( $Y_0$ ) (outcome means dependent variable) and treatment variable ( $X_i$ ) may reduce the ‘hidden bias’ to some extent. In this analysis pre- treatment variable data is not available. We could use pre-treatment (baseline) income per-capita as a control variable as suggest by [Mosely (1997)].

$$Y_{ij} = \alpha + \beta D_{ij} + \gamma X_{ij} + e_{ij} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.1)$$

- $Y_{ij}$  = The outcome of interest of individual (household)  $i$  and province  $j$ .
- $D = 1$  if a household borrows.
- $D = 0$  otherwise.
- $X$  = is set of control (unchanged) variables over time household observable characteristics.

The coefficient of ( $\beta$ ) shows whether participant have lower or higher per-capita income than non-borrowers previous to participating in borrowing activities, restricted on their observed characteristics. If ( $\beta$ ) is positive, it means a positive selection on unobserved features (attributes) exists, borrowers incline to be richer than non-borrowers, which will lead the non-experimental estimator to exaggerate the impact of credit participation.

### 3.3. Method for Measuring Impacts

There are two types of experiments that are used in impact evaluation (a) experimental (b) non-experimental method. In case of experimental method data is not available so we use quasi-experimental method which is the main technique of non-experimental method and this method is mostly used in many credit programmes because non-experimental programmes are less costly and easily implement in impact evaluation programme [Smith and Todd (2005)].

### 3.4. Quasi- Experimental Method

In experimental study by using the randomisation procedure the treatment and control group produce similar results in expressions of both observe and unobserved characteristics [Bryon, *et al.* (2002)]. Alternatively, the quasi-experimental process tries to create a similar control group by asking: “what would the treatment group have done without the treatment?” [Armendariz and Morduch (2005, 2010)]. There are three main approaches: (i) matching (ii) before-after difference estimator (BA) (iii) difference in difference estimator (DID). In this study we use the matching estimator.

### 3.5. Propensity Score Matching (PSM)

Dehejia and Wahba (2002) suggest that matching selects non-participants who have similar observable attributes (characteristics) to participants in order to generate comparison group (control group). The reasoning behind this is that, if a variable affects participation but not the result, then it is not necessary to control for differences with detail to this variable in the treatment versus the control groups. Similarly, if the variable impacts the consequence but not the treatment, then it is not important to control for that variable since the consequences will not significantly different in the treatment versus the control groups. Variables that affect neither treatment nor the result are also visibly irrelevant. Thus, only those variables that effect both the treatment and the outcome are required for the matching and are encompassed in the probit model from which this study derives the propensity score.

If matching cannot completely control on unobserved attributes which automatically create selection bias and the reliability of the estimator becomes more sensitive due to selection bias [Smith and Todd (2005)]. Propensity score matching (PSM) method is most widely used matching estimator.

The (PSM) method first estimates the propensity score for each contributor (credit receiver) and non-contributor (credit non receiver) on the basis of observed features, and then compares mean outcome of participant with that of the matched non-participant. The aim of the PSM is to select non-borrowing households among all non-borrowing households to make a control group, and then compare the outcome of the treated and matched control group.

The crucial assumption is that amongst non-borrowers, those possessing the similar characteristics with actual borrowers should have the same result as compared to what the borrowers would have had without credit participation. This assumption is said to be conditional independence assumption (CIA) [Rosenbaum and Rubin (1983)]. The main point of the PSM method is to control the comparison and treatment units with the

same propensity score and compared with mean estimated from comparison and treatment group [Dehejia and Wahba (2002)].

Dehejia and Wahba (2002) say that PSM method is more efficient (with lower bias) if data hold three conditions. (a) The sample are drawn from both control and treatment group in same geographical location. (b) Data for comparison are collected from same questionnaire. (c) The dataset contains a large set of variable associated to modelling credit participation and the consequences. The dataset used in the current paper do met all these conditions.

If  $X_i$  is high dimensional variable it is very difficult to find similar characteristics. PSM method is simplest way to avoid this problem [Lee (2005)]. Afterward the propensity score is projected, different procedures can be engaged in order to recognise matching partners [Rubin (1984)]. To check the impact of informal loan versus formal loan, formal loan versus non-borrower and informal versus non-borrower hence we shall use multiple treatment effect.

#### 4. EMPIRICAL RESULTS

We start with a simple test for self-selection into credit participation in Section 5.1. Section 5.2 present PSM estimation of the impact on education and healthcare expenditure. Section 5.3 applies a simple strategy to detect unobserved selection bias by employing multiple treatment effect method.

##### 4.1. Self-selection into Credit Participation

This study observed a positive selection of borrowers (Positive  $\beta$ ). The borrowers and non-borrowers are observed to be different in terms of not only observed characteristics such as age, household size, and provinces but also in terms of unobservable characteristics. Conditional on the household head's gender, age, education and household size and province dummies, the pre-treatment income differences is statistically significant at the (1 percent) level.

Table 1

##### *Testing for Positive Selection into Credit Participation (OLS)*

| Control Variables            | Model (1)         | Model (2)       | Model (3)     |
|------------------------------|-------------------|-----------------|---------------|
| Credit participation (Yes=1) | 1184.228(7.15) *  | 833.10(4.15) *  | 1.78(5.28) ** |
| Head's gender (Male=1)       |                   | 569.52(-0.50)   | 1.06(2.52) *  |
| Household head's age         |                   | -10.21(-0.32)   | -0.03(1.46)   |
| Head's age squared           |                   | 0.15(0.50)      | 0.003(1.37)   |
| Head's education (years)     |                   | 47.55(2.34) *   | 0.05(2.86) *  |
| Household size in log        |                   | -120.78(-0.32)  | 0.26(1.36)    |
| Punjab                       |                   | -30.79(-0.10)   | 1.03(3.79) *  |
| KPK                          |                   | 1177.11(4.26) * | 2.88(10.33) * |
| Sindh                        |                   | -448.76(-1.59)  | 0.36(1.28)    |
| Constant                     | 1815.586(17.67) * | 2495.40(2.00) * | 3.46(4.44) *  |
| R-Squared                    | 0.004             | 0.027           | 0.110         |
| Observation                  | 1806              | 1806            | 1806          |

*Note:* Robust t statistic in parenthesis, significant at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent) \*. Dependent variable is the pre-treatment income per capita in Model (1) and Model (2), and in natural logarithm in Model (3). The province of Balochistan is set as a reference dummy for other province.

The logarithmic equation (the last column of Table 1), borrower's pre-treatment income is observed to be 17 percent higher than that of non-borrowers (Statistically significant at the 5 percent level).

Income per capita prior to credit participation may capture a host of unobservable attributes (e.g. entrepreneurial ability, skills, motivation) which affect outcomes of credit participation such as education and healthcare expenditure, and also affect the likelihood of credit participation. In other words, the hypothesis that the borrowers are self-selected in terms of the unobservable characteristics is plausible. Therefore, non-experimental estimators that fail to control for unobservable might overestimate impacts. But controlling for the initial variable such as income and assets may reduce the bias caused by the unobservable attributes [Mosely (1997), p.14].

#### 4.2. PSM Estimation

In this section radius matching (with the default radius is 0.1) and kernel (with default bandwidth of 0.06) result of the credit impact on education and healthcare expenditure are discussed. The sets of controlling covariates should meet conditions of matching controlling variables discussed in Lee (2005). This study also uses the interaction terms to achieve balancing in estimating the propensity scores. In Appendix 6 presents discussion on how we choose covariates in the score estimation stage.

#### *Impact on Education Expenditure*

Our base specification ( $S_1$  and  $S_3$  in Table 2) use a set of covariates of household features such as house head's gender, age, education and school-aged child ratio, number of children and province dummies to estimate the scores. Through this study is not have panel data to apply difference-in-difference matching estimator which is believed to be considerably better than cross-sectional matching estimators, inclusion of the pre-treatment household income and assets may reduce bias related with unobservable characteristics [Mosley (1997)]. The credit effects when pre-treatment income and assets are included in the matching are reported in the second ( $S_2$ ) and fourth row ( $S_4$ ) of Table 2. The purpose of changes in model specification between  $S_1$  and  $S_3$  and between  $S_2$  and  $S_4$  is to check the sensitivity of the effect.

Table 2

#### *The Average Treatment Effect on Monthly Average Education Expenditures by Using Matching Estimators with Sub-sample (6-18 Years of Children)*

| Control Variables   | Treated/<br>Control | Kernel<br>Matching   | Radius<br>Matching   |
|---|---------------------|----------------------|----------------------|
| Head's gender, head's age, head's education, and province dummies ( $S_1$ )   | 113/1333            | 357.935<br>(272.132) | 346.052<br>(269.473) |
| $S_2 = S_1$ plus school child ratio pre-treatment income in log   | 113/1333            | 360.631<br>(274.404) | 345.994<br>(275.359) |
| $S_3 = S_2$ plus number of children from 6 to 18  | 113/1344            | 301.853<br>(274.943) | 314.767<br>(269.984) |
| $S_4 =$ Head's gender, head's age, head's education, number of children from 6 to 18, pre-treatment income in log, province dummies | 113/1334            | 312.512<br>(273.629) | 321.337<br>(272.331) |

Note: Bootstrapped standard error in parenthesis with 10,000 repetitions statistically significant at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent) \*.

This paper fulfils to satisfy the overlap and common support assumption. The Propensity score range from [0.00202797 to 0.27876634] for borrower and non-borrower<sup>(1)</sup> but the means of scores are not much different (0.0782702 and 0.0682934 for borrower and non-borrower groups correspondingly. The estimation of the average treatment effect of credit participation on the treated (ATT) is reported in Table 4.2 for the sub sample (6 to 18 years of children).<sup>2</sup> There is little difference in results between two matching approaches used. Matching just on household characteristic's and province dummies (S<sub>1</sub> and S<sub>3</sub>). After including the pre-treatment income and assets (S<sub>1</sub> and S<sub>3</sub>) the estimated impact of credit participation on education spending is insignificant in every level of specification. It means that impact of formal credit on education is insignificant or no impact on education.

### ***Impact on Healthcare Expenditure***

The scores are from when pre-treatment income and assets are including alongside the other controlling variables in constructing the matches (S<sub>4</sub> in Table 3). The propensity score range from [0.00639665 to 0.34204514] for borrowers and non-borrowers.<sup>3</sup> The estimation of the average treatment effect is limited to the common support area. The estimates of credit impact on healthcare expenditure are reported in Table 3.

Table 3

*The Average Treatment Effect on Monthly Average Healthcare Expenditure by Using Matching Estimator with Whole Sample*

| Control Variables   | Treated/<br>Control | Kernel<br>Matching     | Radius<br>Matching     |
|---|---------------------|------------------------|------------------------|
| S <sub>1</sub> = Head's gender, head's age, head's education, household size in log, head's age*gender, province dummies  | 113/1273            | 1059.100<br>(378.53)*  | 1060.326<br>(379.835)* |
| S <sub>2</sub> = S <sub>1</sub> plus pre-treatment income in log , pre-treatment assets in log  | 113/1190            | 895.100<br>(376.991)*  | 975.230<br>(376.739)*  |
| S <sub>3</sub> = Head's gender, head's age, head's education, child below 6 year children 6 to 18 year, person age 19 to 60, older than 60, head's age*education province dummies | 113/1280            | 1058.734<br>(375.416)* | 1054.523<br>(381.267)* |
| S <sub>4</sub> = S <sub>3</sub> plus pre-treatment income in log , pre-treatment assets in log  | 113/1216            | 891.553<br>(380.223)*  | 983.359<br>(380.864)*  |

Note: Bootstrapped standard error in parenthesis with 10,000 repetitions statistically significant at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent) \*.

The estimates show that the effect of credit participation on healthcare expenditure is positive and statistically significant at (1 percent) for all specification no matter which set of covariates and which matching approach are used. The similarity of borrowers and non-borrowers is built on observed characteristics, so

<sup>1</sup>Probit estimation for constructing propensity scores is reported in Appendix 2.

<sup>2</sup>PSM selects similar non-borrowers in the control group to construct the counterfactual outcome.

<sup>3</sup>Probit estimation for constructing propensity scores is reported in Appendix 3.

bias may still exist if unobservable affect both treatment participation and outcomes of interest. The assumption is easily violated if we are unable to control for all variables, especially the unobservable that affect both the treatment and participation and outcomes [Bryson (2002)]. However, these studies focus only on the poor, the disparity in unobservable between borrowers and non-borrowers may not be so large. Furthermore this study controlled for household pre-treatment income and assets which are more likely to be associated with some unobservable characteristics such as motivation, entrepreneurial ability and skills. As a result, the bias may be reduced and the reliability of the matching estimates improved.

### **4.3. Multiple Ordered Treatment Effect**

In this sub-section multiple treatment effects are estimated to contrast the influence of informal and formal credit on education and healthcare expenditure. An additional advantage of multiple treatment effects is that, they may help to detect potential bias associated with unobservable characteristics, which estimates of binary treatment effects are unable to deal with [Lee (2005)]. To explore the presence of selection bias by [Lee (2005)] checked whether the main scenario of treatment effect is coherent with auxiliary findings. Specifically, applying the multiple ordered treatment effects in the current context when the treatment level is increased, the effect will become stronger (a good treatment). In contrast, if the treatment is reduced, then the effect will be weaker (a bad treatment). Programme effect is not confirmed by multiple ordered treatment effects, and then the initial causal findings (from binary treatment) are questionable and may be due to some unobserved attributes [Lee (2005), p. 119]. On the other hand, if there is no hidden bias, the treatment effect of the full treatment group is expected to be stronger than that of the partial treatment group, and in turn the effect of outcome of full treatment group is greater than that of the non-borrower group, controlling for the same set of covariates  $X_i$ .

One may question that the outcome is consistent with the multiple treatment effect, then the unobserved confounder will be confirm.

The estimation of the multiple treatment effects using the PSM method can employ the conventional matching estimator [Rosenbaum and Rubin (1983)]. In first stage of score is estimation, the multinomial logit or probit model is used [Lechner (2002)]. If the treatment is logically ordered, ordered logit or probit model is applied instead [Imbens (2004)] Nevertheless, the multinomial or ordered logit or probit are quite burdensome, hence a series of binary treatment estimation may be used instead [Imbens and Wooldridge (2009)]. This study follow this strategy and in turn compare the formal credit group with non-borrowing group, the formal credit group with the non-borrowing group, and the formal credit group with the informal credit group.

Estimates of the multiple treatment effects on education expenditure are stated in Table 4. In  $S_1$  and  $S_3$ , household characteristics are used to construct the score, then pre-treatment income and assets are controlled for in  $S_2$  and  $S_4$ . The estimated impacts for formal informal credit are in columns 2 and 3, and the estimates for formal credit vs. informal credit effect are in columns 4 and 5.

The estimates show that both formal and informal credit has no significant effect on household education expenditure. Both radius kernel and matching estimators show

alike estimates that are insignificant. Even including pre-treatment income and assets are include in  $S_2$  and  $S_4$ , but the result are not significant in both cases.

The following table shows the estimation procedure. Counterfactual of the informal and formal group are different, so their treatment effects are not comparable. To overcome this issue, this study directly compare the informal and formal credit group, set either of them as a control group and if the estimation outcome consistent with the multiple treatment effect, then the unobserved confounder will be confirmed.

Further step to confirm the absence of hidden bias is to directly compare impacts of formal credit to informal credit. Estimates of the difference between the formal and informal credit are shown in the last column of Table 4.

Table 4

*The Average Treatment Effect on Monthly Education Expenditure by Using Matching Estimators with Sub-sample (6 to 18 Years of Children)*

| Control Variable | Informal Credit vs. Non-borrower Credit |                       | Formal Credit vs. Non-borrowers Credit |                    | Formal Credit vs. Informal Credit |                       |
|------------------|---|-----------------------|--|--------------------|-----------------------------------|-----------------------|
|                  | ATTK                                    | ATTR                  | ATTK                                   | ATTR               | ATTK                              | ATTR                  |
| $S_1$            | -97.85<br>(52.07)                       | -93.39<br>(54.52)     | 358.65<br>(272.14)                     | 347.53<br>(269.28) | 498.88<br>(266.76)***             | 508.28<br>(267.15)*** |
| $S_2$            | -118.37<br>(53.42)***                   | -118.68<br>(54.07)*** | 221.95<br>(316.92)                     | 333.37<br>(306.81) | 663.61<br>(612.11)                | 795.10<br>(569.93)    |
| $S_3$            | -47.11<br>(47.21)                       | -41.51<br>(48.06)     | 325.68<br>(272.39)                     | 315.06<br>(270.41) | 423.54<br>(256.28)***             | 500.75<br>(256.38)*** |
| $S_4$            | -66.98<br>(48.46)                       | -85.37<br>(54.74)     | 237.11<br>(317.78)                     | 341.41<br>(306.87) | 645.57<br>(591.78)                | 791.89<br>(556.09)    |

Note: Bootstrapped standard errors in parenthesis with 10,000, replication, statistically significant at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent) \*.

$S_1$ : Head's gender, head's age, head's education, province dummies school-aged child ratio, and head's gender\*head's age.

$S_2$ : Head's gender, head's age, head's education, province dummies school-aged child ratio, head's age\*head's education, pre-treatment in log and pre-treatment assets in log.

$S_3$ : Head's gender, head's age, head's education, province dummies, number of children aged 6 to 18 years old, and head's age\*head's gender.

$S_4$ : Head's gender, head's age, head's education, province dummies, number of children aged 6 to 18 years old, head's age\*education, pre-treatment in log and pre-treatment assets in log.

Moreover, the impact higher level treatment (formal credit) is insignificant on education expenditure as compared with lower level of treatment (informal credit).

Further, this study is to check the impact of formal and informal credit on healthcare expenditure. The impact estimation of informal credit and formal credit on healthcare expenditure are reported in Table 5.

Table 5  
*The Average Treatment Effect on Monthly Healthcare Expenditure by  
 Using Matching Estimators with Whole Sample*

| Control Variable | Informal Credit vs. Non-borrower Credit |                       | Formal Credit vs. Non-borrowers Credit |                        | Formal Credit vs. Informal Credit |                      |
|------------------|---|-----------------------|--|------------------------|-----------------------------------|----------------------|
|                  | ATTK                                    | ATTR                  | ATTK                                   | ATTR                   | ATTK                              | ATTR                 |
| S <sub>1</sub>   | 395.34<br>(196.245)**                   | 427.15<br>(295.64)**  | 1056.26<br>(376.51)*                   | 1057.813<br>(377.870)* | 624.70<br>(405.24)**              | 847.09<br>(381.64)** |
| S <sub>2</sub>   | 344.01<br>(201.07)***                   | 364.34<br>(202.26)*** | 895.10<br>(382.09)*                    | 975.230<br>(368.004)*  | 433.21<br>(710.81)                | 536.69<br>(685.82)   |
| S <sub>3</sub>   | 326.05<br>(176.10)***                   | 345.5<br>(173.68)***  | 1058.73<br>(370.12)*                   | 1054.523<br>(385.715)* | 536.52<br>(408.86)***             | 861.89<br>(386.76)** |
| S <sub>4</sub>   | 260.54<br>(171.12)**                    | 245.44<br>(185.39)**  | 904.54<br>(380.41)*                    | 983.948<br>(372.126)*  | 207.78<br>(694.23)*               | 457.11<br>(682.12)** |

Note: Bootstrapped standard errors in parenthesis with 10,000, replication, statistically significant at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent) \*.

S<sub>1</sub>: Head's gender, head's age, head's education, province dummies, household size in log, and head's gender\*head's age.

S<sub>2</sub>: Head's gender, head's age, head's education, province dummies, household size in log, head's age\*head's education, pre-treatment in log and pre-treatment assets in log.

S<sub>3</sub>: Head's gender, head's education, province dummies, child below 6 year old, number of children aged 6 to 18 years old; persons aged 19 to 60 years old and person older than 60 years

S<sub>4</sub>: Head's gender, head's education, province dummies, child below 6 year old, number of children aged 6 to 18 years old, persons aged 19 to 60 years old and person older than 60 years, pre-treatment in log and pre-treatment assets in log.

The result of the difference in impacts between formal and informal credit are presented in the last column of Table 5. The impact of informal credit on health is positively significant at 10 percent and 5 percent level, whereas the impact of formal credit on healthcare is positively significantly at 1 percent level.

Using multiple ordered treatment effects can either undermine (if unobserved biases are present) or enhance (if no unobserved biases) findings of the initial binary treatment effect. While the multiple treatment effect method itself is unable to overcome unobservable bias, it helps to avoid being misled in interpreting binary treatment effect estimates [Lee (2005), p.121].

In the current case, the higher treatment level has greater positive impact on healthcare expenditure, suggesting that there is no other a potential factor or confounders affecting credit participation and healthcare and education expenditure. As a result, the positive treatment effect of credit on healthcare are confirmed while insignificant on education is also confirmed.

## 5. CONCLUSION

This paper investigates the impact of credit participation on the poor's education and healthcare spending in rural Pakistan using PPHS data, while employing Propensity Score Matching (PSM) method.

The PSM estimates of the average treatment effect on the treated (ATT) show that borrowers spent more on healthcare expenditure than non-borrowers. While on education, borrowers and non-borrowers spent the same. Credit participation has significant effect

on the poor's healthcare expenditure while insignificant effect on the poor household's education expenditure. PSM method is less biased than other technique (IV, OLS) because it compares borrowers with similar non-borrowers. This study focuses on poor so that the disparity between treatment and control units is little. This study also control for the pre-treatment income which is more likely to be associated with some main unobservable characteristics such as motivation, entrepreneurial ability and skills. Therefore, this estimation strategy is likely to reduce the bias and improve the reliability of the matching estimates. Furthermore, all the treated units are within the common support and only few are dropped when estimating the ATT effect.

This study also employs the multiple treatment effects which show that there is no impact of formal and informal credit on education in rural Pakistan, whereas both formal and informal credit has significant impact on healthcare expenditure. The ordering of results suggests that no other important unobserved factors substantially affect credit participation and the outcome; hence the reported effects of the household credit on education and healthcare spending may be robust. Furthermore, the overall impact of formal credit on education is also insignificant.<sup>4</sup> To check the consistency of the education expenditure result this study also employed PSM on current enrolment and the result is similar to the reported result that credit participation does not affect education expenditure in rural Pakistan.<sup>5</sup>

## APPENDICES

### Appendix 1

#### *Descriptive Statistics and t-value for Equal Means by Borrowing Status*

| Variable                                     | Borrower |           | Non-Borrower |           | t-value |
|--|----------|-----------|--------------|-----------|---------|
|  | Mean     | Std. Dev. | Mean         | Std. Dev. |         |
| Head's gender (Male=1)                       | 0.983    | 0.131     | 0.958        | 0.120     | 1.28    |
| Head's education (year)                      | 2.739    | 4.679     | 2.002        | 3.960     | 1.91**  |
| Head's age                                   | 49.565   | 13.165    | 48.410       | 0.363     | -0.79   |
| Household size                               | 9.878    | 4.431     | 8.281        | 4.279     | 3.87*   |
| Children below 6 year old                    | 1.661    | 1.324     | 1.179        | 1.362     | 3.69*   |
| Children (6 to18) years old                  | 3.017    | 2.561     | 2.717        | 2.060     | -1.49   |
| Person (19 to 60) years old                  | 4.582    | 2.585     | 3.886        | 2.362     | 3.05*   |
| Older than 60 person                         | 0.635    | 0.753     | 0.521        | 0.751     | -1.57   |
| Pre-treatment asset                          | 7099278  | 19500000  | 1818016      | 6264186   | 1.73**  |
| Pre-treatment income Per-capita              | 631.359  | 1398.207  | 1815.586     | 4359.275  | 2.90*   |
| Monthly education Expenditure                | 1109.891 | 3069.017  | 887.371      | 3694.517  | -0.63   |
| Monthly education Expenditure <sup>(a)</sup> | 836.268  | 2899.017  | 567.633      | 1462.233  | 1.76**  |
| Monthly health Expenditure                   | 2248.150 | 3924.109  | 1410.252     | 3331.001  | 2.59*   |

Note: t-value statistically at (10 percent) \*\*\*, (5 percent) \*\*, (1 percent)\*. <sup>(a)</sup> For sub-sample of household having children below 18 years old.

<sup>4</sup>The estimated result reported in Appendix 5.

<sup>5</sup>We do not report test results in this paper but they will be provided upon request.

## Appendix 2

*Probit Estimation for Constructing the Propensity Scores to Estimate Impacts on  
Education Expenditure for the Sub-sample (6 to 18) Year of Children*

| Control Variable               | Model Specification |                |                  |                 |
|--------------------------------|---------------------|----------------|------------------|-----------------|
|                                | (1)                 | (2)            | (3)              | (4)             |
| Head gender (Male=1)           | 0.46(0.143) ***     | 0.32(0.086)    | 0.52(0.102)*     | 0.51(0.103) *** |
| Head's age                     | 0.01(0.045) **      | 0.01(0.086)    | 0.004(0.178)     | 0.07(0.073)     |
| Education (years)              | 0.24(0.037) **      | 0.26(0.031) ** | 0.24(0.043) **   | 0.27(0.023) **  |
| School child ratio             |                     | -0.1264(0.69)  | -0.3972(0.26)    |                 |
| Children from 6 to 18          |                     | 0.0668(0.06)   | 0.0493(0.12) *** |                 |
| Pre-treatment Income in log    |                     | -0.75(0.00)*   | -0.08(0.00)*     | -0.08(0.00)*    |
| Punjab                         | 4.89(0.00)*         | 5.28(0.00)*    | 5.36(0.00)*      | 5.37(0.00)*     |
| KPK                            | 3.49 (0.00)*        | 4.04(0.00)*    | 4.02(0.00)*      | 4.06(0.00)*     |
| Sindh                          | 5.16(0.00)*         | 0.11(0.00)*    | 5.60(0.00)*      | 5.60(0.00)*     |
| Constant                       | -7.2448             | -7.2448        | -7.1896          | -7.4247         |
| LR <sup>2</sup> χ <sup>2</sup> | 102.23              | 129.17         | 132.91           | 131.64          |
| Prob. >χ <sup>2</sup>          | 0.0000              | 0.0000         | 0.0000           | 0.0000          |
| Observation                    | 1806                | 1806           | 1806             | 1806            |

Note: \* Significant at 1 percent \*\* significant at 5 percent \*\*\*significant at 10 percent; among 1806 households, there are 113 borrower households and 1693 non-borrower households. The province of Balochistan is set as reference dummy for other wards.

## Appendix 3

*Probit Estimation for Constructing the Propensity Scores to Estimate Impacts  
on Health Expenditure for the Whole Sample*

| Control Variable               | Model Specification |                |                |             |
|--------------------------------|---------------------|----------------|----------------|-------------|
|                                | (1)                 | (2)            | (3)            | (4)         |
| Head gender (Male=1)           | -0.04(0.97)         | 0.09(0.95)     | 0.42(0.18)     | 0.48(0.16)  |
| Household head's age           | -0.01(0.77)         | -0.01(0.75)    |                |             |
| Head education (years)         | 0.02(0.03) **       | 0.02(0.11) *** | -0.01(0.71)    | -0.03(0.49) |
| Household size in log          | 0.48 (0.00) *       | 0.38(0.00)*    |                |             |
| Child below 6 year             | 0.03(0.40)          | 0.05(0.25)     |                |             |
| Children from 6 to 18          |                     |                | 0.03(0.15)     | 0.03(0.28)  |
| Persons aged 18 to 60          |                     |                | 0.06(0.01) *** | 0.03(0.20)  |
| Older than 60 person           |                     |                | 0.04(0.56)     | -0.01(0.91) |
| Pre-Treatment income in log    |                     | -0.05(0.00)*   | -0.05(0.00)*   |             |
| Pre-Treatment assets in log    |                     | 0.04(0.00)*    |                | 0.05(0.00)* |
| Head's age*gender              | 0.01(0.73)          | 0.01(0.80)     |                |             |
| Head's age*education           |                     |                | 0.00(0.30)     | 0.00(0.21)  |
| Punjab                         | 5.25(0.00)*         | 5.60(0.00)*    | 5.74(0.00)*    | 5.91(0.00)* |
| KPK                            | 3.75(0.00)*         | 4.31(0.00)*    | 4.19(0.00)*    | 4.60(0.00)* |
| Sindh                          | 5.43(0.00)*         | 5.72(0.00)*    | 5.92(0.00)*    | 6.03(0.00)* |
| Constant                       | -7.7317             | -8.1691        | -8.0301        | -8.4343     |
| LR <sup>2</sup> χ <sup>2</sup> | 119.19              | 172.06         | 117.51         | 117.76      |
| Prob. >χ <sup>2</sup>          | 0.0000              | 0.0000         | 0.0000         | 0.0000      |
| Observation                    | 1806                | 1806           | 1806           | 1806        |

Note: \*Significant at 1 percent \*\* significant at 5 percent \*\*\*significant at 10 percent; among 1806 households, there are 113 borrower households and 1693 non-borrower households. The province of Balochistan is set as reference dummy for other wards.

## Appendix 5

*The Average Treatment Effect on Monthly Average Education Expenditure  
by Using Matching Estimators with Whole Sample*

| Control Variables   | Treated/<br>Control | Kernel<br>Matching | Radius<br>Matching |
|---|---------------------|--------------------|--------------------|
| Head's gender, head's age, head's education,<br>and province dummies ( $S_1$ )  | 103/815             | 320.92 (308.70)    | 303.75 (299.64)    |
| $S_2 = S_1$ plus school child ratio pre-treatment<br>income in log and log assets   | 103/815             | 154.60 (443.58)    | 186.72 (394.72)    |
| $S_3 = S_2$ plus enroll all age student   | 103/815             | 230.64 (457.48)    | 188.42 (386.95)    |
| $S_4 =$ Head's gender, head's age, head's<br>education, enroll all age student, pre-<br>treatment income in log, province dummies | 103/815             | 230.64 (322.10)    | 248.30 (309.10)    |

*Note:* Bootstrapped standard error in parenthesis with 10,000 repetitions statistically significant at (10 percent)\*\*\*; (5 percent)\*\*; (1 percent)\*

## Appendix 6

### Choice of Covariates for Propensity Score Estimation

In the PSM method, choosing covariates is important because they affect the estimation outcomes. According to Lee (2005, p. 44) chosen covariate  $X_i$  must be pre-treatment and affect both outcome ( $Y$ ) and the treatment ( $D$ -credit participation). In addition, to avoid the causality bias,  $X_i$  should not be affected by  $D$ ; hence post-treatment covariates should not be controlled for because they will remove part or all of the result of  $D$  on  $Y$ .

The un-confoundedness assumption or Conditional independence assumption (CIA) (Rosenbaum and Rubin 1983) implies that the observable control covariates should not be affected by treatment, and the outcomes of interest are independent of treatment assignment. Thus, included variables should also be fixed above time or be measured before the treatment intervention [Caliendo and Kopping (2008), p. 38]. The pre-treatment measured variables also must not be affected by anticipation of the treatment participation [Imbens (2004)].

A variable that affects only credit involvement but not the treatment consequence is not necessary to control for because the outcome of interest is not affected by this variable. On the other hand, if a variable affects only outcomes but not the treatment participation, one should not control for since the variable will not make any significant dissimilarities between the treatment and control groups. Consequently only variable that influence concurrently the participation choice and outcome should be involved in the score estimation stage [Bryson, *et al.* (2002), p. 24]. Finally, Dehejia and Wahba (2002) state that exclusion of key variables could completely increase bias in estimates. In the presence of uncertainty, however, it is better to include too many rather too few covariates [Bryson, *et al.* (2002), p. 25].

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## **Fiscal Space for Investment in Agriculture— A Review of Taxes and Subsidies in Agriculture in Pakistan**

STEPHEN DAVIES, WAJIHA SAEED, MUHAMMAD SAAD MOEEN,  
TEHMINA TANVEER, and AAMER IRSHAD

Despite agriculture's importance in terms of its relationship to poverty and welfare of the poorest households, the government finds it increasingly difficult to find the fiscal space for budgetary allocations for agriculture and agricultural R&D. We hypothesise that expansion of expenditures on agriculture is possible in the short to medium run with a combination of re-allocations and new taxation. We argue that existing spending aimed towards the agriculture sector includes very large outlays on implicit subsidies that are largely unproductive. These costs include: subsidisation of gas for fertiliser plants, which approach Rs 48 billion in gas subsidies to fertiliser companies; the full costs of the infrastructure and operation and maintenance of the irrigation system, which amount to Rs 166 billion per year; and losses on wheat procurement, which have been about Rs 25 billion recently.

On the taxation side, while agricultural producers are not currently liable to pay tax on income, they do however pay indirect taxes on agricultural inputs. Using a Social Accounting Matrix (SAM), we estimate agricultural producer pay about Rs 61 billion, mostly from GST taxes on fertiliser. Using a Computable General Equilibrium model, we show that agriculture could contribute further with an income tax on agricultural income. With a "low-rate-wide-base" income tax of 15 percent on non-poor, medium and large farms, as much as Rs 130 billion could be raised, enough to cover, for example, a sizable portion of the operation and maintenance cost of the irrigation system.

*JEL Classifications:* D58, E16, H20, H22, H23, Q10

*Keywords:* Agriculture, Fiscal Policy, Subsidies, Taxation, General Equilibrium, Social Accounting Matrix, Pakistan

### **INTRODUCTION**

Finding the fiscal space for development expenditures and investment is always a challenge for developing countries. This is especially difficult in a country with twin deficit problems and frequently high inflation, along with requirements for a large military budget. Under the directive of IMF programs, Pakistan has been seeking to arrest

Stephen Davies, <s.davies@cgiar.org> is Programme Leader, Pakistan Strategy Support Programme (PSSP), and Senior Research Fellow, IFPRI. Wajiha Saeed <wajihasaheed@gmail.com> is Research Analyst, Pakistan Strategy Support Programme (PSSP). Muhammad Saad Moeen <saadmoeen@gmail.com> is Research Assistant, Pakistan Strategy Support Programme (PSSP). Tehmina Tanveer <tehminatanveer.rana@gmail.com> is Research Analyst, Pakistan Strategy Support Programme (PSSP). Aamer Irshad <aamer\_irshad@yahoo.com> is Chief, Food and Agriculture, Planning Commission of Pakistan.

its growing fiscal deficits through tax reforms. However, these have had limited short-term impact on the tax-to-GDP ratio (see Table 1). When fiscal space is not growing, and is seen as a very binding constraint, investments such as agricultural R&D fail to be prioritised. In this paper, we show that even in what appears to be a severely constrained financial environment, fiscal space can be found with structural analysis and rationalisation of existing spending to maintain key development investments.

Table 1

|                          | <i>Tax to GDP Ratio</i> |             |              |             |              |              |
|--------------------------|-------------------------|-------------|--------------|-------------|--------------|--------------|
|                          | 2009-10                 | 2010-11     | 2011-12      | 2012-13     | 2013-14      | 2014-15      |
| GDP (fc, current prices) | 14,249                  | 17,648      | 19,362       | 21,497      | 23,904       | 25,822       |
| Tax Revenue              | 1,483                   | 1,679       | 2,025        | 2,125       | 2,514        | 2,910        |
| <i>Tax to GDP Ratio</i>  | <i>10.4%</i>            | <i>9.5%</i> | <i>10.5%</i> | <i>9.9%</i> | <i>10.5%</i> | <i>11.3%</i> |

*Sources:* Government of Pakistan. Ministry of Finance, Economic Survey of Pakistan, 2015, and Federal Budget in Brief, various issues.

Spending on agricultural R&D in Pakistan has lagged. In 2009, for every \$100 of agricultural output in Pakistan, \$0.21 was invested in agricultural R&D. This level represents a decline from a high of 0.43 in 1991 and indicates that investments failed to keep pace with growth in the country's agricultural GDP. This ratio is also one of the lowest in South Asia, when compared with India (0.40), Sri Lanka (0.34), Bangladesh, (0.32), and Nepal (0.26) [ASTI-PARC (2012)].

Two common assertions are made to explain or justify this: either that the present fiscal space in Pakistan is too tight for spending on agriculture, or that the sector pays no taxes, leading to the (debatable) conclusion that agriculture therefore cannot and/or should not be a beneficiary of government spending.

We explore the validity of both assertions and conduct a review of taxes and subsidies related to the agriculture sector in Pakistan. We use a new 2011 Social Accounting Matrix (SAM) for Pakistan [PSSP (2015)] to attribute indirect tax revenues paid on commodities to sectors, and we bring together recent literature on implicit subsidies in agriculture, to create a comprehensive picture of the fiscal aspects of the sector. We show that the sector does in fact pay taxes in the form of indirect taxes on inputs, though the potential for further direct taxes exists, and, with a combination of plausible subsidy rationalisations and new taxes, sufficient fiscal space can be found to double spending on agriculture R&D.

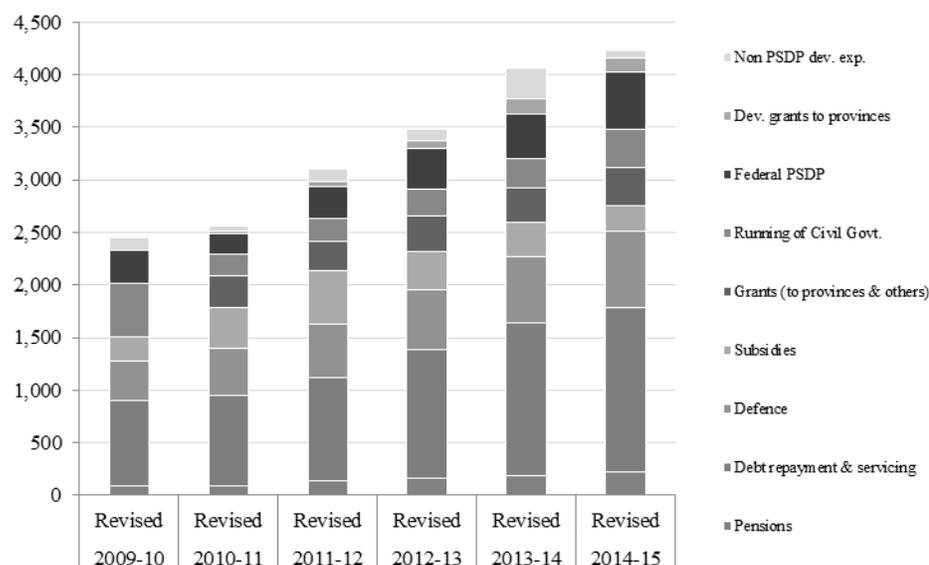
In Section 1, we begin with an overview of the current state of fiscal space in the overall government. In Section 2, we review recent literature on subsidies in agriculture, particularly the subsidies on fertiliser, of wheat farmers and millers, and irrigation water. In Section 3, we look at the structure of taxation in the country and estimate the amount of indirect taxes that can be attributed to agriculture. In Section 4, we use a computable general equilibrium (CGE) model to estimate the potential for revenue generation from a tax on agricultural incomes. Section 5 provides our summaries and conclusions.

## SECTION 1: AN OVERVIEW OF THE STATE OF FISCAL SPACE

Much of Pakistan's available financial resources go to defense spending, debt repayment and servicing, and the running of the government itself, leaving little for development expenditures in general. Figure 1 shows the federal government's spending, where the share of development related spending (on Federal Public Sector Development Plan - PSDP, development grants to provinces, and "other development expenditure") is dwarfed by current expenditures.

**Fig. 1. Breakdown of Federal Government Spending**

(Billion Rs)

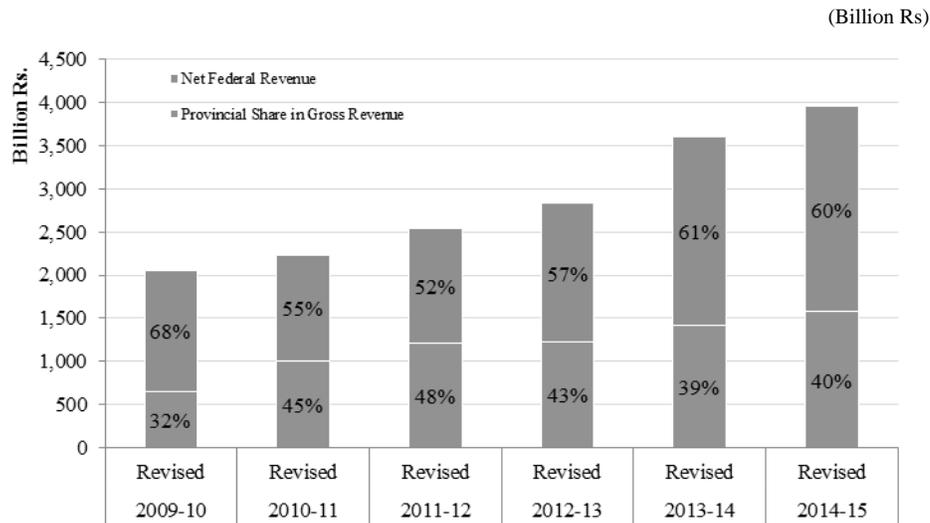


Source: GoP, Ministry of Finance, Federal Budget in Brief, various issues.

In this analysis, we start with 2009-10 to capture the pre-devolution period. In 2010-11, devolution came into effect in Pakistan and major federal ministries were dissolved. Subjects such as health, education and agriculture, formerly controlled at the federal level, became provincial subjects such that provincial departments for these subjects are now the primary policy-making institutions and provincial governments control their budgetary allocations. As the size of the federal government shrank, the federal government chose to allocate a larger share to subsidies and (non-development) grants.<sup>1</sup> The share of PSDP and non-PSDP development expenditures, in 2010-11, shrank. While, the share of the PSDP has since returned to normal "pre-devolution" levels, in the absence of ministries for food, health and education, the federal government now allocates larger shares towards subsidies and/or non-development grants.

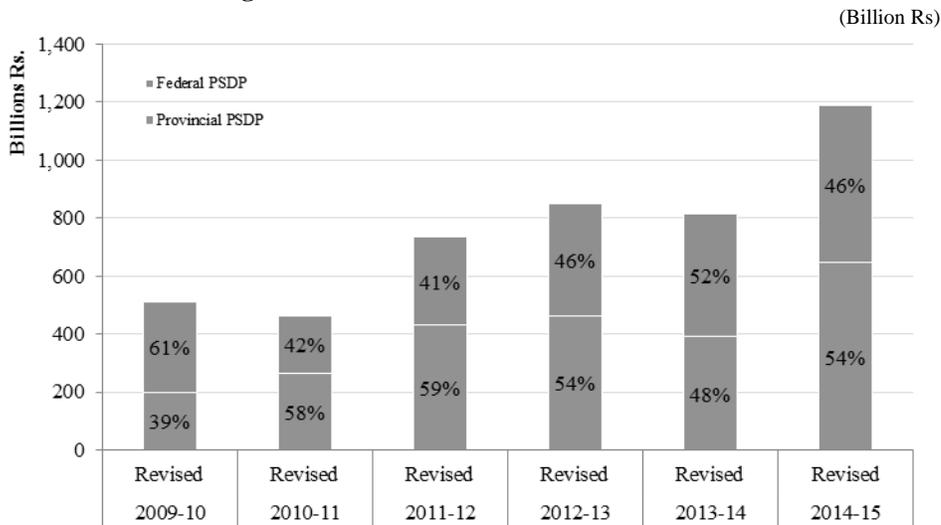
<sup>1</sup>These grants include grants-in-aid to provinces and grants to others. Grants to others form the bulk of these grants with large outlays including, in 2015-16, allocations for "contingent liabilities", "miscellaneous grants", "other outstanding liabilities", and transfers to AJK, Gilgit Baltistan, and loss-making public sector enterprises.

**Fig. 2. Share of Provinces vs. Federal Share in Gross Revenues Based on Revised Allocations**



Source: GoP, Ministry of Finance, Federal Budget in Brief, various issues.

**Fig. 3. Federal PSDP and Provincial PSDP**



Source: GoP, Ministry of Finance, Federal Budget in Brief, various issues.

Post-devolution, these federal ministries have been replaced with provincial counterparts (though new federal ministries have also been created to provide a central coordinating body). For agriculture, the former federal Ministry of Food and Agriculture was dissolved and responsibilities shifted to agriculture departments in the provinces. However, it became apparent quickly that Federal dimensions were still needed and the Ministry of National Food Security and Research (MNFSR) was created. In tandem, the 2009 (or 7th) National Finance Commission awarded the provinces a larger share of the

“divisible pool” of tax revenues beginning in 2010-11. As a result, the provincial share in gross revenues grew from 31 percent of the total revenues in 2009-10, the year before devolution started, to 39 percent in 2014-15.

## **SECTION 2: REVIEW OF GOVERNMENT EXPENDITURES TOWARDS AGRICULTURE**

The government’s expenditure on Pakistan’s agriculture sector takes the form of a few major interventions. On the output side, the government’s most direct engagement with the sector is through wheat procurement and procurement pricing.

On the input side, the government has intervened in the fertiliser sector (since 1989) with an import-substitution policy that supports local fertiliser manufacturers. In addition to fertiliser, the government plays a major role in water for irrigation as the provider, operator and maintainer of large dams, barrages and a massive canal-based irrigation system that is critical to agriculture.

Furthermore, the government has historically played a role in agricultural R&D and provides extension services to farmers through which information and new technologies are disseminated. In the past, these measures were coordinated by the Federal Ministry of Agriculture, and research activities were led by its Pakistan Agricultural Research Council (PARC). Devolution in 2010 led to the Federal Ministry of Agriculture being dissolved in favour of provincial departments instead, which now hold the responsibilities (and finances) for such interventions. While a Ministry for National Food Security and Research was created at the Federal level, and PARC remained Federal, the total budget allocation for agriculture declined sharply: in 2009-10, the Food and Agriculture division received Rs 12 billion (according to the revised budget figure) in the PSDP. Since its inception, the new MNFSR has received significantly smaller allocations ranging from Rs 3 to 5 billion (as per the revised budget figures). Hence, the government’s major outlay towards the agriculture sector is now dominated by the three major subsidies/interventions mentioned earlier.

### **Subsidy to Fertiliser Manufacturers**

The government of Pakistan has been following an import-substitution strategy for the fertiliser sector via what is effectively a subsidy to local fertiliser manufacturers: gas is provided to fertiliser producers as “feedstock” at prices substantially lower than what other sectors pay for gas (“fuel-stock”). Ali, *et al.* (2015) calculate the rupee value of this subsidy, and found that, in 2013-14, the loss to the government ballooned to Rs 48 billion (from Rs 6 billion in 2000-01). This sharp increase occurred due to the country’s energy crisis and consequent increases in fuel prices (Table 3).

This loss is especially large when compared with the government’s spending on agricultural R&D (estimated to be about Rs 8 billion in 2009 by ASTI-PARC 2012) and budget allocations for the ministry of national food security and research (Rs 5.5 billion in 2014-15).

Ali, *et al.* (2015) argue that, in recent years, this loss is not justifiable since 2009-10 when the international price of urea experienced sharp declines but the price of domestically produced urea increased consistently, while a severe energy shortfall arose in the country. Figure 4 shows these trends and the price of domestic urea if there were no subsidy.

Table 3

*Value of Subsidy to Fertiliser Production*

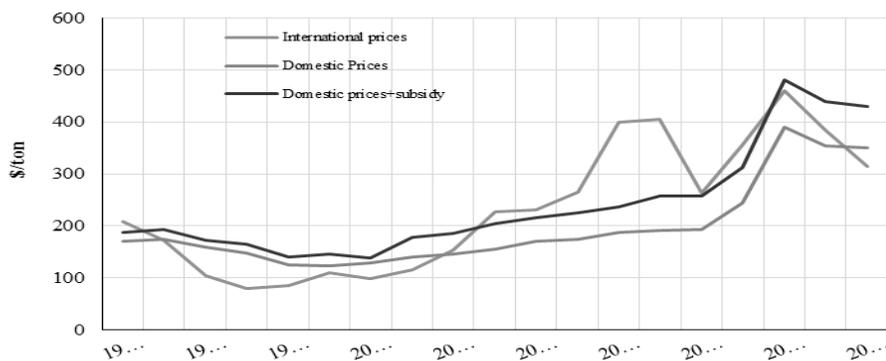
| Year    | Gas Prices<br>(Rs/mcf) Feed |            |       | Difference in<br>Price | Gas Consumed<br>(billion mcf) | Total Production<br>Subsidy* (Billion<br>PKR) |
|---------|-----------------------------|------------|-------|------------------------|-------------------------------|---|
|         | Stock                       | Fuel-Stock |       |                        |                               |   |
| 2000-01 | 63.9                        | 117.2      | 53.2  | 106.0                  | 5.64                          |   |
| 2001-02 | 70.8                        | 95.6       | 24.7  | 110.0                  | 2.72                          |   |
| 2002-03 | 76.1                        | 170.4      | 94.4  | 112.8                  | 10.64                         |   |
| 2003-04 | 79.6                        | 175.7      | 96.1  | 116.1                  | 11.16                         |   |
| 2004-05 | 61.2                        | 185.7      | 124.5 | 119.9                  | 14.93                         |   |
| 2005-06 | 110.8                       | 229.2      | 118.4 | 124.2                  | 14.71                         |   |
| 2006-07 | 124.7                       | 256.7      | 132.0 | 122.8                  | 16.20                         |   |
| 2007-08 | 124.7                       | 256.6      | 132.0 | 128.1                  | 16.90                         |   |
| 2008-09 | 120.3                       | 341.2      | 220.9 | 129.6                  | 28.63                         |   |
| 2009-10 | 132.3                       | 360.4      | 228.1 | 140.5                  | 32.05                         |   |
| 2010-11 | 138.7                       | 375.2      | 236.5 | 140.7                  | 33.29                         |   |
| 2011-12 | 161.8                       | 492.4      | 330.6 | 135.0                  | 44.62                         |   |
| 2012-13 | 116.3                       | 460.0      | 343.7 | 116.7                  | 41.37                         |   |
| 2013-14 | 123.4                       | 488.2      | 364.8 | 128.3                  | 48.04                         |   |

Source: Ali, *et al.* (2015).

Notes: \* The production subsidy on fertiliser is calculated as the difference between fertiliser feedstock and fuel-stock prices per million British thermal units (MMBTU), multiplied by the amount of feedstock gas used by each firm and then aggregated for the sector. The conversion from million cubic feet (MMCFT) to MMBTU was done at the rate of 1 MMCFT=950 MMBTU for SSGCL and SNGPL, and at the rate of 1 MMCFT=750 MMBTU for Mari Gas. Gas consumption figures for the sector were obtained from HDIP (2013), NFDC (1998), NFDC (2008), and NFDC (2014).

Beginning in 2009-10, in the absence of the subsidy, the price of domestic urea (produced using local gas growing increasingly short in supply) would have been about the same as that of foreign urea, or higher. In 2013-14, the price of domestic urea was higher, even with the subsidy. Ali, *et al.* (2015) conclude that the subsidy benefits only fertiliser companies, and is resulting in the misallocation of scarce natural gas.

**Fig. 4. International versus Domestic Urea Prices with and Without Subsidies (1995–2014)**



Source: Ali, *et al.* (2015)

Note: Domestic price without subsidy is calculated by adding back the per unit subsidy to domestic prices.

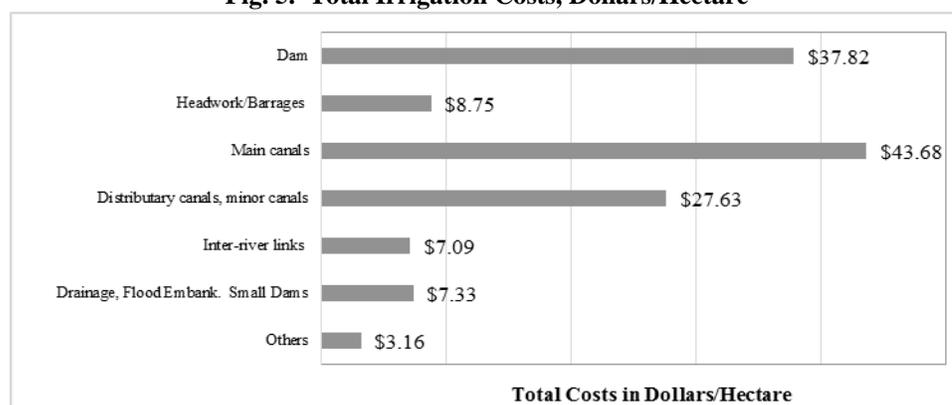
### Subsidisation of Irrigation Waters

A major source of government expenditures for agriculture, which is basically a subsidy, is for irrigation infrastructure. In 2007, the Punjab Irrigation and Power Department (IPD) made an inventory of assets used in the irrigation system for the management of these assets. (This document, written by the Strategic Planning/Reform Unit of the IPD, is hereafter called AMP for Asset Management Plan.) Making use of the data from that analysis, Davies (2012) derived the annual costs for the various infrastructures in the irrigation system. Based on that work, it was possible to estimate the annual costs to maintain that infrastructure.

Figure 5 provides perspectives on the infrastructure required to distribute water through the irrigation system, from dams through the extensive network of barrages, main and secondary canals. The costs in the Figure essentially start from the source of water in a dam (at the top) and show costs for infrastructure at each step through the irrigation system. These are on a per hectare basis and are annual costs. The largest cost is to support infrastructure related to the main canals, which would cost \$43.68 per year for each hectare. The second largest costs are dams and secondary canals, which cost \$37.82 and \$27.63 respectively, per hectare. The overall costs are \$135.47 per year per hectare. For comparison, the gross margin of a wheat producer, from a recent analysis of resource conservation technologies, was about \$600 per hectare. While the gross margin is not profits, and some expenses have to come out of it, a farmer could pay, but full payment will be a challenge to absorb, especially for smaller farmers. Therefore some participation by the government seems likely to be needed.

The Punjab IPD, as part of the assessment of its irrigation infrastructure, determined whether certain expenses should be supported by the public or private sectors. The headworks and barrages, link canals and drainage infrastructure should be left in the public sector, presumably because they are national, or are part of the main Indus River system, or are external to farm decisions. The portion of dam costs that goes into storage is put in the private sector, but it could well be that some of those expenses could logically go to the public sector. The net result is that cost per hectare to farmers to keep up and supervise irrigation infrastructure would be \$114.30 per hectare, or \$1.66 billion per year to service 14.6 million hectares of irrigated crop land.

**Fig. 5. Total Irrigation Costs, Dollars/Hectare**



Source: Davies (2012).

### Wheat Procurement Subsidies

Wheat procurement by the government remains a major case of explicit subsidisation of Pakistan's agriculture sector wherein the government purchases wheat from farmers at government set prices, and restrictions are imposed on the import and export of wheat by the private sector. Successive governments have continued these interventions in some form since independence, with the objective of supporting both farmers (with high producer prices) and consumers (by managing food inflation).

Dorosh and Salam (2008) find that, in terms of supporting wheat producers, it is only 20 percent of wheat farmers who are relatively large and produce surpluses that are able to sell to the government, and that 20 percent of wheat farmers are in fact net purchasers of wheat.

In the next stage, wheat procured by the government is sold to flour mills (on quota basis) at release prices set below per unit procurement costs, to the benefit of millers and resulting in losses to the government. On the consumer side, Dorosh and Salam (2008) employ price multiplier analysis and find that the final impact on overall inflation levels is not very large.

Table 5

*Wheat Procurement Unit Subsidy and Total Subsidy, 2005-06 to 2012-13*

| Year             | Procurement<br>Quantity<br>( <sup>'000</sup> tons) | Support<br>Price<br>(Rs/kg) | Release<br>Price<br>(Rs/kg) | Unit<br>Subsidy*<br>(Rs/kg) | Financial<br>Loss*<br>(Bn Rs) | Financial<br>Loss*<br>(Bn 12/13 Rs) |
|------------------|--|-----------------------------|-----------------------------|-----------------------------|-------------------------------|-------------------------------------|
| 2005-06          | 3,939  | 10.38                       | 10.75                       | 1.40                        | 5.51                          | 12.18                               |
| 2006-07          | 4,514  | 10.63                       | 11.63                       | 1.13                        | 5.08                          | 10.41                               |
| 2007-08          | 4,422  | 15.63                       | 15.63                       | 2.15                        | 9.51                          | 17.40                               |
| 2008-09          | 3,917  | 23.75                       | 18.75                       | 7.76                        | 30.41                         | 46.07                               |
| 2009-10          | 9,231  | 23.75                       | 24.38                       | 4.28                        | 39.46                         | 53.53                               |
| 2010-11          | 6,715  | 23.75                       | 26.25                       | 3.50                        | 23.50                         | 28.01                               |
| 2011-12          | 6,150  | 26.25                       | 33.25                       | 1.08                        | 6.61                          | 7.10                                |
| 2012-13          | 5,948  | 30.00                       | 33.25                       | 4.18                        | 24.84                         | 24.84                               |
| <b>Ave 06-08</b> | <b>4,292</b>                                       | <b>12.21</b>                | <b>12.67</b>                | <b>1.56</b>                 | <b>6.70</b>                   | <b>13.33</b>                        |
| <b>Ave 11-13</b> | <b>6,271</b>                                       | <b>26.67</b>                | <b>30.92</b>                | <b>2.92</b>                 | <b>18.32</b>                  | <b>19.98</b>                        |

Source: Dorosh, *et al.* (2015).

\* Possible financial loss for each year is calculated as the unit subsidy (domestic procurement price plus the cost of incidentals minus the release price) times the quantity of domestic procurement.

Thus, the direct benefits of this wheat subsidy are limited to the relatively large wheat farmers and wheat millers while the losses incurred are substantial. Dorosh, *et al.* (2015) estimate that in 2012-13, the total cost to the government of these interventions (accounting for storage and handling costs) was Rs 25 billion. In other years, (FY 2009 and FY 2010) this loss was as high as Rs 46 -54 billion in real terms. See Table 5. The average loss over the period FY 2011–FY 2013 was 50 percent higher in real terms than the average over the period FY 2006–FY 2008 due largely to a 46 percent increase in the average quantity procured each year. Reducing quantities of procurement to earlier levels could save 6.7 billion rupees per year.

### SECTION 3 A REVIEW OF TAX COLLECTION IN PAKISTAN

#### Major Taxes in Pakistan

Historically, Pakistan has relied considerably on indirect taxes to raise revenues, particularly the General Sales Tax (GST)—an ad valorem tax imposed on various goods. Furthermore, in 2010-11, tax reforms led to the removal of numerous GST exemptions, including exemptions for agricultural inputs such as fertiliser,<sup>2</sup> which had been introduced over the years on various commodity groups in ad-hoc measures. Table 6 decomposes Pakistan's total tax collection by type of tax for 2012-13, when these reforms had become effective. It shows that 60 percent of taxes came from indirect taxes in that fiscal year (FY).

Direct taxes accounted for 33 percent of tax revenues in 2012-13, which came mainly from either withholding tax (WHT), deducted at the source on salaries, contracts, and bank transactions, or as income taxes paid by various businesses. Agricultural enterprises, however, are exempt from paying these. This means that GST paid on inputs is, formally, the only point at which the agricultural producer currently becomes subject to taxation. However, withholding taxes on imported goods (classified as direct taxes by the FBR) are also arguably borne by producers who purchase them if these passed by importers. In the following, we estimate the total tax revenues (indirect taxes on inputs and WHT on imports) that can be attributed to the agriculture sector.

Table 6  
*Overall Tax Collection by Type of Tax—FY 2013*

|   | Federal      | Provincial | Total        | (Billion Rs)<br>% Share |
|---|--------------|------------|--------------|-------------------------|
| <b>Indirect Taxes</b>                                       | <b>1,348</b> | <b>5</b>   | <b>1,352</b> | <b>60</b>               |
| Excise taxes  | 121          | 5          | 126          | 6                       |
| GST - on domestic goods                                     | 413          |            | 413          | 18                      |
| GST - on imports  | 430          |            | 430          | 19                      |
| Surcharges  | 142          |            | 142          | 6                       |
| Custom duties   | 249          |            | 249          | 11                      |
| Export rebates (customs)                                    | -8           |            | -8           | 0                       |
| <b>Direct Taxes</b>   | <b>743</b>   | <b>7</b>   | <b>750</b>   | <b>33</b>               |
| Withholding taxes (WHT) on imports                          | 103          |            | 103          | 5                       |
| All other WHT (salaries, contracts, banking etc.)           | 279          |            | 279          | 12                      |
| Other income taxes (other than WHT)                         | 340          | 7          | 347          | 15                      |
| Other direct taxes (non-income tax)                         | 21           |            | 21           | 1                       |
| <b>Other Taxes</b> (stamp duties, motor vehicle taxes etc.) |              | <b>142</b> | <b>142</b>   | <b>6</b>                |
| <b>Total</b>  | <b>2,091</b> | <b>153</b> | <b>2,244</b> | <b>100</b>              |

*Source:* Federal Board of Revenue Annual Report 2012-13 for federal taxes, Economic Survey 2013-14 for provincial taxes.

<sup>2</sup>Presidential Amendment Ordinance, 2011—SRO 229(I)/2011—Dated 15.03.2011—Through this notification the Federal Government rescinded three notifications namely SRO 535(I)/2008 Dated 11.06.2008, SRO 536(I)/2008 Dated 11.06.2008 & SRO 706(I)/2008 Dated 02.08.2010 withdrawing exemption of sales tax on fertilisers, pesticides & agricultural tractors respectively.

### Indirect Tax Revenues Raised from the Agriculture Sector

While agricultural enterprises are exempt from income taxes, they do pay indirect taxes on inputs. Agricultural inputs such as fertilisers and pesticides were exempted from GST in 2008, but tax reforms in 2011 led to a loss of this exemption, and then, agricultural inputs were subject to the standard 17 percent rate. The FBR reports indirect tax collections by commodities on which they are paid. We disaggregate indirect tax revenues (and WHT on imports) by the sector that must have purchased these commodities using demand shares from a 2011 Social Accounting Matrix (SAM) for Pakistan [PSSP (2015)].

Table 7

#### Structure of Aggregate Demand—2011 SAM

(Percentages)

| Commodities              | Demand Share of    |                      |                                |           |                                 |                          | World | Total |
|--------------------------|--------------------|----------------------|--------------------------------|-----------|---------------------------------|--------------------------|-------|-------|
|                          | Agricul-<br>-ture* | Manufac-<br>-turing* | Services<br>excl.<br>Transport | Transport | Households<br>and<br>Government | Investment<br>and Stocks |       |       |
| Crops                    | 10.23              | 77.06                | 2.20                           | 0.00      | 8.40                            | 1.69                     | 0.43  | 100   |
| Fruits and<br>Vegetables | 5.22               | 0.07                 | 4.87                           | 0.00      | 82.41                           | 0.47                     | 6.96  | 100   |
| Livestock and<br>Poultry | 0.64               | 24.95                | 0.27                           | 0.00      | 62.58                           | 11.52                    | 0.05  | 100   |
| Forestry and<br>Fishing  | 0.67               | 20.04                | 2.73                           | 0.00      | 68.47                           | 0.00                     | 8.09  | 100   |
| Mining                   | 0.00               | 79.70                | 0.43                           | 0.00      | 13.53                           | 2.56                     | 3.78  | 100   |
| Manufacturing<br>of Food | 3.27               | 10.28                | 4.88                           | 0.02      | 76.30                           | 0.63                     | 4.63  | 100   |
| Manufacturing            | 0.37               | 39.49                | 4.89                           | 2.80      | 26.36                           | 9.46                     | 16.63 | 100   |
| Petroleum                | 0.31               | 46.54                | 5.39                           | 20.90     | 22.05                           | 0.17                     | 4.64  | 100   |
| Fertilisers              | 86.14              | 13.21                | 0.53                           | 0.10      | 0.00                            | 0.00                     | 0.02  | 100   |
| Energy                   | 1.69               | 66.61                | 5.83                           | 0.85      | 25.01                           | 0.01                     | 0.00  | 100   |
| Construction             | 0.02               | 15.33                | 21.80                          | 1.01      | 0.00                            | 61.76                    | 0.09  | 100   |
| Services                 | 0.54               | 11.02                | 37.51                          | 4.32      | 43.90                           | 0.02                     | 2.70  | 100   |
| Transport                | 0.39               | 6.80                 | 63.84                          | 2.92      | 22.08                           | 0.00                     | 3.98  | 100   |

Source: Pakistan Social Accounting Matrix 2011(PSSP 2015)

\* Agriculture includes crops, livestock, fruits and vegetables, livestock and poultry, and forestry and fishing.

### Manufacturing Includes Mining, Manufacturing, Energy and Construction

A SAM captures the flows of incomes and expenditures in the economy between producers, factors of production, households, government and tax accounts, savings and investment, and the rest of the world. Table 7 presents, in condensed form, the demand-side of the economy from the 2011 Pakistan SAM. It shows that the agriculture sector purchases 10.2 percent of crops, 5.2 percent of fruits and vegetables and so on. (Note that it purchases 82 percent of all fertiliser). We then assume that since agriculture buys 10.2 percent of crops, then 10.2 percent of taxes collected on sales of crops must have been paid by agricultural enterprises; similarly for all other commodities.

These calculations show that the agriculture sector paid approximately Rs 46 billion in taxes via purchases of inputs in FY 2013 (Table 8). This sum was paid primarily from three major taxes: Rs 21 billion was paid as GST on domestic goods; Rs 12 billion as GST on imported goods; and Rs 6 billion as WHT on imported goods.<sup>3</sup>

<sup>3</sup> This calculation leaves out indirect taxes on purchases of capital goods such as tractors. In the SAM these purchases are captured under a single investment account, i.e. capital purchases by agriculture are not separated.

Table 8

*Estimated Taxes Paid by Agriculture by Type of Tax—(Billion Rs)—FY 2013*

|                       | Paid by<br>Agriculture | Overall<br>Tax Collection | % Paid by<br>Agriculture |
|-----------------------|------------------------|---------------------------|--------------------------|
| <b>Indirect Taxes</b> |                        |                           |                          |
| Excise taxes          | 2.57                   | 121                       | 2.1%                     |
| GST – domestic        | 20.91                  | 413                       | 5.1%                     |
| GST – Imports         | 12.48                  | 430                       | 2.9%                     |
| Surcharges            | 0.34                   | 142                       | 0.2%                     |
| Custom duties         | 2.08                   | 249                       | 0.8%                     |
| Import duties rebate  | -0.06                  | -8                        | -0.8%                    |
| <b>Direct Taxes</b>   |                        |                           |                          |
| WHT on Imports        | 7.36                   | 743                       | 1.0%                     |
| <b>TOTAL</b>          | <b>45.68</b>           | <b>2,091</b>              | <b>2.2%</b>              |

Source: Calculated using Tables 6 and 7.

In Table 9, this payment is disaggregated by type of tax and the commodities that these were paid on. Agriculture paid most of its taxes (Rs 33 billion) on the purchase of fertiliser. The second largest tax payment (of Rs 6 billion) was on the purchase of “Manufacturing—Food” which includes feeds purchased by the livestock and poultry sub-sectors.

These taxes, particularly GST on fertiliser and animal feeds, add to the costs of farmers. However, looking at the sector as a whole, we find that indirect taxes are small relative to intermediate cost and value-added. Based on the input-output structure of the agriculture sector from the 2011 Pakistan SAM, indirect taxes on intermediates are approximately 4.3 percent of total intermediate costs and 0.9 percent of value-added (see Table 10). This is however a sector-level view. It may very well be that GST on fertiliser (being regressive in nature) is in fact prohibitive for smaller farmers. It is also likely that much of the agricultural value-added reported comes from larger farmers. All this adds towards a case for direct taxation on agricultural incomes.

Table 9

*Federal Taxes Paid by Agriculture on Inputs—by Type of Tax and Input Commodity Groups—FY 2013*

| Inputs                 | Indirect Taxes on Inputs |              |              |             |               |                    | Direct Taxes   |              | Total |
|------------------------|--------------------------|--------------|--------------|-------------|---------------|--------------------|----------------|--------------|-------|
|                        | Excise Taxes             | GST-Domestic | GST-Imports  | Surcharges  | Custom Duties | Import Duty Rebate | WHT on Imports |              |       |
| Crops                  | 0                        | 0.9          | 0.7          | 0           | 0.16          | 0                  | 0.64           | 2.4          |       |
| All other agriculture  | 0                        | 0.01         | 0.17         | 0           | 0.16          | 0                  | 0.22           | 0.56         |       |
| Manufacturing, food*   | 2.42                     | 1.41         | 1.25         | 0           | 0.96          | -0.04              | 0.45           | 6.45         |       |
| Manufacturing, other** | 0.06                     | 0.29         | 0.65         | 0           | 0.49          | -0.02              | 0.24           | 1.72         |       |
| Mining and Petroleum   | 0                        | 0.58         | 0.48         | 0.34        | 0.06          | 0                  | 0              | 1.45         |       |
| Fertiliser             | 0                        | 17.67        | 9.09         | 0           | 0             | 0                  | 5.8            | 32.57        |       |
| Energy and Services    | 0.09                     | 0.05         | 0.15         | 0           | 0.24          | -0.01              | 0              | 0.52         |       |
| <b>TOTAL</b>           | <b>2.57</b>              | <b>20.91</b> | <b>12.48</b> | <b>0.34</b> | <b>2.08</b>   | <b>-0.06</b>       | <b>7.36</b>    | <b>45.68</b> |       |

Source: Calculated using Tables 6 and 7.

Notes: Calculations assume all indirect taxes and WHT on imports passed on to buyers.

\* “Manufacturing, food” includes the manufacture of feeds for the livestock sector.

\*\* “Manufacturing, other” includes the manufacture of pesticides.

Table 10

*Agriculture Input-output Structure (FY 2013)*

| Agriculture's Payments to: *                          | Billion Rs   | IO Ratio*   |
|---|--------------|-------------|
| Crops   | 313          | 5%          |
| Fruits and Vegetables                                 | 28           | 0%          |
| Livestock and Poultry, Forestry and Fishing           | 23           | 0%          |
| Manufacturing—Food (includes Feeds)                   | 238          | 4%          |
| Manufacturing (includes Pesticides)                   | 49           | 1%          |
| Mining and Petroleum Products                         | 7            | 0%          |
| Fertiliser  | 271          | 4%          |
| Energy  | 41           | 1%          |
| Construction & Services                               | 87           | 1%          |
| Transport   | 16           | 0%          |
| <b>A: Total Intermediate Cost</b>                     | <b>1,072</b> | <b>17%</b>  |
| <b>B: Indirect Taxes on Intermediates</b>             | <b>45.7</b>  | <b>1%</b>   |
| <b>C: Value Added of Agriculture**</b>                | <b>5,269</b> | <b>82%</b>  |
| <b>Gross Output (A+B+C)</b>                           | <b>6,387</b> | <b>100%</b> |
| <i>Indirect Taxes as % of Intermediate Cost (B:A)</i> | <i>4.3%</i>  |             |
| <i>Indirect Taxes as % of Value Added (B:C)</i>       | <i>0.9%</i>  |             |

\* Payments for intermediates based on Input-Output ratios from SAM 2011 and agriculture value added in FY2013.

\*\* Economic Survey 2014: GDP at factor cost of agriculture excluding cotton ginning, revised FY2013.

We conclude that while agriculture *does* pay a non-trivial amount in taxes under the GST system, the input-output and value-added structure of the sector contains ample space for further taxation. Tax payments by agriculture as a whole are only about 1 percent of agricultural value-added which is high (82 percent of gross output). We also compare indirect taxes paid by agriculture with indirect taxes paid by other sectors (calculated in a similar manner). Table 11 confirms that taxes paid by agriculture are low considering, for example, that agricultural value added in FY 2013 was larger than that of all manufacturing (*Economic Survey 2013-14*), and that other sectors pay income taxes in addition.

Table 11

*Taxes Paid on Intermediates—Comparison across Selected Sectors (Billion Rs—FY2013)*

|                    | Indirect Taxes Paid by: |               |             |             |              |              |
|--------------------|-------------------------|---------------|-------------|-------------|--------------|--------------|
|                    | Agriculture             | Manufacturing | Textiles    | Petroleum   | Transport    | Services     |
| Excise taxes       | 2.6                     | 12.2          | 3.0         | 4.8         | 1.3          | 12.9         |
| GST – domestic     | 20.9                    | 36.0          | 17.4        | 15.9        | 42.2         | 29.3         |
| GST – Imports      | 12.5                    | 46.5          | 30.9        | 0.1         | 38.7         | 43.3         |
| Surcharges         | 0.3                     | 3.5           | 2.1         | 0.0         | 22.9         | 5.9          |
| Custom duties      | 2.1                     | 29.5          | 20.9        | 0.1         | 9.8          | 48.7         |
| Import duty rebate | -0.1                    | -1.0          | -0.7        | 0.0         | -0.2         | -1.8         |
| WHT on Imports     | 7.4                     | 18.1          | 10.9        | 2.6         | 1.9          | 4.3          |
| <b>TOTAL</b>       | <b>45.7</b>             | <b>144.9</b>  | <b>84.6</b> | <b>23.5</b> | <b>116.6</b> | <b>142.7</b> |

Source: Authors' calculations based on FBR Annual Report 2012-13 and SAM 2011.

## SECTION 4

## REVENUE POTENTIAL OF TAXING AGRICULTURAL INCOMES

In this section, we use a Computable General Equilibrium (CGE) model to simulate the introduction of an agricultural income tax. We employ the IFPRI Standard CGE model [Löfgren, Harris, and Robinson (2002)] paired with a 2010-11 Pakistan SAM [PSSP (2015)]. This permits an analysis of the aggregate distributional impacts of simulated shocks, taking into account all direct and indirect effects resulting from linkages between sectors, given the structure of the economy.

## Simulation Results

Using the model specified in Löfgren, Harris, and Robinson (2002), we find that following a “low-rate-broad-base” approach via a nominal rate of income tax of 5 percent on all farmers who own more than 12 acres, and do not fall in the poorest quartile, is sufficient to raise approximately Rs 43 billion in additional revenues. A higher rate of tax of 15 percent (closer to what other sectors may pay) would bring this number to Rs 130 billion (Table 12).

Table 12

*Impact on Government Revenues*

|  | Billion Rs | % Change |
|--|------------|----------|
| Simulated income tax on non-poor, medium and large farmers |            |          |
| 5% Income Tax  | 43.3       | 2.6      |
| 10% Income Tax   | 86.5       | 5.1      |
| 15% Income Tax   | 129.6      | 7.7      |
| Simulated import duty on cotton yarn                       |            |          |
| 15 p.p. increase in import duty                            | -0.27      | -0.02    |

Source: CGE simulations.

That is, each extra percent point added to the income tax rate is worth about Rs 8 billion while the impact on other farm households, while negative, is small (Table 13). Wage earners in the rural economy and urban households may even benefit slightly. Note that these impacts do not account for welfare changes from increased government revenues and spending. The impact of taxing larger farmers on GDP is negligible. Even in the higher, 15 percent tax rate simulation, GDP falls just by 0.01 percent, driven mostly by the crop sector shrinking by 0.06 percent (Table 14). Thus, a non-trivial sum can be raised with fairly low rates of taxation on larger, non-poor farmers, and this has, if any at all, little negative impact on the economy. To put these findings in perspective, we also simulate import duties on yarn, as an example, of actual ad-hoc tax proposals that arise from time to time. In recent years (2014-15), the introduction of import duty on yarn (which was previously exempt) of 15 percent has been proposed. Our simulation reveals that this has little impact on revenue generation and may in fact reduce government revenues due to negative effects on textile sectors. In fact, we find that government revenues *fall* by Rs 267 million with little or negative impacts on associated sectors.

Table 13

*Impacts on Households' Expenditure—(Percentage Changes)*

|                             | Simulations                        |                |                |   |
|-----------------------------|------------------------------------|----------------|----------------|---|
|                             | Income Tax on Medium-Large Farmers |                |                | Import duty on yarn<br>15 p.p. increase |
|                             | 5% Income Tax                      | 10% Income Tax | 15% Income Tax |   |
| Larger & Medium Farmers     | -5.0                               | -10.1          | -15.1          | 0.001                                   |
| Small Farmers               | -0.1                               | -0.2           | -0.2           | 0.002                                   |
| Landless Farmers            | -0.1                               | -0.1           | -0.2           | 0.001                                   |
| Rural farm-wage earners     | 0.0                                | 0.0            | 0.0            | 0.002                                   |
| Rural non-farm-wage earners | 0.1                                | 0.2            | 0.3            | 0.002                                   |
| Urban households            | 0.1                                | 0.2            | 0.3            | 0.001                                   |
| Total                       | -0.2                               | -0.4           | -0.6           | 0.002                                   |

Source: CGE simulations.

Table 14

*Impacts on Sectoral Value Added—(Percentage Changes)*

|                           | Simulations                                 |                |                |   |
|---------------------------|---|----------------|----------------|---|
|                           | Income tax on non-poor medium-large farmers |                |                | Import duty on yarn<br>15 p.p. increase |
|                           | 5% Income Tax                               | 10% Income Tax | 15% Income Tax |   |
| Crops                     | -0.02                                       | -0.04          | -0.06          | 0.001                                   |
| Horticulture              | 0.00  | -0.01          | -0.01          | 0.000                                   |
| Livestock                 | 0.02  | 0.03           | 0.05           | 0.000                                   |
| Mining                    | -0.01                                       | -0.01          | -0.02          | 0.000                                   |
| Ginning                   | 0.00  | 0.00           | 0.00           | 0.002                                   |
| Spinning                  | -0.03                                       | -0.06          | -0.09          | 0.030                                   |
| Weaving                   | -0.04                                       | -0.08          | -0.12          | -0.012                                  |
| Knitwear                  | 0.03  | 0.06           | 0.09           | -0.014                                  |
| Garment                   | -0.03                                       | -0.07          | -0.10          | -0.001                                  |
| Other Textiles            | 0.02  | 0.05           | 0.07           | -0.015                                  |
| Other Manufacturing       | 0.01  | 0.01           | 0.02           | 0.000                                   |
| Energy, Constr., Services | 0.00  | -0.01          | -0.01          | 0.000                                   |
| Total                     | 0.00  | 0.00           | -0.01          | 0.001                                   |

Source: CGE simulations.

## SECTION 5

### SUMMARY AND CONCLUSION

Despite agriculture's importance in its relationship to poverty and welfare of the poorest households, the government finds it increasingly difficult to find fiscal space for budgetary allocations for agriculture and agricultural R&D. In this paper, we assessed the basic position of agricultural taxes and subsidies in Pakistan to produce a picture of its net fiscal position, with an aim to find the fiscal space for productive expenditure on the sector.

Using recent literature, we assessed three main expenditures along with the level of taxation of agriculture in Pakistan. In summary, we found that agriculture pays about Rs 46 billion in indirect taxes intermediate goods (primarily fertiliser) but almost no direct taxes, as there is no income tax. Then, about Rs 41 billion of government revenue was lost in FY 2012-13 from subsidies to the fertiliser sector via subsidised gas feedstock, thus depleting a resource in short supply and that is sold lower than its opportunity cost. A second area with substantial subsidies is the wheat procurement

system where costs of running the system lead to losses of Rs 25 billion on average. Dwarfing all of these is the cost of maintaining the irrigation system, where the full cost is Rs 166 billion, which is largely unpaid for by the agricultural sector.

Putting these costs, losses and subsidies together suggests that the tax payments are offset by subsidies, ignoring irrigation, as the sector pays Rs 46 billion and receives Rs 41 and Rs 25 billion in subsidies, leaving agriculture with a Rs 20 billion benefit. However, farmers pay the indirect taxes, while the subsidies go to fertiliser manufacturers and select flour millers, so they do not reach farmers. There appears to be few reasons for subsidies to go to these beneficiaries.

However, the cost of infrastructure and irrigation maintenance is very large and is picked up by tax payers and through deferred maintenance so the performance deteriorates, as agriculture pays very little. However, we show that an agricultural income tax could generate enough funds to come close to covering the cost of the irrigation system as it would generate Rs 148 billion in tax revenues with a 15 percent tax rate on medium and large farmers. Thus the agricultural system could be basically self-sustaining and have adequate funding with a few reduced subsidies and the presence of an agricultural income tax. The fiscal space can thus be found with a few key changes in the expenditures and revenues related to the agricultural sector.

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## Inclusive Agricultural Growth in Pakistan— Understanding Some Basic Constraints

SOHAIL JEHANGIR MALIK, ASJAD TARIQ SHEIKH, and AMIR HAMZA JILANI

Inclusive agricultural growth is important for overall economic growth and particularly critical for rural socio-economic stability and poverty reduction in Pakistan. The majority of Pakistan's population and 44 percent of the overall labour force are dependent upon agriculture which only accounts for a little over 20 percent of national GDP. The paper highlights some basic constraints that have not been explicitly addressed in the policy research and implementation and have impeded inclusive agriculture growth. A descriptive analysis based on data from the Agriculture Census of Pakistan and the Pakistan Household Income and Economic Survey—both of which were conducted in 2010-11—is used to show how high levels of poverty and its disparity across regions, combined with the declining size of operated holdings and associated fragmentation especially in the smallest size categories which now form over 60 percent of the agricultural holdings in Pakistan, are fundamental constraints. Poverty is both the result as well as the consequence of fragmented markets, weak institutions including governance; and, inadequate policy research and implementation. A better research based policy understanding of some basic constraints, and the variations across regions in such factors such as the declining size and fragmentation of operated farms, rural poverty; and, the levels of market development and institutions is essential along with effective implementation. One size fits all policies have not and will not work.

*JEL Classification:* O40, Q15, I32, P46

*Keywords:* Inclusive Growth, Land Holding, Land Tenure, Income Distribution, Poverty

### 1. INTRODUCTION

Pakistan is primarily an agricultural economy despite the structural transformation of the economy which has reduced the share of agriculture in GDP to around 20 percent. Over 44 percent of the labour force is still directly dependent upon agriculture as is the bulk of the country's manufacturing and trade [Pakistan (2014)]. It is widely believed that the dismal performance of the economy and particularly that of the agriculture sector in recent times has been accompanied by increasing poverty. Poverty in Pakistan is high and increasing and rural poverty is higher than urban poverty and increasing [Malik, *et al.* (2014)]. The large proportion of the labour force that is dependent upon the shrinking share of agricultural GDP could be one of the reasons for this.

Sohail Jehangir Malik <sjmalik01@gmail.com> is Chairman of Innovative Development Strategies (Pvt.) Ltd, Pakistan/USA and Senior Policy Advisor at IFPRI's Pakistan Strategy Support Programme, Islamabad, Pakistan. Asjad Tariq Sheikh <asjad\_tariq@yahoo.com> is Research Assistant at IFPRI's Pakistan Strategy Support Programme, Islamabad, Pakistan. Amir Hamza Jilani <amir\_j123@hotmail.com> is Graduate Student at Georgetown University, Washington DC, USA.

Why has agriculture growth failed in Pakistan? Is inclusive agriculture growth<sup>1</sup> possible? What are the most fundamental constraints not explicitly addressed in Pakistan's policy and implementation.

The obvious challenges to agriculture growth in Pakistan have been known for decades. The flat (low) yields despite the large yield gaps relative to demonstrated potential [see Annex Figure 1]; the lack of diversification away from the four major crops wheat, cotton, sugarcane and rice [see Annex Figure 2];<sup>2</sup> the low productivity of water and non-reliability of water services; the under-performance of rural factor and input markets; the rapidly declining investment—especially public investment, including the serious under-investment in research and technology development; and the inadequate dissemination of this technology and decayed extension services are all well documented. These results are shown in documents such as the Report of the National Commission on Agriculture (NCA) 1988, the National Agricultural Policy 1991, the Agricultural Perspective and Policy 2004 and the Draft National Food Security and Agriculture Policy 2013.

Some of the underlying factors that have impeded the surmounting of these challenges to Pakistan's agricultural growth and hence employment generation and rural poverty reduction have also been discussed in the available literature. These include unequal land distribution and the resultant skewed distribution of power and policy biases; the inefficient allocation and use of irrigation water; government intervention in markets that creates distortions and rent seeking opportunities for a few; the neglect of agriculture in the policy decision making hierarchy and in resource allocation decisions except decisions that lead to elite capture; the serious disconnects between the center and the provinces in decision making and implementation and above all a tendency to enforce one size fits all policies in a regulatory environment that discourages investment and reduces market efficiency.

What has not been explicit in the debate in Pakistan to date, however, is a clearer understanding of the source structure of Pakistan's agricultural incomes from which this inclusive poverty reducing growth is supposed to emanate and the constraints that are inherent in it. There has been a huge change in the size structure of farms in Pakistan, mostly at the lower end of the distribution, with associated implications for the poverty status of the farming population and hence the ability to invest for growth. The number of under 5 acre operators has more than tripled between 1960 and 2010, from 19 percent of all farms to over 64 percent of all farms [Pakistan (1960 and 2010)]. Moreover there is a huge disparity in the source structure of rural incomes not only by farm size but also by regional location. These regional disparities result in part from the diversity of natural resource endowments but also in large part from the vast disparity in the development of infrastructure (both hard and soft) and markets; and, availability of public and private resources across regions. One size fits all policies cannot be expected to work in this scenario. This paper therefore, aims to present a descriptive analysis based on two large nationally representative data sets from 2010 to clarify the fundamental underlying

<sup>1</sup>We define inclusive growth as one which provides a level playing field and possibility of participation for all. For an interesting discussion on the definition of inclusive growth please see Lipton M. and van der Gaag Jacques (1993).

<sup>2</sup>Maize is a recent exception.

problem. The analysis here is backed by a review of the existing international literature to enable a contextualisation of implications of these constraints and assist further policy research and implementation to ensure that agriculture can play its role of providing inclusive growth and poverty reduction in Pakistan.

Following this introduction the literature review is presented in Section 2. The data sets are described briefly in Section 3. The analysis is presented in the subsequent sections and is followed by policy implications and recommendations in the last section.

## 2. LITERATURE REVIEW

A growing body of international evidence confirms that when agriculture grows, overall economic growth reduces both rural and urban poverty faster. Increasing agricultural productivity can benefit millions through higher incomes and poverty reduction, surplus and cheaper food, and by generating new development opportunities that are employment-intensive. Numerous international studies highlight that when agriculture grows rapidly, poverty declines rapidly as well.<sup>3</sup> However, when agriculture is stagnant even as other sectors grow, poverty declines relatively little. According to a DFID policy paper, “no country has ever successfully reduced poverty through agriculture alone, but almost none have achieved it without first increasing agricultural productivity.”<sup>4</sup> The essential element of poverty reduction in this reasoning is rapid growth in agricultural production.

Mellor and Dorosh (2010) conclude that a high rate of agricultural growth has far reaching positive implications for economic development in terms of accelerating employment and accelerating poverty reduction.<sup>5</sup> In most low income countries, rapid agricultural growth provides a large share of GDP growth as well. However, agriculture’s dominance in employment growth continues even into middle income status as its share of GDP growth declines. Additionally, agricultural growth fosters a “diffused spatial pattern” of non-agricultural growth through its multiplier effects to the rural non-farm sector. This is because as incomes in the farm sector grow, expenditure on rural and non-farm goods and services produced in these same small towns grow as well.

A dramatic acceleration of both agricultural and rural growth immediately followed the Green Revolution of the 1960s although the gains have slowed significantly especially in the case of Pakistan. Over time, the revolution has drawn a host of supporters as well as critics who have questioned its impact on reducing poverty and inequality. Numerous critics have blamed the Green Revolution for income inequalities, maldistribution of assets and the worsening of absolute poverty. Niazi (2004) for example, argues that the Green Revolution contributed to the process of rural impoverishment and inequality in Pakistan by consolidating pre-existing socio-economic differences, caused by uneven access to productive resources such as land which favoured the rich. According to Cleaver (1972), these inequalities were exacerbated by

<sup>3</sup>Timmer, C. P. (1997) “How Well do the Poor Connect to the Growth Process?” *CAER Discussion Paper No. 178*, Harvard Institute for International Development, Cambridge.

<sup>4</sup>DFID (2005) ‘Growth and Poverty Reduction: The role of Agriculture’, *DFID Policy Paper*, December 2005, pp. 1.

<sup>5</sup>Mellor, J. W. and Dorosh, P. (2010) “Agriculture and the Economic Transformation of Ethiopia”, *International Food Policy and Research Institute, Working Paper 010*, April 2010, pp. 5.

what he described as the “innate bias of the Green Revolution towards the rich in rural Pakistan, a situation that favoured commercial farmers, better-off peasants and large landholders over poor peasants, simple commodity producers, subsistence smallholders and landless tenants”.<sup>6</sup> As such, Niazi and Cleaver both echo the arguments made by early critics of the Green Revolution, who pointed out that it would merely worsen the incidence of rural poverty, and contribute to an uneven distribution of rural resources, assets and income.<sup>7</sup>

Junankar (1975) points to a similar story in India, arguing that the Green Revolution increased inequality in rural India.<sup>8</sup> He highlights that the high-yielding varieties introduced during this period required regular supply of irrigation and fairly large amounts of fertiliser, which favoured the rich, large farms over small farms. Although Junankar argues that large farms began to substitute capital (e.g. tractors) for labour, he does not specifically investigate the impact of the Green Revolution on employment and wages. According to an IFPRI publication in 2002, *Green Revolution: Curse or Blessing*, a major shortcoming of the Green Revolution was that it spread only in irrigated and high-potential rain-fed areas. As such, many villages or regions without sufficient access to water were left to benefit only indirectly through increased employment, migration opportunities and cheaper food. In India for example, incomes in many low-potential rainfall areas have improved little while poverty in irrigated and high-potential rain-fed areas has reduced since the revolution.<sup>9</sup>

By contrast, supporters of the Green Revolution often speak of its impact on agricultural growth, which has been linked to new income and employment-generating opportunities, including in the local, non-farm economy. Indeed, the Green Revolution had a substantial impact on agricultural and food production. The adoption of high yielding varieties resulted in both yields and production of rice and wheat virtually doubling. In Asia, as more area was planted to high yielding varieties, cereal production doubled between 1970 and 1995. Instead of widespread famine, cereal and calorie availability per person increased by nearly 30 percent, while prices of wheat and rice fell.<sup>10</sup> Earlier, Mellor (1966) had argued that the rural population in third world countries would obtain significant benefits from agricultural growth, as income-generating opportunities arose in the local, non-farm sector.<sup>11</sup> He maintained that agricultural development focused on small and medium sized farms would generate rapid, equitable and geographically dispersed growth owing to agriculture’s substantial labour-intensive linkages with the rural, non-farm economy.

Hazell, *et al.* (2007) present a particularly compelling case for channelling development efforts to support small farms. The argument is based on two principal

<sup>6</sup>Cleaver, Harry (1972) ‘The Contradictions of the Green Revolution’, *Monthly Review*, Vol.24, No.2.

<sup>7</sup>Niazi, T. (2004) “Rural Poverty and the Green Revolution: The Lessons from Pakistan”, *The Journal of Peasant Studies*, 31:2, 242–260.

<sup>8</sup>Junankar, P. N. (1975) “Green Revolution and Inequality”, *Economic and Political Weekly*, Vol. 10, No. 13 (Mar. 29, 1975), pp. 1.

<sup>9</sup>In addition to Niazi, Cleaver and Junankar, other trenchant critics of the Green Revolution include Gadgil and Guha (1995), Griffin (1972, 1974, 1989), Glaeser (1987) and Pearse (1980).

<sup>10</sup>International Food Policy and Research Institute. 2002. *Green Revolution: Curse or Blessing?*, IFPRI, pp. 2.

<sup>11</sup>Mellor, John W. 1966. *The Economics of Agricultural Development*, Ithaca, NY: Cornell University Press.

considerations: (1) the efficiency of small-scale agriculture in the developing world; and (2) the equity and poverty-reduction nature of smallholder agricultural development. The efficiency argument for supporting small farms is based on extensive research that has explored the inverse relationship between farm size and production per unit of land. The data highlights that larger farms have lower gross and net yields per hectare of land per year, relative to smaller farms. Although the results can vary based on definitions of farm size and measures of productivity, the evidence for this inverse relationship is strongest in Asia, where land is relatively scarce as compared to labour.

The standard explanations for this inverse relationship highlight the small farms' more intensive use of labour and the lower costs associated with supervising family labour on small farms relative to hired labour on larger farms. Economies of scale in agriculture may apply as farms grow in size in input supply, processing and transport of cash crops, but generally, economies of scale are weak. In fact, there may be some diseconomies of scale once production exceeds the scope and capacity of the large farm.<sup>12</sup> Nevertheless, the scale of farming comes with different sets of transactions costs for different types of operations. When labour costs constitute a large proportion of agricultural costs, as in most developing economies, small farms may have significant advantages over larger units. This is because unit transaction costs associated with labour search, supervision and screening decrease as farm size falls—given that household members are a large part of the workforce in small farms and the farm operator has a smaller area over which to supervise.<sup>13</sup> In contrast, when economies develop, wages rise and agriculture becomes more capital intensive, large farms have the advantage because they choose low labour/capital ratios (as in developed countries where labour is more costly relative to capital) in an effort to cut unit transaction costs associated with capital. Therefore, in developing countries where land is scarce relative to labour, small farms have the competitive edge for less technologically advanced agriculture because they cut transaction costs associated with labour [Hazell, *et al.* (2007)].

It is worth recognising that the evidence for the inverse relationship is not undisputed. Arguing against an exclusive focus on smallholders, Collier and Dercon (2014) summarise a number of theoretical arguments. For example, they point out that the smallest farms may be less efficient if collateral requirements impact their ability to raise working capital. As such, economies of scale need to be outweighed by plausible market imperfections for the inverse productivity relationship to hold. They also argue that most investigations of the inverse relationship rely predominantly on yield data from small farms less than 5 hectares, telling us little about the yields of larger farms. Therefore, the inverse productivity relationship may be a product of the efficiency of small farms among smallholder farms rather than a reflection of the inefficiency of large farms.

Indeed, Collier and Dercon (2014) are sceptical of the evidence base arguing for an efficiency based argument favouring smallholder agriculture. Nevertheless, they clarify that while the current model and inverse relationship may be flawed, this “does not mean smallholders are *not* reasonably efficient in what they do, given the market failures and other constraints they face”. They do, however, conclude that a narrow focus on smallholder agriculture is not a guaranteed recipe for growth, and that a greater role

<sup>12</sup>Hazell, *et al.* (2007) ‘The Future of Small Farms’, pp. 10.

<sup>13</sup>Lipton M. (2006) “Can Small Farmers Survive”, pp. 78.

for larger farms in experimenting and pushing the technological frontier should be emphasised. Similarly, with potential economies of scale higher up the value chain in logistics, finance and marketing, they argue in favour of larger farms and larger scale commercial investment in agriculture.

Hazell, *et al.* (2007) makes a strong case for preferring small-scale farms to large farms in terms of equity and poverty reduction. One particularly compelling finding is that small-farm households tend to have more favourable expenditure patterns for promoting growth of the local nonfarm economy. They spend higher shares of incremental income on local non-tradeables, thereby stimulating demand for many labour-intensive goods and services in the rural non-farm economy. Through strong links across the economy, small farms are able to create new income and employment opportunities and ultimately, contribute to growth and poverty-reduction. In order to achieve this rapid agricultural growth with positive economy-wide linkages, Mellor and Dorosh (2010) argue that it is necessary to engage “middle-farmers”<sup>14</sup>. These are described as farmers who are large enough to adopt new technologies and produce market surpluses, yet small and numerous enough to have expenditure patterns that drive a vibrant, rural non-farm sector.

Recognising that smallholders are a diverse set of households and individuals with varying constraints on their ability to undertake potentially profitable activities in the agricultural sector, Fan, *et al.* (2013) distinguish between three types of smallholder farmers: subsistence farmers without profit potential, subsistence farmers with profit potential and commercialised smallholder farmers. These farmers are distinguished based on the type of constraints they face. Subsistence farmers without profit potential face both “soft” and “hard” constraints to land size and agricultural production. Soft constraints include limited access to markets and information, limited financial capital and limited access to quality infrastructure, while hard constraints include marginal lands that are far from markets and limited in size, low rainfall, and poor soil quality. Unlike pure subsistence farmers with limited profit potential, smallholder farmers that have the potential to turn production systems into profitable enterprises face primarily soft constraints. With a little help, these farmers could successfully be linked to value chains and generate high growth in agricultural production. The constraints they face can be addressed through various policy and programmatic channels, which will be discussed later in this section. Finally, commercial smallholders are those already involved in profitable agricultural activities but are held back from scaling up these commercial activities due to factors such as limited access to capital, insurance and other risk-reducing tools.

Hazell (2013) also outlines similar differences within the motives and contributions of small farms. Commercially viable small farms for example, are market driven and generate significant market surpluses, particularly in Asia and Africa. They are powerful engines of rural economic growth, creating new income and employment opportunities in both the farm and rural nonfarm economy. Investing in them can therefore go a long way in spurring rapid growth in agricultural production and lifting the poor out of poverty, similar to what happened during Asia’s Green Revolution. On the other hand, there are subsistence-oriented poor farmers who are invariably net buyers of food with minimal market-orientation. Investing in them is more of a safety net approach to poverty reduction rather than a growth strategy.

<sup>14</sup>Mellor, J. W. and Dorosh, P. (2010) “Agriculture and the Economic Transformation of Ethiopia”, International Food Policy and Research Institute, Working Paper 010, April 2010, pp. 5.

Based on the above distinctions, it appears that while some smallholders have the potential to shift from subsistence farming to commercial oriented and profitable farming systems, others may need to be supported in exiting agriculture and seeking non-farm employment opportunities [Fan, *et al.* (2013)]. Hazell (2013) argues that a large number of small farms are not going to make it as commercial businesses, especially asset-poor farmers in remote regions.<sup>15</sup> Nevertheless, an often exclusive focus on direct poverty alleviation has taken attention away from those smallholders that do have significant agricultural potential and can contribute to growth and poverty reduction. However, these smallholders continue to face a number of challenges that limit their ability to undertake more productive and innovative activities.

Mellor and Malik (2015), in a recent paper on the dominant role of the small commercial farmer in growth and poverty reduction in Pakistan, define the rural classes relevant to growth, employment and poverty reduction to demonstrate how those definitions can be translated into area defined categories; and, to modelling the impact of each class on growth and employment. They also analyse the effect of varying the proportions of each class on growth and employment.

This study adds to the literature by highlighting the poverty trap that chokes the agriculture sector of Pakistan and the urgent need for specific attention to the predominant smallholder sector and to regional disparities.

### 3. DATA

We use data from the Pakistan Bureau of Statistics, Household Income and Economic Survey (HIES) 2010-11 for the estimation of the income by sources and data from the Agriculture Census of Pakistan 2010 for the distribution of farm households. We estimate the headcount of poverty by size of farm and by region using the HIES 2010-11 data.

A comparison of the data sets in Table 1 below indicates that the raised data from the HIES covers about 55.5 percent of all rural households in the Agriculture Census.

Table 1

#### *A Comparison of the Data*

| Size of Farm (Acres) | Number of Households (HIES 2010-11) | Percentage of Households (HIES 2010-11) | Number of Households (Ag Census 2010) | Percentage of Households (Ag. Census 2010) | HIES Hholds as % of Ag Census Hholds |
|----------------------|-------------------------------------|---|---------------------------------------|--|--------------------------------------|
| No Land              | 8,718,243                           | 65.0                                    | 15,743,523                            | 66.0                                       | 55.4                                 |
| upto 5 acres         | 2,664,507                           | 20.0                                    | 5,350,940                             | 22.0                                       | 49.8                                 |
| 5 to under 12.5      | 1,447,051                           | 11.0                                    | 2,048,984                             | 9.0  | 70.6                                 |
| 12.5 to under 25     | 349,781                             | 3.0                                     | 560,743                               | 2.0  | 62.4                                 |
| 25 to under 50       | 85,183                              | 1.0                                     | 210,910                               | 1.0  | 40.4                                 |
| 50 to under 75       | 33,902                              | 0.3                                     | 52,700                                | 0.2  | 64.3                                 |
| 75 and above         | 19,447                              | 0.1                                     | 40,210                                | 0.2  | 48.4                                 |
| Total                | 13,318,113                          | 100                                     | 24,008,011                            | 100  | 55.5                                 |

Source: Reports of HIES 2010-11.

[http://www.pbs.gov.pk/sites/default/files/pslm/publications/hies10\\_11/complete\\_report.pdf](http://www.pbs.gov.pk/sites/default/files/pslm/publications/hies10_11/complete_report.pdf) page 21  
Report of Agriculture Census 2010. [http://www.pbs.gov.pk/sites/default/files/aco/publications/agricultural\\_census2010/WRITE-UP%20AGRI.%20CENSUS%202010.pdf](http://www.pbs.gov.pk/sites/default/files/aco/publications/agricultural_census2010/WRITE-UP%20AGRI.%20CENSUS%202010.pdf)

<sup>15</sup>Hazell, P. (2013) "Is Small Farm Led Development Still a Relevant Strategy for Africa and Asia?" pp. 11.

While the percentage of households in each size category differs marginally, in broad aggregate the proportions are similar. The limitations of HIES 2010 are discussed in detail in Malik, *et al.* (2014). Here we take refuge in large numbers to assume that the results are broadly indicative.

#### 4. RESULTS

##### Size and Tenure

Data from the Agriculture Census of 2010 helps to provide a detailed profile of the size and tenancy structure of farms in Pakistan. Nearly 65 percent of all farms in Pakistan are less than 5 acres in size whereas 25 percent are between 5 and 12.5 acres. This can be seen in Table 2. This implies that nearly 90 percent of all farms in Pakistan are currently less than 12.5 acres which was traditionally designated as the minimum subsistence level of holding. Any large surpluses for overall inclusive growth and poverty reduction have to come from the remaining 10 percent of farms. But these remaining farms are also diverse across regions in quality and development and are fragmented.

Table 2

*Tenancy Status and Fragmentation by Farm Size in Pakistan*

| Size of Farm (acres)                    | Owners<br>% | OCT<br>% | Tenant<br>% | Total<br>% | No. of<br>House-<br>holds | % of Total<br>Households | ONO<br>% | SC<br>% | Farm<br>Size<br>(acre) | Frag<br>Size<br>(acres) |
|---|-------------|----------|-------------|------------|---------------------------|--------------------------|----------|---------|------------------------|-------------------------|
| more than zero but<br>less than 5 acres | 86          | 6        | 7           | 100        | 5,350,941                 | 64.7                     | 5        | 10      | 2                      | 1                       |
| 5 and but less than<br>12.5             | 77          | 14       | 9           | 100        | 2,048,984                 | 24.8                     | 3        | 17      | 7                      | 2                       |
| 12.5 and but less than<br>25            | 72          | 20       | 8           | 100        | 560,743                   | 6.8                      | 3        | 19      | 17                     | 5                       |
| 25 and above                            | 74          | 20       | 6           | 100        | 303,819                   | 3.7                      | 8        | 19      | 60                     | 15                      |
| Total                                   | 84          | 9        | 7           | 100        | 8,264,488                 | 100                      | 4        | 13      | 6                      | 4                       |

Source: Computed from Government of Pakistan, Census 2010.

Note: OCT denotes Owner cum tenant, ONO denotes Owner Non Operator, SC denotes Share-cropper, Frag denotes Fragment.

The situation is further compounded by tenancy arrangements that require that a part of the produce be paid in rent or in kind share. Nearly 13 percent of all under 5 acres farms are either owner cum tenant or tenant holdings and share cropping continues to be the predominant form of tenancy arrangement according to this data. Nearly 10 percent of the smallest size category of farms is sharecropping.

As already stated the small sized farm is further composed of smaller fragments. While the overall average farm size is about 6 acres the average size in the smallest less than 5 acres category is only about 2 acres. Land fragmentation exacerbates the situation. The average size of a fragment is nearly 4 acres overall and only 1 acre in the smallest less than 5 acres category. These small fragments compound the crop husbandry and management problems.

### Size Structure and Regional Disparity of Rural Incomes

The low levels of yields and inadequate access to credit, inputs and technology can be put in the context of the vicious low level trap that is strangling Pakistan's agriculture potential.

How can the country increase productivity and promote agricultural growth, when more than 68 percent of the total crop income and nearly 68 percent of the total livestock income of Pakistan comes from operational holdings of the traditionally defined less than 12.5 acre subsistence level. This was a level of operational holding deemed just sufficient to meet the subsistence needs of the farm family. This definition from the 1950s does not take into account the enormous additional population pressure which Pakistan's population explosion has generated over the last sixty years. In this context the smaller categories of farm size are forced to diversify to other sources of income to subsist such as wages, salaries, business income, rentals, pensions and other transfers. With inadequate development of domestic commerce this is a very difficult situation. The data in Table 3 highlights this situation.

Table 3

#### *Percentage share of Each Source of Income by Farm Size in Pakistan*

| Size of Farm (Acres)                 | Crop Income | Livestock Income | Wages and Salaries | Business Income | Rental and Pension Income | Other Transfer Income | Remittances | Total Income |
|--------------------------------------|-------------|------------------|--------------------|-----------------|---------------------------|-----------------------|-------------|--------------|
| No Land                              | 0           | 16               | 82                 | 75              | 73                        | 70                    | 71          | 49           |
| more than zero but less than 5 acres | 27          | 40               | 12                 | 17              | 17                        | 17                    | 20          | 21           |
| 5 and but less than 12.5             | 41          | 28               | 4                  | 6               | 7                         | 10                    | 7           | 18           |
| 12.5 and but less than 25            | 18          | 10               | 1                  | 1               | 2                         | 3                     | 1           | 7            |
| 25 and above                         | 14          | 6                | 1                  | 1               | 2                         | 0.4                   | 1           | 5            |
| Total                                | 100         | 100              | 100                | 100             | 100                       | 100                   | 100         | 100          |

*Source:* Computed from Government of Pakistan (2010-11) [www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11](http://www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11).

There are large regional variations also that stem from the diversity of agro-climatic and socio-economic conditions and the size of the regions. Within the crop and livestock income nearly 19 percent of crop income and 30 percent of livestock income comes from one zone only i.e. the Rice/Wheat zone of Punjab (Table 4).

As already stated for the smallest under 5 acre category (or put another way for 65 percent of the farm households of Pakistan) Crop and livestock income together account for only 58 percent of all income. They have to rely on other sources of income to subsist (Table 5).

Table 4

*Percentage share of Each Source of Income in Total Income by Agro-Climatic Zones*

| Zones                | Crop Income | Livestock Income | Wages and Salaries | Business Income | Rental and Pension Income | Other Transfer Income | Remittances | Total Income |
|----------------------|-------------|------------------|--------------------|-----------------|---------------------------|-----------------------|-------------|--------------|
| Rice/Wheat Punjab    | 19          | 30               | 17                 | 20              | 22                        | 15                    | 27          | 21           |
| Mixed Punjab         | 16          | 18               | 14                 | 16              | 20                        | 9                     | 11          | 16           |
| Cotton/Wheat Punjab  | 23          | 18               | 16                 | 14              | 10                        | 14                    | 13          | 20           |
| Low Intensity Punjab | 10          | 8                | 8                  | 12              | 5                         | 18                    | 6           | 9            |
| Barani Punjab        | 1           | 5                | 8                  | 6               | 24                        | 1                     | 12          | 4            |
| Cotton/Wheat Sindh   | 11          | 5                | 5                  | 1               | 1                         | 2                     | 0.2         | 7            |
| Rice/Other Sindh     | 11          | 5                | 8                  | 2               | 2                         | 12                    | 0.2         | 8            |
| KPK                  | 6           | 11               | 20                 | 28              | 16                        | 23                    | 30          | 11           |
| Balochistan          | 4           | 0.3              | 3                  | 1               | 0                         | 5                     | 0.5         | 3            |
| Total                | 100         | 100              | 100                | 100             | 100                       | 100                   | 100         | 100          |

Source: Computed from Government of Pakistan (2010-11) [www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11](http://www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11)

Table 5

*Percentage Share of Source of Income in Each Farm Size in Pakistan*

| Pakistan-Size of Farm (acres)        | Crop Income | Livestock Income | Wages and Salaries | Business Income | Rental and Pension Income | Other Transfer Income | Remittances | Total Income |
|--------------------------------------|-------------|------------------|--------------------|-----------------|---------------------------|-----------------------|-------------|--------------|
| No Land                              | 0           | 3                | 56                 | 19              | 4                         | 2                     | 15          | 100          |
| more than zero but less than 5 acres | 37          | 21               | 19                 | 10              | 2                         | 1                     | 10          | 100          |
| 5 and but less than 12.5             | 65          | 17               | 8                  | 4               | 1                         | 1                     | 4           | 100          |
| 12.5 and but less than 25            | 73          | 16               | 5                  | 2               | 1                         | 1                     | 2           | 100          |
| 25 and Above                         | 78          | 12               | 4                  | 3               | 1                         | 0.1                   | 2           | 100          |
| Total                                | 28          | 11               | 34                 | 13              | 3                         | 2                     | 10          | 100          |

Source: Computed from Government of Pakistan (2010-11) [www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11](http://www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11)

Crop and livestock income are most important in cotton/wheat Sindh where these together account for nearly 90 percent of all income, and least important in Barani Punjab where it accounts for 37 percent and KPK where it accounts for 44 percent (Table 6).

Table 6

*Percentage Share of Each Source of Income in Total Income by Agro-climatic Zones*

| Zones                | Crop Income | Livestock Income | Wages and Salaries | Business Income | Rental and Pension Income | Other Transfer Income | Remittances | Total Income |
|----------------------|-------------|------------------|--------------------|-----------------|---------------------------|-----------------------|-------------|--------------|
| Rice/Wheat Punjab    | 51          | 25               | 10                 | 6               | 1                         | 1                     | 7           | 100          |
| Mixed Punjab         | 56          | 21               | 10                 | 6               | 2                         | 0                     | 4           | 100          |
| Cotton/Wheat Punjab  | 65          | 16               | 10                 | 4               | 1                         | 1                     | 4           | 100          |
| Low Intensity Punjab | 59          | 16               | 10                 | 8               | 1                         | 2                     | 4           | 100          |
| Barani Punjab        | 13          | 24               | 25                 | 10              | 9                         | 0.3                   | 18          | 100          |
| Cotton/Wheat Sindh   | 79          | 11               | 9                  | 1               | 0.2                       | 0.3                   | 0.2         | 100          |
| Rice/Other Sindh     | 74          | 12               | 12                 | 1               | 0.3                       | 1                     | 0.2         | 100          |
| KPK                  | 27          | 17               | 21                 | 15              | 2                         | 2                     | 16          | 100          |
| Balochistan          | 80          | 2                | 14                 | 1               | 0.0                       | 2                     | 1           | 100          |
| Total                | 56          | 18               | 12                 | 6               | 1                         | 1                     | 6           | 100          |

Source: Computed from Government of Pakistan (2010-11) [www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11](http://www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11)

***The Poverty Trap***

This size of farm and sources of income structure translates into high levels of poverty. The estimates of the incidence of poverty based on the total expenditures necessary to provide the minimum calorie requirement of 2350 calories per adult equivalent, which translates into poverty line expenditure of Rupees 2413 per adult equivalent per month, are presented in Table 7 by farm size and Table 8 by agro climatic zone.

Table 7

*Incidence of Poverty by Farm Size in Pakistan*

| Size of Farm (acres)                 | Percentage of Poor Households in Category | Percentage of all Poor Households |
|--------------------------------------|---|-----------------------------------|
| No Land                              | 49  | 72                                |
| more than zero but less than 5 acres | 40  | 20                                |
| 5 and but less than 12.5             | 34  | 7                                 |
| 12.5 and but less than 25            | 23  | 1                                 |
| 25 and Above                         | 10  | 0.3                               |
| Total                                | 45  | 100                               |

*Source:* Government of Pakistan, Census 2010 and Government of Pakistan (2010-11) [www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11](http://www.pbs.gov.pk/content/household-integrated-economic-survey-hies-2010-11)

Table 8

*Incidence of Poverty by Agro-climatic Zones (Excluding Non-farm Households)*

| Zones                | Percentage of Poverty | Percentage of Poor Households |
|----------------------|-----------------------|-------------------------------|
| Rice/Wheat Punjab    | 24                    | 9                             |
| Mixed Punjab         | 22                    | 8                             |
| Cotton/Wheat Punjab  | 36                    | 16                            |
| Low Intensity Punjab | 54                    | 21                            |
| Barani Punjab        | 29                    | 6                             |
| Cotton/Wheat Sindh   | 43                    | 11                            |
| Rice/Other Sindh     | 47                    | 6                             |
| KPK                  | 44                    | 23                            |
| Balochistan          | 33                    | 4                             |
| Total                | 36                    | 100                           |

*Source:* Government of Pakistan, Census (2010) and Government of Pakistan, HIES (2010-11).

*Note:* Using Poverty Line Rs. 2413 per AE per month.

Nearly 45 percent of all rural households are estimated to be below the poverty line in 2010. The incidence of poverty is highest in the non-farm sector and in the smallest size of farm categories. And poverty varies by agro-climatic zones. This means that the smaller size categories are much more disadvantaged in the poorer zones and regions.

In-optimal input use, limited ability to take risks or diversify cropping patterns, and the continuing low labour productivity responsible for the low inclusive growth of Pakistan's Agriculture is in large measure due to the high levels of poverty of the farm sector and consequently its poverty reducing potential.

## 5. SOME POLICY RECOMMENDATIONS

If the current situation continues the poverty trap will worsen and agriculture productivity and growth will decline even further. Declining farm size and fragmentation will make it impossible to support an already unsustainable crop sector.

In addition to the size of farm, type of tenure, structure of incomes and its regional disparity, and the poverty trap it perpetuates that were discussed above, Pakistan's agriculture sector also faces a series of traditional challenges even if it gets beyond the huge constraints described above.

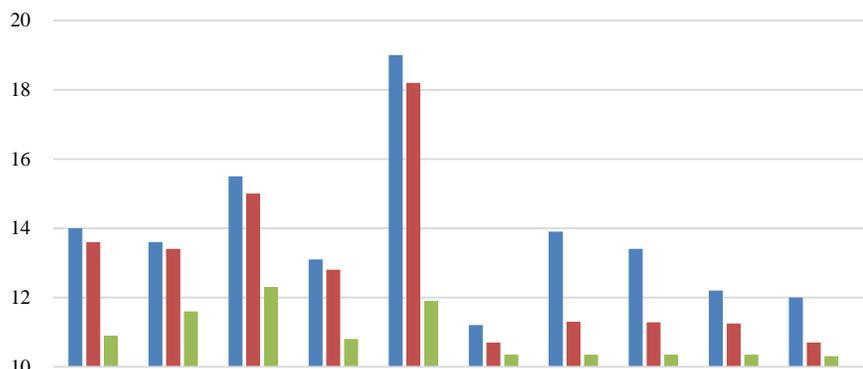
Foremost in terms of the challenges, following Fan, *et al.* (2013) categorisation of soft constraints, are insufficient access to markets, quality infrastructure and technology, the high marketing and transportation costs and higher transaction costs and lower profit margins.

The national research system does not prioritise smallholder-friendly technologies. The extension system is all but non-existent. The public system like in many developing countries has been scaled back under the assumption that the market will take care of these needs. However, the private sector tends to serve larger farms and those favourably located near roads and markets so as to ensure lower transaction costs.

Pakistan has an inadequate system of land titling and a fragmented and weak rural credit market that makes it difficult to undertake the necessary investments to scale up agricultural operation. Land grabbing has taken away some of the most productive land and the development of housing colonies has displaced many smallholders from land as well as markets. The lack of access to education and the skills necessary to manage production systems and adopt innovative and high-return technologies add an additional burden.

The way forward is to move towards a science based and context-specific set of farm policies. The elements of the resilience approach can be built upon to improve risk-mitigation and adaptation strategies for the small holder agriculture of Pakistan. It involves putting the small farmer in the centre of all policy making and support, to learn and build on indigenous knowledge and promote value chains that favour the small farmer. Policy needs to focus on encouraging smallholder-friendly financing and investment. Most importantly the system needs to recognise the importance of agricultural research and policy support.

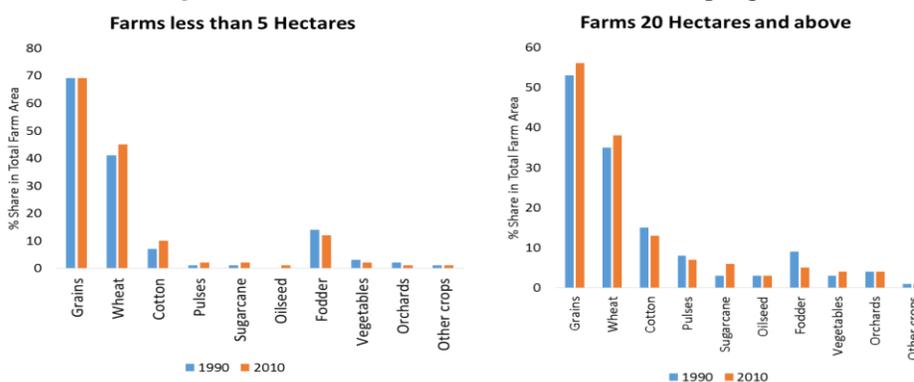
**Annex Fig. 1. Pakistan’s Agriculture Yield Potential**



Source: PARC (2011).

Note: Yields for cows are measured as liters/day.

**Annex Fig. 2. Limited Diversification of Pakistan’s Crop Agriculture**



Source: Agriculture Census (1990 and 2010).

**Annex Table 1**

*Classification of Districts into Agro-climatic (Crop) Zones*

| Zone                 | Districts  |
|----------------------|--|
| Barani Punjab        | Attock, Rawalpindi, Islamabad, Jhelum, Chakwal   |
| Mixed Punjab         | Sargodha, Khushab, Faisalabad, Toba Tek Singh, Jhang, Okara  |
| Low Intensity Punjab | Mianwali, Bhakkar, M. Garh, Layyah, D.G. Khan, Rajanpur  |
| Cotton/Wheat Punjab  | Sahiwal, Pakpattan, Multan, Lodhran, Khanewal, Vehari, Bahawalpur, Rahimyar, Khan, Bahawalnagar  |
| Rice/Wheat Punjab    | Gujrat, M.B. Din, Sialkot, Narowal, Gujranwala, Hafizabad, Sheikhpura, NanKana Sahib, Lahore, Kasur                                    |
| Cotton/Wheat Sindh   | Khairpur, Ghotki, Sukkur, N. Feroze, Nawabshah, Sanghar, Thar parkar, Mirpur khas, Umarkot   |
| Rice/Other Sindh     | Jacobabad, Kashmore, Shikarpur, Larkana, K.S.Kot, Dadu, Jamshoro, Hyderabad, Matiari, Tando Allahyar, T.M.Khan, Badin, Thatta, Karachi |
| KPK                  | All Districts  |
| Balochistan          | All districts  |

Source: Authors, adapted from Pinckney (1989).

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## Factors Influencing Choice of Energy Sources in Rural Pakistan

MUHAMMAD SAAD MOEEN, ASJAD TARIQ SHEIKH, MUHAMMAD SAQIB SHAHZAD  
SALEEM, and SHEHRYAR RASHID

Modernisation of the agricultural and industrial sectors in Pakistan over the last thirty years, increased village electrification, increasing use of energy appliances by domestic users, and the usage of modern technology in all sectors, caused energy demand to increase more rapidly than energy supply. Sources of energy vary between urban and rural populations, across income groups, and by type of households. Pakistanis consume energy from both modern and traditional sources for different purposes, such as lighting, cooking, heating, and transportation. Modern sources of energy include electricity, oil, gas and coal, while traditional sources consist of animal/plant residue (firewood, crop residue and animal waste). Using a multinomial logit regression model, this study analyses how rural households make choices among different energy alternatives. The results suggest that because of the limited access to modern energy sources, households rely on traditional sources excessively, which may have a negative impact not only on human and animal health but also on the environment. These results suggest that the conversion of traditional energy sources into modern ones, such as, biogas, use of energy efficient appliances, etc. can have a positive impact on the environment and sustainable economic growth.

*JEL Classification:* R20, D11, Q43, Q42, Q5

*Keywords:* Rural, Households, Energy Consumption, Energy Sources, Environment

### 1. INTRODUCTION

Increasing demand and limited supply of modern energy sources is a major policy concern in Pakistan. Modernisation of agricultural and industrial sectors, increased village electrification, increasing use of energy appliances by domestic users, and the usage of modern technology in all sectors caused energy demand to increase more rapidly than supply. Sources of energy vary between urban and rural populations, across income groups, and by type of households. Most households use both modern (e.g., electricity, oil, gas and coal), and traditional energy sources (e.g., firewood, animal and plant

Muhammad Saad Moeen <saadmoeen@hotmail.com> is Research Analyst, IFPRI's Pakistan Strategy Support Programme (PSSP), Islamabad. Muhammad Asjad Tariq is Research Analyst, IFPRI's Pakistan Strategy Support Programme (PSSP), Islamabad. Saqib Shahzad <saqib.297@googlemail.com> is Research Analyst, IFPRI's Pakistan Strategy Support Programme (PSSP), Islamabad. Shehryar Rashid is Research Analyst, IFPRI's Pakistan Strategy Support Programme (PSSP), Islamabad.

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residue) for different purposes, such as lighting, cooking, heating, and transportation. Because of large-scale village electrification in Pakistan, electricity is the major source for lighting. However, for cooking and heating, a majority of the rural population relies mostly on traditional sources of energy, of which firewood is the major source [Mirsa and Kemp (2009); Jan, *et al.* (2012)].

Traditional sources of energy are easily accessible and affordable for a majority of rural households. Their use, however, has serious implications for health, environment, and biodiversity. A higher demand for firewood can result in deforestation, loss of biodiversity, land erosion, and other types of harm to the environment [Heltberg, *et al.* (2000); Dewees (1989); Liu, *et al.* (2008)]. In addition, burning animal/plant residue creates indoor pollution that can cause several respiratory and lung diseases [Awan, *et al.* (2013)]. In addition to health and environmental problems, the use of animal/plant residue has several socioeconomic implications. For example, the collection of animal/plant residue increases the work load on women and children, who are prime collectors of animal/plant residue in rural areas. High deforestation can result in a wood shortage that may reduce the cooking frequency and/or the amount of cooked food, which has implications for the nutritional status of households [FAO (2008)].

The concept of household energy choice can be explained by either the 'energy ladder' or the 'fuel-stacking' models [Heltberg (2003)]. The energy ladder model explains the transition in energy consumption from traditional animal/plant residue to modern sources is caused by an improvement in income. This model is based on a three-stage fuel switching process. In the first stage, households rely on animal/plant residue. In the second stage, with improvement in income, households move to transition fuels such as kerosene, coal and charcoal. In the third stage, households adopt modern sources of energy with a further improvement in income. In the fuel-stacking model, households do not completely discard traditional sources of energy as their income rises. Instead, they simultaneously use both, traditional and modern energy sources. Earlier studies support the energy ladder model [Hosier and Dowd (1987); Leach (1992); Sathaye and Tyler (1991); Smith, *et al.* (1994); Reddy and Reddy (1994)]. However, several studies conducted after the 1990s found the fuel-stacking model is more appropriate [Barnes and Qian (1992); Hosier and Kipondya (1993); Davis (1998); Masera, *et al.* (2000); Heltberg (2005)]. Both these models assume income as the major determining factor of household choice about energy sources.<sup>1</sup> Recent studies point out that it is not only income but several socioeconomic, institutional, and market factors influence a household's choice of energy source [Mirza and Kemp (2009); Jayaraj, *et al.* (2011); Nnaji, *et al.* (2012); Adepoju, *et al.* (2012); Jan, *et al.* (2012)].

As discussed earlier, rural households in Pakistan rely more on traditional sources of energy and face several socio-economic, health, and environmental issues. To overcome the negative effects of traditional energy sources on human health and the environment, and to improve living conditions of poor households in rural areas, there is a need for cleaner and efficient sources of energy that do not damage the environment and health of humans and

<sup>1</sup>The ordered probit model is used with the energy ladder model, and usually uses time series data, which is not available in our series. In our data, households simultaneously use different energy sources i.e. traditional sources (firewood, animal and crop residue) and modern sources (natural gas) for cooking and heating. This supports the fuel stacking model and multinomial logit model is appropriate.

animals. Understanding household energy choices is important to encourage policies that can support the provision of cleaner, efficient and cost effective sources of energy to rural households. For this, in-depth research is required that shows how different socioeconomic, institutional, and market factors influence a household's probability of choosing modern versus traditional sources of energy.

The issue of energy choice is not well-researched in Pakistan. The determinants of a household's energy choice are examined by Mirza and Kemp (2009) for rural Punjab, and Jan, *et al.* (2012) in rural KPK. Both studies support the fuel-stacking model and point out that the lack of resources at the household level, energy prices, and the unavailability of modern energy sources are the major reasons of households' dependence on traditional sources. Despite providing useful information, these studies suffer from estimation weaknesses. A household selects a source of energy over other available alternative varieties which maximise its welfare. Therefore, a simple descriptive analysis [Jan, *et al.* (2012) or a bivariate logit analysis of different energy sources [Mirza and Kemp (2009)] may give misleading results. Using a multinomial logit model, this paper examines the household decision making process for the choice of traditional and modern energy sources. This analysis is based on data from the Rural Household Panel Survey (RHPS), Round 3.0, conducted in 2014.

This paper is divided into seven sections. Details of sample design and survey process are given in Section II. Section III describes the data. The conceptual framework and empirical model are explained in Section IV. Section V discusses the results, while conclusions and policy recommendations are given in Section VI. Section VII provides an overview of the study limitations and gives suggestions for further research.

## 2. SAMPLE DESIGN AND SURVEY PROCESS

In response to a request to assess important economic policy priorities for the Government of Pakistan, the Pakistan Strategy Support Program (PSSP) launched a panel survey entitled the "Rural Household Panel Survey (RHPS)" in 2012. The sample universe included all households in rural areas of the provinces of Punjab, Sindh and Khyber-Pakhtunkhwa (KPK). Balochistan was dropped from the sample due to security reasons in 2012. The multistage stratified sampling technique was used. In the first stage, Probability Proportionate to Size (PPS)<sup>2</sup> was used to select districts. The proportion of rural households in each province determined the number of districts chosen from there. A total of 19 districts were selected from within the three provinces; 12 from Punjab, 5 from Sindh and 2 from KPK. Within each district, 4 mouzas as Primary Sampling Units (PSUs) were chosen using an equal probability systematic selection. The PPS at this stage would ensure each household had same probability of being in sample.

In each Mouza, the enumeration teams conducted reconnaissance. They prepared a map of the village. A Mouza is divided into enumeration blocks. Each block consists of maximum 200 households. One enumeration block was randomly selected. Households within each Mouza or Primary Sampling Units (PSU) have been considered as Secondary Sampling Units (SSU). A complete household listing was conducted in this block, and 28 households were randomly selected from this list. There was no replacement for households

<sup>2</sup>This method ensures that the districts with more rural households have a greater chance to be selected.

that refused to participate in the survey. Thus a total of 2,124 households were selected for the survey. Of these, 34 refused and the survey was conducted on 2,090 households.

Six survey modules were developed to collect information. These included three questionnaires for each household in the sample (one each for males, females and for a household member 18-35 years old) and a community (one per Mouza), schools (at least one per Mouza) and prices (one district, Union Council and Mouza) questionnaire.

The survey was conducted by nineteen teams, each comprising two males, two females and a supervisor. Monitoring of the whole survey process was conducted by a team of monitors, while a survey coordinator controlled all field operations. Our study used data from the third round of this survey, which was completed in June 2014. [For details one the first Round, see Nazli and Haider (2012)]. Detailed information on household energy sources, consumption of energy, and expenditure on energy was collected in this round. Because of attrition, Round 3 comprised of 1,869 households, with 1,177 in Punjab, 486 in Sindh, and 206 in KPK.

### 3. DATA

Data shows that households use different sources of energy for different purposes. A majority of households use a mix of different sources (see Table 1). Electricity is consumed by a majority of households (90 percent), which indicates that Pakistan has made significant progress in village electrification. Lighting is the main use of electricity, as nearly 98 percent of those households with electricity use it for this purpose. Firewood is the main source for cooking and heating, which is used by almost two-thirds of households. Animal and plant residue is another source for cooking and heating, and nearly 17 percent of households use this source for cooking, while 22 percent use residues for heating. A smaller percentage (15 percent) of households uses natural gas for cooking and heating.

Table 1

*Household Energy Consumption by Purpose in Rural Pakistan (Percentage)*

| Energy Sources       | Lighting | Cooking | Heating |
|----------------------|----------|---------|---------|
| Electricity          | 97.72    | 0.00    | 0.00    |
| Natural Gas          | 0.00     | 14.7    | 15.64   |
| Firewood             | 1.66     | 68.32   | 62.37   |
| Animal/plant Residue | 0.00     | 16.98   | 21.99   |
| Others               | 0.62     | 0.00    | 0.00    |
| Total                | 100      | 100     | 100     |

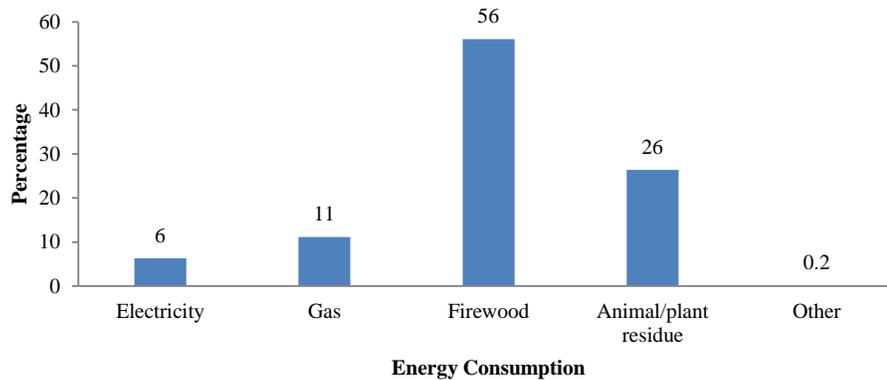
*Source:* Author's calculations from the Rural Household Panel Data Round – 3, PSSP-IDS.

To examine the consumption share of a particular source of energy in the total energy mix<sup>3</sup>, we convert the quantity of consumption of all energy sources into heating values using Millions of British Thermal Units (MMBtu), which derives total energy consumption by each household. This enables us to calculate the consumption share of energy units in total energy consumption by each source. (See Annexure: Tables 1 and 2).

<sup>3</sup>Energy mix is defined total energy consumption by each energy sources consumed by the households.

The results of energy consumption in MMBtu compared with energy usage in rural Pakistan are shown in Figure 1, which shows that 90 percent of households used electricity in rural Pakistan. However, the share of consumption of electricity is only 6 percent. The use of natural gas is 10 percent and its share of consumption is 11 percent. Firewood is the major source of energy, and it accounts for more than 56 percent of total energy units consumed. Low share of energy units from electricity and gas explains the prevailing situation in rural Pakistan, where electricity is used only for lighting and the gas network is very thin in rural areas; as such, many villages do not have a supply of natural gas.

**Fig. 1. Energy Consumption in Rural Pakistan**



Source: Author's calculations from the Rural Household Panel Data Round – 3, PSSP-IDS.

The data also show that 43 percent of households use only a single source of energy for cooking and heating; 38 percent use two, and 19 percent households have more than two sources of energy for cooking and heating. These results show that households' depend largely on traditional sources of energy for cooking and heating and use them in combination. Similar trends were observed across provinces. However, the proportion of households using electricity is only 68 percent in Sindh. Usage of firewood is considerably higher in KPK where about 93 percent households use firewood for cooking and heating. This may be because of low temperatures during the winter, lower accessibility to modern sources of energy for heating and more forest cover in this province. As compared to other provinces, the use of animal/plant residue is higher in Punjab (44 percent) which may partly be explained by the higher proportion of livestock holders in this province.<sup>4</sup>

Households were also asked about outages/shortages of various energy sources during the last year and the usage of alternate sources in case of outages/shortage. Data shows that the average outage of electricity is 12.50 hours per day. A majority of households (35 percent) use emergency lights and (14 percent) candles as an alternative source. Households who use gas, face gas outages; on average, 2.30 hours per day in winter and 1.38 hours per day in summer. In case of gas outages, nearly one-third of

<sup>4</sup>In the sample, livestock holders are 76.58 percent in Punjab, 69 percent in Sindh and 71 percent in KPK.

households use firewood and 41 percent use other sources (e.g., petrol, diesel, or coal) as an alternative source (see Table 2). This indicates that firewood is the main substitute for gas. In case of firewood shortage, a majority of households (71 percent) use animal/plant residue, and some households (7 percent) use gas as an alternative source. When there is a shortage of animal/plant residue, most of the households depend on firewood (56 percent). This indicates that gas, firewood and animal/plant residues are substitutes of each other.

Table 2

*Alternative Source of Energy in Case of Outages/Shortages of an Energy Sources  
(Percentage)*

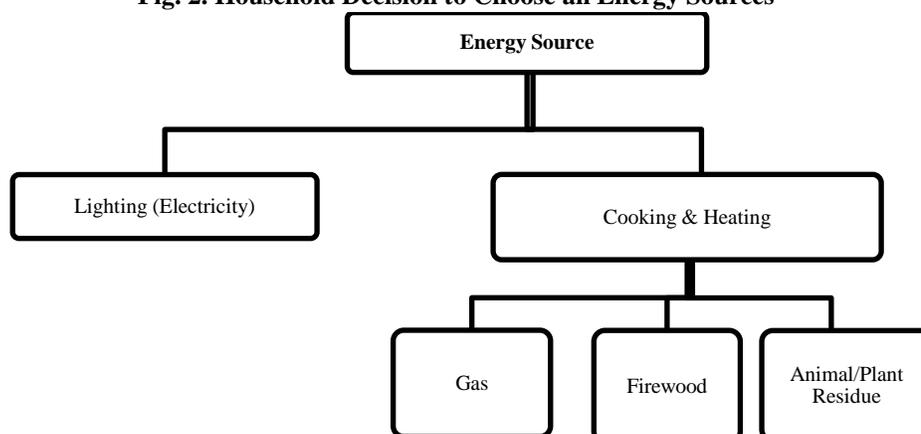
| Main Source of Energy | Alternative Source of Energy |      |          |                      |        |
|-----------------------|------------------------------|------|----------|----------------------|--------|
|                       | No Alternative               | Gas  | Firewood | Animal/Plant Residue | Others |
| Gas                   | 20.10                        | 0.00 | 35.41    | 1.05                 | 43.44  |
| Firewood              | 16.66                        | 7.18 | 0.00     | 70.73                | 5.43   |
| Animal/Plant Residue  | 4.60                         | 0.00 | 55.51    | 29.72                | 10.17  |
| Others                | 17.92                        | 0.00 | 0.00     | 0.00                 | 82.08  |

*Source:* Author's calculation from the Household Panel Data Round – 3, PSSP-IDS. Note: For other sources of energy, the major alternate source is petrol.

#### 4. CONCEPTUAL FRAMEWORK

These results indicate that households use electricity solely for lighting with almost no alternative except candles. However, for cooking and heating, they have a choice between natural gas, firewood, and animal/plant residue. Therefore our analysis will be based on the three sources of energy that are potential alternatives and on which households can make decisions. A household's decision to choose energy sources is explained in Figure 2.

**Fig. 2. Household Decision to Choose an Energy Sources**



*Source:* Author's Construction.

**4.1. Empirical Model**

The discussion above indicates that a household has a choice of alternative energy sources and, presumably, selects one that gives the highest utility. Such behaviour can be explained by multinomial logit models [McFadden (1974); Maddala (2001); Greene (2008)]. These models<sup>5</sup> are used to model the relationships between a polytomous response variable (with more than 2 categories of responses) and a set of explanatory variables, when responses are unordered.<sup>6</sup>

Consider a household’s choice of available energy sources, and assume that utility depends on choices made from a set C, which includes all possible energy sources. The household is assumed to have a utility function of the form

$$U_{ij} = U(Z_{ij}) \quad \dots \quad (1)$$

Where, for any household *i*, a given level of utility will be associated with any alternative energy source *j*, where *j*=1...*k*. The *k* is the number of energy sources. The random utility model is the theoretical basis for integrating the choice behaviour of a household. In this model, the utility of a choice is comprised of a systematic (explainable or deterministic) component, *V<sub>ij</sub>*, and an error (unexplainable or random) component, *e<sub>ij</sub>*, which is independent of the deterministic part and follows a predetermined distribution.

$$U_{ij} = V_{ij} + e_{ij} \quad \dots \quad (2)$$

The deterministic part can be written as:

$$V_{ij} = X_i \gamma_j \quad \dots \quad (3)$$

Where *γ<sub>j</sub>* are parameters, and *X<sub>i</sub>* are explanatory variables; the *e<sub>ij</sub>* is a random disturbance reflecting intrinsically random choice behaviour, measurement or specification error, or other unobserved attributes of the alternatives. The error terms are also assumed to be identically and independently distributed across alternative activities. Also let *P<sub>ij</sub>* denote the probability associated with the choice of a particular energy source *j* (*g, f, r*) for household *i*, where *g* denotes gas, *f* is firewood, and *r* is animal/plant residue such that *P<sub>ij</sub>*= 1 if the *i*th individual selects *j*th source, *P<sub>ij</sub>* =0 otherwise. The multinomial logit model with unordered choice set (*j*=1, 2, 3) is given by:

$$P_{ij} = \frac{\exp(X_i \gamma_j)}{\sum_{j=0}^3 \exp(X_i \gamma_j)} \quad \dots \quad (4)$$

Setting *γ<sub>0</sub>* = 0, the model can be written as:

$$P_{ij} = \frac{\exp(X_i \gamma_j)}{1 + \sum_{j=1}^3 \exp(X_i \gamma_j)} \quad (j = 1,2,3) \text{ and } P_{i0} = \frac{1}{1 + \sum_{j=1}^3 \exp(X_i \gamma_j)} \quad \dots \quad \dots \quad (5)$$

<sup>5</sup>See footnote 2. The ordered probit model, suggested by participants in our session, works for the energy ladder model, but usually uses time series data. In this analysis we assume households use simultaneously different energy sources and with sufficient income, can switch between sources. Thus the multinomial model is appropriate. In the conclusions, however, we suggest several other possible approaches.

<sup>6</sup>Dependent variables are arbitrary numerical values because the ranking does not imply that outcome 1 is less than outcome 2, which in turn is less than outcome 3.

Where  $X_i$  is the vector of explanatory variables,  $\gamma_i$  represents are the parameters to be estimated. This model can be estimated using the maximum likelihood estimation method.

To describe results, the average marginal effects are computed by differentiating the conditional expected value of the dependent variable with respect to explanatory variables. When the explanatory variable is a discrete variable, the marginal (or incremental) effect is an arithmetic difference,  $E(y|x_1 = 1) - E(y|x_1 = 0)$ , rather than a derivative [Sui and Zhihao Yu (2012)]. In the estimation process, gas is considered as the referent/base case. All results are explained in comparison with the reference category. We estimated two models, one for heating and the other for cooking.

## 5. RESULTS

Before presenting the results of estimated model, we look at the unit costs of different energy sources which are calculated in terms of PKR per MMBtu, and which indicates that gas is the most cost effective source of energy at Rs 250 per MMBtu (see Table 3). Firewood is the most expensive source of energy with a unit cost of 330 PKR/MMBtu, followed by animal/plant residue (316 PKR/MMBtu). Disaggregation by per capita expenditure quintile shows a positive association between unit cost and expenditure quintile. This means as income improves, expenditure on energy sources increases. This table shows that the unit cost of gas is higher than the other two sources for households in highest income group. This may be due to the fact that households move to more efficient sources of energy with an improvement in income. In Pakistan, the gas tariff is tiered, and so rises with the household consumption level, as seen in Table 3. However, traditional sources do not have formal markets and they are largely collected, not purchased, at least among lower income households. This informal market does not have standard prices because of the un-regulated market structure. The table shows that the unit cost of firewood and animal/plant residue varies across expenditure quintile which supports the argument regarding the market structure of traditional sources.

Table 3

### *Unit Cost of Energy by Expenditure Quintile*

| Sources of Energy    | (PKR/MMBtu) |     |     |     |            | Total |
|----------------------|-------------|-----|-----|-----|------------|-------|
|                      | 1(Poorest)  | 2   | 3   | 4   | 5(Richest) |       |
| Gas                  | 152         | 198 | 223 | 256 | 387        | 251   |
| Firewood             | 300         | 326 | 325 | 353 | 355        | 330   |
| Animal/Plant Residue | 298         | 301 | 335 | 360 | 303        | 316   |

*Source:* Author's calculation from Rural Household Panel Data Round – 3, PSSP-IDS.

### 5.1. Explanatory Variables

The sample comprised of 1,869 households, 70 percent from Punjab, 20 percent from Sindh and 10 percent from KPK. Explanatory variables include various household, energy use and community specific factors, with their definition and summary statistics reported in Table 4. This table shows that the average age of the household head was 47.90 years. Half of households have some education. Female headed households are

very few in the sample. On average, a household has 2.8 dependents. A majority of household heads are involved in nonfarm activities. Average number of females and children involved in firewood collections is less than 1. The average distance between villages and nearest city is 15.5 kilometre. Internal road structure in most of the villages is not well developed.

Table 4  
*Summary Statistics*

| Variable  | Mean  | Standard Deviation |
|---|-------|--------------------|
| <b>Household characteristics</b>                            |       |                    |
| Age of household head (years)                               | 47.86 | 13.20              |
| Education of household head (1=if any schooling)            | 0.49  | 0.50               |
| Gender of household head (=1 if male)                       | 0.95  | 0.22               |
| Number of Dependents (number)                               | 2.79  | 2.12               |
| Farm household (yes=1)                                      | 0.44  | 0.50               |
| <b>Household labour supply</b>                              |       |                    |
| Number of females involved in collecting firewood (number)  | 0.34  | 0.61               |
| Number of children involved in collecting firewood (number) | 0.17  | 0.54               |
| <b>Household income groups</b>                              |       |                    |
| First Income Quantile (yes=1)                               | 0.20  | 0.40               |
| Second Income Quantile (yes=1)                              | 0.20  | 0.40               |
| Third Income Quantile (yes=1)                               | 0.20  | 0.40               |
| Forth Income Quantile (yes=1)                               | 0.20  | 0.40               |
| Fifth Income Quantile (yes=1)                               | 0.20  | 0.40               |
| <b>Energy consumption</b>                                   |       |                    |
| Energy Consumption (MMBTu)                                  | 2.78  | 3.12               |
| <b>Community variable</b>                                   |       |                    |
| Distance to Nearest Market (kilometer)                      | 15.51 | 14.47              |
| Type of internal roads (developed=1)                        | 0.42  | 0.49               |
| <b>Location variables</b>                                   |       |                    |
| Punjab (yes=1)  | 0.67  | 0.47               |
| Sindh (yes=1)   | 0.24  | 0.43               |
| KPK (yes=1)   | 0.09  | 0.29               |

Source: Author's own estimation by using Rural Household Panel Data Round – 3, PSSP-IDS.

## 5.2. Regression Results

For both cooking and heating, energy consumption (MMBTu), gender of household head, farm household and female collection of firewood are positive and significantly affect the choice of the firewood and animal/plant residue relative to gas. More literate households tend to use gas as source of energy for cooking and heating relative to firewood and animal/plant residue. Distance to nearest market is positive and only significantly affects the choice of firewood relative to gas. Internal road development and higher income quintiles are negative and significantly affect the choice of gas relative to firewood and animal/plant residue for cooking and heating.

The coefficients from the estimated model are difficult to interpret because they are relative to the base outcome. Another way to evaluate the effect of covariates is to examine the average marginal effect of changing their values on the probability of

observing an outcome. The average marginal effects of cooking and heating are presented in Tables 5 and 6, respectively. Results shows that the probability of choosing gas as source of cooking or heating increases if head of the household is male, with some education, belongs to a higher income group, and the community infrastructure is developed. Because the rows sum to zero, it is possible to see the substitution into and out of an energy source. So, for example, if a household head shifts to literate, the probability of using gas for cooking rises by about 5 percent, and there is no particular shift out of either firewood or residues. In contrast, the same improvement in education for heating leads to a significant movement of about 3.8 percent out of animal/plant residue use (see Table 5).

Table 5  
*Average Marginal Effects for Cooking*

| Variable  | Gas       | Firewood  | Animal/Plant Residue |
|---|-----------|-----------|----------------------|
| <b>Household characteristics</b>                            |           |           |                      |
| Household Head Age (years)                                  | 0.002     | -0.001    | 0.001                |
| Dummy Household Head Education (1=literate)                 | 0.050***  | -0.026    | -0.024               |
| Dummy Household Head Gender (=1 if male)                    | -0.058*** | 0.072     | -0.014               |
| Number of Dependents (number)                               | 2.800     | 2.100     | 0.013**              |
| Dummy for Farm Household (yes=1)                            | -0.064*** | -0.012    | 0.076                |
| <b>Household labour supply</b>                              |           |           |                      |
| Number of Females Involved in collecting firewood (number)  | -0.215*** | 0.112***  | 0.103***             |
| Number of Children Involved in collecting firewood (number) | -0.035    | 0.006     | 0.028                |
| <b>Household income groups</b>                              |           |           |                      |
| Dummy for Second Income Quintile (yes=1)                    | 0.020     | -0.070    | 0.050                |
| Dummy for Third Income Quintile (yes=1)                     | 0.020     | -0.031*** | 0.011**              |
| Dummy for Fourth Income Quintile (yes=1)                    | 0.062     | -0.088    | 0.026                |
| Dummy for Fifth Income Quintile (yes=1)                     | 0.075***  | -0.074**  | -0.001               |
| <b>Energy consumption</b>                                   |           |           |                      |
| Energy Consumption (MMBTu)                                  | -0.001    | 0.115***  | -0.114***            |
| <b>Community variable</b>                                   |           |           |                      |
| Distance to Nearest Market (kilometer)                      | -0.001    | 0.004***  | -0.003**             |
| Dummy for Developed Internal Mouza Road (developed=1)       | 0.147***  | -0.175*** | 0.028                |
| <b>Location variables</b>                                   |           |           |                      |
| Dummy for Punjab Province (yes=1)                           | -0.044    | -0.083    | 0.127**              |
| Dummy for KPK Province (yes=1)                              | -0.107**  | 0.216***  | -0.108*              |

Source: Source: Author's own estimation by using Rural Household Panel Data Round – 3, PSSP-IDS.

Notes: Standard errors are in parenthesis and robust; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The presence of females involved in the collection of firewood and higher distance to market reduce the probability of choosing gas. These results are substantiated by the average marginal effects of firewood and animal/plant residue for both cooking and heating. Raising the number of females involved in collecting firewood by one person decreases gas use by 21.5 percent but of course, an increase in females involved in collecting firewood is highly correlated with the use of firewood. If those females increase, a higher dependence on animal/plant residue also arises, suggesting that firewood and residues are perhaps equal complements in use, at least for cooking. They appear to be less symmetric in heating choices. Similarly, developing internal Mouza roads tends to increase the probability of using gas by 14.7 percent, and most of this

appears to be a shift from using firewood, as the latter probability decreased by 17.5 percent with more developed Mouza roads, but no effect is seen on animal/plant residue. The same magnitudes were seen for both cooking and heating, although they were not significant in the heating analysis. Households tend to use more gas and less firewood with higher income.

The results for heating and cooking have the same directions and magnitudes, but the significance levels of some variables change. For example, the probability of the number of dependents, distances to the nearest market and energy consumption (MMBTu) are significant for animal /plant residue in cooking but not heating. Similarly, the Household Head Gender and farm household are significant for animal/plant residue. The number of children involved in collecting firewood is also significant for firewood (see Table 6).

Table 6  
*Average Marginal Effects for Heating*

| Variable  | Gas       | Firewood  | Animal/Plant Residue |
|---|-----------|-----------|----------------------|
| <b>Household characteristics</b>                            |           |           |                      |
| Household Head Age (years)                                  | 0.0005    | -0.001    | 0.0003               |
| Dummy Household Head Education (1=literate)                 | 0.054***  | -0.016    | -0.038*              |
| Dummy Household Head Gender (=1 if male)                    | -0.086*** | 0.048     | 0.037                |
| Number of Dependents (number)                               | -0.007*   | -0.001    | 0.007                |
| Dummy for Farm Household (yes=1)                            | -0.056*** | 0.0004    | 0.056*               |
| <b>Household labour supply</b>                              |           |           |                      |
| Number of Females Involved in collecting firewood (number)  | -0.141*** | 0.052*    | 0.089***             |
| Number of Children Involved in collecting firewood (number) | -0.035    | 0.013***  | 0.021**              |
| <b>Household income groups</b>                              |           |           |                      |
| Dummy for Second Income Quintile (yes=1)                    | -0.002    | -0.046    | 0.048                |
| Dummy for Third Income Quintile (yes=1)                     | 0.035***  | -0.036**  | 0.0002               |
| Dummy for Fourth Income Quintile (yes=1)                    | 0.074***  | -0.095    | 0.021                |
| Dummy for Fifth Income Quintile (yes=1)                     | 0.075     | -0.058    | -0.017**             |
| <b>Energy consumption</b>                                   |           |           |                      |
| Energy Consumption (MMBTu)                                  | -0.009    | 0.095*    | -0.086               |
| <b>Community variable</b>                                   |           |           |                      |
| Distance to Nearest Market (kilometer)                      | -0.001*** | 0.004***  | -0.003               |
| Dummy for Developed Internal Mouza Road (developed=1)       | 0.148     | -0.165    | 0.016*               |
| <b>Location variables</b>                                   |           |           |                      |
| Dummy for Punjab Province (yes=1)                           | -0.054    | -0.084*** | 0.138**              |
| Dummy for KPK Province (yes=1)                              | -0.080    | 0.331     | -0.250               |

Source: Source: Author's own estimation by using Rural Household Panel Data Round – 3, PSSP-IDS.

Notes: Standard errors are in parenthesis and robust; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 5.3. Health and Environment Impact

Use of traditional energy sources has a serious impact on health and the environment, especially when these traditional sources are used in un-controlled levels and with un-controlled appliances. In Pakistan, and especially in rural areas, these traditional sources are often used in an un-controlled way. These traditional energy sources produce various pollutants such as Nitric Oxide (NOX), Carbon Mono Oxide (CO) and Carbon Dioxide (CO<sub>2</sub>) which have serious environment and health risks (see Table 7).

Table 7

*Health and Environment Impact in Case of Using Traditional Energy Sources in Uncontrolled Measure*

| Pollutant | Name of Pollutant                 | Un-Controlled           |   | Health and Environment Impact   |
|-----------|-----------------------------------|-------------------------|---|---|
|           |                                   | 1 Kg Firewood per MMBtu | 1 Kg Animal and Plant Residue per MMBtu |   |
| NOX       | Nitric Oxide and Nitrogen Dioxide | 0.49                    | 0.67                                    | Water Quality Deterioration, Global Warming, Toxic Chemicals, Visibility Impairment   |
| CO        | Carbon Monoxide                   | 1.33                    | 27.56                                   | Dull headache, Weakness, Dizziness, Vomiting, Shortness of breath, Confusion, Blurred vision, Loss of consciousness                             |
| SO2       | Sulfur Dioxide                    | 0.06                    | n/a                                     | Inhalation and TOXIC, Skin and Eye Contact (CORROSIVE), Ingestion Effects of Long-Term (Chronic), Exposure, Carcinogenicity                     |
| VOC       | Volatile Organic Compound         | 0.04                    | 1.78                                    | Acetone, Benzene, Ethylene glycol, Formaldehyde, Methylene chloride, Perchloroethylene, Toluene, Xylene, 1,3-butadiene                          |
| PM        | Particulate Matter                | 1.27                    | 2.89                                    | Heart or lung disease, nonfatal heart attacks irregular heartbeat, aggravated asthma, decreased lung function, coughing or difficulty breathing |
| CO2       | Carbon Dioxide                    | 460                     | 476                                     | Cardiovascular Effects, Nerve Damage, Asphyxiation  |

*Source:* Department for Environment Food and Rural Affairs (UK) and Global Change Impact Studies Centre (GCISC), Pakistan.

Nitric Oxide affects water quality and is thought to be a cause of global warming, toxic chemicals and visibility impairment. Similarly, Carbon monoxide and carbon dioxide have many health risks: headaches, weakness and dizziness, vomiting, shortness of breath, confusion, blurred vision, and a loss of consciousness, skin and eye contact

(corrosive), ingestion, cardiovascular effects, nerve damage and asphyxiation. The use of traditional energy sources in controlled measures, with improved stoves, will reduce the amount of smoke, indoor air pollution and put less pressure on energy consumption. The use of traditional energy sources with improved stoves could reduce pollutants more than fifty percent compared to use of traditional energy sources in an un-controlled way. Improved stoves are fuel efficient and also reduce the household labour effort going to collecting firewood.

## 6. CONCLUSIONS

The development of the energy sector and management of supply side factors has proven to be a difficult task for the government of Pakistan in the last 30 years. Resolving problems within the energy sector is vital for the future of Pakistan, as energy limitations affect growth of the economy and agriculture and other rural non-form sectors, which in turn impacts poverty. Yet to date, most of the focus for policy makers and research institutions has been on developing solutions for the supply of energy, with an emphasis on providing electricity to urban locations. Little attention is given to increasing the efficiency of the energy sources used in rural areas. Using data from RHPS, collected in 2014, and applying a multinomial logit model, this study attempts to fill this research gap by identifying the factors that impact the choice of energy sources in rural areas of Pakistan.

The results support the fuel stacking model, as rural households use different sources of energy simultaneously. Firewood is preferred for both cooking and heating, while plant residue is mostly used for heating. The likelihood of using traditional energy sources is positively associated with labour supply and has negative association with distance to market. The lesser use of gas arises because of its limited supply in rural areas, although it is affordable by households who are better educated and well-off. A developed infrastructure increases the probability of using gas. However, implementing policies to effect this change will not be that simple, as we have identified education and roads as important factors, which require large financial outlays. Also, the impact of such investments can only be seen in the long term.

This paper also shows that traditional energy sources have harmful effects on the environment and human and animal health. In view of the limited supply and existing shortage of gas in the country, this study proposes two solutions that not only fulfill the demand for efficient energy source but also minimise the harmful effects on environment and health: (1) to generate gas from animal/plant residue; (2) encourage rural households to use energy-efficient appliances. These suggestions would help the Government of Pakistan in the implementation of Vision 2025.

## 7. STUDY LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Finally, there are several suggested areas for further research. One might be to consider the use of an ordered probit model, where the ordering is found in the cost per MMBtu. In that case, there might be a natural ordering in terms moving up in costs per Btu. If in fact households are making decisions on those costs, this could be an appropriate approach. A second possibility is to look more directly at an optimisation

approach. In this case, household might want to minimise the full costs of providing energy for a variety of uses, given their locations, options and costs of energy (including harvesting in the case of traditional sources). For this research, some kind of household production model could shed light on a range of policy options, and be a logical extension to the work done in this research and in the data available in the RHPS.

Also, it is worth noting that one of this study's limitations is that it focused exclusively on choice of energy source of rural households in Pakistan using data from the Rural Household Panel Survey (RHPS). Corresponding data from urban households is currently not available, and it might be worth examining the same relationship in an urban or overall context. Additionally, Balochistan was excluded from the sample of this study for security reasons.

## ANNEXURE

Table 1

### *Heating Value of Energy Sources*

| Fuel             | kJ/Kg  | MMBtu/Kg |
|------------------|--------|----------|
| Dung Cake        | 7,000  | 0.007    |
| Coal             | 29,000 | 0.027    |
| Petrol           | 45,000 | 0.043    |
| Kerosene         | 45,000 | 0.043    |
| Diesel           | 45,000 | 0.043    |
| LPG              | 45,000 | 0.043    |
| Biogas           | 45,000 | 0.043    |
| Electricity Unit | 3,600  | 0.003    |

Source: Energy Year Book 2015.

Table 2

### *Calculation of Heating Value of Animal/Plant Residue and Firewood*

| Animal/plant Residue |                  | Firewood      |                  |
|----------------------|------------------|---------------|------------------|
| 1 tone               | 1000 Kg          | 1 Tone        | 1000 Kg          |
| 1 Maund              | 40 Kg            | 1 Maund       | 40 Kg            |
|                      | 15.48 MMBtu/Tone |               | 16.93 MMBtu/Tone |
| Heating Value        | 0.015 MMBtu/Kg   | Heating Value | 0.016 MMBtu/Kg   |
|                      | 0.62 MMBtu/Maund |               | 0.67 MMBtu/Maund |

Sources:

- (1) [http://www1.eere.energy.gov/biomass/feedstock\\_databases.html](http://www1.eere.energy.gov/biomass/feedstock_databases.html)
- (2) Jenkins, B., Properties of Biomass, Appendix to Biomass Energy Fundamentals, EPRI Report TR-102107, January, 1993.
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- (4) Tillman, David, Wood as an Energy Resource, Academic Press, New York, 1978.
- (5) Bushnell, D., Biomass Fuel Characterisation: Testing and Evaluating the Combustion Characteristics of Selected Biomass Fuels, BPA report, 1989.
- (6) <http://www.ecn.nl/phyllis>

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## Combating Nutrient Deficiency in Pakistan

AMNA EJAZ, HASEEB ALI, MUBARIK ALI, and UMAR FAROOQ

To quantify the micronutrient deficiencies and their overtime trends, food quantities reported to be consumed in HIES surveys data during 1991-92 and 2011-12 are converted into major and micronutrients using the FAO Food Composition Table for Pakistan. To see the impact of different price and income support policies on micronutrient consumption, nutrient demand elasticities are estimated for 2011-12 for carbohydrates (energy), protein, calcium, vitamin A, vitamin C, vitamin B<sub>1</sub>, vitamin B<sub>2</sub>, and Niacin. The Almost Ideal Demand System (AIDS) is applied to estimate the demand elasticities of the eight food groups which are then converted into nutrient demand elasticities using the transformation of Hunag (1996). On average, per capita consumptions of almost all micronutrients are deficient compared to their respective recommended levels. Our analysis suggest that income support to the poor in Pakistan through programmes like BISP would have been much more effective to eradicate nutrient deficiency, if deficient nutrient(s) are targeted and support is provided to those foods having highest demand elasticity for that nutrient. For example, the promotion of wheat and other cereals are important to eradicate energy deficiency, and promotion of vegetables, fruits, and milk are particularly important in eradicating vitamin A, C and iron deficiencies. These commodities are also high value crops for farmers, thus the price support in these crops will also impact micronutrient consumption through income effect.

### INTRODUCTION

Estimates of micronutrient deficiencies are alarmingly high in Pakistan, especially among children and women. According to the National Nutritional Survey of Pakistan conducted in 2011-12, two out of every (44 percent) children under five years are stunted, 15 percent have wasting and 32 percent are have underweight problem, while 15 percent of women in the productive age have chronic energy deficiency (low BMIs) all suggesting a serious malnutrition problem among women and children. Micronutrient deficiencies are also very serious: 27 percent women and 44 percent children are iron deficient; 68 percent of women and 54 percent of children under the age 5 are quoted as Vitamin A deficient; over 58 percent of women have calcium deficiency, and 69 percent are vitamin D deficient. Despite an increase in food availability, most of the

Amna Ejaz <amnahejaz@gmail.com> is affiliated with the Pakistan Strategy Support Programme, Islamabad. Haseeb Ali is affiliated with the University of Minnesota, USA. Mubarik Ali is Member (FSCC), Ministry of Planning, Development and Reform, Islamabad. Umar Farooq is affiliated with the Pakistan Agriculture Research Council, Islamabad.

micronutrient deficiency measures have deteriorated overtime since the last survey was conducted in 2011 [NNT (2011)].<sup>1</sup>

Promotion of appropriate food can be an important strategy to overcome targeted nutrient deficiencies. For this purpose, policy makers should know what commodity can be the most effective with a given incentive, in eradicating a particular nutrient deficiency in the population. Although, food composition table does provide nutrient density of various nutrients in different commodities consumed, however, it does not incorporate the income or price response of the commodity. A commodity may be dense in a nutrient but it may not respond to the policy incentive thus can play a little role to improve its efficiency. This paper estimates the nutrient demand elasticities at the food group level which indicate the change in the consumption of various nutrients with a given change in price or income support to the consumers. These elasticities can be applied in simulating the impact of various price policies and market shocks in the domestic and international markets.

Poverty or low-income is one of the primary causes of nutrient malnutrition because it has close link with the factors responsible for such malnutrition, like inadequate access to food and lack of knowledge about nutritive importance of various foods. For example, in Pakistan, the incidence of iron deficiency is relatively higher among adults from low-income families [Yaqoob and Abbasi (2002)]. Similarly, highly significant difference in parents' monthly income was found between the children (1-2 years of age) suffered from iron deficiency anemia and those who did not [Ali and Zuberi (2001)]. In rural Hyderabad of India, boys belonging to better income group were having better childhood nutritional status as compared with the boys from lower wage earning families [Satyanaryana, *et al.* (1980)]. Being important in micronutrient deficiency, the analysis in this paper is conducted by income group.

The region in which a household lives also plays an important role in defining micronutrient deficiencies. Normally people lives in urban areas have better access to food compared to those in rural areas as food can travel from many production centres in the urban market while such connection of rural markets is limited. Therefore, this analysis is also conducted by rural and urban regions.

To quantify the effect of policy support on nutrient supply, demand elasticities of 8 food groups and 9 nutrients are estimated. A comprehensive household consumption survey data set collected from throughout Pakistan during 1991-92 and 2011-12 by Federal Bureau of Statistics enabled us to generate the nutrient demand elasticities separately for each year. The large sample effectively allowed us to incorporate the household characteristics in the demand estimation including income of the household.

This study is organised into six sections. The next section provides a brief review on the development of the estimation of commodity and nutrient demand elasticities,

<sup>1</sup>According to the National Nutrition Survey 2001-02 (NNS 2011-12), about 13 percent women pregnant during the time of survey complained the night blindness, which has increased from 10 percent during the last pregnancy. Bitot's spots (a clinical sign of vitamin-A deficiency) were found in 1.2 percent children of below 5 years age during the NNS 2001-02, which increased to 2.0 percent children in the NNS 2011-12. The incidence of anemia as conjunctiva pallor reported among 48.7 percent mothers in NNS 2001-02 was increased to 52 percent in the NNS 2011-12. Anemia was clinically found in 21.9 percent and 29 percent children of age below 5 years in the respective surveys [Pakistan (2002 and 2012)].

followed by a section on the description of methodologies used in this study for estimating the nutrient demand elasticities at food group level. Next is a section on data description and estimation procedures. The results and discussion section covers discussion on consumption patterns, existing status and trends of nutrient availability in Pakistan, and demand and nutrient elasticities of the nine chosen nutrients. The final section concludes at summarising the findings and suggesting policy implications.

### REVIEW OF LITERATURE

Lancaster (1966) had first conceptually linked the food choices and nutritional status. However, his approach was considered difficult to implement at that time as it involved non-linear programming to obtain nutritional implications of food consumption [Huang (1996)]. Adrian and Daniel (1976), Basiotis, *et al.* (1983) and Devaney and Fraker (1989) estimated demand for specific nutrients as a function of income and socio-demographic variables. Pitt (1983), Sahn (1988) and Gould, *et al.* (1991) proposed a formulation to calculate nutrient elasticities; however, no information was conferred about underlying derivation of demand model [Huang (1996)].

In this analysis, the Almost Ideal Demand System (AIDS) due to Deaton and Muellbauer (1980) was applied to estimate the demand function for major food groups. The reason is that AID permits a full range of commodities (complementary and substitute goods, normal and inferior goods). Moreover, AIDS has theoretical superiority as being flexible in allowing, but not requiring, the general restrictions of demand theory to hold [Farooq, *et al.* (1999)]. The specification not only helps to estimate the own-price, but also cross-price and income elasticities of demand. Using these demand elasticities and nutritional shares of various food groups in total food, nutritional elasticities are estimated using the transformation of Hunag (1996).

### RESEARCH METHODOLOGY

#### Demand Analysis

##### *Almost Ideal Demand System (AIDS)*

The estimation of AIDS has been carried out using a system of equations comprising household budget shares for the food group. For the *I*th<sup>2</sup> food group, the budget share equation used for empirical estimation was,

$$\omega_I = \alpha_I + \sum_{i=1}^n \gamma_i \ln p_i + \beta_I \ln \left( \frac{M_I}{PI_I} \right) \dots \dots \dots \dots \dots \quad (1)$$

where  $\omega$  is the budget share of the *I*th food group,  $\alpha_I = \alpha_I^* + \sum_{h=1}^s \delta_{ih,I} H_h$ ,  $p$  is price,  $M_I$  is the total food consumption expenditure on the *I*th food group,  $H_h$  pertains to the

<sup>2</sup>In the subsequent text, I, J and i,j refers to food groups and individual commodities/sub-groups within a food group, respectively.

household characteristics, and  $PI_I$  is the price index for the food group under consideration, defined by:

$$\ln PI_I = \alpha_{o,I} + \sum_{i,I=1}^n \alpha_{i,I} \ln p_{i,I} + \frac{1}{2} \sum_{i,I=1}^n \sum_{j,I=1}^n \gamma_{ij,I} \ln p_I \ln p_I \quad \dots \quad \dots \quad (2)$$

The  $\alpha^*$ ,  $\gamma$ ,  $\beta$ ,  $\delta$  are parameters, to be estimated, with the following restrictions:

$$\text{Adding up:} \quad \sum_{i,I=1}^n \alpha_I = 1 \quad \sum_{I=1}^n \beta_I = 0 \quad \sum_{I=1}^n \gamma_I = 0 \quad \sum_{I=1}^n \delta_I = 0 \quad (h=1 \dots s) \quad \dots \quad (3)$$

$$\text{Homogeneity:} \quad \sum_{I=1}^n \gamma_I = 0 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

$$\text{Symmetry:} \quad \gamma_{ij,I} = \gamma_{ji,I} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

Since the budget shares add up to unity, therefore, during estimation one share equation was arbitrarily dropped to make the system non-singular. Equation (1) along with restrictions (3) and (5) were estimated using full information maximum likelihood method by following the iteration sequence as described by Fan, *et al.* (1995). Following Blanciforti, *et al.* (1986), the uncompensated income, own-price and cross-price elasticities were computed from the parameter estimates using the following expressions.

$$\text{Income elasticity:} \quad \eta_{i,I} = \frac{\beta_{i,I}}{\omega_{i,I}} + 1 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (6)$$

$$\text{Own-price elasticity:} \quad \varepsilon_{ii,I} = -1 + \frac{\gamma_{ij,I}}{\omega_{i,I}} - \frac{\beta_{i,I} \alpha_{i,I}}{\omega_{i,I}} - \frac{\beta_{i,I}}{\omega_{i,I}} \sum_{j,I} \gamma_{ij,I} \ln p_{j,I} \quad \dots \quad (7)$$

$$\text{Cross-price elasticity:} \quad \varepsilon_{ij,I} = \frac{\gamma_{ij,I}}{\omega_{i,I}} - \frac{\beta_{i,I} \alpha_{i,I}}{\omega_{i,I}} - \frac{\beta_{i,I}}{\omega_{i,I}} \sum_{j,I} \gamma_{ij,I} \ln p_{j,I} \quad \dots \quad (8)$$

**Nutrient Elasticities Estimation**

Following Huang (1996), income and price elasticities were estimated as follows:

$$d\phi_k / \phi_k = \sum_{j=1}^n \left( \sum_i \varepsilon_{ij} a_{ki} X_i / \phi_k \right) dp_j / p_j + \left( \sum_i \eta_i a_{ki} X_i / \phi_k \right) dM / M$$

$$d\phi_k / \phi_k = \sum_{j=1}^n \pi_{kj} dp_j / p_j + \rho_k dM / M \quad \dots \quad \dots \quad \dots \quad (9)$$

where  $\phi_k$  represents the total amount of  $k$ th nutrient obtained from various foods,  $\pi_{kj} = \sum_i \varepsilon_{ij} a_{ki} X_i / \phi_k$  symbolises the weighted average effect on the availability of the  $k$ th nutrient in response to a change in the price of the  $j$ th food group through the effect of all own and cross-price elasticities,<sup>3</sup> and  $\rho_k = \sum_i \eta_i a_{ki} X_i / \phi_k$  is an income elasticity

<sup>3</sup>The  $a_{ki} X_i / \phi_k$  is the share of the  $i$ th food group in total amount of the  $k$ th nutrient available to the household, whereas  $\varepsilon_{ij}$  is own and cross price elasticities of the commodity.

measuring the effect of changes in income on the  $k$ th nutrient availability. The general calculation of nutrient elasticity matrix consisted of  $l$  nutrients and  $n$  foods can be obtained as follows:

$$N = S \times D \quad \dots \quad (10)$$

Where  $N$  is the  $l \times (n + 1)$  matrix of nutrient elasticities (the first  $n$  columns are price elasticities while the last column is for income elasticities),  $S$  is the  $l \times n$  matrix of food shares with rows indicating food shares of a particular nutrient, and  $D$  is the  $n \times (n + 1)$  matrix of demand elasticities. Each element in nutrient elasticities matrix  $N$ , indicates the extent and direction of quantitative change in the intake of a certain nutrient, when the market price of a food group changes or income of the consumer alters. The nutrient price elasticity indicates the percentage change in the availability of that nutrient with one percent change in the price of  $i$ th food group through own- and cross-price elasticity effects. This implies that the nutrient price elasticity contains the total effect of the change in the price of the food group under consideration as well as the cross effects (substitution and complementary) of other groups.

## DATA AND ESTIMATION PROCEDURES

### Data Sources

The data from the Household Income and Expenditure Surveys (HIES) for the years 1991-92 and 2011-12 are used for this study. Conducted by the Pakistan Bureau of Statistics, the households are randomly selected using two stage stratified random sampling approach. The data includes monthly consumption of food and non-food items with some details of food items, monthly expenditure on each item, family structure, income from all sources, and selected socioeconomic characteristics of the family. About 150 food items were found consumed in raw/fresh, semi-prepared and fully prepared forms.

A small sample who did not consume one or more of the food group was excluded from the analysis. Thus, a 14,036 household out of the total of 14,594 from 1991-92 survey, while 12,705 out of 15,807 households from 2011-12 survey are used in this study. These households were then grouped on the basis of income and regional location in order to obtain a clearer understanding of how household consumption and food expenditure patterns have changed within each stratum over the time period of twenty year.

All food items consumed by a family were transformed into per capita availability and classified into eight broad groups, i.e. wheat, other cereals, meats, pulses, milk products and fats, fruits, vegetables and miscellaneous. Details of these food group classifications are presented in Annexure 2.

Finally, using nutrient content information from Food Composition Table for Pakistan [Pakistan (2001)], per capita nutrient intake and nutrient shares of various food groups are estimated. The weighted average per capita nutrient requirements are estimated using household mean of age and sex composition information from our data and age and gender specific Recommended Dietary Allowances (RDAs) from Food and Nutrition Board (1989). The nutrient analysis pertains to nine essential nutrients and

micronutrients. These are carbohydrates (energy), protein, calcium, vitamin A, vitamin C, vitamin B<sub>1</sub>, vitamin B<sub>2</sub>, and Niacin.

## RESULTS AND DISCUSSION

This section is divided into three sub-sections. First the descriptive statistics are discussed. The remaining two subsections discuss demand and nutrient elasticities, respectively.

### Characteristics of the sample households

As shown in Table 1, some of the household characteristics used in this study included average family size, average age of household head, percentage of household in possession of a refrigerator and percentage of households with radios and/or television sets.

Table 1

#### *Sample Household Characteristics by Income and Region*

|              | Average Family Size<br>(Number) |         | Head Age |         | Possession of<br>Refrigerator (%) |         | Possession of<br>Radio/TV (%) |         |
|--------------|---------------------------------|---------|----------|---------|-----------------------------------|---------|-------------------------------|---------|
|              | 1991-92                         | 2011-12 | 1991-92  | 2011-12 | 1991-92                           | 2011-12 | 1991-92                       | 2011-12 |
| Low-Income   | 5.6                             | 5.39    | 42.96    | 43.62   | 3.35                              | 21.98   | 9.05                          | 47.15   |
| High-Income  | 7.68                            | 7.52    | 46.46    | 49.1    | 24.36                             | 62.81   | 15.98                         | 76.72   |
| Rural Region | 6.47                            | 6.67    | 44.56    | 45.95   | 4.5                               | 27.15   | 11.79                         | 48.3    |
| Urban Region | 6.83                            | 6.4     | 44.82    | 47.35   | 28.26                             | 63.2    | 13.42                         | 80.85   |
| Overall      | 6.61                            | 6.55    | 44.66    | 46.56   | 13.54                             | 43.73   | 12.41                         | 63.27   |

There has been a slight overall decline in the average household size over the two rounds of surveys with average household size of higher income households remains significantly larger. With respect to region, however, the previously observed trend of larger households found in the urban sector has been reversed in 2011-12. Moreover, while the average household size in the urban region has decreased, in the rural areas it has increased.

The average age of household head has increased over the time period of 1991-92 to 2011-12 as access to health facilities has increased. An interesting statistic to note is that while the percentage of households reporting ownership of refrigerators has increased, it still remains at about 63 percent even for the higher income group. For the overall population, more than half the population still lack proper food storage facilities.

### Consumption Patterns

Table 2 presents average daily per capita consumption quantities of the eight food groups, with respect to income and region while Table 3 gives the respective shares of each.

The average daily per capita quantity of food consumed has remained stagnant at around one kilogram over the two time periods. The composition of this intake however is observed to have changed significantly.

Table 2

Table 3

There has been a decrease in wheat, pulse and vegetables consumption. While the decline in wheat consumption may be attributed to less strenuous life style, decrease in pulses implies a loss of good protein source and decreasing of vegetable consumption implies loosing of a good vitamin and mineral source.

The biggest increase has been in the consumption of fruits, from about 22 grams to 96 grams per person per day on average. Consumption of meat and poultry has also increased, followed by miscellaneous food items. However, looking the composition of different meats consumed, the consumption of poultry has increased while that of red meat has decreased, again has a consequences on the availability of micronutrient iron.

While the daily food intake of higher income household has increased between 1991-92 and 2011-12, it has decreased by 4.6 percent for the low income household over the same period. The decline in the consumption of vegetables and pulses by low income group has been more dramatic than by the high income group. This indicates overtime deteriorating food security situation for the lower income group. A similar trend is also observed been rural and urban regions, with the average daily consumption of urban areas increasing while that of rural areas declining. This latter trend however could be attributed to changes in work patterns in the rural sectors, which may not require extensive manual labour and subsequent energy demand.

### Consumption Expenditures

The expenditure on food has increased by almost six times from Rs 294 in 1991, to Rs 1718 in 2011, as depicted in Table 4. The highest increase has been in the expenditure of meat and poultry. Surprisingly, the per capita expenditure on pulses has decreased significantly between the two time periods. This also corresponds with the fall in per capita consumption of pulses, as previously discussed.

Table 4

#### *Average per capita Monthly Expenditure*

| Food Groups           | Monthly Expenditure (Rs.) |         |             |         |         |         |         |         |         |         |
|-----------------------|---------------------------|---------|-------------|---------|---------|---------|---------|---------|---------|---------|
|                       | Low-income                |         | High-income |         | Rural   |         | Urban   |         | Overall |         |
|                       | 1991-92                   | 2011-12 | 1991-92     | 2011-12 | 1991-92 | 2011-12 | 1991-92 | 2011-12 | 1991/92 | 2010/11 |
| Wheat                 | 45.1                      | 251.3   | 44.0        | 245.2   | 45.8    | 261.4   | 42.5    | 231.7   | 44.6    | 248.1   |
| Other Cereals         | 16.7                      | 69.5    | 18.2        | 91.3    | 17.9    | 80.1    | 16.7    | 82.3    | 17.4    | 81.1    |
| Pulses                | 9.4                       | 1.3     | 10.4        | 1.5     | 9.6     | 1.4     | 10.4    | 1.5     | 9.9     | 1.4     |
| Milk Products and Fat | 82.5                      | 567.3   | 97.0        | 707.1   | 88.0    | 611.5   | 92.0    | 678.4   | 89.5    | 641.6   |
| Meats                 | 20.3                      | 183.8   | 43.4        | 292.1   | 24.2    | 194.7   | 43.4    | 298.3   | 31.5    | 241.4   |
| Fruits                | 7.1                       | 38.4    | 15.7        | 82.8    | 8.3     | 45.0    | 16.1    | 82.8    | 11.3    | 62.0    |
| Vegetables            | 26.9                      | 153.7   | 31.6        | 165.8   | 27.2    | 155.6   | 32.3    | 165.8   | 29.1    | 160.2   |
| Miscellaneous         | 50.1                      | 250.3   | 70.8        | 310.3   | 51.7    | 253.4   | 73.8    | 317.4   | 60.1    | 282.2   |
| Total                 | 258.0                     | 1,515.7 | 331.2       | 1,896.1 | 272.7   | 1,602.9 | 327.2   | 1,858.2 | 293.5   | 1,718.0 |

Table 5 presents the respective expenditure shares of each food group as a percentage of total expenditure. The highest expenditure share, over both the periods, across income groups and regions, has been on milk products and fats while the overall lowest expenditure share was for pulses. As seen in the preceding paragraph, the highest decrease in budget share has been for pulses while the expenditure share on meat group has increased the most. This suggests that there has been a shift away from a cheaper source of protein to meat and poultry, which is a more expensive source.

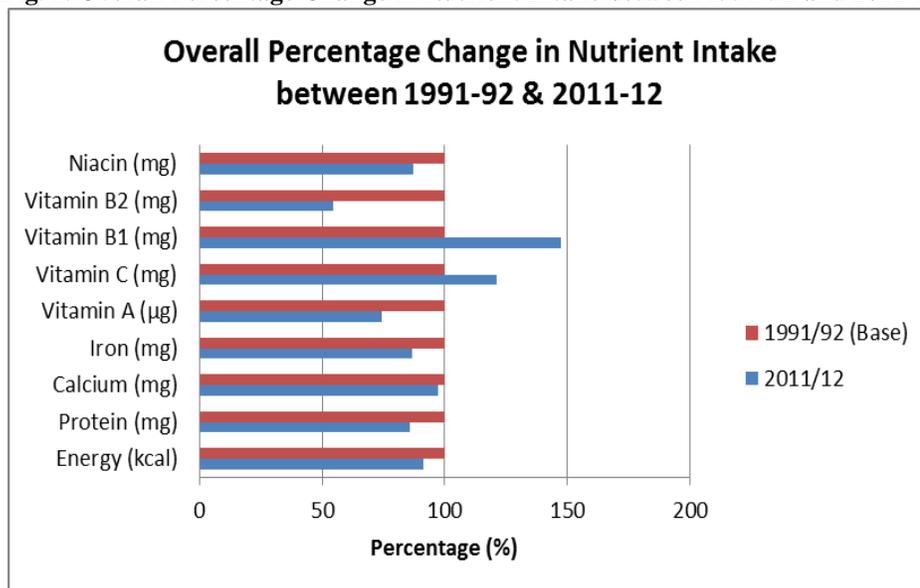
Table 5

Interestingly, while there has been a significant increase in consumption of fruit, its share in total food expenditure has in fact decreased by 6 percent. In addition, while the consumption of other cereals food group has declined overall by about 50 percent, only a 20.5 percent reduction in its budget share is observed.

### Nutrients Availability

Tables 6 and 7 present average daily per capita nutrient availability by income and regions respectively. An overall picture of the changes in nutrient availability between the two time periods is shown in Figure 1.

**Fig. 1. Overall Percentage Change in Nutrient Intake between 1991-92 and 2011-12**



With the exception of Vitamin-C and Vitamin B<sub>1</sub>, all other nutrients were found to be consumed below their respective daily Recommended Dietary Allowances (RDA). The high-income households were less deficient in all nutrients as compared to their counterparts in both time periods.

Region wise, rural households recorded a significantly higher intake of calcium and protein in both time periods. Iron intake, though higher for rural households in 1991-92 reduced for both the regions and now stands equal.

Analysing percentage changes in nutrient intake over the two time periods, aside from vitamin-C and Vitamin-B<sub>1</sub>, intake of all nutrients has decreased, with the low income households performing worse than higher income one's for all nutrients.

The percentage contribution of each food group in total nutrient supply is given income wise in Table 8 and region wise in Table 9. Overall, the highest source of energy and protein, Vitamin B<sub>1</sub> and Niacin is wheat. Milk and fats are the highest source of calcium and Vitamin B<sub>2</sub>. Vegetables provide the highest source of Vitamin A while for vitamin C, fruits are the leading source.

Table 6

Table 7

Table 8  
*Percent Contribution of Various Food Groups in Total Nutrient Supply by Income Class  
 for the Years 2011-12*

| Income / Food<br>Groups | Wheat | Other<br>Cereals | Pulses | Milk &<br>Fats | Meats | Fruits | Vegetables | Miscellaneous |
|-------------------------|-------|------------------|--------|----------------|-------|--------|------------|---------------|
| Low Income              |       |                  |        |                |       |        |            |               |
| Energy                  | 51.51 | 5.34             | 1.01   | 24.43          | 1.87  | 2.04   | 1.76       | 12.04         |
| Protein                 | 59.09 | 4.83             | 2.92   | 18.10          | 7.91  | 1.40   | 3.68       | 2.08          |
| Calcium                 | 14.53 | 1.29             | 2.00   | 64.96          | 1.12  | 3.11   | 8.40       | 4.59          |
| Iron                    | 40.16 | 12.99            | 6.18   | 8.11           | 8.90  | 1.60   | 5.18       | 16.89         |
| Vitamin A*              | 0.00  | 1.11             | 0.19   | 15.11          | 2.24  | 32.66  | 47.35      | 1.30          |
| Vitamin C               | 0.00  | 12.40            | 0.47   | 3.91           | 0.02  | 36.56  | 43.71      | 2.93          |
| Vitamin B1              | 60.46 | 5.00             | 1.99   | 7.08           | 1.40  | 9.81   | 5.84       | 8.42          |
| Vitamin B2              | 32.75 | 3.37             | 3.00   | 38.28          | 6.63  | 3.65   | 8.63       | 3.68          |
| Niacin                  | 63.14 | 8.27             | 2.40   | 4.49           | 10.52 | 2.87   | 5.30       | 2.89          |
| High Income             |       |                  |        |                |       |        |            |               |
| Energy                  | 47.08 | 5.58             | 1.06   | 26.30          | 2.99  | 3.16   | 1.77       | 12.06         |
| Protein                 | 52.19 | 4.93             | 2.94   | 19.62          | 12.23 | 2.09   | 3.57       | 2.42          |
| Calcium                 | 12.18 | 1.20             | 1.87   | 66.08          | 1.67  | 4.49   | 7.51       | 5.00          |
| Iron                    | 34.27 | 12.70            | 6.02   | 8.39           | 13.16 | 2.35   | 4.71       | 18.42         |
| Vitamin A               | 0.00  | 0.93             | 0.19   | 11.65          | 2.63  | 43.07  | 40.37      | 1.13          |
| Vitamin C               | 0.00  | 9.48             | 0.54   | 3.64           | 0.03  | 47.05  | 36.99      | 2.27          |
| Vitamin B1              | 53.52 | 4.89             | 2.09   | 7.61           | 2.25  | 14.57  | 5.74       | 9.34          |
| Vitamin B2              | 27.72 | 3.13             | 2.93   | 39.65          | 9.63  | 5.21   | 7.87       | 3.86          |
| Niacin                  | 55.84 | 7.93             | 2.56   | 4.80           | 16.38 | 4.24   | 5.20       | 2.88          |
| Overall                 |       |                  |        |                |       |        |            |               |
| Energy                  | 49.24 | 5.46             | 1.04   | 25.39          | 2.45  | 2.61   | 1.77       | 12.05         |
| Protein                 | 55.50 | 4.89             | 2.93   | 18.89          | 10.16 | 1.76   | 3.62       | 2.26          |
| Calcium                 | 13.28 | 1.24             | 1.93   | 65.56          | 1.42  | 3.84   | 7.92       | 4.81          |
| Iron                    | 37.04 | 12.83            | 6.10   | 8.26           | 11.15 | 1.99   | 4.93       | 17.70         |
| Vitamin A               | 0.00  | 1.01             | 0.19   | 13.21          | 2.46  | 38.37  | 43.53      | 1.21          |
| Vitamin C               | 0.00  | 10.78            | 0.51   | 3.76           | 0.02  | 42.40  | 39.97      | 2.57          |
| Vitamin B1              | 56.85 | 4.94             | 2.04   | 7.36           | 1.84  | 12.28  | 5.79       | 8.90          |
| Vitamin B2              | 30.08 | 3.24             | 2.96   | 39.01          | 8.22  | 4.48   | 8.23       | 3.78          |
| Niacin                  | 59.34 | 8.09             | 2.48   | 4.65           | 13.57 | 3.59   | 5.25       | 2.89          |

\*Vitamin A was estimated as B-Carotene.

Table 9  
*Percent Contribution of Various Food Groups in Total Nutrient Supply by  
 Region for the Years 2011-12*

| Income / Food<br>Groups | Wheat | Other cereals | Pulses | Milk & Fats | Meats | Fruits | Vegetables | Miscellaneous |
|-------------------------|-------|---------------|--------|-------------|-------|--------|------------|---------------|
| Rural                   |       |               |        |             |       |        |            |               |
| Energy                  | 51.36 | 5.71          | 0.97   | 24.52       | 1.92  | 2.13   | 1.70       | 11.69         |
| Protein                 | 58.27 | 5.19          | 2.75   | 18.86       | 8.05  | 1.45   | 3.52       | 1.91          |
| Calcium                 | 14.20 | 1.35          | 1.86   | 65.82       | 1.13  | 3.26   | 8.01       | 4.38          |
| Iron                    | 39.69 | 14.20         | 5.85   | 8.35        | 9.01  | 1.67   | 5.02       | 16.20         |
| Vitamin A*              | 0.00  | 1.17          | 0.18   | 14.91       | 2.17  | 34.50  | 45.88      | 1.16          |
| Vitamin C               | 0.00  | 11.84         | 0.47   | 3.99        | 0.02  | 38.86  | 42.15      | 2.67          |
| Vitamin B1              | 60.09 | 5.36          | 1.91   | 7.29        | 1.44  | 10.59  | 5.66       | 7.66          |
| Vitamin B2              | 32.25 | 3.58          | 2.82   | 39.10       | 6.67  | 3.80   | 8.32       | 3.46          |
| Niacin                  | 62.66 | 8.70          | 2.28   | 4.62        | 10.84 | 2.99   | 5.14       | 2.60          |
| Urban                   |       |               |        |             |       |        |            |               |
| Energy                  | 46.26 | 5.11          | 1.14   | 26.60       | 3.17  | 3.29   | 1.86       | 12.55         |
| Protein                 | 51.69 | 4.46          | 3.18   | 18.93       | 13.07 | 2.18   | 3.76       | 2.74          |
| Calcium                 | 12.07 | 1.11          | 2.01   | 65.22       | 1.79  | 4.61   | 7.81       | 5.38          |
| Iron                    | 33.57 | 11.04         | 6.42   | 8.13        | 13.96 | 2.41   | 4.81       | 19.66         |
| Vitamin A               | 0.00  | 0.82          | 0.20   | 11.12       | 2.82  | 43.13  | 40.63      | 1.27          |
| Vitamin C               | 0.00  | 9.55          | 0.56   | 3.49        | 0.03  | 46.49  | 37.44      | 2.45          |
| Vitamin B1              | 52.46 | 4.37          | 2.22   | 7.44        | 2.38  | 14.58  | 5.97       | 10.58         |
| Vitamin B2              | 27.24 | 2.80          | 3.14   | 38.89       | 10.26 | 5.37   | 8.10       | 4.19          |
| Niacin                  | 54.82 | 7.27          | 2.75   | 4.70        | 17.28 | 4.40   | 5.40       | 3.27          |
| Overall                 |       |               |        |             |       |        |            |               |
| Energy                  | 49.24 | 5.46          | 1.04   | 25.39       | 2.45  | 2.61   | 1.77       | 12.05         |
| Protein                 | 55.50 | 4.89          | 2.93   | 18.89       | 10.16 | 1.76   | 3.62       | 2.26          |
| Calcium                 | 13.28 | 1.24          | 1.93   | 65.56       | 1.42  | 3.84   | 7.92       | 4.81          |
| Iron                    | 37.04 | 12.83         | 6.10   | 8.26        | 11.15 | 1.99   | 4.93       | 17.70         |
| Vitamin A               | 0.00  | 1.01          | 0.19   | 13.21       | 2.46  | 38.37  | 43.53      | 1.21          |
| Vitamin C               | 0.00  | 10.78         | 0.51   | 3.76        | 0.02  | 42.40  | 39.97      | 2.57          |
| Vitamin B1              | 56.85 | 4.94          | 2.04   | 7.36        | 1.84  | 12.28  | 5.79       | 8.90          |
| Vitamin B2              | 30.08 | 3.24          | 2.96   | 39.01       | 8.22  | 4.48   | 8.23       | 3.78          |
| Niacin                  | 59.34 | 8.09          | 2.48   | 4.65        | 13.57 | 3.59   | 5.25       | 2.89          |

\*Vitamin A was estimated as B-Carotene.

### Demand Elasticities

The demand elasticities for eight food groups were estimated using Almost Ideal Demand System. The parameter estimates of the AIDS model were incorporated into equation (11) to (13) for estimating uncompensated price and income elasticities. For each income, region and overall strata, 64 own- and cross-price and 8 income elasticities were estimated, as reported in Tables 10 and 11. All own-price elasticities had correct (negative) signs.

Table 10

*Demand Elasticities of Major Food Groups by Income Class for the Years 2011-12*

| Income/ Food Group | With Respect to the Price of |               |        |               |       |        |            |               |        |
|--------------------|------------------------------|---------------|--------|---------------|-------|--------|------------|---------------|--------|
|                    | Wheat                        | Other Cereals | Pulses | Milk and Fats | Meats | Fruits | Vegetables | Miscellaneous | Income |
| <b>Low Income</b>  |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.55                        | -0.07         | 0.00   | 0.27          | -0.13 | -0.01  | -0.05      | -0.01         | 0.56   |
| Other cereals      | -0.23                        | -0.20         | -0.09  | 0.28          | -0.22 | 0.00   | -0.28      | -0.11         | 0.85   |
| Pulses             | -0.04                        | -0.25         | -0.44  | 0.35          | -0.59 | 0.03   | 0.08       | -0.07         | 0.94   |
| Milk & Fats        | 0.02                         | 0.03          | 0.02   | -1.25         | -0.02 | -0.01  | 0.05       | -0.04         | 1.18   |
| Meats              | -0.47                        | -0.22         | -0.20  | -0.20         | -0.08 | 0.00   | -0.22      | -0.18         | 1.58   |
| Fruits             | -0.31                        | -0.04         | 0.02   | -0.17         | 0.01  | -0.82  | -0.16      | 0.00          | 1.46   |
| Vegetables         | -0.18                        | -0.25         | 0.03   | 0.34          | -0.19 | -0.03  | -0.53      | -0.09         | 0.90   |
| Miscellaneous      | -0.06                        | -0.05         | -0.01  | 0.03          | -0.03 | 0.02   | -0.04      | -0.69         | 0.83   |
| <b>High Income</b> |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.38                        | -0.13         | 0.02   | 0.29          | -0.04 | -0.02  | 0.00       | -0.18         | 0.43   |
| Other cereals      | -0.30                        | -0.19         | -0.04  | 0.17          | -0.27 | 0.02   | -0.24      | 0.22          | 0.64   |
| Pulses             | 0.08                         | -0.13         | -0.41  | 0.33          | -0.67 | 0.02   | 0.07       | -0.06         | 0.77   |
| Milk & Fats        | 0.01                         | 0.00          | 0.01   | -1.22         | -0.02 | 0.00   | 0.04       | 0.03          | 1.15   |
| Meats              | -0.20                        | -0.20         | -0.15  | -0.15         | -0.35 | -0.02  | -0.17      | -0.19         | 1.42   |
| Fruits             | -0.28                        | -0.05         | -0.01  | -0.22         | -0.10 | -0.87  | -0.21      | -0.04         | 1.78   |
| Vegetables         | -0.05                        | -0.24         | 0.02   | 0.33          | -0.21 | -0.06  | -0.47      | -0.13         | 0.81   |
| Miscellaneous      | -0.25                        | 0.07          | -0.01  | 0.13          | -0.10 | 0.02   | -0.07      | -0.76         | 0.96   |
| <b>Overall</b>     |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.43                        | -0.10         | 0.01   | 0.27          | -0.10 | -0.02  | -0.01      | -0.10         | 0.49   |
| Other cereals      | -0.28                        | -0.20         | -0.07  | 0.22          | -0.24 | 0.01   | -0.26      | 0.08          | 0.73   |
| Pulses             | 0.03                         | -0.18         | -0.43  | 0.33          | -0.64 | 0.02   | 0.07       | -0.06         | 0.85   |
| Milk & Fats        | 0.01                         | 0.01          | 0.02   | -1.23         | -0.01 | 0.00   | 0.05       | 0.00          | 1.16   |
| Meats              | -0.34                        | -0.21         | -0.17  | -0.16         | -0.24 | -0.01  | -0.20      | -0.20         | 1.52   |
| Fruits             | -0.35                        | -0.04         | 0.00   | -0.24         | -0.05 | -0.84  | -0.21      | -0.03         | 1.77   |
| Vegetables         | -0.08                        | -0.25         | 0.03   | 0.33          | -0.21 | -0.05  | -0.49      | -0.11         | 0.84   |
| Miscellaneous      | -0.18                        | 0.02          | -0.01  | 0.08          | -0.06 | 0.02   | -0.06      | -0.72         | 0.90   |

Table 11

*Demand Elasticities of Major Food Groups by Region for the Years 2011-12*

| Income/ Food Group | With Respect to the Price of |               |        |               |       |        |            |               |        |
|--------------------|------------------------------|---------------|--------|---------------|-------|--------|------------|---------------|--------|
|                    | Wheat                        | Other Cereals | Pulses | Milk and Fats | Meats | Fruits | Vegetables | Miscellaneous | Income |
| <b>Rural</b>       |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.64                        | -0.12         | 0.01   | 0.32          | -0.10 | -0.01  | -0.04      | 0.03          | 0.54   |
| Other cereals      | -0.32                        | -0.19         | -0.05  | 0.27          | -0.25 | 0.02   | -0.26      | -0.01         | 0.80   |
| Pulses             | 0.01                         | -0.15         | -0.35  | 0.31          | -0.65 | 0.03   | 0.09       | -0.16         | 0.88   |
| Milk & Fats        | 0.03                         | 0.02          | 0.01   | -1.28         | -0.02 | -0.01  | 0.05       | -0.06         | 1.24   |
| Meats              | -0.37                        | -0.24         | -0.20  | -0.12         | -0.12 | 0.01   | -0.23      | -0.16         | 1.42   |
| Fruits             | -0.27                        | 0.00          | 0.01   | -0.21         | 0.03  | -0.81  | -0.21      | -0.07         | 1.52   |
| Vegetables         | -0.14                        | -0.25         | 0.03   | 0.39          | -0.22 | -0.04  | -0.56      | -0.05         | 0.83   |
| Miscellaneous      | -0.02                        | -0.01         | -0.03  | 0.01          | -0.04 | 0.01   | -0.03      | -0.73         | 0.83   |
| <b>Urban</b>       |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.29                        | -0.09         | 0.01   | 0.29          | -0.13 | -0.03  | 0.00       | -0.20         | 0.43   |
| Other cereals      | -0.24                        | -0.17         | -0.08  | 0.20          | -0.28 | 0.00   | -0.26      | 0.15          | 0.67   |
| Pulses             | -0.01                        | -0.20         | -0.48  | 0.37          | -0.59 | 0.02   | 0.06       | 0.03          | 0.81   |
| Milk & Fats        | 0.03                         | 0.01          | 0.02   | -1.19         | -0.03 | 0.00   | 0.04       | 0.04          | 1.08   |
| Meats              | -0.31                        | -0.19         | -0.14  | -0.25         | -0.24 | -0.02  | -0.17      | -0.21         | 1.54   |
| Fruits             | -0.33                        | -0.07         | -0.01  | -0.25         | -0.10 | -0.88  | -0.21      | -0.01         | 1.87   |
| Vegetables         | -0.06                        | -0.24         | 0.02   | 0.27          | -0.20 | -0.06  | -0.43      | -0.16         | 0.85   |
| Miscellaneous      | -0.26                        | 0.04          | 0.00   | 0.14          | -0.09 | 0.03   | -0.08      | -0.73         | 0.96   |
| <b>Overall</b>     |                              |               |        |               |       |        |            |               |        |
| Wheat              | -0.43                        | -0.10         | 0.01   | 0.27          | -0.10 | -0.02  | -0.01      | -0.10         | 0.49   |
| Other cereals      | -0.28                        | -0.20         | -0.07  | 0.22          | -0.24 | 0.01   | -0.26      | 0.08          | 0.73   |
| Pulses             | 0.03                         | -0.18         | -0.43  | 0.33          | -0.64 | 0.02   | 0.07       | -0.06         | 0.85   |
| Milk & Fats        | 0.01                         | 0.01          | 0.02   | -1.23         | -0.01 | 0.00   | 0.05       | 0.00          | 1.16   |
| Meats              | -0.34                        | -0.21         | -0.17  | -0.16         | -0.24 | -0.01  | -0.20      | -0.20         | 1.52   |
| Fruits             | -0.35                        | -0.04         | 0.00   | -0.24         | -0.05 | -0.84  | -0.21      | -0.03         | 1.77   |
| Vegetables         | -0.08                        | -0.25         | 0.03   | 0.33          | -0.21 | -0.05  | -0.49      | -0.11         | 0.84   |
| Miscellaneous      | -0.18                        | 0.02          | -0.01  | 0.08          | -0.06 | 0.02   | -0.06      | -0.72         | 0.90   |

Quantitatively, the own-price elasticities of fruits, meats, milk products and fats, and other cereals food group are greater than one. The same can also be observed across income groups and across regions.

Positive cross-price elasticity suggests that the two commodities are gross substitutes while negative cross-price elasticity implies that they are complementary to one another. Overall, out of 56 cross-price elasticities (off-diagonal elements), 18 were positive. Milk products and fats, fruits and pulses groups appeared to have most substitution relations while meat and poultry have a complementary relationship with its counterpart food groups.

All income elasticities have correct (positive) sign. The income elasticity of fruits and miscellaneous food groups are relatively higher in high-income households and urban households as compared with low-income households and rural households as shown in Table 11.

High expenditure elasticities ( $\eta > 1$ ) were observed for milk products & fats, signifying them as luxuries. Similar observations can be made across income groups and regions in Tables 10 and 11 respectively.

### Nutrients Elasticities

Nutrient elasticities were estimated by multiplying the matrices of demand elasticities (Tables 10 and 11) and nutrient shares for the nine nutrients (Tables 8 and 9). These nutrient elasticities are presented in Tables 12 and 13 for income groups and regions respectively.

Table 12  
*Nutrient Elasticities of Major Food Groups in Pakistan by  
Income Groups for the Years 2011-12*

| Income / Food Groups | Wheat  | Other cereals | Pulses | Milk and Fats | Meats  | Fruits | Vegetables | Miscellaneous | Income |
|----------------------|--------|---------------|--------|---------------|--------|--------|------------|---------------|--------|
| <b>Low Income</b>    |        |               |        |               |        |        |            |               |        |
| Energy               | -0.317 | -0.056        | -0.007 | -0.147        | -0.099 | -0.023 | -0.050     | -0.111        | 0.810  |
| Protein              | -0.384 | -0.081        | -0.026 | -0.050        | -0.124 | -0.020 | -0.072     | -0.053        | 0.811  |
| Calcium              | -0.101 | -0.023        | 0.004  | -0.740        | -0.063 | -0.032 | -0.029     | -0.073        | 1.058  |
| Iron                 | -0.319 | -0.109        | -0.054 | 0.067         | -0.142 | -0.016 | -0.105     | -0.164        | 0.842  |
| Vitamin A            | -0.196 | -0.135        | 0.017  | -0.085        | -0.093 | -0.282 | -0.303     | -0.063        | 1.139  |
| Vitamin C            | -0.221 | -0.150        | 0.007  | 0.074         | -0.110 | -0.311 | -0.324     | -0.074        | 1.109  |
| Vitamin B1           | -0.398 | -0.081        | -0.010 | 0.096         | -0.119 | -0.088 | -0.093     | -0.082        | 0.774  |
| Vitamin B2           | -0.241 | -0.064        | -0.018 | -0.360        | -0.098 | -0.038 | -0.071     | -0.071        | 0.961  |
| Niacin               | -0.438 | -0.105        | -0.034 | 0.137         | -0.137 | -0.033 | -0.109     | -0.063        | 0.781  |
| <b>High Income</b>   |        |               |        |               |        |        |            |               |        |
| Energy               | -0.238 | -0.074        | 0.001  | -0.163        | -0.078 | -0.033 | -0.028     | -0.165        | 0.779  |
| Protein              | -0.247 | -0.111        | -0.018 | -0.080        | -0.115 | -0.029 | -0.042     | -0.126        | 0.768  |
| Calcium              | -0.072 | -0.041        | 0.0013 | -0.747        | -0.066 | -0.045 | -0.024     | -0.054        | 1.047  |
| Iron                 | -0.244 | -0.100        | -0.043 | 0.052         | -0.168 | -0.024 | -0.083     | -0.206        | 0.816  |
| Vitamin A            | -0.149 | -0.124        | 0.000  | -0.107        | -0.148 | -0.400 | -0.281     | -0.075        | 1.282  |
| Vitamin C            | -0.182 | -0.128        | -0.004 | -0.008        | -0.161 | -0.430 | -0.293     | -0.060        | 1.265  |
| Vitamin B1           | -0.287 | -0.098        | -0.003 | 0.071         | -0.097 | -0.136 | -0.072     | -0.171        | 0.793  |
| Vitamin B2           | -0.155 | -0.083        | -0.016 | -0.386        | -0.108 | -0.055 | -0.054     | -0.093        | 0.948  |
| Niacin               | -0.288 | -0.133        | -0.025 | 0.110         | -0.140 | -0.049 | -0.075     | -0.144        | 0.744  |
| <b>Overall</b>       |        |               |        |               |        |        |            |               |        |
| Energy               | -0.264 | -0.067        | -0.002 | -0.159        | -0.093 | -0.030 | -0.033     | -0.141        | 0.790  |
| Protein              | -0.298 | -0.099        | -0.021 | -0.070        | -0.125 | -0.027 | -0.051     | -0.095        | 0.786  |
| Calcium              | -0.084 | -0.033        | 0.002  | -0.744        | -0.062 | -0.039 | -0.027     | -0.063        | 1.050  |
| Iron                 | -0.273 | -0.105        | -0.048 | 0.055         | -0.159 | -0.021 | -0.090     | -0.187        | 0.827  |
| Vitamin A            | -0.180 | -0.129        | 0.006  | -0.112        | -0.124 | -0.344 | -0.300     | -0.074        | 1.256  |
| Vitamin C            | -0.213 | -0.138        | -0.001 | 0.012         | -0.137 | -0.374 | -0.316     | -0.069        | 1.236  |
| Vitamin B1           | -0.327 | -0.092        | -0.006 | 0.074         | -0.114 | -0.114 | -0.078     | -0.133        | 0.789  |
| Vitamin B2           | -0.189 | -0.075        | -0.017 | -0.376        | -0.105 | -0.048 | -0.061     | -0.085        | 0.955  |
| Niacin               | -0.346 | -0.122        | -0.029 | 0.118         | -0.145 | -0.043 | -0.086     | -0.109        | 0.762  |

Table 13  
*Nutrient Elasticities of Major Food Groups in Pakistan by  
 Region for the Years 2011-12*

| Income / Food<br>Groups | Wheat  | Other cereals | Pulses | Milk and Fats | Meats  | Fruits | Vegetables | Miscellaneous | Income |
|-------------------------|--------|---------------|--------|---------------|--------|--------|------------|---------------|--------|
| <b>Rural</b>            |        |               |        |               |        |        |            |               |        |
| Energy                  | -0.354 | -0.076        | -0.004 | -0.131        | -0.088 | -0.022 | -0.042     | -0.091        | 0.808  |
| Protein                 | -0.420 | -0.106        | -0.019 | -0.031        | -0.112 | -0.017 | -0.065     | -0.027        | 0.797  |
| Calcium                 | -0.097 | -0.029        | 0.003  | -0.762        | -0.062 | -0.036 | -0.027     | -0.079        | 1.091  |
| Iron                    | -0.342 | -0.116        | -0.043 | 0.083         | -0.144 | -0.014 | -0.098     | -0.139        | 0.813  |
| Vitamin A               | -0.164 | -0.120        | 0.016  | -0.081        | -0.099 | -0.301 | -0.326     | -0.070        | 1.144  |
| Vitamin C               | -0.200 | -0.129        | 0.011  | 0.067         | -0.115 | -0.331 | -0.343     | -0.073        | 1.113  |
| Vitamin B1              | -0.440 | -0.100        | -0.004 | 0.117         | -0.103 | -0.091 | -0.090     | -0.057        | 0.768  |
| Vitamin B2              | -0.250 | -0.077        | -0.014 | -0.361        | -0.094 | -0.038 | -0.068     | -0.061        | 0.965  |
| Niacin                  | -0.481 | -0.131        | -0.026 | 0.172         | -0.127 | -0.029 | -0.102     | -0.028        | 0.750  |
| <b>Urban</b>            |        |               |        |               |        |        |            |               |        |
| Energy                  | -0.195 | -0.056        | -0.005 | -0.161        | -0.116 | -0.038 | -0.031     | -0.177        | 0.779  |
| Protein                 | -0.214 | -0.092        | -0.029 | -0.078        | -0.148 | -0.035 | -0.046     | -0.144        | 0.785  |
| Calcium                 | -0.060 | -0.032        | 0.0020 | -0.720        | -0.082 | -0.045 | -0.026     | -0.051        | 1.015  |
| Iron                    | -0.229 | -0.092        | -0.054 | 0.046         | -0.178 | -0.027 | -0.086     | -0.227        | 0.848  |
| Vitamin A               | -0.177 | -0.131        | -0.002 | -0.135        | -0.141 | -0.403 | -0.267     | -0.076        | 1.333  |
| Vitamin C               | -0.203 | -0.136        | -0.009 | -0.033        | -0.157 | -0.429 | -0.283     | -0.065        | 1.316  |
| Vitamin B1              | -0.248 | -0.081        | -0.013 | 0.070         | -0.138 | -0.142 | -0.074     | -0.189        | 0.816  |
| Vitamin B2              | -0.142 | -0.072        | -0.021 | -0.378        | -0.125 | -0.058 | -0.056     | -0.100        | 0.951  |
| Niacin                  | -0.256 | -0.113        | -0.038 | 0.094         | -0.169 | -0.057 | -0.078     | -0.168        | 0.785  |
| <b>Overall</b>          |        |               |        |               |        |        |            |               |        |
| Energy                  | -0.264 | -0.067        | -0.002 | -0.159        | -0.093 | -0.030 | -0.033     | -0.141        | 0.790  |
| Protein                 | -0.298 | -0.099        | -0.021 | -0.070        | -0.125 | -0.027 | -0.051     | -0.095        | 0.786  |
| Calcium                 | -0.084 | -0.033        | 0.002  | -0.744        | -0.062 | -0.039 | -0.027     | -0.063        | 1.050  |
| Iron                    | -0.273 | -0.105        | -0.048 | 0.055         | -0.159 | -0.021 | -0.090     | -0.187        | 0.827  |
| Vitamin A               | -0.180 | -0.129        | 0.006  | -0.112        | -0.124 | -0.344 | -0.300     | -0.074        | 1.256  |
| Vitamin C               | -0.213 | -0.138        | -0.001 | 0.012         | -0.137 | -0.374 | -0.316     | -0.069        | 1.236  |
| Vitamin B1              | -0.327 | -0.092        | -0.006 | 0.074         | -0.114 | -0.114 | -0.078     | -0.133        | 0.789  |
| Vitamin B2              | -0.189 | -0.075        | -0.017 | -0.376        | -0.105 | -0.048 | -0.061     | -0.085        | 0.955  |
| Niacin                  | -0.346 | -0.122        | -0.029 | 0.118         | -0.145 | -0.043 | -0.086     | -0.109        | 0.762  |

72 price and 9 income elasticities of nutrient intakes were calculated for each stratum. Overall, only 6 were carrying positive sign. This implies that lowering prices of any food group would help alleviating micronutrient deficiency. The number of positive sign carrying elasticities was 7 and 8 in low- and high-income groups, respectively. This suggests that lowering prices of any food group would enhance the consumption of majority of micronutrients with almost similar impacts on both income classes (Table 12).

Comparing nutrient elasticities across food groups revealed that fruits and vegetables have much higher nutrient price elasticities than other food groups for vitamin A and vitamin C suggesting highly significant role of vegetables in alleviating the deficiency of these micronutrients when their prices are reduced through technological innovations. The magnitude of nutrient price elasticities for vitamin B<sub>1</sub> from vegetables is third highest in rank, suggesting that vegetable can also be important in controlling the deficiency of this micronutrient. Milk products and fats are most important in alleviating the deficiency of calcium and vitamin B<sub>2</sub>.

The nutrient elasticities with respect to change in income are also quite high (> 0.7) for all micronutrients. A 10 percent rise in the per capita household income would lead to more than proportionate consumption of calcium, vitamin A, and vitamin C, and

between 7–10 percent enhancement in the consumption of all other nutrients. Considering the facilitative role of vitamin C and niacin in proper utilisation of vitamin B<sub>1</sub> and B<sub>2</sub> with their significantly high nutrient elasticities further strengthen the role of vegetables in alleviating the micronutrient deficiency in Pakistan. The same can be observed across income groups (Table 12) and thus it can be concluded that lowering the prices of vegetables through appropriate policies and technological interventions would significantly help alleviating the deficiency of majority of nutrients.

### SUMMARY AND SUGGESTIONS

The widespread nutrient deficiency in Pakistan and its implications on human health and productivity signify the need of appropriate strategy for their control. In the food-based approach, increased consumption of nutrient-rich foods carries significant role in mitigating these deficiencies. For this to be more effective, however, the information on nutrient density as well as consumers' response to various income and price policies is required.

While food composition table does provide densities of various nutrients in different food items, information on the responsiveness of various nutrients and micronutrients to prices of different food groups and income of the consumers are normally lacking. The present study is thus aimed at fulfilling this information gap for the case of Pakistan. The results of this exercise will help policy-makers in selecting appropriate food group most responsive to the given policy in eradicating the targeted nutrient.

For the present exercise, food consumption data from household surveys for the years 1991-92 and 2011-12 are used. On the basis of average monthly income, the sample households were grouped into low- and high-income classes whereas about 150 food items were classified into eight food groups: wheat, other cereals, pulses, milk and fat products, meats, fruits, vegetables, and miscellaneous. The households are divided into rural and urban region based on the prescription of region in the survey. Using the commodity specific nutritional information from FAO Food Composition Table, the total availability of carbohydrates, protein, calcium, iron, vitamin A, vitamin C, vitamin B<sub>1</sub>, vitamin B<sub>2</sub> and niacin are then estimated. The Almost Ideal Demand System (AIDS) is applied to obtain demand and income elasticities of each food group which are then converted into nutrient demand elasticities using the conversion of Huang (1996).

The average per capita consumption of food has remained stagnant at around one kilogram over the two time periods. However, there is a significant change in the mix of food consumed overtime. The consumptions of pulses and vegetables have significantly declined which was compensated with a significant increase in the consumption of fruits. The intakes of milk, meat and miscellaneous food items have also increased but the change was relatively small. Looking in more detail, the poultry consumption has significantly increased while the consumption of red meat has declined. A small decline in the consumption of wheat and other cereals is also observed.

The consumption pattern and the changes in this pattern have consequences on the intake of major and micronutrients. With the exception of Vitamin-C and Vitamin B<sub>1</sub>, all other nutrients are found to be consumed lower than their respective daily Recommended

Dietary Allowances (RDA) during 2011-12. The high-income households are less deficient in all nutrients as compared to their counterparts in both time periods. Region wise, rural households record a significantly higher intake of calcium and protein in both time periods. Iron intake, though higher for rural households in 1991-92, has become almost equal at lower level in both the region. Analysing percentage changes in nutrient intake over the two time periods, intake of all nutrients, except vitamin-C and Vitamin-B<sub>1</sub>, has decreased with the low income households performing worse than their higher income counterpart.

Comparing nutrient elasticities of various nutrients revealed that income elasticities are greater than one for calcium, Vitamin A, and vitamin C. The income elasticity are also quite high ( $> 0.7$ ) for all other micronutrients. This suggests that a 10 percent rise in per capita household income, would lead to more than 10 percent increase in the consumption of calcium, vitamin A, and vitamin C, while the consumption of other nutrient will increase between 7-10 percent.

Comparing the price elasticities across food group, fruits and vegetables have much higher nutrient price elasticities than other food groups for vitamin A and vitamin C suggesting highly significant role of fruits and vegetables in alleviating the deficiency of these micronutrients when their prices are reduced say through price support or technological innovations. The research allocation for these crops will be most effective in mitigating vitamin A and C deficiencies. The magnitude of nutrient price elasticities for vitamin B<sub>1</sub> from vegetables is third highest in rank, suggesting that vegetables can also play important role in mitigating the deficiency of this micronutrient. Milk products and fats are most important in alleviating the deficiency of calcium and vitamin B<sub>2</sub>. Iron deficiencies can be mitigated most effectively by lowering the price of wheat meat. However, bioavailability of iron from wheat is low, therefore, banking on wheat for improving iron deficiency must be coupled with strategies of improving its bioavailability.

## ANNEXURE 1

## Model Selection

| Study and Year                 | Country                  | First Stage Analysis   | Second Stage Analysis   |
|--------------------------------|--------------------------|--|---|
| Radhakrishna and Murthy (1973) | India                    | Linear Expenditure System (LES)                                    | Frisch's Method   |
| Haden (1990)                   | Japan                    | Linear functional form with one year lagged budget shares as habit | Almost Ideal Demand System (AIDS)   |
| Fan, <i>et al.</i> (1995)      | China                    | Linear Expenditure System (LES)                                    | Almost Ideal Demand System (AIDS)   |
| Wu, <i>et al.</i> (1993)       | China                    | Almost Ideal Demand System (AIDS)                                  | Almost Ideal Demand System (AIDS)   |
| Wu, <i>et al.</i> (1995)       | China                    | Almost Ideal Demand System (AIDS)                                  | Almost Ideal Demand System (AIDS)   |
| Gao, <i>et al.</i> (1995)      | United States of America | Gamma-Tobit-Model  | Combination of Rotterdam, Central Bureau of Statistics (CBS) model and AIDS |
| Gao, <i>et al.</i> (1996)      | China                    | Almost Ideal Demand System (AIDS)                                  | Generalised Linear Expenditure System (GLES)                                |
| Wang, <i>et al.</i> (1996)     | United States of America | Double-hurdle model  | Combination of Rotterdam, Central Bureau of Statistics (CBS) model and AIDS |
| Han, <i>et al.</i> (1998)      | China                    | Linear Expenditure System (LES)                                    | Linear Approximate Almost Ideal Demand System (LA/AIDS)                     |
| Ali (2000)                     | Taiwan                   | Linear Expenditure System (LES)                                    | Almost Ideal Demand System (AIDS)   |
| Weinberger (2001)              | India                    | Linear Expenditure System (LES)                                    | Almost Ideal Demand System (AIDS)   |

## ANNEXURE 2

## Classification of Various Food Groups

| Food Groups            | Commodities Grouped   |
|------------------------|---|
| Wheat                  | Wheat and wheat flour,  |
| Other cereals          | Rice, rice flour, maize, maize flour, barley, barley flour, 'sooji', other cereals like porridges, vermacilies etc.   |
| Pulses                 | Gram flour, black gram dal, white gram whole, mash (whole and <i>dal</i> ), mung (whole and <i>dal</i> ), lentil (whole and <i>dal</i> ), pigeon pea ' <i>arhar</i> ' ( <i>dal</i> ) and other pulses.  |
| Meats                  | Mutton, beef, dry meat, fish (fresh, frozen and dry), prawns (fresh, frozen and canned), chicken, eggs and other poultry.   |
| Dairy products and fat | Liquid milk, butter milk ' <i>lassi</i> ', curd, milk cream, packed milk, dry milk, infants milk, adult milk, concentrated milk, butter, cheese, butter oil, ice cream, ' <i>kheer</i> ', vegetable ghee, mustard oil, cooking oil and other fats   |
| Fruits (fresh and dry) | Banana, orange, apple, pomegranate, grapes, mango, melons, apricot, jaman, lemon, dates, guava, other fresh fruits, almond, walnut, chilgoza, pistatio, peanuts, raisin and other dry fruits.   |
| Vegetables             | Tomato, cauliflower, brinjal/eggplant, okra, peas, green pods of radish ' <i>moongra</i> ', green chilies, red chilies, onion, garlic, turnips, radish, carrot, ginger, Cabbage, spinach, mustard leaves, bottle gourd, cucumber, round gourd, Pumpkin, other vegetables, and canned vegetables   |
| Miscellaneous          | Biscuit, bread, cakes, patties, ' <i>poori</i> ', ' <i>samosa</i> ', other baked and fried products, table salt, caraway, cardamom, turmeric, coriander seed, clove, other spices, white sugar, brown sugar, brown sugar clods ' <i>gur</i> ', honey, syrups, chocolate, ' <i>burfi</i> ', ' <i>jalebi</i> ', ' <i>halwa</i> ', other sweets, black tea, green tea, coffee, soft drinks, squashes, sugarcane juice, other juices, cigarette, ' <i>biri</i> ', tobacco, chewing leaves and its accessories, chewing tobacco, readymade food, breakfasts, lunches, dinners*, snacks, jams, jellies, ketchup, vinegar, pickle, yeast and ice |

\* outside and take-home meals.

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# Hold-up Problem in Price Cap Regulation with Limited Ability of Commitment in High Inflation

TAKUYA NAKAIZUMI

In this study, we examine the hold-up problem under price cap regulation in developing economies characterised by high inflation that have a limited ability to commit. The governments of developing countries are unable to modify the exact inflation rate. If high inflation is brought about by unexpected monetary expansion after the initial average price is fixed, the insufficient ability to show exact inflation causes a lack of commitment to adjust the initial fixed price to the modified price. The study's findings show that those that have a limited ability to commit cause a hold-up problem if inflation is sufficiently high for a firm to stop production at the initial price, while the hold-up problem does not occur if inflation is lower and the initial fixed price generates a sufficient profit for the first-best investment for the firm.

*JEL Classification:* D86, L14, L43, L51

*Keywords:* Price Cap Regulation, Hold-up Problem, Limited Ability of Commitment, Inflation Adjustment

## 1. INTRODUCTION

Jean-Jacques Laffont's seminal work "Regulation and Development" [2005] modified the optimal incentive regulation of developed countries to be appropriate for developing countries, whose governments have only a limited ability in various aspects. Laffont's work has garnered increasing attention, especially in the study of developing economies and economics of regulation.

In this study, we examine the hold-up problem in the case of price cap regulation for economies that have a limited ability to commit (i.e., they are unable to modify the exact inflation rate). Price cap regulation is a commitment to fix the price of a regulated firm at the initial level with some adjustment based on inflation. It thus provides an incentive for the regulated firm to reduce its cost of production. By contrast, average cost pricing does not provide any incentive to reduce costs because it allows firms to raise prices ex-post whenever costs exceed prices. Average cost pricing is easy to calculate and there is no need to commit to an initial price.

Of these two cost approaches, price cap regulation is preferable for providing

Takuya Nakaizumi <nakaizum@kanto-gakuin.ac.jp> is Professor, Kanto Gakuin University, Yokohama-city, Japan.

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regulated firms with an incentive to reduce costs. However, price cap regulation might be difficult for developing countries to commit to and adjust because of the limited abilities of their governments to calculate an adequate inflation rate. In these cases, the hold-up problem might occur and a regulated firm's investment may decrease.

If high inflation is brought about by unexpected monetary expansion after the initial price is fixed, the above-mentioned limited ability of the government causes a lack of adjustment from the initial fixed price to the modified price. This study shows that such a limited ability to commit causes a hold-up problem if inflation is sufficiently high for the firm not to afford the initial price, while the hold-up problem does not occur if inflation is lower because the initial fixed price generates sufficient profit for first-best investment for the firm.

The present research is based on incomplete contract theory introduced by Grossman and Hart (1986) and Hart Moore's [1990] seminal work on the property rights approach<sup>1</sup>, while our model is a simplified version of Edlin and Reichelstein (1996). They consider whether the first-best outcome is achieved in a typical buyer/seller model of incomplete contracts and show that fixed price contracts bring about the first-best investment. In our model, however, we deal with the case that the nominal term deviates from the real term because of unexpected inflation. The government authorities cannot verify the difference between the real change and nominal change of the cost facing unexpected inflation. Thus, a fixed price contract does not work and the hold-up problem occurs.

Nominal consideration in the incomplete contract literature was introduced by Jovanovic and Ueda (1997), based on Aghion, Dewatripont, and Rey (1994). These studies give the possibility of renegotiation design and lead to the first-best outcome. Our model, however, does not allow it and the hold-up problem occurs.

To our knowledge, this is the first study of limited commitment by the government leading to the hold-up problem, as pointed out in Laffont (2005) and Estache and Wren-Lewis (2009). The remainder of the paper is organised as follows. In the next section, we present the model, and we derive the results in Section 3. Section 4 offers concluding remarks.

## 2. THE MODEL

A natural monopoly firm produces good  $X$ , and the average cost in the initial period is  $C$ . We assume that  $C$  and the initial price are verifiable. Thus, without inflation, price cap regulation works and the optimal effort can be derived. If unexpected inflation occurs, on the contrary, the government authorities cannot verify the difference between the real change and nominal change of the cost and therefore the hold-up problem may occur.

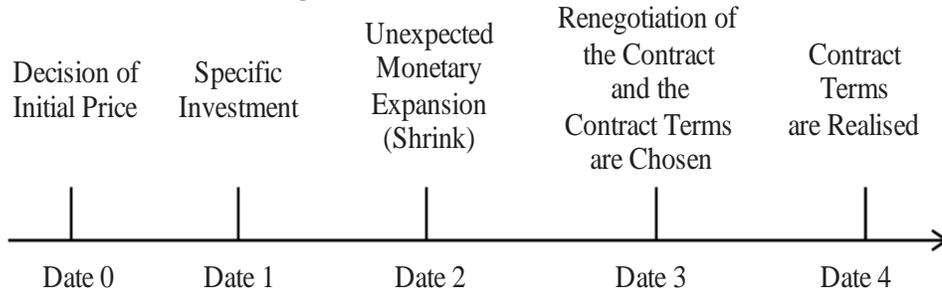
The government regulator regulates the monopoly firm by adopting price cap regulation. It tries to fix the price as low as possible and decrease the deadweight loss of the market caused by the monopoly. The monopoly firm, on the contrary, maximises profit subject to the regulation.

We develop the simplified model derived by Edlin and Reichelstein (1996), in which only the regulated firm invests *ex-ante*. Thereafter, unexpected monetary

<sup>1</sup>See Hart [1995].

expansion causes unexpected inflation. There are five periods (see Figure 1). At time zero, the regulator sets price  $P$ . Based on price cap regulation,  $P$  is fixed with an average cost of the monopoly firm of  $C$ , which is verifiable and should be fixed except for an inflation adjustment.

**Fig. 1. Timeline of the Five Periods**



At time one, the central bank decides monetary expansion  $M$ , which is assumed to be exogenous for the government. The monetary expansion causes future inflation, the rate of which is  $\tau$ .

It should be noted that specific price regulation except the initial cost at time zero cannot be realised, because the inflation rate is uncertain at time zero and because the government cannot discriminate the inflation and real shocks in terms of the increase in the cost. Thus, a simple contract with a specific price, as proposed by Edlin and Reichelstein (1996), cannot achieve the first-best outcome. We also assume that a contract with the real term cannot be used because the resale price of the goods produced by the regulated firm should be written in nominal terms.

The real interest rate is assumed to be zero and the discount factor is 1. Even if the real interest rate is normalised to zero, we must consider the nominal interest rate with inflation rate  $\tau$ .

At time two, the monopoly firm makes a specific investment  $e$ , which reduces cost  $C$  and the reduced cost is  $C-e$ . The cost of investment is  $\psi(e)$ , which is assumed to be  $\psi' > 0$ ,  $\psi'' > 0$ . Moreover, both the investment and the cost of investment are unverifiable. Although the real interest rate is assumed to be zero, the nominal interest rate is equal to the inflation rate  $\tau$ . We thus consider the case that it takes one period to realise the investment after it has been made. Then, the firm considers the inflation rate brought about by the specific investment as  $(1 + \tau)\psi(e)$  instead of  $\psi(e)$ .

In developed countries, it is easy to verify  $\tau$ . In some developing countries, on the contrary, this might be difficult to calculate in order to justify the exact inflation rate. We assume  $\tau$  is unverifiable in our model. We also assume that the inflation rate cannot be verified even ex-post. This might cause both the monopoly firm and the government to renegotiate the regulated price ex-post after the inflation rate has been realised.

At time three, inflation rate  $\tau$  is revealed and renegotiation might occur. We specify the bargaining procedure and government objectives. The government maximises consumer welfare when the firm produces the goods. Consumer welfare is assumed to be  $W$ .

We assume that the regulated firm and government divide the outcome based on  $\alpha:1-\alpha$  according to extended Nash bargaining, ensuring zero profit to the firm. The cost reduction of the firm is  $e$ . Thus, the outcome of the renegotiation is  $W+e$ . The parties then renegotiate that with the zero profit condition of the firm.

At time four, the regulator should adjust the regulated price according to the results of the renegotiation. Then, the transaction takes place.

### 3. FIRST-BEST AND EQUILIBRIUM OUTCOMES

In this section, we derive the equilibrium behaviour and ex-ante investment by the regulated firm. First, we derive the first-best outcome in which  $\tau$  is verifiable. By adjusting inflation rate  $\tau$ , the estimated regulated price is  $\hat{P}=(1+t)C$ . If the government can commit to adjust inflation, the firm maximises the following equation by  $e$ :

$$\hat{P}-(1+t)C-e-(1+t)\psi(e) = e-(1+t)\psi(e)$$

The first-order condition is as follows:

$$1-(1+t)\psi'(e) = 0$$

This provides the optimal investment level  $\hat{e}$ .

Next, we turn to the case that  $\tau$ ,  $e$ , and the costs,  $\psi$ , are unverifiable. Owing to the limited ability of the government, it cannot calculate the exact inflation rate  $\tau$ . Further, if the regulated firm acquires the profit at initial price  $P$ , the regulatory authority has no incentive to renegotiate. Thus, the regulator adopts initial price  $P$  even if inflation occurs, unless it is not so large. If the inflation rate is large, however, the firm no longer enjoys the positive benefit from initial price  $P$ . This stops production, and hence both parties have an incentive to renegotiate, which causes a hold-up problem. First, we derive the condition that there is no renegotiation. We derive the following proposition.

**Proposition 1: Investment Level with Lower Inflation**

Although inflation is unverifiable, if inflation is less than  $\hat{\tau}$ , the hold-up problem does not occur and the first-best ex-ante investment is achieved.

$$\tau \leq \hat{\tau} = \frac{\hat{e} - \psi(\hat{e})}{C + \psi(\hat{e})} \quad \dots \quad (1)$$

**Proof** If (1) holds, the monopoly firm’s maximisation problem ex-ante is the following equation:

$$\begin{aligned} & \max_e P - (1 + \tau)C + e - (1 + t)\psi(e) \\ & = e - (1 + t)\psi(e) - tC \end{aligned}$$

If  $\hat{e} - (1 + t)\psi(\hat{e}) - tC > 0$ , that is,  $\tau \leq \hat{\tau}$ , then the firm makes the optimal investment and production. (Q.E.D.)

Now, we turn to the case with higher inflation such as

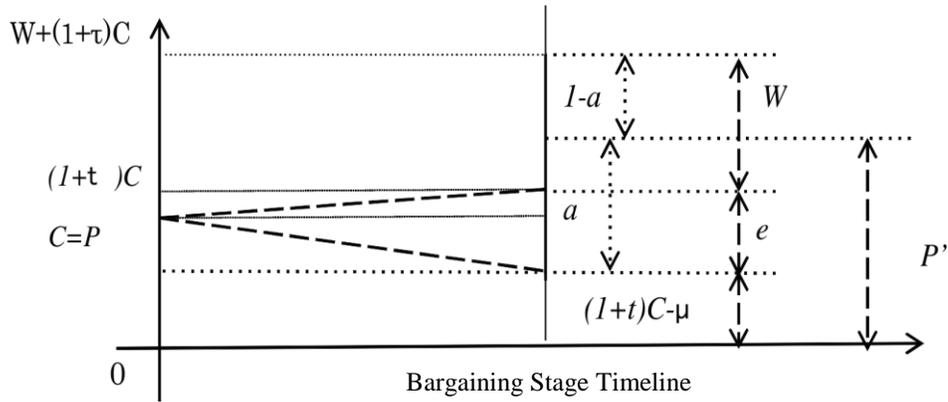
$$\tau > \hat{\tau} = \frac{\hat{e} - \psi(\hat{e})}{C + \psi(\hat{e})} \quad \dots \quad (2)$$

Renegotiation takes place because the firm stops production at the initial price unless the revenue exceeds  $C - e$ . Thus, the government must ensure that the firm generates the revenue at the lowest break-even level ex-post.

Based on extended Nash bargaining, both parties receive a share of the surplus  $W + e$  with  $\alpha, 1 - \alpha$ . Thus, the regulated firm receives the surplus  $\alpha(W + e)$ , while the government has the surplus  $(1 - \alpha)(W + e)$ . Thus, the surplus must be added to the cost to produce the good,  $(1 + \tau)C - e$  (see Figure 2). Thus, renegotiated price  $P'$  is as follows:

$$P' = \alpha(W + \mu) + (1 + \tau)C - e$$

**Fig. 2. Illustration of the Renegotiation Surplus from  $t=0$  to  $t=3$**



The firm maximises the following equation by  $e$  with regulated price  $P'$ :

$$\begin{aligned} P' - (1 + \tau)C + e - (1 + \tau)\psi(e) \\ = \alpha(W + e) + (1 + t)C - e - ((1 + t)C - e) - (1 + \tau)\psi(e) \\ = \alpha(W + e) - (1 + \tau)\psi(e) \end{aligned}$$

By solving the first-order condition, we derive  $e^*$ , which is lower than  $\hat{e}$  of the first-best outcome. This lower investment is caused by the hold-up problem with higher inflation. Interestingly, without perfect bargaining power by the monopoly firm,  $\alpha=1$ , the hold-up problem will occur even if the renegotiated price is higher than the optimal adjusted price,  $P' > \hat{P} = (1 + t)P$ . We sum up the results in the following proposition.

**Proposition 2: Hold-up Problem with Higher Inflation** If  $\tau > \hat{\tau}$ , renegotiation and thus hold-ups occur. Even if the renegotiated price is larger than the optimal adjusted price,  $P' > \hat{P}$ , the hold-up problem occurs and this leads to less specific investment,  $\hat{e} > e^*$ , unless  $\alpha=1$ .

**Proof** If  $\tau > \hat{\tau}$ , renegotiation and thus hold-ups occur. Then, the firm maximises the following:

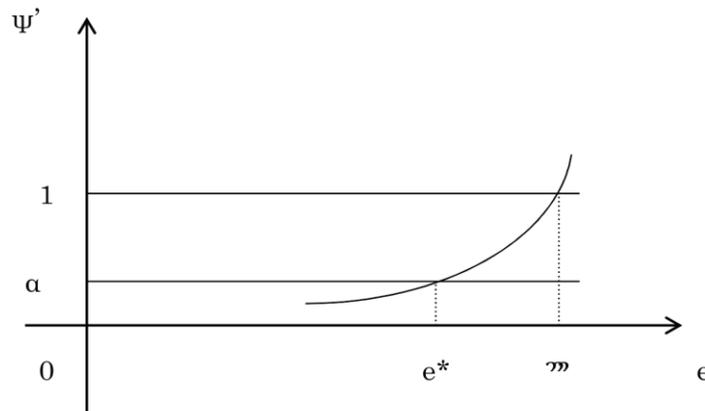
$$P' - (1 + \tau)C + e - (1 + t)\psi(e) = \alpha(W + e) - (1 + t)\psi(e) \dots \dots \dots (3)$$

Hence, the first-order condition is as follows:

$$\alpha - (1+t)\psi'(e) = 0$$

Here,  $\alpha < 1$  means lower investment than that at the optimal level, as shown in Figure 3.

**Fig. 3. Hold-up Problem and the Underinvestment of the Firm**



Consequently, higher inflation causes the hold-up problem in developing countries that have a limited ability to commit. In addition, higher inflation raises the adjustment price above the level of the optimal adjustment price.

#### 4. CONCLUDING REMARKS

In this study, we showed theoretically that a limited ability to commit causes the hold-up problem and decreases investment as a result of renegotiation. In particular, the hold-up problem for a regulated monopoly firm occurs under price cap regulation if the government cannot specify the inflation rate accurately and the inflation rate is high. We also show that although the government cannot specify the inflation rate accurately, the first-best outcome can be achieved if inflation is sufficiently low.

In summary, higher inflation causes the hold-up problem in developing countries that have a limited ability to commit. In addition, it causes a higher price than the optimal adjustment price.

We conclude by discussing a limitation of the model. In this model, we abstracted the uncertainty. However, the research could be extended to include using a model with uncertainty, and we could prove the robustness of the results explicitly. Building an explicit model with uncertainty, in this regard is thus a possible future research direction.

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## Impact of Public-Private-Partnership Programmes on Students' Learning Outcomes: Evidence from a Quasi-Experiment

FATIMA HAFEEZ, ADNAN HAIDER, and NAEEM UZ ZAFAR

Learning outcomes refer to the performance of the students in academic tests pertaining to the respective grade level. In Pakistan, survey evidences from Annual Status of Education Report (ASER) show a significant dispersion in learning outcomes of public schools as compared with private sector counterpart. The perceived results of learning outcomes in private schools very clear but less evidence is found for educational outcome of schools run under public-private partnership programs. This becomes especially relevant when status of curricular, co-curricular, and extra-curricular activities is compared between public school, private schools, and schools run under public private partnership. In recent literature, it is found that schools taken up by public-private partnership have been providing a better learning environment—Infrastructure Rehabilitation and Development, Administrative changes, Academic Innovation and Planning, Teacher Reform and Student Affairs—is perceived to have a positive impact on learning outcomes. It is to investigate and document that the investments in these areas are justifiable. To promote this fact, we conduct a quasi-experiment to examine the profiles of students in a public-private partnership school at Karachi (running under Zindagi Trust program) and a public school (as counterfactual) in the same neighbourhood. We also recorded the household and socioeconomic characteristics to create a good set of control variables. The propensity-score results show that public-private school is performing better than that of comparison group in attaining learning outcomes thus showing positive effects of PPP. Finally, the study probed into household and parental covariates of student's educational outcomes to enhance internal validity of results.

*JEL Classification:* I21, C21, L32.

*Keywords:* Educational Learning Outcomes, Public-Private Partnership, Quasi-experiment.

*Education is the preparation of children to assume their adult roles in society as loving parents, as engaged citizens, as contributors to society and their communities, and as productive workers. The premise is that schooling and education are linked: a child who spends more years in school is thereby expected to acquire more education—more skills, more capabilities, more competencies.*

Fatima Hafeez <Fatima.hafeez@khi.iba.edu.pk> is Graduate Research Fellow, Institute of Business Administration, Karachi. Adnan Haider <ahaider@iba.edu.pk> is Assistant Professor of Economics and Finance, Institute of Business Administration, Karachi. Naeem uz Zafar <naemuzzafar@gmail.com> is currently working as Member of Social Sector Development at Ministry of Planning, Development and Reform (Planning Commission), Islamabad.

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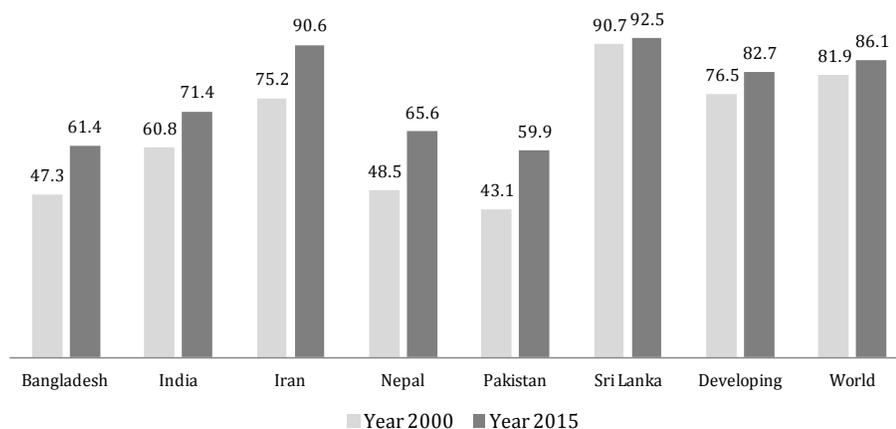
*Yet, tragically, it has been demonstrated again and again that this is not always the case. Schoolin' ain't learnin'*

Sir Lant Pritchett (2013)

## 1. INTRODUCTION

In 2012, the National Assembly of Pakistan (NAP) received assent of the President on an Act to provide free compulsory education to all children of the age of five to sixteen<sup>1</sup>. This is indicative of a consensus that every child has a basic right to education; it may be because of perceived multiple gains to education on all levels. However, there is no consensus over the right means to provide this basic facility. It becomes more relevant when the global adult literacy rate is 86.1 percent in 2015 while Pakistan still remains at lower rank with 59.9 percent on average [UNESCO (2015)].<sup>1</sup> Due to substantial efforts by the Federal government have led to an increase in adult literacy rate from 43.1 percent in 2000 to 59.9 percent in 2015. But still the average performance in improving literacy rate is much lower as compared with the neighbour countries and other regional counterpart (see, Figure 1 for a comparison).

**Fig. 1. Adult Literacy Rate**



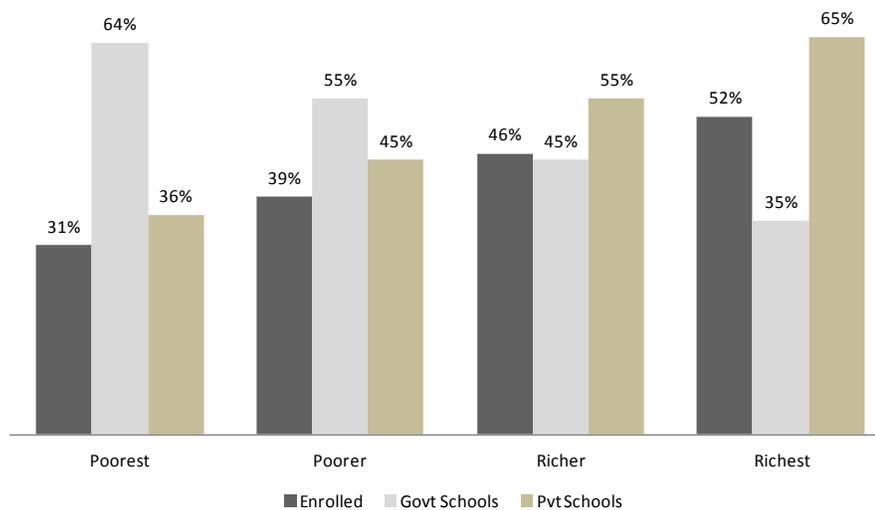
Source: UNESCO, Institute for statistics, 2015.

There are many socio-economic and political reasons which restrain the adult literacy rate in Pakistan. Among these, literature has identified five major bottlenecks to piecemeal improvements in literacy numbers which are income poverty, gender inequality, high population growth, feudalistic system and lack of quality education services. In the presence of these constraints, Pakistan is facing two key challenges – basic access to primary schooling especially in rural areas and the long lasting effects it has on the educational outcomes of a child. Figure 2 provides information about primary enrollment across different income quantiles of Pakistan. Bottom income quantile is considered as a poorest group which shows net enrolment around 31 percent on average. This also implies, around 69 percent of children belong to extremely poor families are

<sup>1</sup>United Nations Educational, Scientific and Cultural Organisation (UNESCO), Institute for statistics.

out-of-school in rural Pakistan. In contrast to these numbers, 52 percent of the children from the upper income quantile group are enrolled in pre-schooling. However, still 48 percent of the children of this richest group are out-of-schools. Furthermore, the enrollment trend across different income quantiles also indicates a highest percentage of children from poorest families are attending government schools. Whereas, around 65 percent of children belong to richest group are mainly enrolled in private schools in Pakistan. It is due to the fact that public schools in Pakistan especially in rural areas are working in a bad condition. Annual Status of Education Report (hence after, ASER) 2014 data shows that most public schools do not have basic facilities of clean drinking water, electricity, boundary wall and toilets, as compare to private schools. And so is true for the infrastructure as library, playground, labs and the students are seated outside classrooms with multi grade education.

**Fig. 2. Primary School Enrolment—A Quantile View**



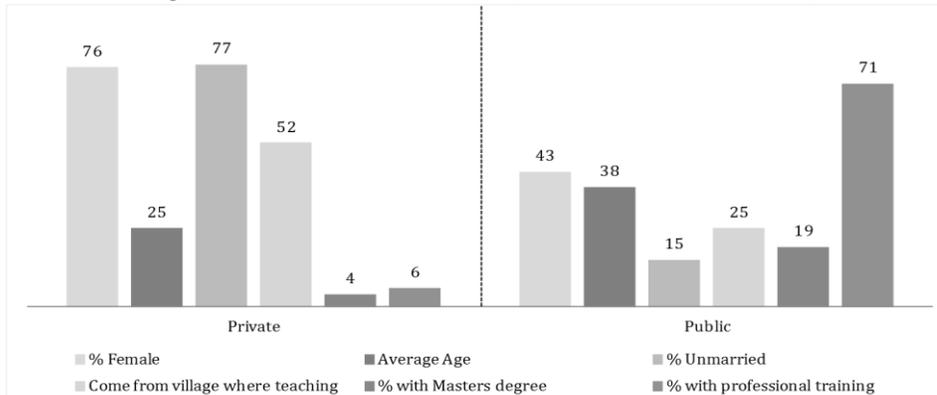
Data Source: ASER (2014).

With the least of resources, books and computer, the public school has more teachers who are more educated than the private school teachers (see, Figure 3). But it is evident that while having less educated teachers including more females with less average age experiences, private schools still provide relatively better facilities in terms of physical infrastructures and even produce better academic outcomes than government schools [see, Amjad (2012) and Amjad and MacLeod (2012)]. Sindh is not exceptional in this regard, which is the second most developed province in Pakistan with a population of 42 million and a literacy rate of 59 percent. There are 47,557 registered schools in the province, yet 73 percent of school-age children are still out of school. A recent survey report by ASER<sup>2</sup> establishes that Sindh scores worst on education than any other indicator; student's basic literacy and numeracy results are not more than 20 percent and there is hardly any presence of basic learning environment in public schools. Karachi is a cosmopolitan city in Sindh with a

<sup>2</sup>ASER Annual Report, 2014.

huge immigrant population. Home to over 23.5 million people, 38 percent of it is under the age of 15 years.<sup>3</sup> It has the highest school enrolment relative to the 22 districts of Pakistan according to the Sindh Education Management Information System (SEMIS) census 2013. Educational sector in Karachi faces a number of problems including the students' learning outcomes. Which may be because of an increasing corruption in the respective sector, possible existence of ghost schools and ghost teachers or the socioeconomic factors may be influencing the educational outcomes. There are many such hypotheses that what could be the determinants. But nothing is established in case of Karachi in particular and Singh in general that what factors may be affecting.

**Fig. 3. Teachers Characteristics (Public vs. Private Schools)**



Data Source: Andrabi, et al. (2007 & 2008).

The students from same class, same home or the same community may have different learning outcomes. Motivating from this fact, this study explores the factors influencing the differences in learning outcomes while considering a number of control factors. The matter is important to understand as the educational situation of Sindh may be attributed to the schools and variant education standards among schools. UNESCO pointed that the existence of different types of schooling is raising concerns of inequitable social divide [NEP (2009)].<sup>4</sup> Thus one of the options which may be considered to get hold of the deteriorating educational situation in Sindh is the joint effort by the two key stake holders, Public Private Partnership (PPP). There are 2,139 schools operating under the PPP mechanism in Sindh. There are different kinds of Public private partnerships where responsibilities between private and public would vary from school to school. In some cases, private partners are limited to providing infrastructure while in others their responsibility would extend to administration and more.

The existence of such an intervention under Zindagi Trust Administration is SMB Fatima School. The Trust was registered in 2002 and adopted the school under Sindh Government's Adopt a School Policy with the prime motive of quality education. Its aim is to utilise the already governments allocated resources for the betterment of the students. One of the few basic steps was the consolidation of 13 schools operating in the

<sup>3</sup>Population Census of Pakistan, 1998.

<sup>4</sup>National Education Policy, 2009.

same building and eradicating the use of school playground for the public use. Throughout these years the focus remained on training public school teachers, administration and extracurricular activities.

The Chairman of ruling party of Sindh, Bilawal Bhutto Zardari has announced the establishment of 23 more Public Private Partnership schools; one in every district. The private sector has been given an elaborate set of responsibilities; which will be supported by the public sector. The setup requires not just a big amount of public infrastructure but also determines the future of the province's children. The success of the model has as yet not been established. Thus this paper is an effort to evaluate whether the initiative by the Government of Sindh to partner with the private sector has beneficial results.

Box-1 shows the details of intervention the current school is providing and are expected to be in the 23 new schools. There are a number of rigorous done of Public

#### Box 1

##### Detail of Intervention Made by Private Sector

- (1) Infrastructure Rehabilitation and Development
  - Repair and re-installation of broken electric wiring
  - Replacement of dysfunctional blackboards or desks
  - Conversion of abandoned rooms to student activity rooms (e.g. art room)
  - Rebuilding cramped, blocked toilets
  - Repairing water/sewage lines
  - Building a Health Room, staffed with a full-time nurse
  - Building an Art Room, a Library, an A/V Room, two Computer Labs and a Science Lab
- (2) Administrative changes
  - Merging the multiple schools running in one campus into one school under one administration
  - Maintaining teacher and student records for attendance, performance, etc.
  - Disallowing private use of school grounds
  - Hiring custodial staff for maintenance and cleanliness of the existing or refurbished premises
  - Detailing staff responsibilities in job descriptions
  - Formulating a detailed admissions policy describing admissions criteria, responsibilities and deadlines
- (3) Academic Innovation and Planning
  - Introduction of modern, thought-provoking textbooks in Urdu, English, Mathematics.
  - Teaching a video-based science curriculum in our well-equipped A/V Room
  - Hiring academic coordinators for English, Mathematics and Science to plan syllabi with learning outcomes and timelines, design tests, monitor progress, observe and train teachers
- (4) Teacher Reform
  - Monitoring teacher attendance
  - Penalising staff for unreported absences, lateness and shirking duty
  - Regularising general and subject-specific training for teachers, ongoing through academic coordinators and targeted through external trainers
  - Evaluating teacher performance through regular teaching demos, lesson plan reviews as well as in-class monitoring by academic coordinators throughout the term.
- (5) Student Affairs
  - Art
  - Chess
  - Sports (netball, basketball, football, hockey, throw ball, taekwondo, rowing, cricket)
  - Public speaking
  - Sexual health and abuse awareness

Source: Zindagi Trust (2015).

Private Partnership in education sector and a number of them are underway. But there is no evidence of rigorous evaluation of specifically such a program found so far. If any research done to find the effect would be of immense importance for the welfare of the society. This paper is an effort to contribute to the pool of data base about public private partnership in education. The prime role of the paper would be finding the differences among the Public Schools and the Private schools and the evaluation of such a school underway since a decade. The detailed set of responsibilities private sector providing in a public private partnership are **be** Infrastructure Rehabilitation and Development, Administrative changes, Academic Innovation and Planning, Teacher Reform and Student Affairs. The detail set of interventions made by the Trust are given in Box-1. Finding the effect of each in isolation won't be fruitful thus the effect of all the factors are observed simultaneously. For the purpose of this study we will compare the educational outcomes of the public schools and private schools students all over Pakistan, among four major provinces and then four major cities. Key hypothesis under consideration at this stage would be, do private schools produce better academic outcomes than public schools? Once the difference is established we will look for how the public schools differ from the public private partnership school. Thus in the second stage, we would like to test a similar hypothesis but with different treatment group such as, do public-private partnership schools produce better academic outcomes than public schools? The causation would be assessed while controlling a number of control variables under consideration.

The rest of the paper organises itself as Section 2 reports the existing work done in the field of finding differences among the public, private and public private partnership schools and Section 3 shows its empirical methodology involved in finding the results. Section 4 shows the final results and Section 5 concludes the paper.

## 2. REVIEW OF LITERATURE

The demand for education in the developing countries is far more pressing than that in the developed countries. The excess demand leads to a rise in private sector education to cater to the demands of the ones who have the means to pursue it. This leads to a gap between public schools and the private schools; the former lagging behind and the latter performing better. Broadly defined the education is parted in the developing country in the four major ways—public schools, public private partnership schools, low cost private schools and private schools. The perceived and major differences among them are shown in Table 1.

Table 1

### *Major Differences among School Types*

|                            | Public School                 | PPP School                | Low Cost Private Schools      | Private Schools           |
|----------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------|
| Infrastructure             | Good space but not maintained | Good and maintained space | Not much and maintained space | Moderate maintained space |
| Administration             | Poor                          | Good                      | Moderate                      | Good                      |
| Academic Innovation        | No Innovation                 | Good                      | Poor                          | Good                      |
| Teachers Pay               | Very good                     | Good                      | Poor                          | Good                      |
| Teacher Absenteeism        | High                          | Low                       | Low                           | Low                       |
| Extracurricular Activities | No                            | Yes                       | No                            | Yes                       |

The educational market in the developed country varies to that of the developing countries. The inception of the Private schools in the Developed Countries is welcomed, as it is perceived to bring in competition to the Educational Sector [Andersen (2008)]. On the other hand it is taken as a threat in the Developing Countries. It is expected that the Public sector will completely banish from performing as its job is taken up by the Private Sector. ASER India annual report 2009 on rural area clearly shows the difference in educational outcomes among the two sector schools [Wadhwa (2009)]. Similarly when the government school students in Colombia were provided school fee vouchers by the government, they can opt for either school, the students were 15 percent more likely to be in private schools. Other than this they were in a higher grade than the government school counterfactuals, had better score in standardised tests and were less likely to dropout from school or cohabit [Angrist, Bettinger, Bloom, King and Kremer (2002)].

To cater to this unending demand of quality education, in the wake of perceived better future returns at all levels, has given rise to low cost private schools and private schools. Private sector schools are widely prevalent not only among the urban elite but the rural areas as well. The educational outcomes are found to be better in areas with better educated females, takes role as teachers. Despite they are co-educational girl's enrolment is high in rural Pakistan [Andrabi, Das, and Khawja (2002)].

The group which can afford low cost private schools is comparatively smaller with positive but statistically insignificant impact on child learning in India [Chudgar and Quin (2012)]. And it is noted that a simple intervention in the public school is expected to raise results twice as of the low cost private schools [Tooley and Dixon (2005)]. The test scores of Math, Urdu and General Knowledge are compared among the Public, Private and NGO schools, in Pakistan, there is no significant difference found between the public and NGO school. Though there is a significant difference between the public school and private school. The major difference is explained by the variation in the household factors and the teacher related factors [Arif and Saqib (2003)].

Within the public school educational outcomes variation is found to be linked with better student teacher ratio and teachers education [Andrabi, Khan, Khan, and Naseer (2012)]. Private school teachers are less paid and less trained but is expected to be involved in teaching or teaching related activities with a low absenteeism rate, and better students learning outcomes [Muralidharan and Kremer (2006)]. It is also established in the context of Pakistan [Andrabi, Das, and Khawja (2002)].

Thus, the private schools are inclined to hire a better set of teachers and a slightly better set of facilities to attract a good bunch of students. And it is successful in showing results better than those of the public school [Amjad and MacLeod (2012)]. The public school benchmark is so low that the private school is not inclined to do anything more than a few things showing better result. Therefore, a slight intervention in the public school of such a nature will improve grades and the underutilised public school resources can be utilised. To provide quality education free of cost the two key stake holders from the demand side, private sector, and the supply side, public sector, are combined together. In the private sector remained social workers and non-governmental organisations. Public sector's role is to providing grants, subsidies or vouchers [Angrist, Bettinger, Bloom, King, and Kremer (2002)]. Or letting the private sector operate in a public building, taking decisions about infrastructure rehabilitation and development, administrative changes, academic innovation and planning, teacher reform and student affairs (SMB Fatima Jinnah School).

The schools run under the private sector, NGO's, are reported to be performing better than the regular public schools at a lesser cost in Pakistan. According to ASER 2011 data PPP schools on average are performing better than the Public as well as Private schools for Reading, Math and English. Though the difference in scores is not mainly associated to the school type; it is found that PPP school students are 5 times more likely to be attending private tuitions than the public school students [Amjad and MacLeod (2012)].

World Bank made an effort to summarise the assumed effect of the most common types of PPP; vouchers, subsidies, contracting of private management and private finance initiatives. The objective was to show its impact on four key school indicators – increasing enrolment, improving education outcomes, reducing inequality and reducing costs. The effects are shown in the Table 2. The benefits of public private partnership are perceived to be creation of competition in education sector which would lead to efficient use of resources and increased consumer welfare (Pessoa, 2008). It may also increase risk sharing between the stakes holders, public as well as the private players will show ownership to the problem faced. There are a number of such projects underway in Pakistan with a set of perceived outcomes.

Table 2

*PPP's Impact on Key Indicators*

| Contract                          | Effect on increasing enrolment                              | Effect on increasing educational outcome   | Effect on reducing education inequality | Effect on reducing cost                       |
|-----------------------------------|---|--|---|---|
| Vouchers                          | Strong: number of students who receive voucher.             | Strong: school choice  | Strong: when targeted                   | Strong: when private sector is more efficient |
| Subsidies                         | Strong: use of already built private infrastructure         | Moderate: limited by available places and quality of service delivered in private sector | Strong: when targeted                   | Moderate                                      |
| Private management and operations | Moderate: limited by the supply of private school operators | Moderate: limited by available places in private sector                                  | Strong: when targeted                   | Moderate                                      |
| Private finance initiatives       | Moderate: limited by financial constraints                  | Low  | Strong when targeted                    | Strong  |

Source: Patrinos, et al. (2009).

Learning environment if paired in parting education may increase educational outcomes. The environment may sum up to text books, work books, teacher's books and resources, and the material used in the better learning of the concept. It is true in context of Slovenian [Irena, Samo, and Branka (2014)]. PPP may be private sector's intervention of motivating students to participate actively in class at public school through provision of proper learning environment in which the child feels confident

enough. Such an intervention when taken up in a public school in Pakistan showed significant change in the student's educational outcomes [Naseer, Patnam, and Raza (2010)]. The environment may also be the infrastructure and motivated teachers. It is established in Indonesia that more school construction will lead to increase in average years of education and average wages [Duflo (2001)]. Similarly if teachers are provided with better environment may reduce absenteeism [Chaudhury, *et al.* (2006)]. The students scores increase, if their teachers are provided with incentives [Muralidharan and Sundararaman (2013)].

Another aspect of certain PPPs is imparting extracurricular activities. While effect of extracurricular activities on welfare of student has been established, its impact on educational outcomes is still debatable. In turnkey schools, with provisions of extracurricular activities which are not related to the curricular shows improvement in students' social and academic achievements [Kahyaogullari (2013)].

We will be interested in looking into a more detailed form of PPP in the context of Karachi, and its applicability in Sindh with the effect on increase in educational outcome. The PPP would be inclusive of private management and operation and private finance initiatives. The programs of PPP nature underway in Pakistan and their desired objectives are given in Table 3.

Table 3

*Educational Services*

| Province    | Programme  | Objectives  |
|-------------|--|---|
|             | Educational Services   |   |
| Balochistan | Urban girl fellowship  | Increase girls enrolment in schools   |
| Balochistan | Basic education support project                                      |   |
| Punjab      | Financial assistance per child basis                                 | Improve quality and increase productivity   |
| Punjab      | Pilot education voucher scheme                                       | Improve quality of education and encourage girls enrolment in schools                             |
|             | Supplement and Support Service                                       |   |
|             | Quality enhancement and institutional development in private schools | Improve quality   |
| Punjab      | Computer based training of teachers                                  | Improve quality   |
| Sindh       | Quality assurance resource centre                                    | Improve quality and the academic achievement of low performing students                           |
|             | Operations Management Services                                       |   |
|             | Adopt a school   | Improve quality of education  |
|             | Pakistan railway schools   | Improve school management   |
|             | Management of government schools in Lahore city and Sargodha         | Improve management of schools and quality of education  |
| Punjab      | Quality education for all  | Improve quality of education in primary schools, reduce number of dropouts and increase enrolment |
|             | Infrastructure Services/Education Services                           |   |
|             | Leasing public school building for private operations                | Leasing public school building to private operators   |

Source: World Bank (2009).

IDEAS-PAK (2015)<sup>5</sup> report lead by Dr Faisal Bari shows that the PPP schools are provided with better infrastructure, teacher training and support to the head teacher than the counterfactual, public school. The outcome is better increased enrolment and scores; though test scores are high in context of Punjab though ambiguous for Sindh. The results are getting more favourable for PPP school as the span of time increases. One's decision whether or not to teach their child is influenced by a number of factors. It may be their informed decision for the wellbeing of the family in long run or the peer pressure they face. On the other hand, the family had no other option than to send the child to school or the conditions are so bad, the family has nothing to eat, it is perceived that sending the child to school will not yield any benefits. These are the demand side factors that influence the demand of school. Once the child steps into school these demand side factors plays a pivotal role in determining what the child scores in an academic exam. These factors may be personal, household and on the community level. A family's socio economic status (SES) has a significant impact on a child's academic achievements. Children from higher SES are reported to have higher learning outcomes at primary level in USA [DaGLi and Jones (2012)]. The results are consistent in Pakistan as well at the matriculation exam level [Akhtar (2011)], while the findings are contrary in case of Turkey, study conducted at under graduate level. It is reported that the students from low SES are reported to academically perform better than the students from high SES [CILasun (2013)].

The age at which a student joins the school also determines educational outcomes. The students from higher SES if sent late to school are expected to perform better than those taken at the right age. It is contrary for the students from lower SES and other than white racial class, established in USA [DaGLi and Jones (2012)]. The family income is a significant factor in determining the learning outcomes of the students. A study in USA signifies that \$1,000 increase in income raises combined math and reading test scores by 6 percent. And the gains are larger for the disadvantaged families than for those already having a higher income [Dahl and Lochner (2012)].

Parents leaves an important impact on the child's learning outcome [Jesson, McNaughton, and Kolose (2014)]. The way parents help the child to read assisting and giving time to the child have a considerable influence on the child's performance in New Zealand. The household resources, parents educational level, parents ability to support the child and the level of support child is getting is found to be highly correlated with the learning outcomes in Australia [Geelan, Loudon, and Wildy (2013)]. It is also found that the bigger family size signifies a smaller share of resources for each one of the family member. Thus it is negatively correlated with the child's academic outcomes. Similarly single parent signifies a smaller endowment of resources to start with thus it also have a negative impact on the learning [Marks (2006)].

It may also be supported by a study in Uruguay that girls with both parents are reported to be performing better than those with single parents [Cid (2008)]. The birth order is also reported to be a significant indicator of child educational outcomes in Pakistan. A study conducted in KPK reports that the expenditure on eldest child is more than that of the next child thus the educational outcomes are better of the first child than that of the second child [Atta, Jamil, Baloch, and Ayaz (2011)].

<sup>5</sup>Institute of Development and Economic Alternatives (IDEAS), Pakistan, 2015.

### 3. EXPERIMENTAL METHODOLOGY

Extracurricular activities and a number of other activities, along with education plays very important role in child education and development. NGO took over public school with a view to consolidate and do an intervention of giving extracurricular and co-curriculum activities to students. These activities are part of education system in many private schools but do not exist in public schools. This means that initiative taken by the NGO may be taken as an intervention done for the first time in public sector education. We planned to probe into impact of this initiative in students' academic performance. To estimate the impact of this intervention, we have to form a comparison group (counterfactual). We chose another school from public sector with similar characteristics for control group. The only difference is, in the control group, PPP intervention is absent. It is possible that choice of PPP school and hence all students interviewed from PPP school may suffer with self selection bias. To overcome this problem one possible strategy is matching technique. This approach compared observations from treatment group with equivalent observations from control group thus enabling us to create a treated individual as a controlled individual counterfactually. Once counterfactual groups are created, then descriptive statistics were used in estimating the impact of this intervention on academic outcome of students.

A number of recent empirical studies proposed Propensity Score Matching (PSM) as a way of testing when pure randomisation is difficult to implement or in a case where intervention has already been done. This method has also been used by Krueger and Zhu (2004) in its study of New York City school choice program, by Barrera-Osorio (2007) in Colombia effects of school construction, by Barrera-Osorio and Patrinos (2009) in evaluation of school voucher program in Chile and more recently by Naseer, Patnam, and Raza (2010) for CRI intervention assessment in the case of Pakistan. The method is illustrated as:

Consider our aim is to estimate the "treatment effect" of an intervention in a quasi-experimental setup, where a binary treatment variable  $D$  is defined by:

$$D: \begin{array}{ll} = 0 & \text{treated} \\ = 1 & \text{untreated} \end{array}$$

If intervention affects an outcome variable  $Y$  than we can write treatment effect for some unit  $i$  as:

$$\Delta_i = Y_{i1} - Y_{i0}$$

If we consider the whole sample rather an individual effect, then in expectation terms, the treatment effect can be written as:

$$E(\Delta_i) = E(Y_{i1}) - E(Y_{i0})$$

This expression is also called, average treatment effect (ATE). Using binary treatment variable, we can further classify ATE into its two forms:

$$\text{ATET: } E(\Delta_i|D = 1) = E(Y_{i1}|D = 1) - E(Y_{i0}|D = 1) = E(Y_{i1} - Y_{i0}|D = 1)$$

$$\text{ATENT: } E(\Delta_i|D = 0) = E(Y_{i1}|D = 0) - E(Y_{i0}|D = 0) = E(Y_{i1} - Y_{i0}|D = 0)$$

Let, program is conditioning upon vector of co-variates, then, ATE expression can be written as:

$$E(\Delta_i|X) = E(Y_{i1}|X) - E(Y_{i0}|X)$$

In a case, where program intervention has already taken place, the method must settle for estimates of the average impact of the program on the participants treatment group with  $D=1$ , compared with a credible counterfactual. It is important to note that ATE expression given above between program participants and the comparison group fails to give us an unbiased estimate for  $E(\Delta_i|X)$  as shown in the equation below:

$$E(\Delta_i|X) = E(Y_{i1}|X, D = 1) - E(Y_{i0}|X, D = 0)$$

Add and subtract,  $E(Y_{i0}|X, D = 1)$ , we get:

$$\begin{aligned} E(\Delta_i|X) &= E(Y_{i1}|X, D = 1) - E(Y_{i0}|X, D = 1) + E(Y_{i0}|X, D = 1) - E(Y_{i0}|X, D = 0) \\ ATE &= E(\Delta_i|X) = E(Y_{i1} - Y_{i0}|X, D = 1) + E(Y_{i0}|X, D = 1) - E(Y_{i0}|X, D = 0) \\ ATE &= ATET + Selection\ bias \end{aligned}$$

The above expression shows that in the absence of pure randomisation, some sort of selection bias may be occurred in estimating ATE. In order to control this bias, one possibility could be the use of PSM algorithms. This method requires an assumption of conditional independence of treatment for recovering an unbiased estimator of mean impact. In addition to this assumption, the method also requires that the propensity score function  $P(D|X)$  is strictly between zero and one. Rosenbaum (2002) and Rosenbaum and Rubin (1983) show that if conditioning on  $X_i$  eliminates selection bias then it must be the case that conditioning on  $P(D|X_i)$  also eliminates selection bias. It is important to note that any standard probability model can be used to estimate the propensity score, *e.g. a logit model*:

$$P(D|X_i) = \frac{e^{\mu h(X_i)}}{1 + e^{\mu h(X_i)}}$$

Where  $h(X_i)$  is a function of covariates with linear and higher order terms. Using this expression, ATET can be modified as:

$$ATET = E_i[E_{P(D|X_i)}(\Delta_i|X_i, D = 1, P(X_i))]$$

With the help of above estimator, we matched on the factor which has led to the school choice. After looking into the theory and the logic proposes that in families of lower social class the decision to shift from public to public private partnership school could only be on how informed the parents are. As it is widely known that this particular school is operating under Public Private Partnership contract and it may be providing better education. Thus along with key co-variates, we also use father education and the mother education for matching the students potential outcomes. The outcome remained Math result, English result, sum of mean-score result.

### ***Survey and Questionnaire Design***

With the purpose of evaluating the effect of an intervention in public school we surveyed the household, community and academic profiles of students. To examine the

change in outcomes we formed a comparison group comprising a public school in the same neighbourhood, and conducted a similar survey there. The survey consisted of collecting house hold data consisting of a number of dimensions (See, Box-2) and conducting a test in both the schools.

### **Box 2**

#### **Dimensions of Household Survey**

The dimensions of the house hold data consisted of the following

- Student information
- Household information
- Parental information
- Parents education
- Family income and employment information
- Possessions
- Health status
- Hygienic conditions
- Mobility
- Time spend at home
- Food intake
- Eating habits
- Types of houses
- Religious beliefs
- Community data
- Parents desire

Household members from the students' family were interviewed one-to-one to elicit their response on different dimensions. Schools were visited on a random unannounced day to avoid self-selection bias. The sample size is 93 of which 52 belong to the treatment group and 41 to control group. This sample has 99 percent probability that the sample achieved statistical significance for a given sample size and a given difference in mean. Through convenience sampling we confined our sample to students of Class 5 and 8. The students not present there were less than 1 percent of the total population. We collected the house hold data of 140 students in the treated schools but only 66 appeared in the test of English and even less for the mathematics test. Thus we were left with the sample size of 52 only. In the control group we started with the sample size of 100, tests were conducted, but house hold data could only be collected for 41 students.

## **4. RESULTS AND DISCUSSION**

This section aims to address briefly our empirical findings. In the first subsection, we will analyse the educational outcomes of the public schools and private schools students all over Pakistan. For testing our key hypothesis under consideration at this stage would be, do private schools produce better academic outcomes than public schools? To test this hypothesis, ASER dataset 2014 is being utilised. Once the difference is

established we will look for how the public schools differ from the public-private partnership school. Thus in the second stage, we would like to test a similar hypothesis but with different treatment group such as, do public-private partnership schools produce better academic outcomes than public schools? The causation would be assessed while controlling a number of control variables under consideration.

#### *Hypothesis testing – I: Comparison of Public vs. Private Schools*

In ASER 2014 dataset, students were asked basic questions to assess the reading skills, learning skills, math level, English reading, concluding word and sentence meaning, telling time, solving word problem and naming things in English. The same question was asked from all the students irrespective of their grade and they were awarded points between 1 to 5, 1 being very poor and 5 being very good. Using this dataset, we first discussed results for the whole nation then for four major provinces and five major cities. In Pakistan on average the private school might not have reached the threshold in educational scores but still it is better than the average public school score; aggregately for all grades and subjects. On average the difference in score among schools is no less than 1 point (see, Figure A1 and Figure A2).

The absolute scores vary among schools; the 25th to 75th percentile range of private school is greater in scores than that of public schools for all grades except grade 9 and 10 (see, Figure A25). The possible reason the private school score is also very low may be that they include low cost private schools and other private schools. May be the score of public schools are high because it include the data of Public Private Partnership Schools. Thus on all the further result discussion there is a possibility that the differences are under estimated.

For the purpose of this study we kept our focus to reading scores, math score and English reading scores. Anonymously it is evident that there exists a significant difference in the scores for all three grading scales and all the grades among the schools. Private schools even after possible understatement of results are performing better than possibly overstated public schools. The scores from the very beginning years are not very hope full as the public school is performing way less than the private school. Reading Score on average shows that not all Students in both the schools are able to read sentences. The private school is closer to 4 showing possibility that most of them can at least read sentences (score 4) while the public school on average is half way between forming words (score 3) and sentences (score 4) (see, Figure A3).

Figure A4 shows that on average not all the students of both the school can write a Story (score 5). The average difference between the Schools remained the public school lagging behind the private schools for all grade levels, though the difference tends to decrease as the class increases. When observing the absolute 25th to 75th percentile, Figure A26, there are no differences in scores among grade 3rd, 6th, 8th, 9th and 10; exception of some outliers. The difference is most for grade 2nd and grade 7th. The non-existence of variation at higher grade level may be explained by the fact that reading a story (score 5) is a basic task and can be mastered by a grade 4th student.

Math score again portrays the same gloomy picture. On average not all the students know the division of numbers, though the average for private school is closer to knowing subtraction (score 4) while public schools are closer to recognising numbers

from 1 to 99 (Score 3) (see, Figure A5). In private school on average 2nd grade student can recognise number from 1 to 99 (score 3) as compared to public school 3rd grade students can do that. Similarly 4th grader on average in private school can subtract (Score 4) while a 5<sup>th</sup> grader in public school (see, Figure A6).

In absolute terms Figure A27 show that 7th grade and onwards the private school students has mastered the division (score 5), exception of outliers. Public school 7th and 8<sup>th</sup> grade scores are lagging behind, showing their inability to divide. 1st grade students in public schools still ranges at not knowing anything while in private school the students can at least recognise numbers from 1 to 9 (Score 3). There is no improvement shown in private school score between grade 2 to 3 while a drastic change for public school and no improvement in public school score while transition through grade 3 to 4 and grade 7 to 8.

The private school students on average can at least read words (score 4) while the public school students are have mastered recognising the small letters (score 3) (see, Figure A7). Probing into the differences on grade level (see, Figure A8) the difference is huge on average. Most of the 1st grade students know the small letters (score 3) while the 2nd grade of public school is compete able to it. The difference in scores among schools tends to decrease as the class increases.

The 75th percentile of 3rd grade private school is the ability to read sentences while it is true for 5th grade public school (Figure A28). The difference in score among school remains until grade 6; the grade 7 scores even differ. In absolute terms 2nd grader of private school is same as the 5th grader public school.

The difference is highly evident between grades 2 to 5. Score's difference among schools tends to decrease as the grade gets higher which may be justified by the basic nature of the questions. The private school on average scores between 2.5 to 4.8, whereas, the public school on average varies from 1.5 to 4.7. There is no major variance among subjects.

Province's when compared on the educational outcomes shows that Punjab is followed by Khyber Pakhtunkhwa than Balochistan and Sindh in the end for public school. For Private schools Khyber Pakhtunkhwa is replaced by Balochistan. The average scores for both the schools remained between 2 to 3.5 out of 5 (Figure A9). In absolute terms the Box graph (Figure A29) shows similar results for Punjab and Khyber Pakhtunkhwa. Sindh is lagging behind the other 3 provinces in public sector though the score is similar to Punjab and Khyber Pakhtunkhwa in private sector. Surprisingly Balochistan's private schools are performing way better than the other provinces.

The overall score shows a gloomy picture and the argument can be made valid that the benchmark, public schools, is so low that the counterfactual, private schools, does not have the incentive to perform any better. The provincial results are consistent to the prior conclusion that the private schools are performing better than the public schools at all levels and the differences are decreasing as the grade level increases. Among the provinces Sindh shows the greatest difference then Baluchistan is next followed by Khyber Pakhtunkhwa and Punjab shows the least difference among schools (Figure A10). The box graph (Figure A30) shows that Punjab's scores is more or less identical, Khyber Pakhtunkhwa shows slight variation, Balochistan shows differences in scores and Sindh shows difference on all levels of at least a score.

On average none of the schools in the provinces could read the sentences (score 3); public school have on average mastered reading the words while private schools are closer to reading sentences. The reading scores among provinces in different sectors remained as those of the overall scores (Figure A11). The box graph (Figure A31) shows that public sector Sindh and Balochistan scores are lagging behind the Punjab and Khyber Pakhtunkhwa scores though all are performing similar in the private sector.

The differences in reading scores over grades are consistent to the conclusion for overall scores, the difference in Punjab being least to being highest in Sindh. The difference also decreases as the grade level increases (Figure A12). Punjab's public school and Private schools are performing better than those of other provinces at each grade level (Figure A32). For private schools Punjab is followed by Sindh then Balochistan and Khyber Pakhtunkhwa. Sindh is worst for the Public School followed by Balochistan and then Khyber Pakhtunkhwa.

The provinces performance on average for math is more or less similar to that of the overall score and the reading score. All the provinces in public sector have mastered recognising the numbers from 1 to 99 (score 3) except for Sindh. In the private sector all the provinces on average are unable to subtract (Figure A13). In Figure A31, Sindh public school is performing the worst followed by Balochistan. For Private schools all are performing the same. When looking at the average math score on grade level grade 1 in Sindh private school is comparable to grade 3 of public school, in Balochistan grade 1 of private school is comparable to grade 2 of the public school.

In Khyber Pakhtunkhwa grade 2 is comparable to grade 3 and in Punjab public school is clearly performing better than the private schools previous grade (Figure A14). Box Graph (Figure A34) shows Sindh and Khyber Pakhtunkhwa Math scores are clearly better in the private sector than in the other provinces. Punjab's public schools are clearly performing the best in math scores. English Reading scores show that among both the schools on average the provinces have not mastered reading words in English. Public schools are further lagging behind, Sindh is the only province which have not yet mastered recognising small letters (Figure A15). Figure A35 shows that the Sindh public school being the worst followed by Balochistan while they boxes are all same for private schools.

The variation in score among schools is such that in Sindh public school grade 1 score is comparable to grade 4 score, in Balochistan grade 1 is comparable to grade 3, Khyber Pakhtunkhwa grade 1 is comparable to grade 2 and this comparison doesn't fall for Punjab (Figure A16). Sindh private school English reading score is performing the best followed simultaneously by Punjab and Balochistan. And the public school in Punjab are the best without any question (Figure A36).

To further narrow down the scope of the study, it is important to find out the differences in the capital cities of the provinces. It will also show the results specific to the urban area only. The cities overall result in public sector shows Quetta and Islamabad are performing equally and best followed by Lahore than Peshawar and at last Karachi. In private sector Quetta is followed by Sindh and Lahore then Islamabad and in the end Peshawar (Figure A17). In absolute percentiles all the cities are performing equally and better in the public sector other than Karachi. While in the private sector Lahore and Quetta are lagging behind remaining others are performing equally (Figure A37).

Islamabad's public schools are performing better or equal to the private schools. Lahore, Quetta and Peshawar's scores are varying, public school scores are better in some instances while private in others. In Karachi the private school scores are comparable to 2 grade higher public school score (Figure A18). Peshawar's public and private schools both are performing better than the other cities followed by Quetta. Islamabad and Lahore shows similar trend for both schools exception for private lagging behind in some cases of Islamabad and public aging behind in some cases of Lahore. In Karachi public school score is lagging behind the most (Figure A38).

The public school on average shows that reading sentences (score 4) is mastered by all the cities except for Karachi. For private schools it is mastered by all except Islamabad (Figure A19). All the cities are performing equally in both the types of schools except for Quetta in public school which is performing better than others (Figure A39).

When seen in terms of grades in Karachi private school score on average can be compared with two grade higher public school score. Lahore's private schools on average are performing slightly higher than the public schools. Quetta and Peshawar public school is performing better than private school for first 2 grades than the private school scores is greater or equivalent to the public school scores. In case of Islamabad public schools are performing better than the private schools except for grade 8 and 9 (Figure A20). Karachi's private schools are performing the best as their students at grade 2 level read a story.

Followed by Lahore and Quetta then Peshawar and Islamabad is in the end. Lahore, Quetta and Peshawar's public school result is the best followed by Karachi and then Islamabad (Figure A40). The cities on average have mastered subtraction (score 4) in both the schools except for Karachi's public school and Islamabad's private schools (Figure A21). The box diagram (Figure A41) shows that all the cities are falling in the same range of scores except for Islamabad's public school.

Karachi shows the greatest difference between the public schools and private schools followed by Lahore. For grade 1 Quetta and Peshawar's public school scores are greater than private school scores and for the remaining grades Private schools are greater. In case of Islamabad public school scores are greater or equal to private school scores (Figure A20). Karachi's private schools are performing way better as the 3<sup>rd</sup> grader can do division (score 5) followed by Lahore.

Quetta and Peshawar's public schools are performing the best (Figure A42). English reading scores shows that on average public and private schools in all the cities has mastered reading words (score 4) except for Sindh's public school and Islamabad's private schools (Figure A23). Public schools of Quetta and Islamabad are performing better while private school of Lahore, Karachi and Quetta are better for English reading Score as compared to other cities (Figure A43).

Public and private school difference is huge in context of Karachi followed by Lahore. Quetta and Peshawar showed similar result grade 1 result public school is performing better than the private school and for the remaining private school is performing better or equivalent to public schools. For Islamabad the public school is performing better or equivalent to private schools (Figure A24). Quetta is clearly performing better than any other city for both public and private schools. Peshawar's public schools and private schools are performing just the same (Figure A44).

*Hypothesis I: Impact Assessment*

Propensity score matching algorithm together with logistic regression specification is used to pair the students, on the basis of their household factors, among schools. Then the differences among the scores of those students were recorded. The change in educational outcomes is then attributed to the school type or the treatment provided. Math, English and their Average was treated as the outcome variable to measure the change attributable to the treatment provided. The variables used in matching are Mother's Education, Father's Education and House type (see, Descriptive Statistics available in, Table A01). The matching variables are limited in this analysis because of the limited variable's data is available in ASER data set. The analysis remained consistent to the prior hypothesis that the provision of better school resources, environment, teachers and infrastructure would lead to better educational outcomes. The educational outcomes in partnership schools at all level are expected to be greater than the Public schools by at least difference of two grades. The differences are also found to be significant at 5 percent level of significance (see, Table 4).

Table 4

| <i>ASER—Average Treatment Effect on the Treated: Propensity Score Matching</i> |                   |                        |
|--|-------------------|------------------------|
|  | Unmatched         | ATT                    |
| Reading  | 0.35*<br>(46.70)  | 0.28*<br>(3.85)        |
| Math   | 0.36*<br>(50.00)  | 0.25*<br>(3.65)        |
| English  | 0.50*<br>(66.14)  | 0.24*<br>(3.34)        |
| Average Result   | 0.39*<br>(51.13)  | 0.30*<br>(3.85)        |
| Observations   | Treated<br>41,494 | Non Treated<br>101,354 |

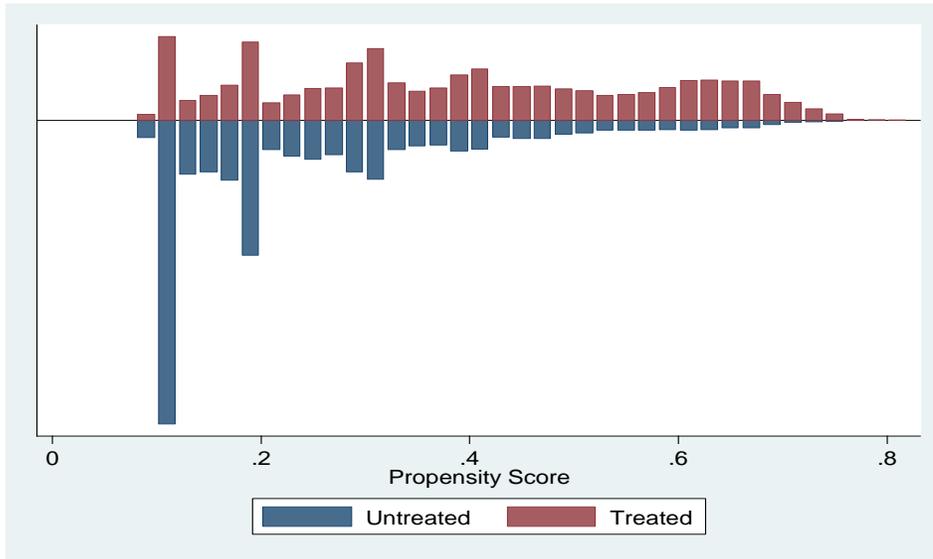
*Notes:* Absolute values of bootstrapped t-statistics in parentheses. The first column reports un matched marks on the test and the second column is the effect on a weighted aggregate computed by using a 3-parameter item response model.

\*\* indicates significance at 1 percent level; \* indicates significance at 5 percent level; + indicates significance at 10 percent level.

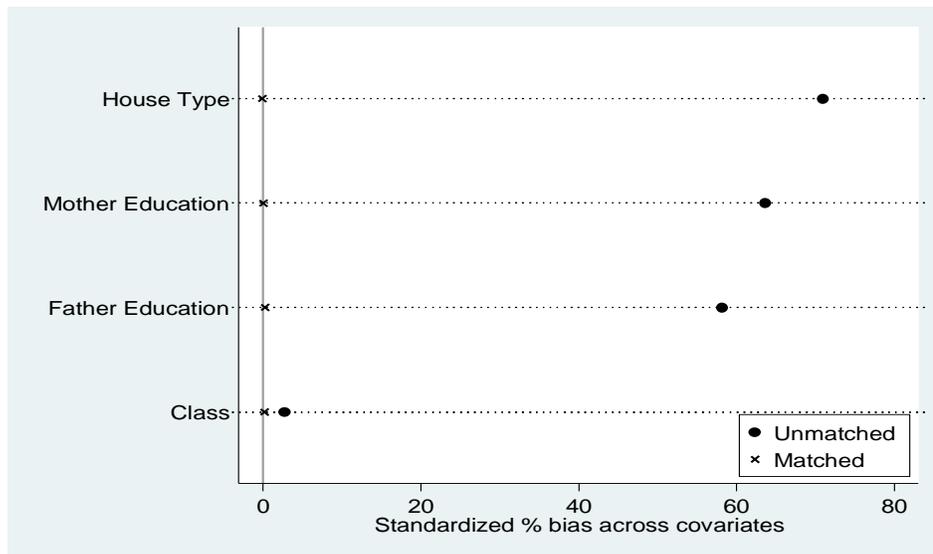
Figure 4 and Figure 5 are showing the bias across the covariates and the propensity score matching graph for treated and untreated observations. These figures show that the balancing property is satisfied in all the blocks with statistically insignificant difference in means between all the observed covariates in three strata of propensity scores. The Rosenbaum bounds test also confirms the same result.<sup>6</sup>

<sup>6</sup>For assessing robustness of PSM estimation results in STATA, we have also used two alternative matching algorithms, like, Kernel matching and Radius Matching algorithms. Despite the fact, using these alternative schemes, there is no change in the significance of reported results.

**Fig. 4. Histogram of Propensity Score Distribution for Treated and Control Groups ASER Case**



**Fig. 5. ASER—PS Bias across Covariates**



*Hypothesis testing – II: Comparison of Public-Private-Partnership vs. Public Schools (Zindagi Trust Intervention)*

The differences in educational outcomes could easily be concluded through observation while the test was conducted in each school. The treated school students showed immense confidence and were confident enough to deal with the tests

themselves. In the public school students kept asking for different questions, showed a blank response and required translating help even in the English test. In PPP schools the teacher also showed confidence in their students learning to deal with the test and left the Class room while the test was conducted by independent invigilators. This was not the case in the public school, teachers never left the class room nor did they restraint their selves from assisting the students. This was certainly the case showed in the public school English results of class 8. We somehow were able to control it in other classes and subject tests. Table 5 shows the differences in the differences in the mean of PPP school results and the public school results. Similar observation can be seen in Figure A45.

Table 5

*Zindagi Trust—Mean Differencing Results*

|                                    | Class 5            | Class 8           |
|------------------------------------|--------------------|-------------------|
| Math Result                        | 1.196*<br>(0.292)  | 2.593*<br>(0.44)  |
| English Result                     | 2.582*<br>(0.5777) | 0.677<br>(0.659)  |
| Sum of Math and English Result     | 3.771*<br>(0.831)  | 3.447*<br>(0.927) |
| Average of math and English Result | 1.885*<br>(0.415)  | 1.723*<br>(0.463) |

*Standard errors in parentheses.*

\*  $p < 0.05$

Figure A51 shows the absolute differences among the School overall outcome. The Box plots show the 25th to 75th percentile range of school scores and the line on the box shows the median value. The blue line on the graph, above, shows the mean score of partnership school while the red line, below, shows the mean score of public school. All the differences are unanimously positive in favour of the PPP School. When we probe into the scores for different grades the mean of PPP School is better than the Public school (Figure A46). This is also relevant for the absolute values of both grade 5 and grade 8. In case of Grade 5 the Partnership schools 25th percentile starts after crossing the 75<sup>th</sup> percentile of the public school. The minimum difference observed is of at least 2 grades in between (Figure A52). The difference in Math and English score among schools is significant (Figure A47 and Figure A49).

Overall the Math scores are lagging behind the English scores in both the schools. The difference in math score is more than that of the English score among schools. In Figure A53, the math score of the public school is unanimously at score 3 with some outliers while the private school 25th percentile starts from score 3. Despite the ambiguity of English Score partnership school's 25th percentile starts from the 75th percentile of the public school (Figure A55).

The differences between mean math result in class 5 and 8 are significant at 5 percent level of significance (Figure A48). The increase in the mean difference with not much difference in the standard error may be a proponent that the lack of knowledge is accumulating over the years in public schools or/and the incremental knowledge in PPP

school is accumulating. Though before any concrete conclusion is reached, over this matter, it requires a detailed study in the particular field. The box plot (Figure A54) shows extreme variation in scores among schools. At grade 5 Public school remains a line and 8 grades is practically no better than that. 8 grade's highest value is at the 25th percentile of PPP school.

Mean difference in English result at grade 5 level is significant but not at grade 8 level it may be because of the uncontrolled factor (Figure A50). Still the box plot (Figure A58) shows a greater difference, consistent to prior analysis, at grade 5 level. At grade 8 level, there is wide variation in scores at public school. The 25th percentile of public school grade 8 begins way before that of Partnership school while the 75th percentile ends together. The mean difference in the sum of math and English result and in the average of two results is significant at 5 percent level of significance at both the grade levels. It shows that the understatement of difference in English result at grade 8th level was not enough to go against PPP School. Thus it is proved there is a significant difference in the results and are in favour of PPP School.

Table 6

*Zindagi Trust—Regression Results*

|          | Math Result       | English Result    | Sum of Math<br>and English<br>Result | Average of<br>math and<br>English Result |
|----------|-------------------|-------------------|--------------------------------------|--|
| School   | 1.83*<br>(.266)   | 1.642*<br>(0.448) | 3.615*<br>(0.618)                    | 1.807*<br>(0.309)                        |
| Class    | 0.484*<br>(0.088) | 0.757*<br>(0.146) | 1.297*<br>(0.204)                    | 0.648<br>(0.102)                         |
| Constant | -0.116<br>(0.569) | 0.8652<br>(0.963) | 0.382<br>(1.341)                     | 0.191<br>(0.67)                          |

*Standard errors* in parentheses.

\* p<0.05

For association of the differences in mean to the provision of treatment we used a simple regression. Estimation results are shown in Table 6. We regressed the four ways of measuring educational outcome on school and class. The constant remained in significant and all the other variables in regression remained significant at 5 percent level of significance. The coefficient of variable school is signifying the treatment; treated is 1 and control is 0. The coefficient is significant despite changes in the dependent variable. The coefficient signifies that on average, if a student provided with such a treatment will show improvement in the results by more than a level higher. The coefficient of variable class remained very small signifying that on average the students of class 8 are not on a learning level much higher than the 5 grade students.

***Assessment of Control Variables***

To address the importance of covariates, first we consider the role of household factors like number of households, number of children, gender and age of siblings, number of sibling, number of female siblings and number of male siblings. Number of

children in the household was the only variable which was significantly different from between schools; there were more children on average in a PPP school attending student's household than in public school. When number of children in the house hold is included in regression its coefficient is insignificant. Then we probed into the students information, it included 13 questions. The question were who teaches at home, time spend studying students work status and its effect on studies, is father happy or anybody else is not happy with students education and work, there response about students involvement in extracurricular activities and vocational training and the students likeness and disliking to different school dimensions.

Does the parent teach, does the student go to tuition, the time child spends studying at home and does the child works are significantly different among schools. In public school more parents reported teaches their children themselves while in PPP School most students goes to tuition and PPP school student's spends 0.4 hours more studying and a few of the students are reported to be working than the comparison group students. It may be as a result of the intervention that parents started sending their children to tuition instead of teaching the children themselves, student started spending more time studying and they were less involved in working. When run regression parental help have positive significant coefficient with results while tuition, time spend studying and work status does not have significant impact. We generated a variable which sums up the number of help a child gets from out of school. And added 1 to the variable if siblings help each regarding studies other and subtracted 1 if siblings disturb each other in studies. The variable has significant positive correlation with the educational outcomes.

Fathers and families happiness about child's education and work and is the child engaged are significantly different among the schools. These can be the factors which may influence the academic results of students. Fathers are happier with child education and work in PPP School than the public school. It was not reported in the government school that any family member is unhappy with child's education while it was reported in PPP School. And the students in public school are reported to be engaged more than that in PPP School. When these variables were included in the regression they all have in significant impact on results.

The ranking to agreement to school level personal liking and disliking of different school characteristics are significantly different among schools students. Public school students ranked making friends the highest agreement while PPP school student gave highest rank to their likeness towards teachers. Similarly PPP students report strong disagreement to all the disliking school level variables. While at public school they ranked it highest that they do not understand the course and they don't get chance to play at school. But all these variables showed insignificant coefficient in relation to the educational outcome.

The next part is about the household information, these are among the house hold variable which may trigger the change in educational outcomes. They consists of mother tongue, and the most spoken language, relationship to the head of the family, gender of the house hold head, family structure and the number of small household units existing under the same roof. Gender of the household head, relationship to the house hold head and family structure are statistically different between both the schools. The PPP students

are more likely to be daughters of the house hold head than the public school. The gender of the house hold head is most likely to be male than the gender of the house hold head in a public school. And the PPP school student is more likely to be in a joint family than a public school student. Only gender of the house hold head showed significant coefficient when regressed with educational outcome.

We then moved to the parental information of the students; which included questions like: are you a permanent resident of Karachi, are parents alive, parents age and mothers age at the time of marriage. These variables may contribute to the change in the results. All the variables are statistically different among the schools except for the father's age. The PPP students are more likely to be the residents of Karachi than the public school students. In public schools none of the observations reported that the child is orphan while there are such observations in PPP School. The age of mother now and at the time of marriage is also expected to be higher in PPP than in the public school. Native place other than Karachi mother alive, parents age and mothers age at the time of marriage have no significant coefficient, when regressed on the educational outcomes. It is observed significantly that the students headed by their mothers in the absence of their father are performing significantly better.

The next area of concern is parent education. It probed into the computer literacy among the different family members and the parent's education. All these factors may be causing change in the educational outcomes of students except for is the child computer literate. All these variables are significantly different among the schools except for computer literacy of the students. When asked is anybody computer literate at home public school students responded more in yes than the PPP school student. Public school reported almost no mothers to be computer literate while fathers and aunt/uncle cousins as more computer literate and PPP school students showed almost similar computer literacy among the parents, cousins and aunt uncle. The public school students are reported to be more computer literate than the PPP schools.

On average the fathers of students studying at PPP School are likely to be more educated than those of public school. And it is opposite in case of mothers, mothers at public school are comparatively more educated than the mothers at public schools. When the parental education is observed in the regression setting only the computer literacy of the student reported have significant coefficient with regard to the educational outcome. We then looked into the family income and employment information. The change in these factors may cause a difference in the educational outcomes of the students. Fathers work nature, work type, self-employment status and mothers work status, nature and self-employment status differs among schools. Fathers of public school students are more likely to be self-employed, permanent and red collar at employment/work while PPP school student's fathers are less likely to be self-employed and permanent and white collar workers. While the mothers of students at public school is more likely to be working in temporary occupation and are self-employed as compared to the other schools mothers. PPP mothers are less likely to be employed, more likely to be permanent at employment and less likely to be self-employed. When plotted in the regression setting none of these have any significant coefficient. The modes of communication were also explored. We asked

for the availability of Radio Computer, TV and number of mobile phones. There is no statistical difference in the responses among the schools except for the number of mobiles. The public school students have a greater number of mobiles than the average number of mobiles owned by the household of PPP School. None of these have a significant coefficient against the academic outcomes.

Household appliances may be among the variables whose difference may trigger the gap between the educational outcomes. The appliance information we gathered are the microwave oven, iron, blender and washing machine. The response showed statistically significant difference among schools for microwave oven. Public school students reported to have more microwave ovens than the PPP school students. When seen in regression setting only iron have significant coefficient with respect to educational outcomes.

To measure the mobility's effect on educational outcomes we asked for the availability of motorcycle and car. The responses are statistically different for the availability of motorcycle and car. The public school students are more likely to own a motorcycle and car than the students in PPP School. In regression setting none of these variables have significant coefficient against the academic results. We then moved forward to home comfort asking for the availability of ceiling fan, number of beds, number of floor beds, number of chairs and tables. The responses for the number of beds are statistically different among schools. PPP school all the students are likely to have at least 1 bed though public school is likely to have less. Numbers of beds also show statistically significant coefficients against the academic outcomes.

Anthropometrics were studied asking about the place of birth, height at the time of birth, weight at the time of birth and is the child immunised. The responses were not statistically significant when compared between schools except for the immunisation. The public school students reported to be more immunised than the PPP school students. When observed against the educational outcomes the coefficient is not significant. Moving to the health outcomes it is reported that when last ill PPP school students were more likely to have been consulted from somebody and had bought the medicine than those of government school. When seen in regressed on the educational outcomes both the variables were statistically insignificant. Then we probed into the hygienic conditions. The responses to having bathed daily are significantly different among schools. The PPP school students reported not having bath daily as compared to the public school students. While asking that the washroom was well built PPP school student reported that there washroom was cemented though it was not so for most of the public school students. Similarly in case of consumption water public school students are likely to have a better quality of water than the PPP school students. None of these variables have a significant coefficient. Then we asked about the commuting of the students to school. The way one travels to school and the time one takes in getting back to normal are significantly different among the schools. The commuting vehicle has a significant coefficient against the educational outcome. It signifies two things the family have house hold resources and they are being used for the child.

While going deep into the time spend at home, we looked into broadly time was spend in working or studying, what kind of work does the child do and for how long and the siblings behaviour? The response to weather work or study and siblings

behaviour varies between schools. The students at PPP School are more likely to be spending more time studying and indifferent about sibling's behaviour; while the students at public school are less likely to be studying and are helping their siblings in studies. These variables do not show a significant coefficient in relation to the educational outcomes.

Participation in cooking food, cleaning dusting and washing dishes/clothes varies between schools. In all of these works PPP School students are less likely to participate than the public school students. It may be influenced by the intervention that the child spends more time studying and thus less in such activities. None of these have a significant coefficient to the educational outcomes.

Caloric information showed that the calorie consumption varies for the consumption of vegetables, chicken and the number of breads consumed. The PPP students are shown to be under nourished from the given data. The consumption of pulses has a negative significant relationship to the academic outcomes. The consumption of fruits has positive significant relationship. The eating habits when probed by asking questions like does the family eat together, how many meals are taken, total rice and bread cooked? These factors do not vary among the schools. And the coefficients are not statistically significant when seen in relation to the academic results. The housing characteristics are noted as the house ownership, lives in apartment or house, is registered electricity, water, gas, number of rooms and toilets, ceiling type. These factors do not vary between schools. And none of these variables are significant with respect to the academic results.

The next set of variables is the religious beliefs. It included the religion, sect, where does one pray, do you visits the religious congregation and how often do one visit the religious congregation. None of these variables are significant in relation to the educational outcomes except for where does one prays. We then explored the community characteristics which included provision of carpeted roads, sewerage lines, water lines, public tap and public latrine, and load shedding conditions, its timings, coping strategy and time wasted. Load shedding in the area, its timing and coping strategy are significantly different among schools. It is reported by some students in public schools reported not having load shedding issues in the area. And on average electricity timings of load shedding faced by public school students are less than those in PPP School. Still the public school students have access to better coping strategies. Only public taps have the positive significant coefficient in relation to the academic results. The parents desire included a set of variables like what do you expect your child to be, where do you see your child in future, would you allow your child to work and ranking a set of variables-employment, hygienic environment, being a good mother and wife, for a good marriage proposal-from most important to least important. They are not statistically different among the schools nor do they have significant relationship to the academic outcomes.

When regression is run with the set of control variables mentioned above of help provided from home, computer literacy in the family and the house hold resources. The coefficients to the treatment decreased but these are still significant. The regression with controls results are shown in Table 7.

Table 7

*Zindagi Trust—Regression Results with Controls*

|          | Math Result       | English Result    | Sum of math<br>and English<br>Result | Average of<br>Math and<br>English Result |
|----------|-------------------|-------------------|--------------------------------------|--|
| School   | 1.766*<br>(0.316) | 1.176*<br>(0.559) | 3.1*<br>(0.744)                      | 1.550*<br>(0.372)                        |
| Class    | 0.476*<br>(0.102) | 0.77*<br>(0.173)  | 1.292*<br>(0.239)                    | 0.646*<br>(0.119)                        |
| Constant | -2.708<br>(0.983) | 0.388<br>(1.581)  | -3.098<br>(2.286)                    | -1.549<br>(1.143)                        |
| Controls | Yes               | Yes               | yes                                  | Yes                                      |

Note: standard errors in parentheses.

\* p<0.05

*Hypothesis II: Impact Assessment (Zindagi Trust)*

In order to assess the program intervention, PSM model is again used to pair the students, on the basis of their household factors, among schools. Then the differences among the scores of those students were recorded. The change in educational outcomes is then attributed to the school type or the treatment provided. Math, English and their Sum was treated as the outcome variable to measure the change attributable to the treatment provided. The variables used in matching are Mother's Education, Father's Education and House type (see, Descriptive Statistics available in Table A2). The matching variables are limited in this analysis because of the limited variable's data is available in ASER data set.

Table 8

*Zindagi Trust—Average Treatment Effect on the Treated*

|              | Unobserved | ATT         |
|--------------|------------|-------------|
| Math         | 2.16*      | 2.04*       |
| t-value      | (7.31)     | (5.09)      |
| English      | 2.24*      | 0.75        |
| t-value      | (4.62)     | (0.86)      |
| Total Result | 4.42*      | 2.78*       |
| t-value      | (6.10)     | (2.56)      |
|              | Treated    | Non Treated |
| Observations | 51         | 30          |

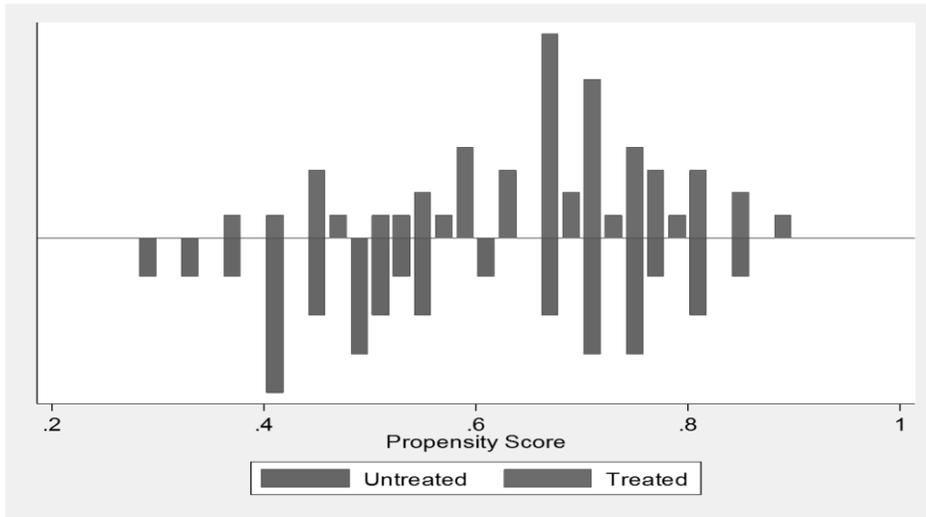
Notes: 1. Absolute values of bootstrapped t-statistics in parentheses. The first column reports un matched marks on the test and the second column is the effect on a weighted aggregate computed by using a 3-parameter item response model.

\*\* indicates significance at 1 percent level; \* indicates significance at 5 percent level; + indicates significance at 10 percent level.

The analysis remained consistent to the prior hypothesis that the provision of better school resources, environment, teachers and infrastructure would lead to better educational outcomes. The educational outcomes in partnership schools at all level are

expected to be greater than the Public schools by at least difference of two grades. The differences are also found to be significant at 5 percent level of significance (see, Table 8).

**Fig. 6. Histogram of Propensity Score Distribution for Treated and Control Groups (Zindagi Trust)**



**Fig. 7. Zindagi Trust—PS Bias across Covariates**

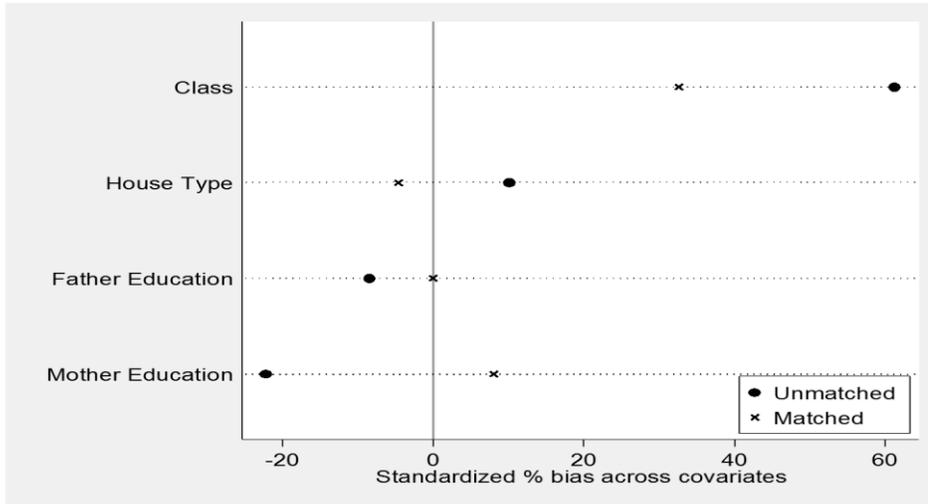


Figure 6 and Figure 7 are showing the bias correction across the covariates and the propensity score matching graph for treated and untreated observations. These figures show that the balancing property is satisfied in all the blocks with statistically insignificant difference in means between all the observed covariates in three strata of propensity scores. The Rosenbaum bounds test also confirms the same result (see, Table 9).

Table 9  
*Zindagi Trust—Rosenbaum Bounds*<sup>7</sup>

| Gamma | Math     | English  | Total Result |
|-------|----------|----------|--------------|
| 1     | 4.00E-08 | 0.048369 | 0.000034     |
| 1.05  | 8.90E-08 | 0.065273 | 0.000063     |
| 1.1   | 1.80E-07 | 0.08522  | 0.000111     |
| 1.15  | 3.50E-07 | 0.108118 | 0.000186     |
| 1.2   | 6.40E-07 | 0.133781 | 0.000297     |
| 1.25  | 1.10E-06 | 0.161947 | 0.000459     |
| 1.3   | 1.90E-06 | 0.192298 | 0.000684     |
| 1.35  | 3.00E-06 | 0.224476 | 0.000989     |
| 1.4   | 4.60E-06 | 0.258101 | 0.001392     |
| 1.45  | 7.00E-06 | 0.292792 | 0.001913     |
| 1.5   | 0.00001  | 0.328171 | 0.002571     |
| 1.55  | 0.000015 | 0.363881 | 0.003387     |
| 1.6   | 0.000021 | 0.399593 | 0.004384     |
| 1.65  | 0.000028 | 0.435006 | 0.005582     |
| 1.7   | 0.000038 | 0.469855 | 0.007003     |
| 1.75  | 0.000051 | 0.503913 | 0.008666     |
| 1.8   | 0.000067 | 0.536987 | 0.010592     |
| 1.85  | 0.000086 | 0.56892  | 0.012797     |
| 1.9   | 0.000109 | 0.599588 | 0.015299     |
| 1.95  | 0.000137 | 0.628898 | 0.018112     |
| 2     | 0.000171 | 0.656786 | 0.02125      |

### ***Robustness Check***

For robustness check purpose, we have used a number of explanatory variables for propensity score matching—like, Father Education, Mother Education, House Type, Number of household members, Number of children in household, Number of siblings, possessing an iron, gender of the household head, child weight at the time of birth. Table A2 in Appendix provides the mean and standard deviation of those variables. It is interesting to note that, these variables are not much different from each other among schools. The matching estimates shows the change in the math result, English result, sum of results and the average of results caused by the provision of treatment provided to the students. The computed pseudo R-squared is 1.82. Table 10 shows that there is a significant difference between the results on all dimensions. The subject result is expected to increase significantly by at least a grade level higher if the public school students are provided with such a treatment.

<sup>7</sup>See, bound test detail in Rosenbaum (2002).

Table 10

Zindagi Trust—Matching Results

|                    | PPP School | Public School | Differences | Standard Error | t-value |
|--------------------|------------|---------------|-------------|----------------|---------|
| Math Result        | 4.98       | 2.7           | 2.28*       | 0.345          | 6.59    |
| English Result     | 7.78       | 5.22          | 2.56*       | 0.817          | 3.13    |
| Sum of Results     | 12.76      | 7.92          | 4.84*       | 0.961          | 5.03    |
| Average of Results | 6.38       | 3.96          | 2.42*       | 0.480          | 5.03    |

\* p<0.05.

Fig. 8. Histogram of Propensity Score Distribution for Treated and Control Groups

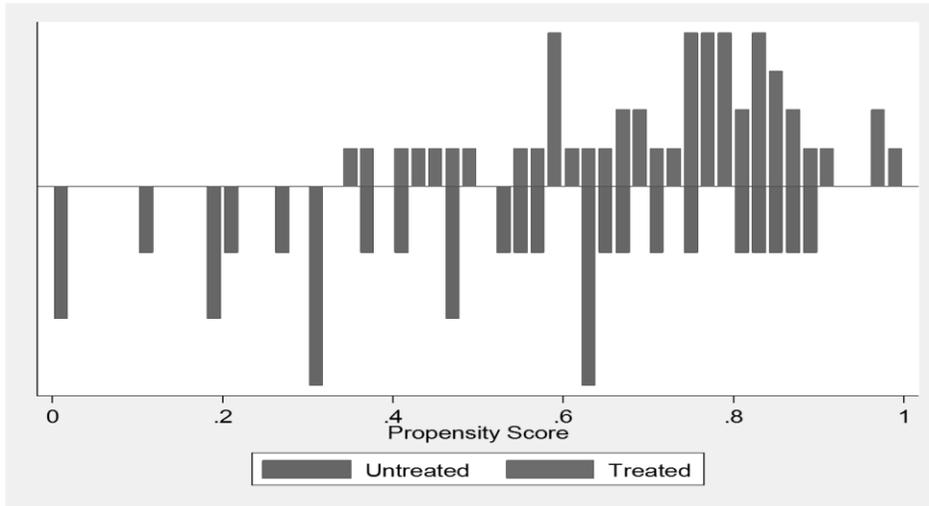


Fig. 9. Zindagi Trust—PS Bias across Covariates

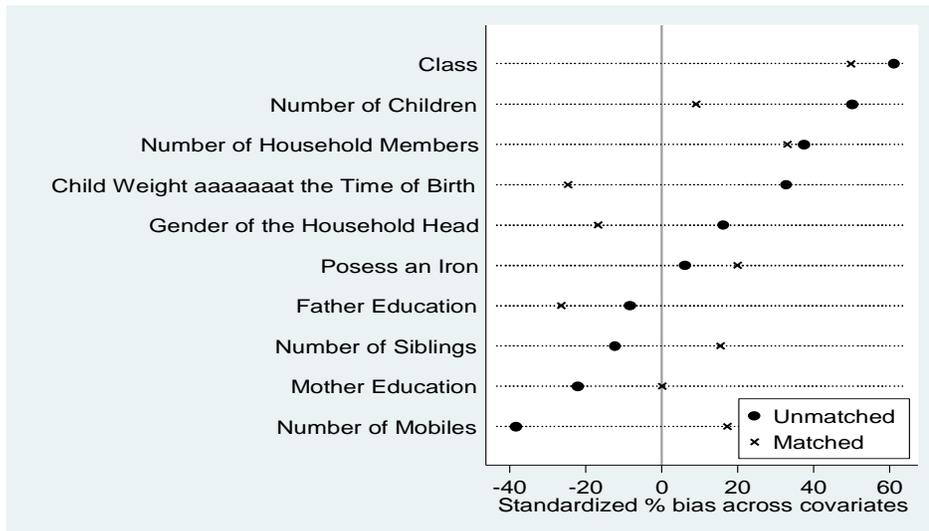


Figure 8 and Figure 9 are also showing the validity of the test conducted. This is a meagre effort to evaluate the possible traces of a way of possible quality education.

## **5. CONCLUSION**

Not having the quality education may drag one into a vicious cycle of miseries. Government mandated the free education and spending a huge share of budget on educational sector. Even than if the educational level of child is as low as 12 percent of the 5th grade students have mastered 2nd grade curriculum and 7 percent of the 6th grade students have mastered 3rd grade curriculum. Thus with the provision of infrastructure, administrative change, innovation and planning and teachers and student affairs when paired with the usual public school education would show improvement. 67 percent of the 5th grade students have mastered 2nd grade curriculum and 76 percent of the 8th grade students have mastered 3rd grade curriculum. Though, the household characteristics of students are not significantly different among PPP School and public school. On average the result are improving by a grade level and the proportion of students crossed at a certain level at PPP School is twice as much as of the public school. Perhaps, the causal effect is not fixed but the household factors which may be changed because of the intervention as the time spends on studying have increased among students. It is observed in the visits to both the school that students at PPP School were more confident and did not ask much question during the test duration. After looking a positive impact of this program intervention, it is suggested that, government in Pakistan should promote the idea of PPP in education sector and welcome donors and NGOs to play their role in promoting quality of schooling for better educational learning outcomes.

## APPENDIX

Table A1

## ASER—Descriptive Statistics

| Variable   | Total |      | Public School |      | Private School |      | Differences |      |
|--|-------|------|---------------|------|----------------|------|-------------|------|
|  | Mean  | SE   | Mean          | SE   | Mean           | SE   | Mean        | SE   |
| Child  |       |      |               |      |                |      |             |      |
| Mother Highest Class Completed                   | 2.64  | 0.01 | 1.90          | 0.01 | 4.76           | 0.02 | -2.86       | 0.02 |
| Father Highest Class Completed                   | 5.41  | 0.01 | 4.70          | 0.02 | 7.91           | 0.03 | -3.20       | 0.03 |
| Mother Age                                       | 36.22 | 0.00 | 36.99         | 0.00 | 35.95          | 0.00 | 1.05        | 0.00 |
| House Type                                       | 1.97  | 0.02 | 1.84          | 0.02 | 2.39           | 0.03 | -0.55       | 0.04 |
| School   |       |      |               |      |                |      |             |      |
| Current Class Grade                              | 4.35  | 0.01 | 4.34          | 0.01 | 4.41           | 0.01 | -0.07       | 0.01 |
| Institute Type                                   | 1.33  | 0.00 | 1.00          | 0.00 | 2.00           | 0.00 | -1.00       | 0.00 |
| Reading Highest level                            | 3.64  | 0.00 | 3.55          | 0.00 | 3.90           | 0.01 | -0.35       | 0.01 |
| Is Bonus Question 1 Answered                     | 0.90  | 0.00 | 0.89          | 0.00 | 0.91           | 0.00 | -0.02       | 0.00 |
| Is Bonus Question 2 Answered                     | 0.88  | 0.00 | 0.87          | 0.00 | 0.89           | 0.00 | -0.02       | 0.00 |
| Math Highest level                               | 3.61  | 0.00 | 3.51          | 0.00 | 3.87           | 0.01 | -0.36       | 0.01 |
| English Reading Highest level                    | 3.64  | 0.00 | 3.50          | 0.00 | 4.00           | 0.01 | -0.50       | 0.01 |
| Is Know Words                                    | 0.77  | 0.00 | 0.76          | 0.00 | 0.80           | 0.00 | -0.04       | 0.00 |
| Is Know Sentences                                | 0.83  | 0.00 | 0.82          | 0.00 | 0.85           | 0.00 | -0.03       | 0.00 |
| Tell Time  | 0.71  | 0.00 | 0.71          | 0.00 | 0.71           | 0.00 | 0.00        | 0.00 |
| Word Problem                                     | 0.63  | 0.00 | 0.61          | 0.00 | 0.67           | 0.00 | -0.06       | 0.00 |
| Can Name   | 0.76  | 0.01 | 0.73          | 0.01 | 0.82           | 0.01 | -0.09       | 0.01 |
| Is Bonus Question 1 Answered*5                   | 4.50  | 0.01 | 4.46          | 0.01 | 4.57           | 0.01 | -0.10       | 0.02 |
| Is Bonus Question 2 Answered*5                   | 4.39  | 0.01 | 4.35          | 0.01 | 4.46           | 0.01 | -0.11       | 0.02 |
| Is Know Words*5                                  | 3.86  | 0.01 | 3.80          | 0.01 | 3.99           | 0.01 | -0.19       | 0.02 |
| Is Know Sentences*5                              | 4.16  | 0.01 | 4.10          | 0.01 | 4.25           | 0.01 | -0.15       | 0.01 |
| Tell Time*5                                      | 3.57  | 0.01 | 3.57          | 0.01 | 3.57           | 0.02 | 0.00        | 0.02 |
| Word Problem*5                                   | 3.14  | 0.01 | 3.04          | 0.01 | 3.33           | 0.01 | -0.29       | 0.02 |
| Can Name*5                                       | 3.80  | 0.00 | 3.66          | 0.00 | 4.09           | 0.01 | -0.43       | 0.01 |
| Result   | 3.03  | 0.00 | 2.92          | 0.00 | 3.31           | 0.01 | -0.39       | 0.01 |
| Province   | 2.36  | 0.00 | 2.44          | 0.00 | 4.00           | 0.01 | -1.55       | 0.01 |
| Punjab Result                                    | 3.24  | 0.01 | 3.24          | 0.01 | 2.13           | 0.01 | -1.11       | 0.01 |
| Sindh Result                                     | 2.40  | 0.01 | 2.30          | 0.01 | 3.02           | 0.02 | -0.75       | 0.03 |
| Balochistan Result                               | 2.80  | 0.01 | 2.75          | 0.01 | 3.25           | 0.02 | -0.50       | 0.03 |
| Khyber Pakhtunkhwa Result                        | 3.04  | 0.01 | 2.97          | 0.01 | 3.58           | 0.03 | -0.60       | 0.03 |
| Punjab Reading Highest Level                     | 3.83  | 0.01 | 3.83          | 0.01 | 3.23           | 0.01 | 0.60        | 0.02 |
| Sindh Reading Highest Level                      | 3.13  | 0.01 | 3.04          | 0.01 | 3.84           | 0.02 | -0.80       | 0.02 |
| Balochistan Reading Highest Level                | 3.37  | 0.01 | 3.34          | 0.01 | 3.96           | 0.03 | -0.62       | 0.03 |
| Khyber Pakhtunkhwa Reading Highest Level         | 3.61  | 0.01 | 3.56          | 0.01 | 3.79           | 0.01 | -0.23       | 0.02 |
| Punjab Math Highest Level                        | 3.74  | 0.01 | 3.74          | 0.01 | 3.76           | 0.01 | -0.01       | 0.02 |
| Sindh Math Highest Level                         | 2.97  | 0.01 | 2.87          | 0.01 | 3.64           | 0.02 | -0.78       | 0.03 |
| Balochistan Math Highest Level                   | 3.32  | 0.01 | 3.29          | 0.01 | 3.80           | 0.03 | -0.51       | 0.03 |
| Khyber Pakhtunkhwa Math Highest Level            | 3.71  | 0.01 | 3.67          | 0.01 | 3.85           | 0.01 | -0.18       | 0.02 |
| Punjab English Reading Highest Level             | 3.84  | 0.01 | 3.82          | 0.01 | 3.89           | 0.01 | -0.07       | 0.02 |
| Sindh English Reading Highest Level              | 2.76  | 0.01 | 2.61          | 0.01 | 3.72           | 0.02 | -1.11       | 0.03 |
| Balochistan English Reading Highest Level        | 3.28  | 0.01 | 3.24          | 0.01 | 4.03           | 0.03 | -0.79       | 0.03 |
| Khyber Pakhtunkhwa English Reading Highest Level | 3.76  | 0.01 | 3.69          | 0.01 | 3.95           | 0.01 | -0.25       | 0.02 |
| Cities   | 2.57  | 0.01 | 2.94          | 0.02 | 2.44           | 0.01 | 0.50        | 0.02 |
| Lahore Result                                    | 3.51  | 0.03 | 3.51          | 0.05 | 3.54           | 0.04 | -0.02       | 0.07 |
| Karachi Result                                   | 3.48  | 0.01 | 3.04          | 0.03 | 3.57           | 0.02 | -0.53       | 0.03 |
| Quetta Result                                    | 3.79  | 0.03 | 3.81          | 0.04 | 3.76           | 0.04 | 0.05        | 0.06 |
| Peshawar result                                  | 3.25  | 0.03 | 3.24          | 0.05 | 3.27           | 0.04 | -0.04       | 0.07 |
| Islamabad Result                                 | 3.64  | 0.03 | 3.83          | 0.04 | 3.40           | 0.05 | 0.42        | 0.06 |
| Lahore Reading Highest Level                     | 4.06  | 0.03 | 4.06          | 0.05 | 4.08           | 0.05 | -0.02       | 0.07 |
| Karachi Reading Highest Level                    | 4.12  | 0.01 | 3.73          | 0.03 | 4.21           | 0.01 | -0.47       | 0.03 |
| Quetta Reading Highest Level                     | 4.18  | 0.03 | 4.26          | 0.03 | 4.10           | 0.04 | 0.16        | 0.05 |
| Peshawar Reading Highest Level                   | 4.04  | 0.02 | 4.03          | 0.03 | 4.04           | 0.03 | -0.01       | 0.04 |
| Islamabad Reading Highest Level                  | 3.91  | 0.03 | 4.08          | 0.04 | 3.70           | 0.05 | 0.38        | 0.06 |
| Lahore Math Highest Level                        | 3.97  | 0.03 | 3.96          | 0.05 | 4.00           | 0.05 | -0.04       | 0.07 |
| Karachi Math Highest Level                       | 4.05  | 0.01 | 3.59          | 0.03 | 4.14           | 0.01 | -0.55       | 0.03 |
| Quetta Math Highest Level                        | 4.06  | 0.02 | 4.08          | 0.03 | 4.04           | 0.04 | -0.04       | 0.05 |
| Peshawar Math Highest Level                      | 4.05  | 0.02 | 4.02          | 0.03 | 4.08           | 0.03 | -0.06       | 0.04 |
| Islamabad Math Highest Level                     | 4.05  | 0.03 | 4.21          | 0.03 | 3.84           | 0.04 | 0.37        | 0.05 |
| Lahore English Reading Highest Level             | 4.14  | 0.03 | 4.11          | 0.05 | 4.20           | 0.04 | -0.09       | 0.06 |
| Karachi English Reading Highest Level            | 4.15  | 0.01 | 3.75          | 0.03 | 4.24           | 0.01 | -0.48       | 0.03 |
| Quetta English Reading Highest Level             | 4.33  | 0.02 | 4.31          | 0.03 | 4.35           | 0.03 | -0.03       | 0.04 |
| Peshawar English Reading Highest Level           | 4.09  | 0.02 | 4.07          | 0.03 | 4.11           | 0.03 | -0.03       | 0.04 |
| Islamabad English Reading Highest Level          | 4.13  | 0.03 | 4.31          | 0.03 | 3.90           | 0.04 | 0.41        | 0.05 |

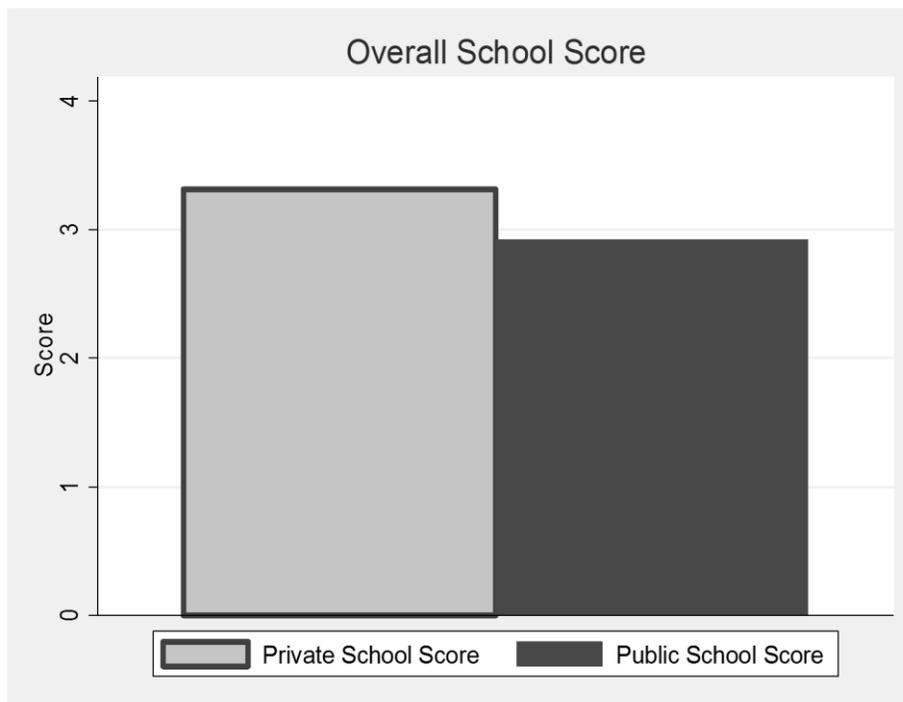
Data Source: ASER Pakistan, 2014 (<http://www.aserpakistan.org>)

Table A2  
Zindagi Trust—Descriptive Statistics

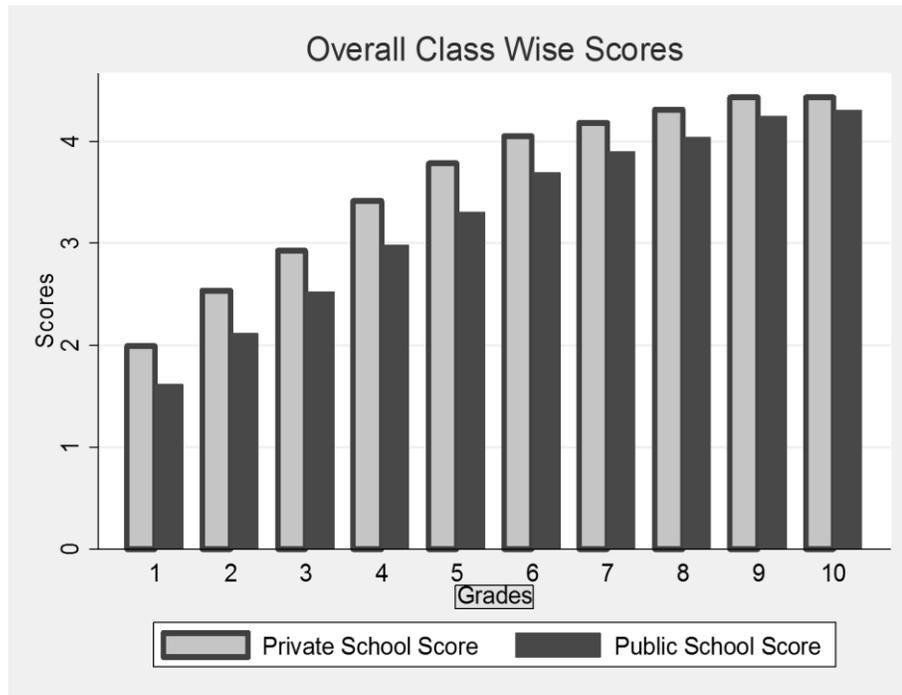
| Variable                          | Total |       | Public School |      | Partnership School |      | Differences |      |
|-----------------------------------|-------|-------|---------------|------|--------------------|------|-------------|------|
|                                   | Mean  | SE    | Mean          | SE   | Mean               | SE   | Mean        | SE   |
| <b>Child</b>                      |       |       |               |      |                    |      |             |      |
| Father Education                  | 2.68  | 0.09  | 2.76          | 0.18 | 2.65               | 0.10 | 0.10        | 0.22 |
| Mother Education                  | 2.58  | 0.09  | 2.79          | 0.20 | 2.52               | 0.09 | 0.27        | 0.20 |
| House Type                        | 1.78  | 0.03  | 1.75          | 0.07 | 1.79               | 0.03 | -0.04       | 0.08 |
| Number of house hold members      | 7.16  | 3.46  | 6.52          | 1.75 | 7.69               | 4.35 | -1.16       | 0.61 |
| Number of children in house holds | 4.11  | 2.173 | 3.60          | 2.22 | 4.53               | 2.06 | -0.93       | 0.44 |
| Number of siblings                | 4.63  | 1.528 | 4.73          | 1.27 | 4.55               | 1.72 | 0.19        | 0.26 |
| Possessing an iron                | 0.948 | 0.222 | 0.95          | 0.22 | 0.95               | 0.23 | 0.01        | 0.34 |
| Number of mobiles at home         | 2.6   | 2.176 | 3.03          | 2.18 | 2.33               | 2.15 | 0.70        | 0.35 |
| Gender of the household head      | 0.85  | 0.358 | 0.82          | 0.39 | 0.87               | 0.34 | -0.05       | 0.58 |
| Child weight at the time of birth | 2.022 | 0.58  | 1.91          | 0.56 | 2.09               | 0.59 | -0.18       | 0.11 |
| <b>School</b>                     |       |       |               |      |                    |      |             |      |
| Class                             | 6.74  | 0.11  | 6.07          | 0.22 | 6.95               | 0.12 | -0.88       | 0.25 |
| Result                            | 10.86 | 0.42  | 8.39          | 0.48 | 12.81              | 0.52 | -0.42       | 0.72 |
| Math Result                       | 4.01  | 0.18  | 2.82          | 0.14 | 4.98               | 0.24 | -2.16       | 0.30 |
| English Result                    | 17.24 | 0.63  | 13.61         | 0.98 | 19.50              | 0.70 | -5.89       | 1.18 |

Data Source: SMB Fatima School, 2014 (<http://www.zindagitrust.org>)

Fig. A1. ASER—Overall School Score (on average)

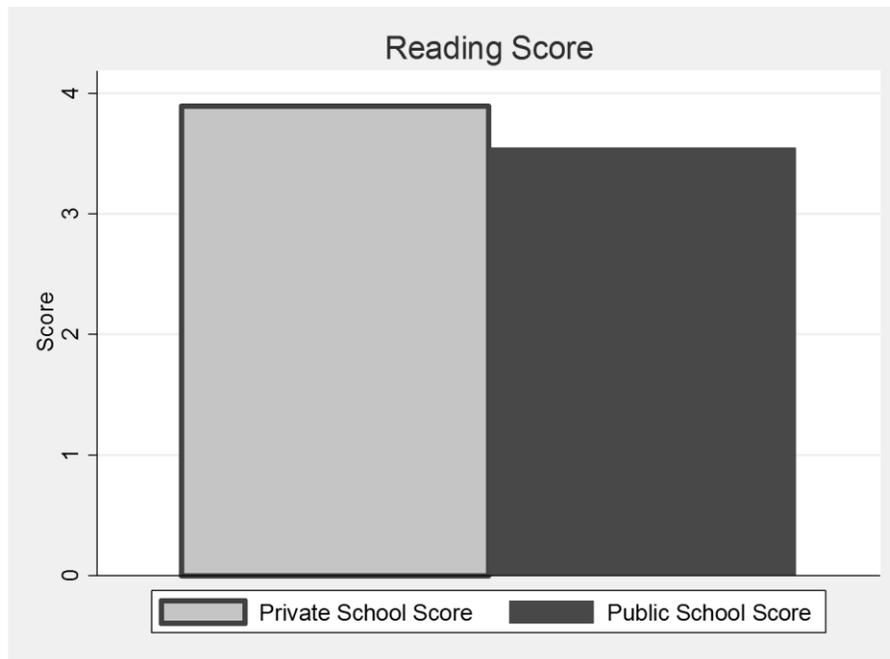


**Fig. A2. ASER—School Score (on average)**

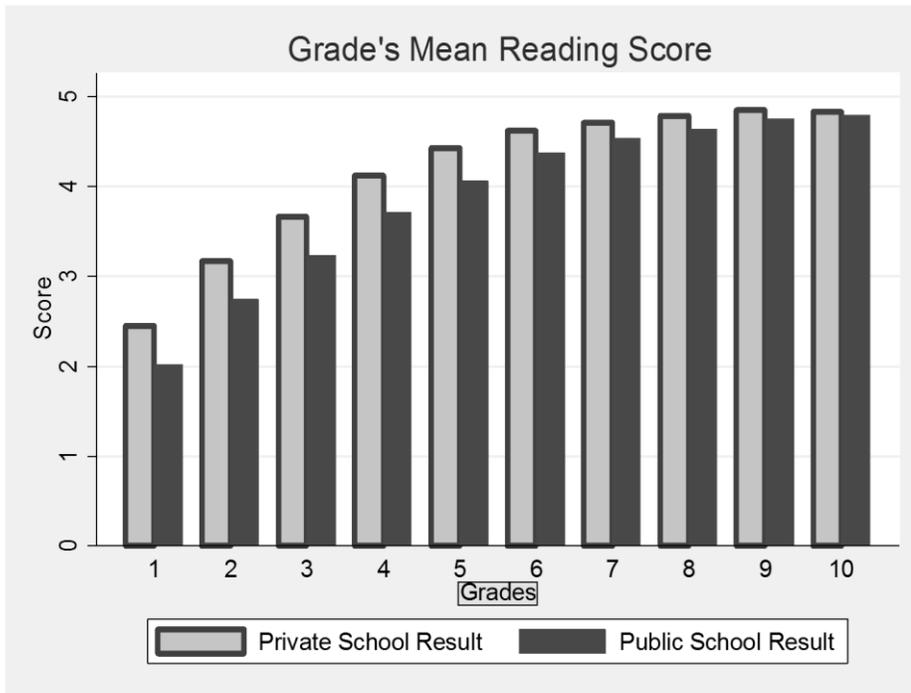


Data Source: ASER Pakistan (2014).

**Fig. A3. ASER—Overall Reading Score (on average)**

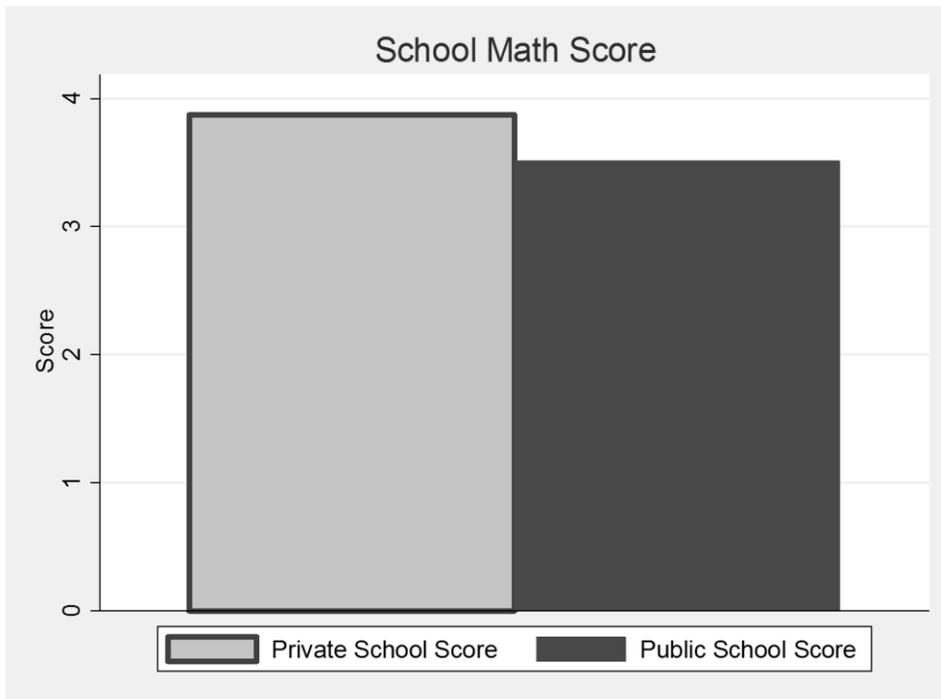


**Fig. A4. ASER—Reading Score (on average)**

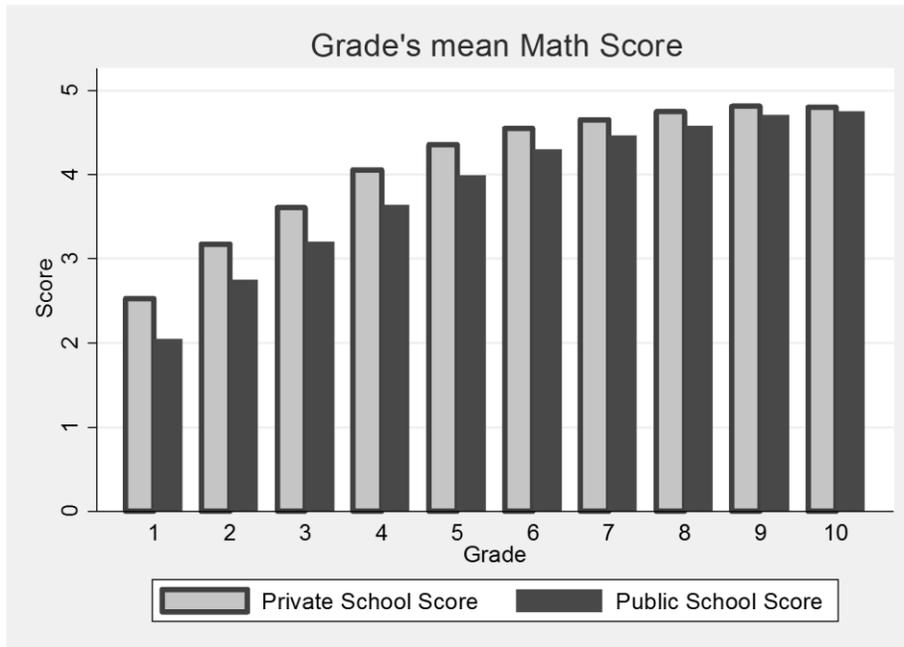


Data Source: ASER Pakistan (2014).

**Fig. A5. ASER—Overall Math Score (on average)**

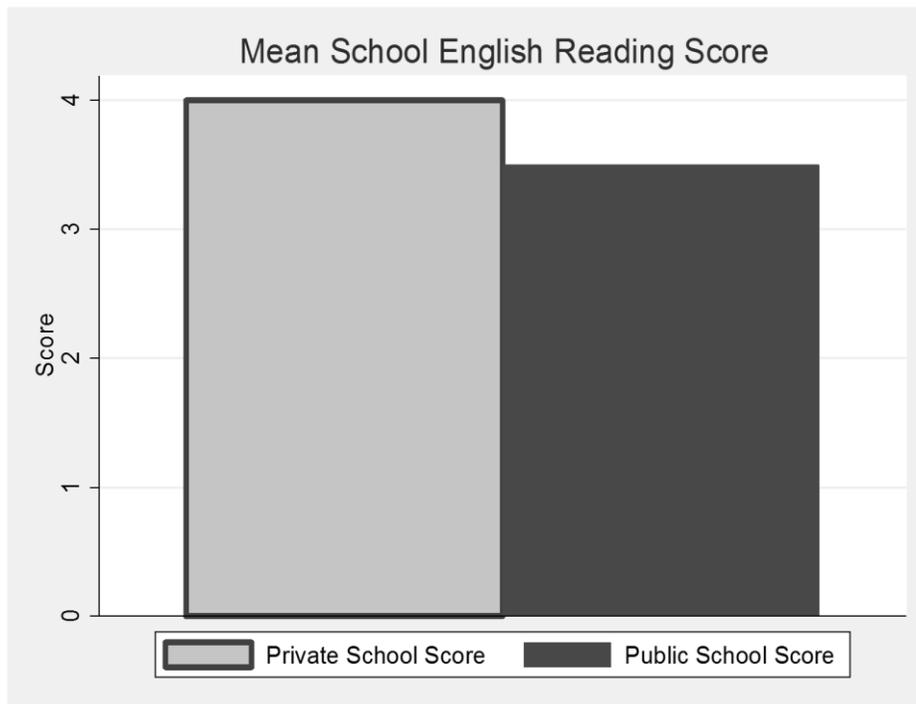


**Fig. A6. ASER—Math Score (on average)**

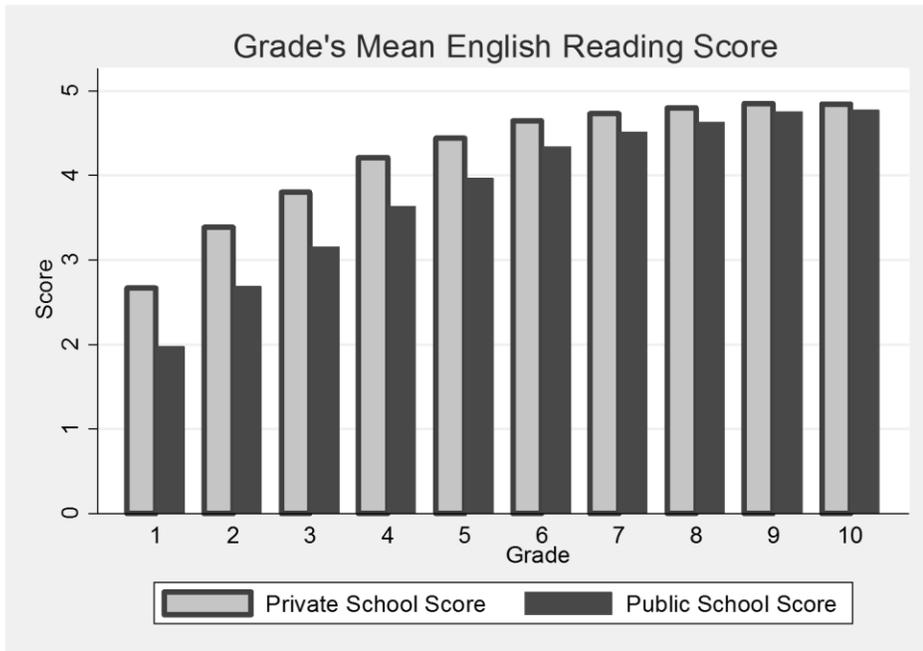


Data Source: ASER Pakistan (2014).

**Fig. A7. ASER—Overall English Reading Score (on average)**

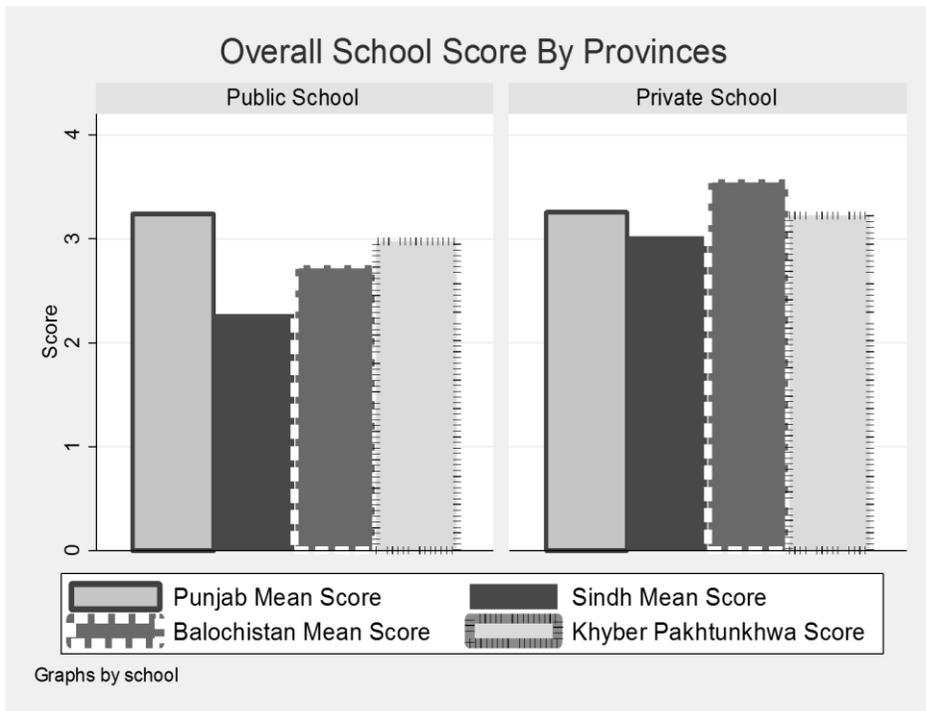


**Fig. A8: ASER – English Reading Score (on average)**



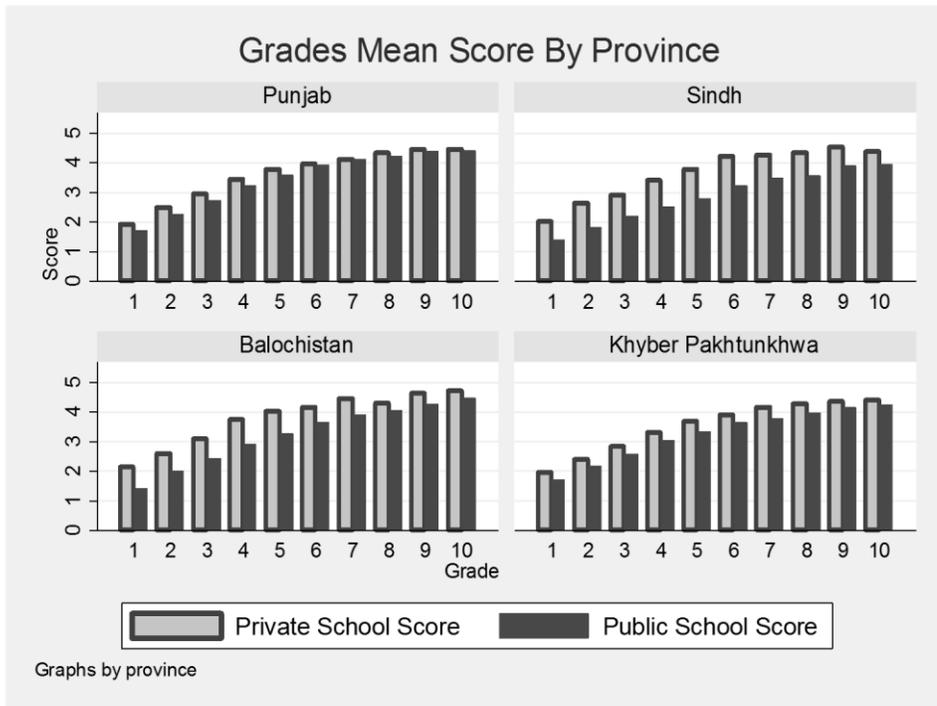
Data Source: ASER Pakistan (2014).

**Fig. A9. ASER—Overall School Score by Province (on average)**



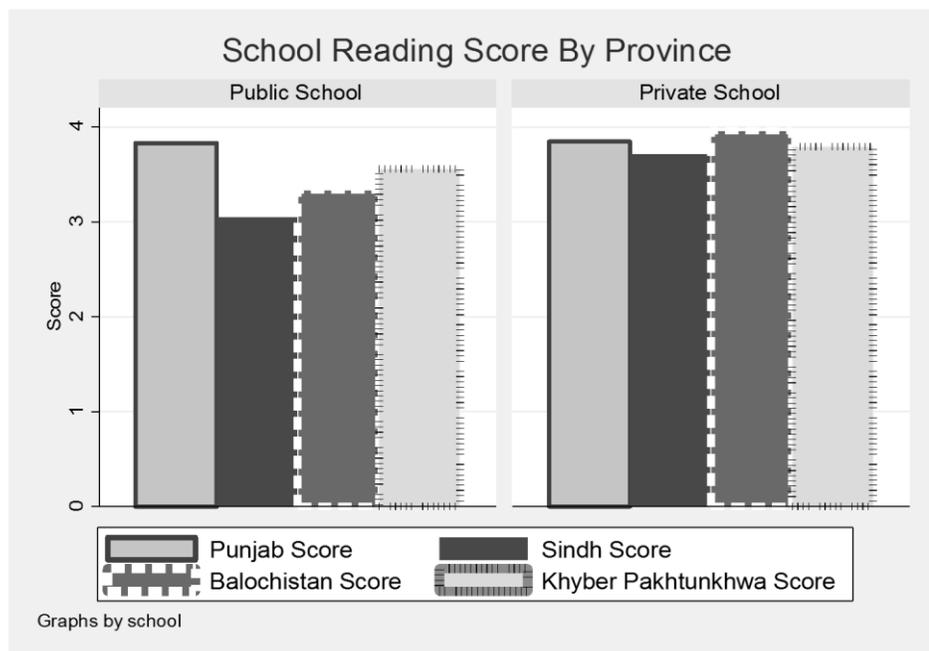
Graphs by school

**Fig. A10. ASER—School Score by Province (on average)**

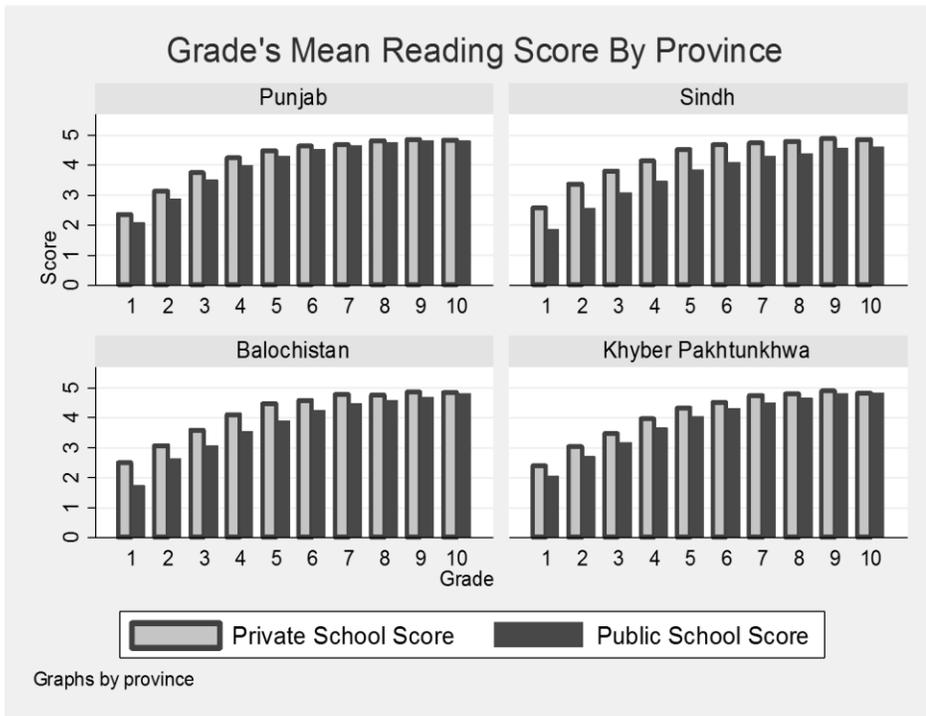


Data Source: ASER Pakistan (2014).

**Fig. A11. ASER—Overall Reading Score by Province (on average)**

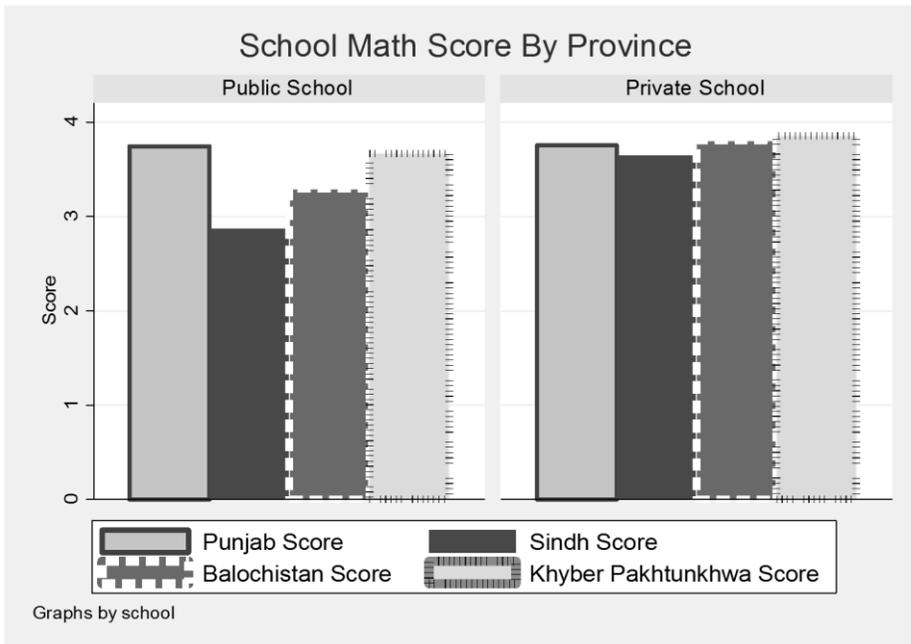


**Fig. A12. ASER—Reading Score by Province (on average)**

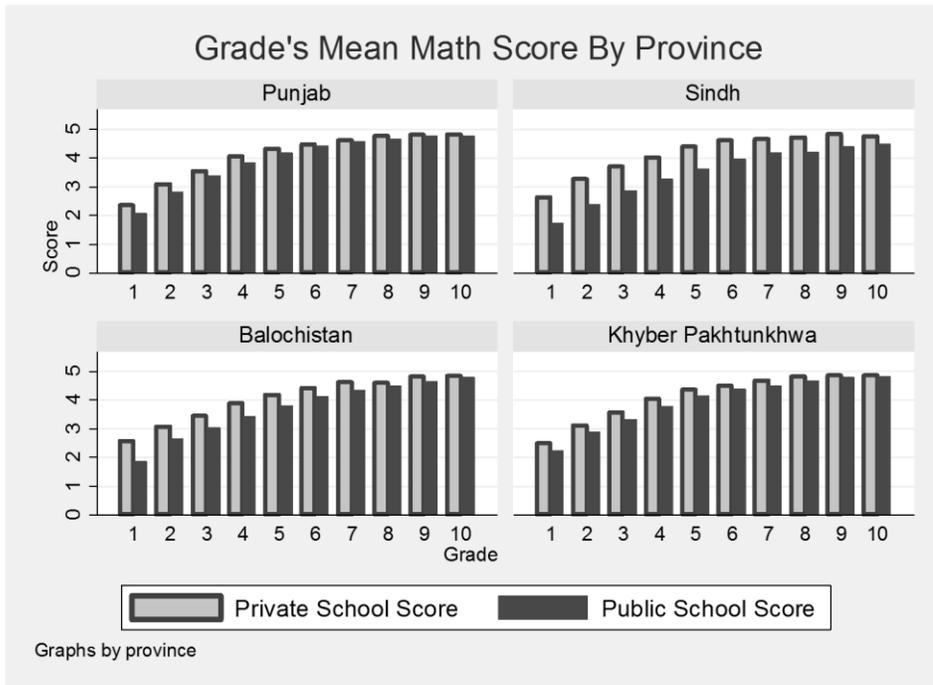


Data Source: ASER Pakistan (2014).

**Fig. A13. ASER—Overall Math Score by Province (on average)**

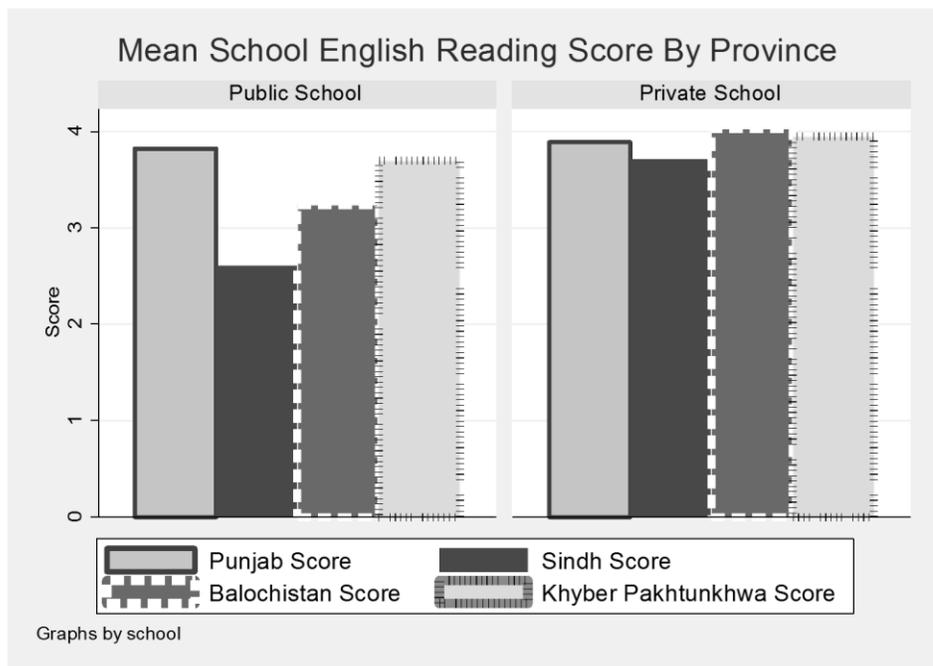


**Fig. A14. ASER—Math Score by Province (on average)**

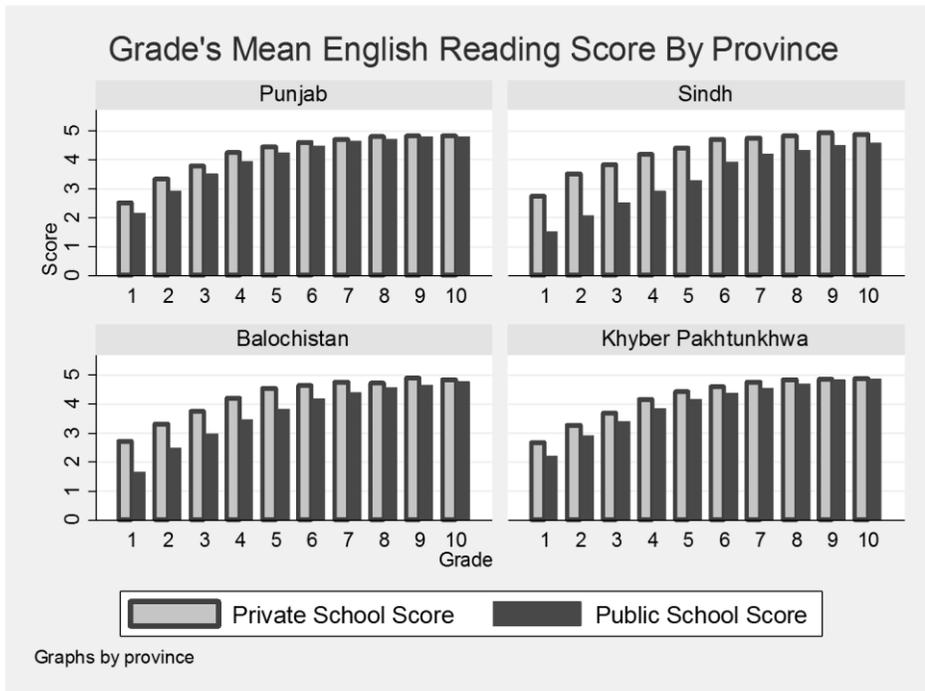


Data Source: ASER Pakistan (2014).

**Fig. A15. ASER—Overall English Reading Score by Province (on average)**

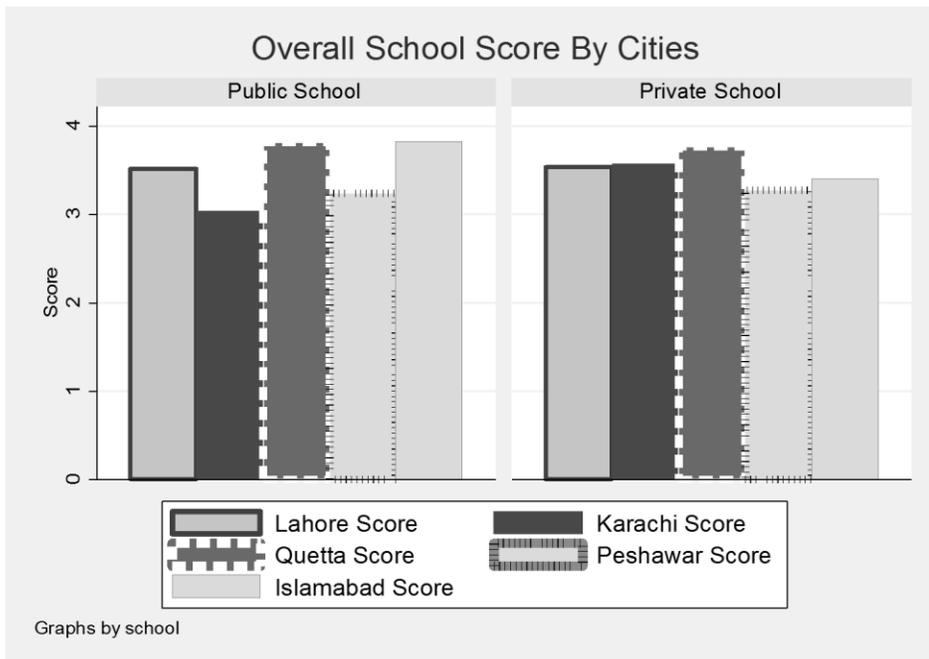


**Fig. A16. ASER—Overall English Reading Score by Province (on average)**

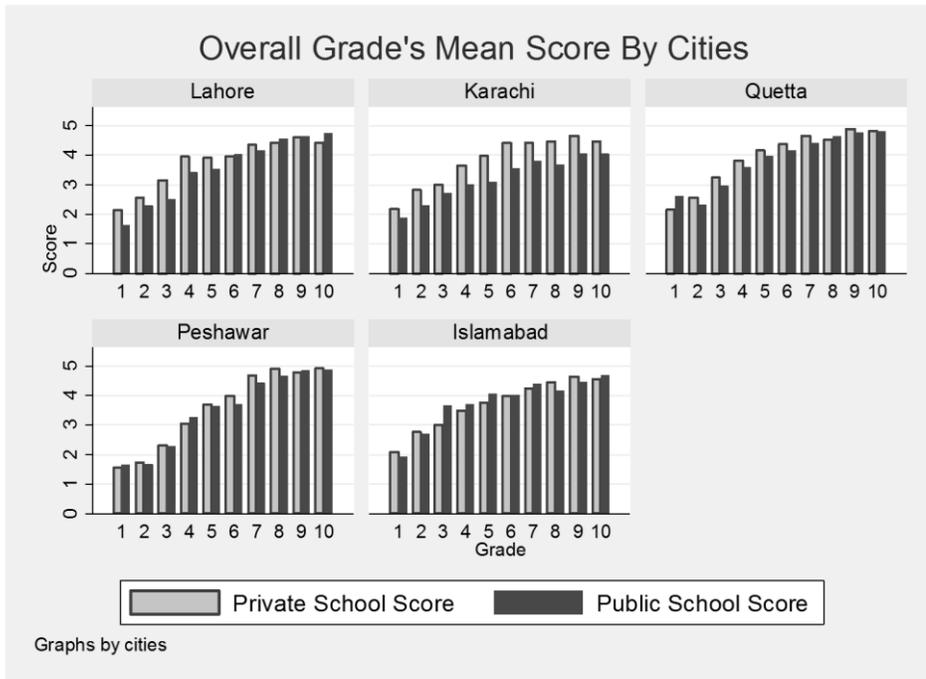


Data Source: ASER Pakistan, 2014

**Fig. A17. ASER—Overall School Score by Cities (on average)**

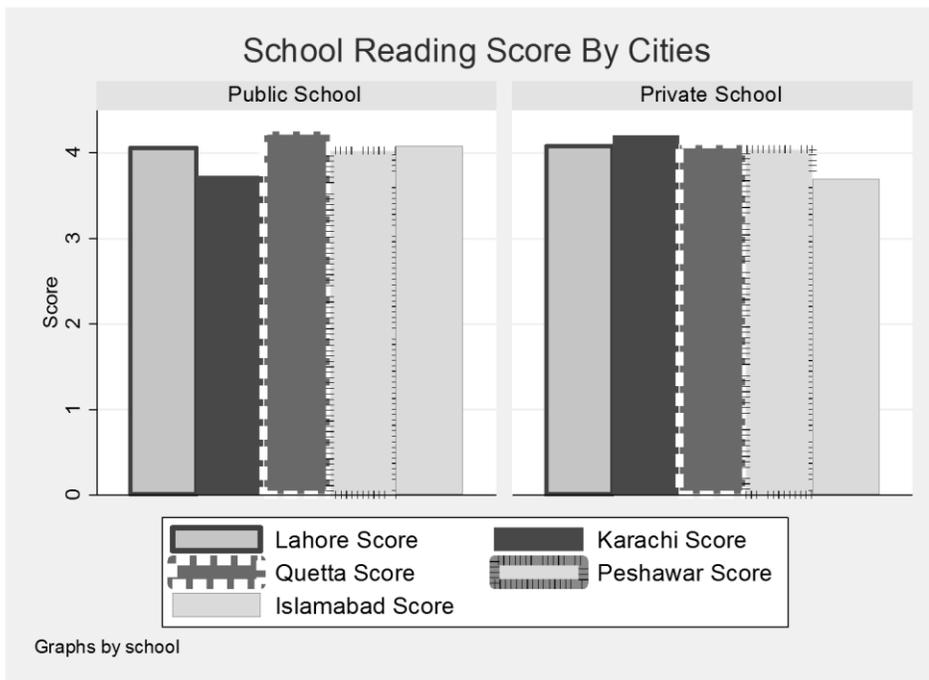


**Fig. A18. ASER—School Score by Cities (on average)**

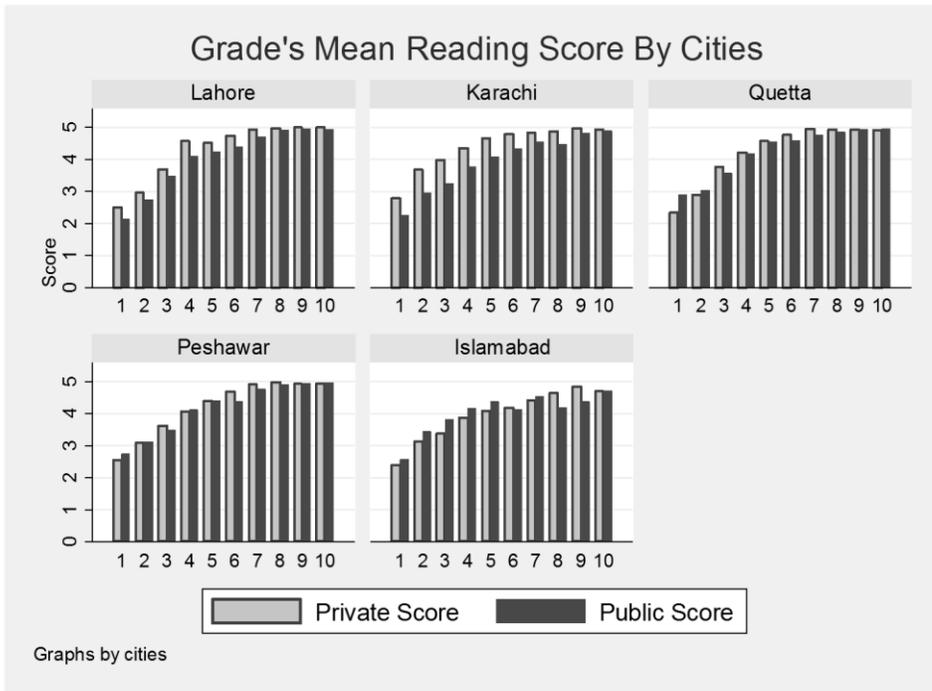


Data Source: ASER Pakistan (2014).

**Fig. A19. ASER – Overall Reading Score by Cities (on average)**



**Fig. A20. ASER—Reading Score by Cities (on average)**



Data Source: ASER Pakistan (2014).

**Fig. A21. ASER—Overall Math Score by Cities (on average)**

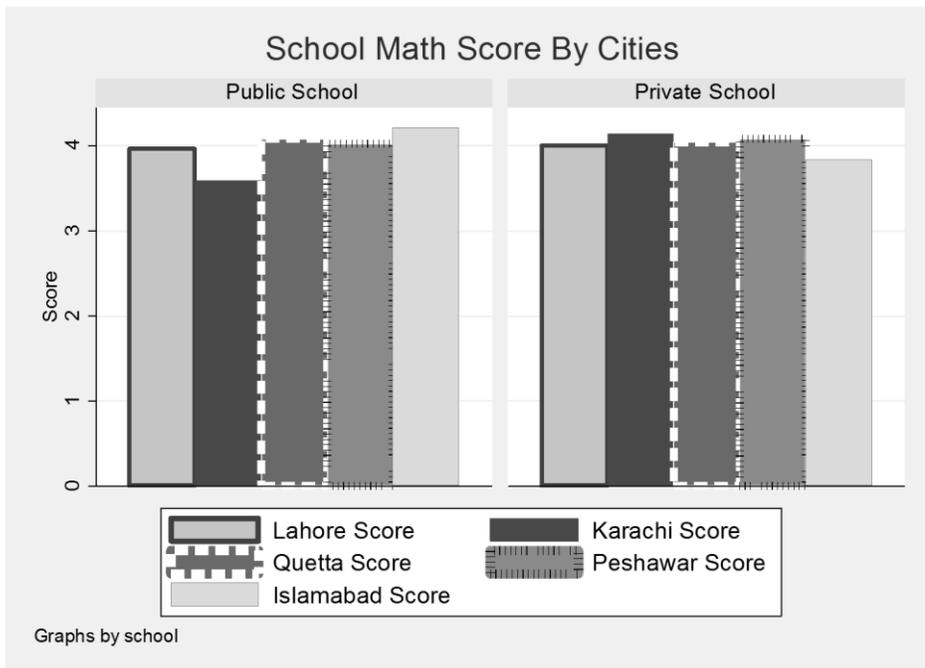
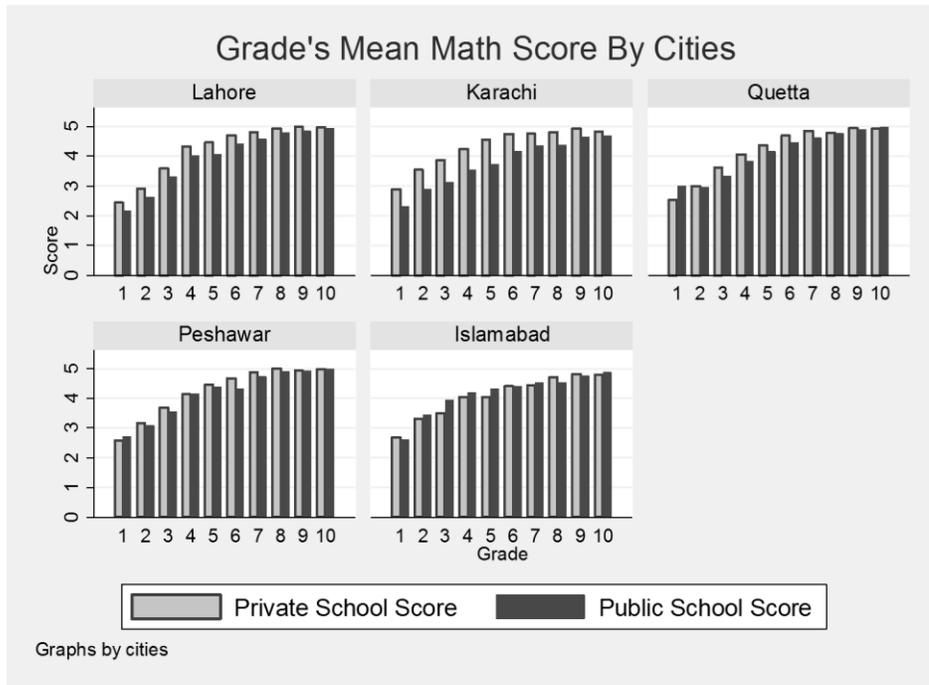
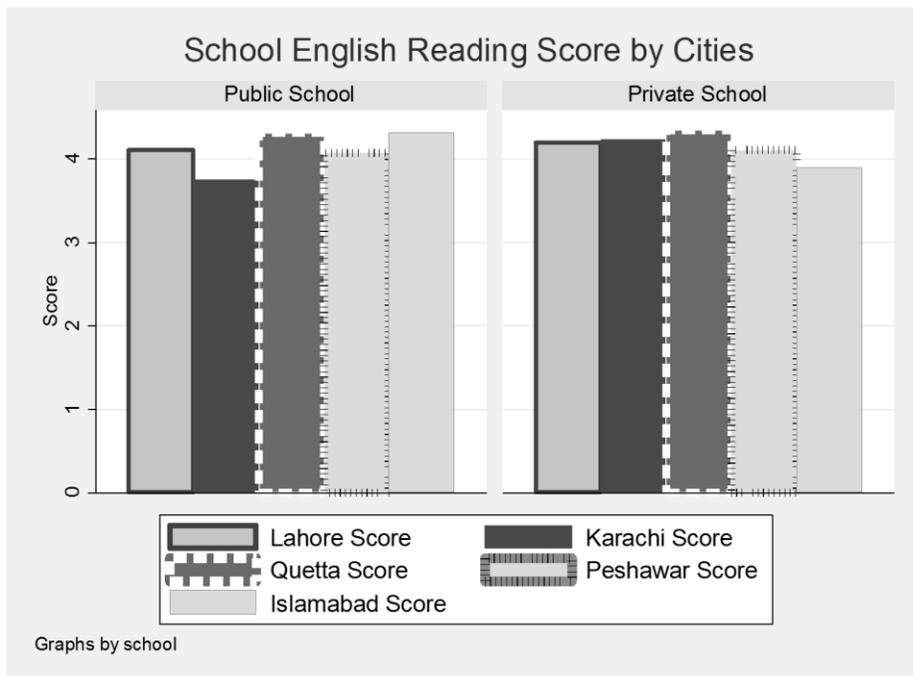


Figure A22: ASER – Math Score by Cities (on average)

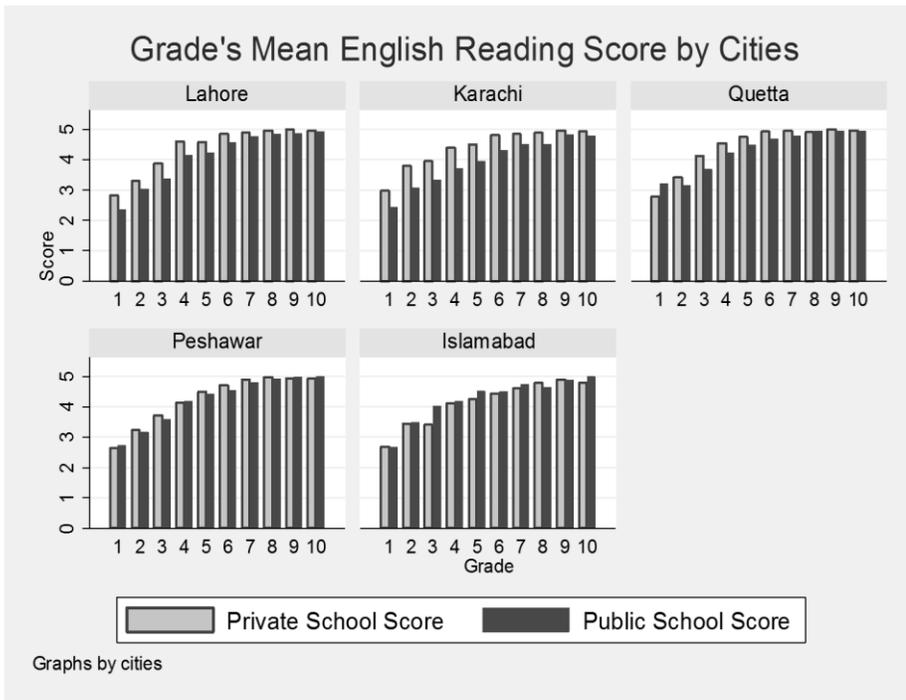


Data Source: ASER Pakistan (2014).

Fig. A23. ASER—Overall English Reading Score by Cities (on average)

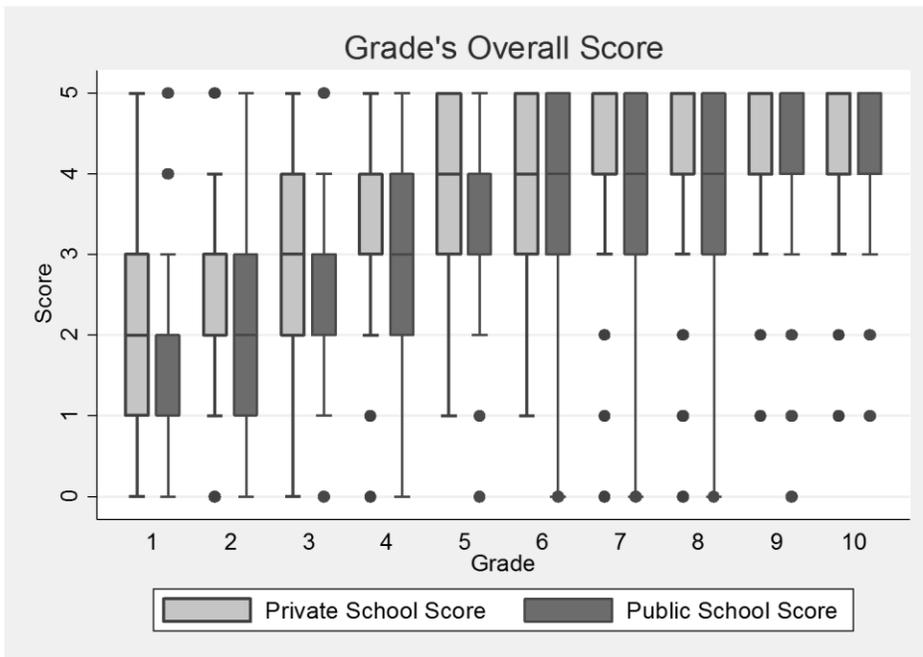


**Fig. A24. ASER—English Reading Score by Cities (on average)**

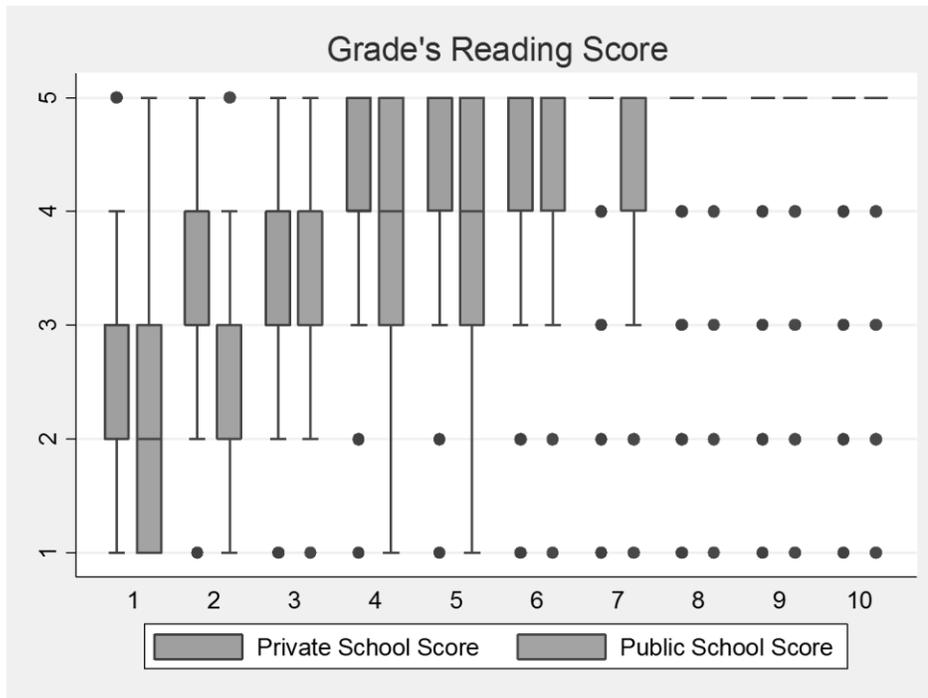


Data Source: ASER Pakistan (2014).

**Fig. A25. ASER—Overall School Score**

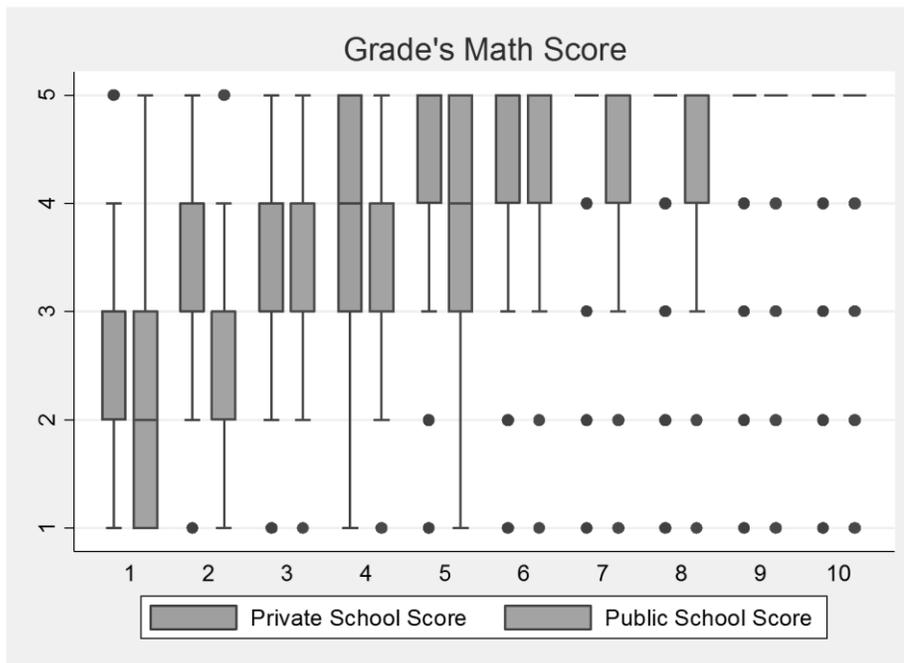


**Fig. A26. ASER—Overall Reading Score**

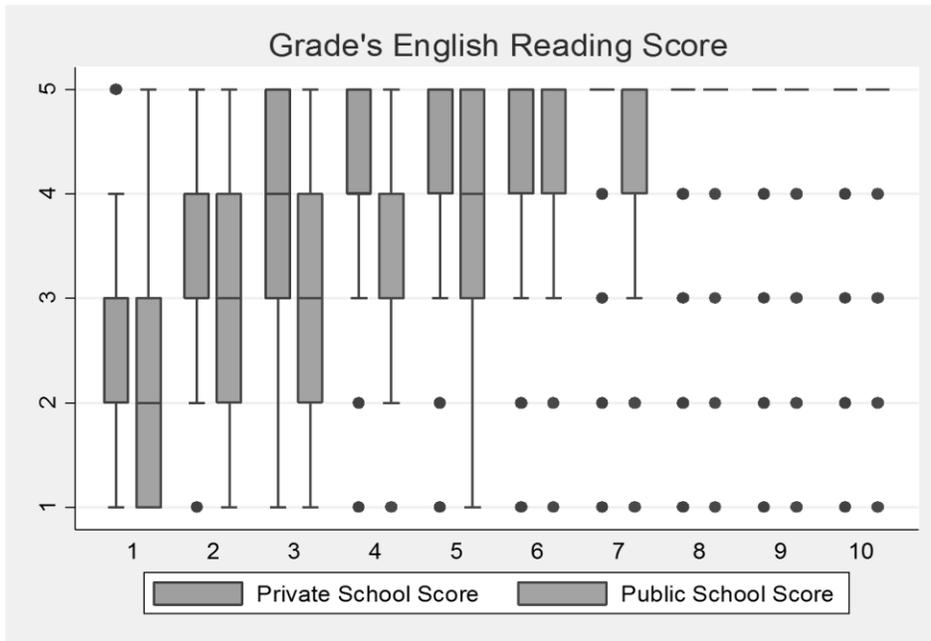


Data Source: ASER Pakistan (2014).

**Fig. A27. ASER—Overall Math Score**

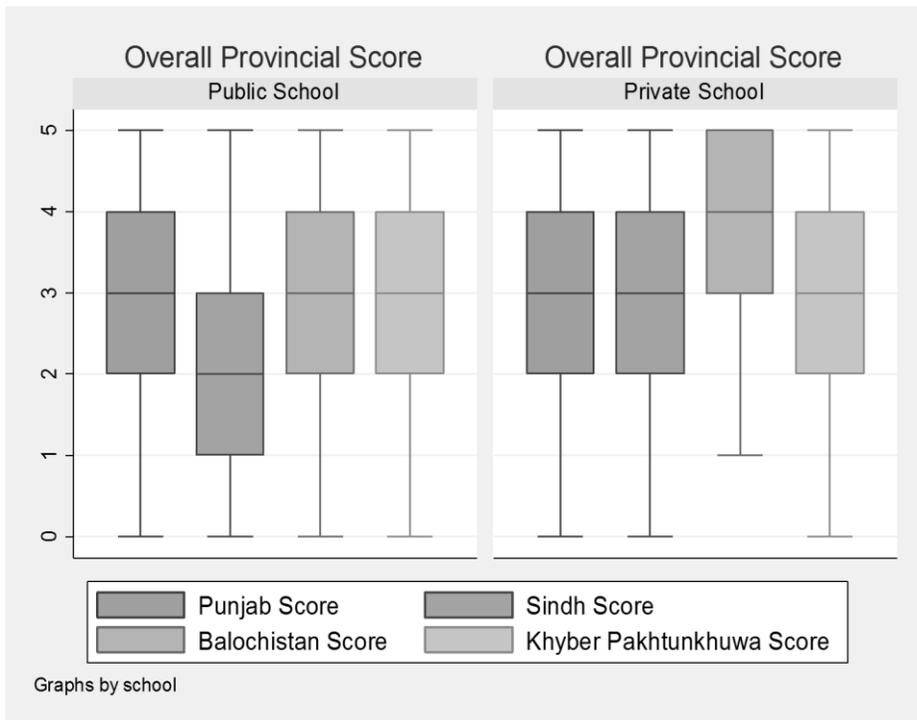


**Fig. A28. ASER—Overall English Reading Score**



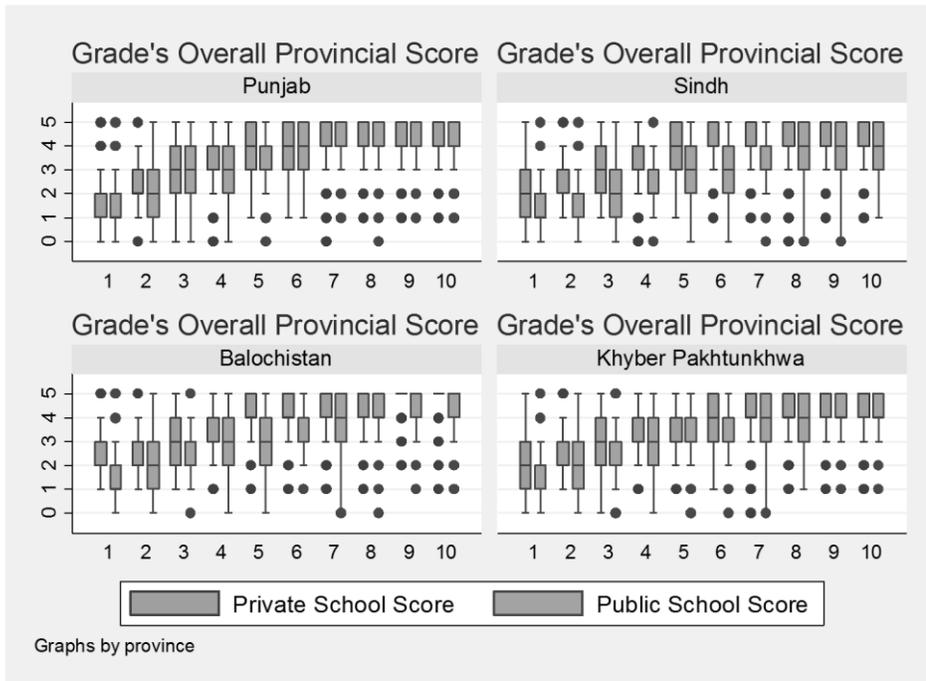
Data Source: ASER Pakistan (2014).

**Fig. A29. ASER—Overall Score by Province**



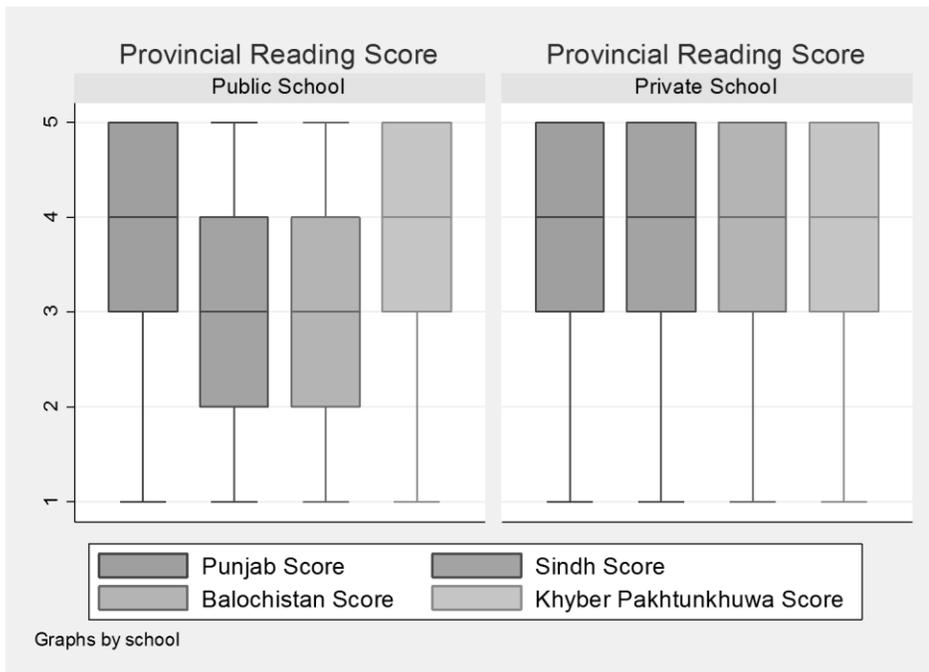
Graphs by school

**Fig. A30. ASER—Score by Province**

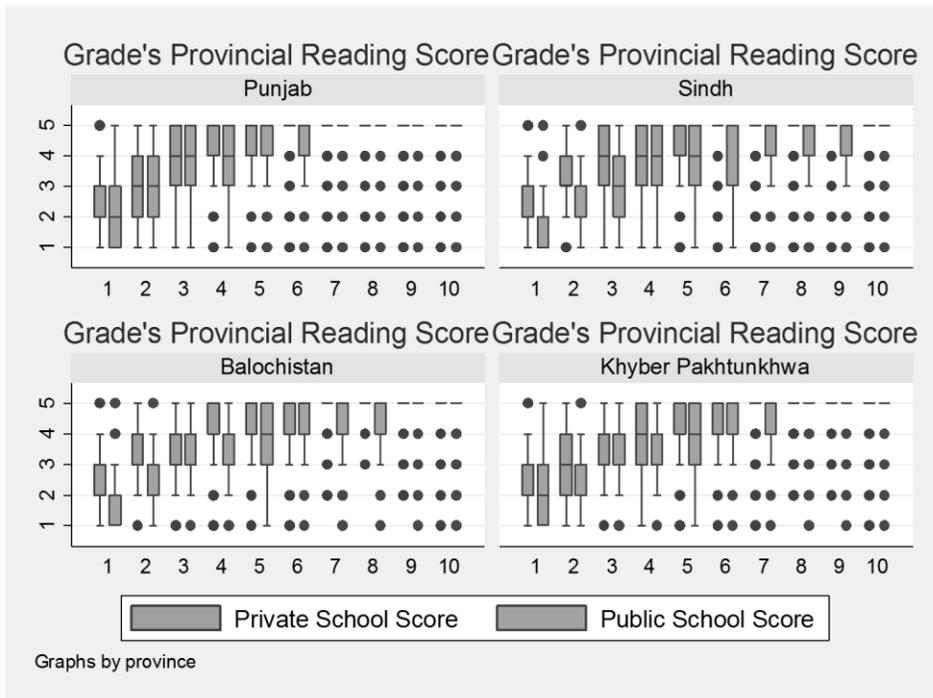


Data Source: ASER Pakistan (2014).

**Fig. A31. ASER—Overall Reading Score by Province**

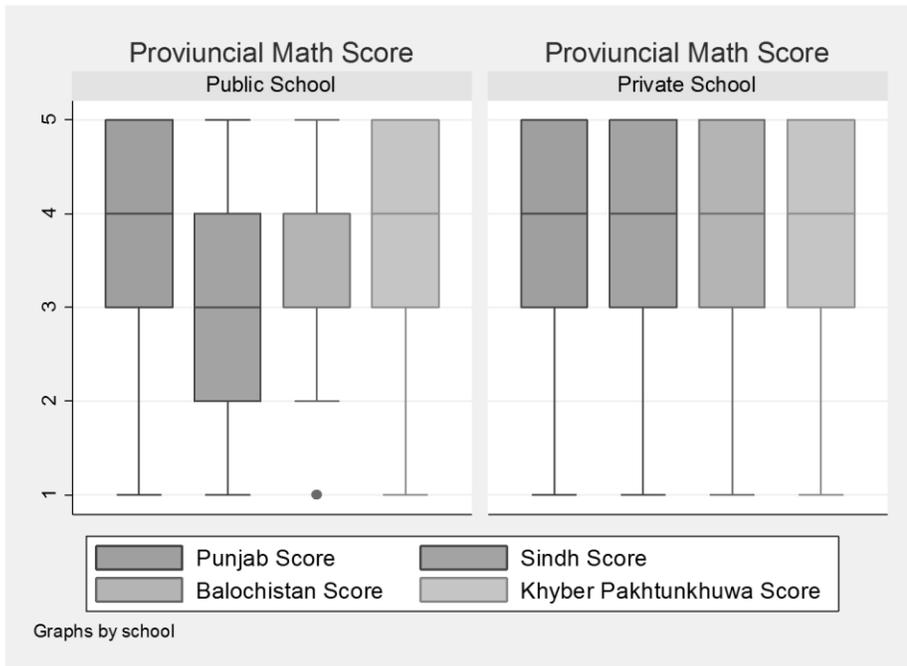


**Fig. A32. ASER—Reading Score by Province**

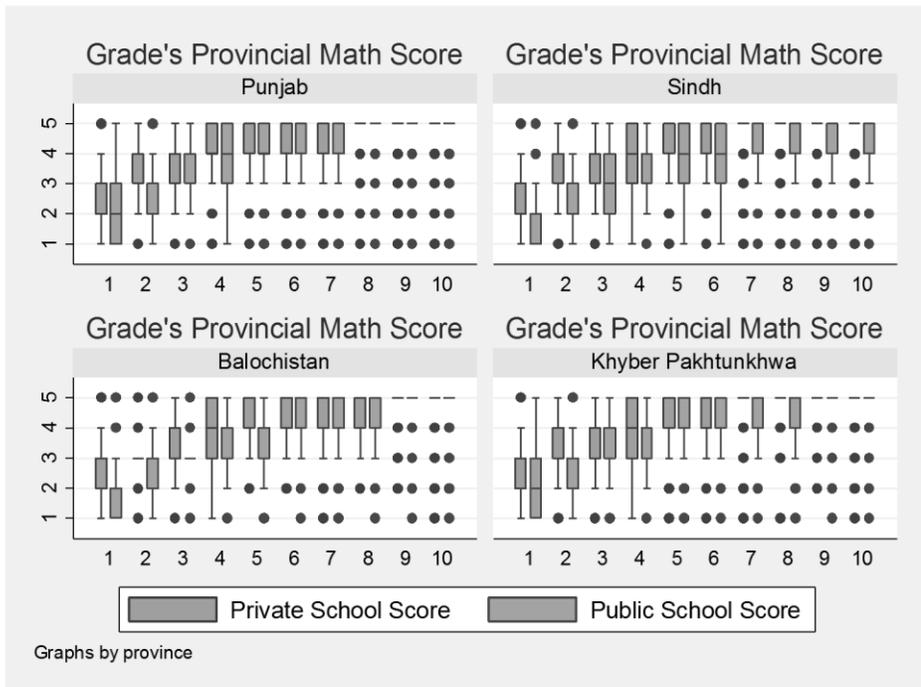


Data Source: ASER Pakistan (2014).

**Fig. A33. ASER—Overall Math Score by Province**

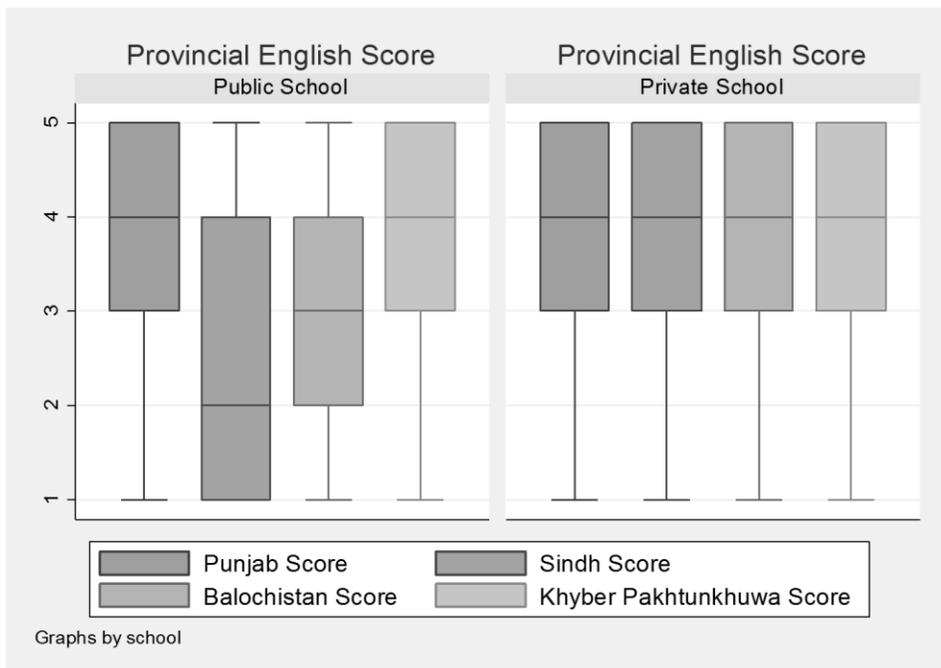


**Fig. A34. ASER—Math Score by Province**

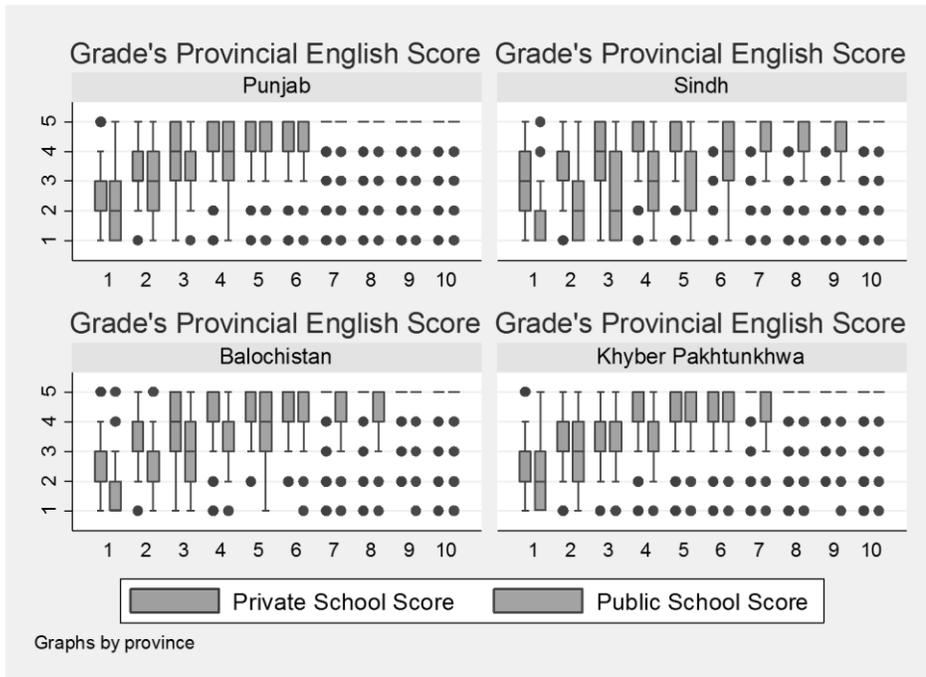


Data Source: ASER Pakistan (2014).

**Fig. A35. ASER—Overall English Reading Score by Province**

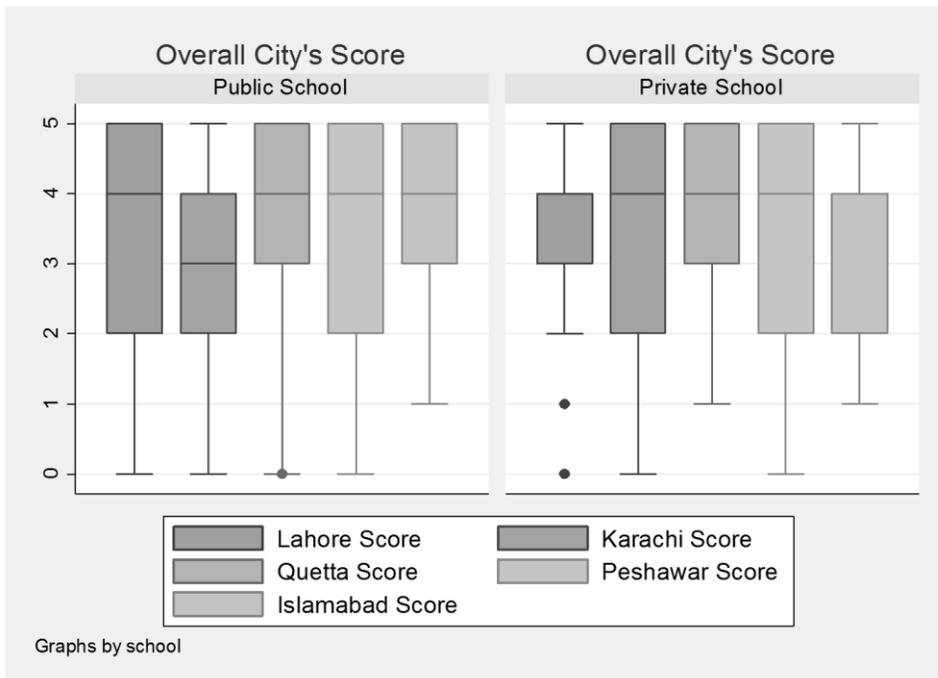


**Fig. A36. ASER—English Reading Score by Province**

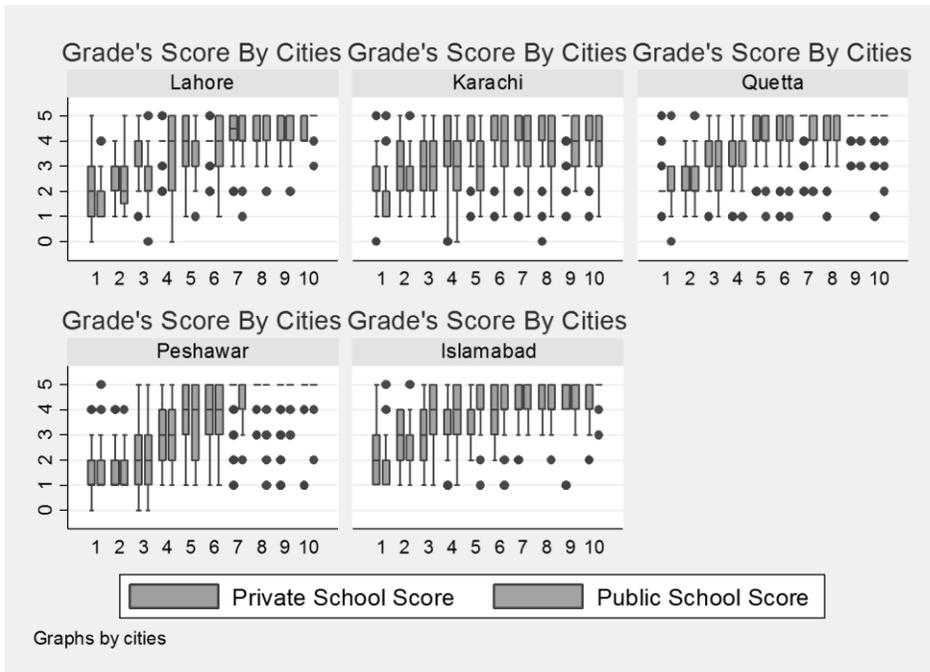


Data Source: ASER Pakistan (2014).

**Fig. A37. ASER—Overall Score by City**

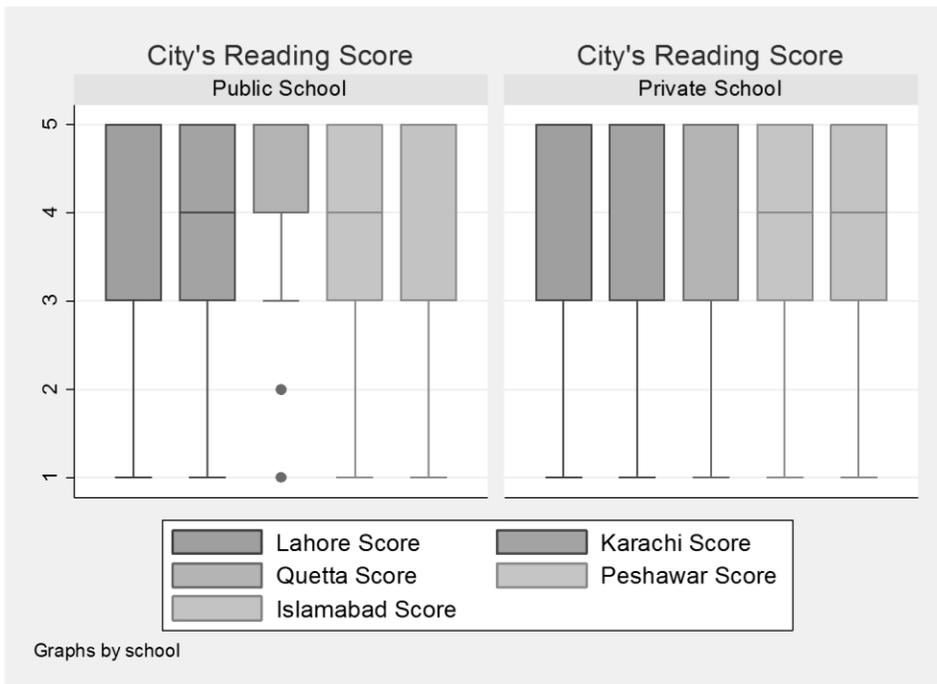


**Fig. A38. ASER—School Score by City**



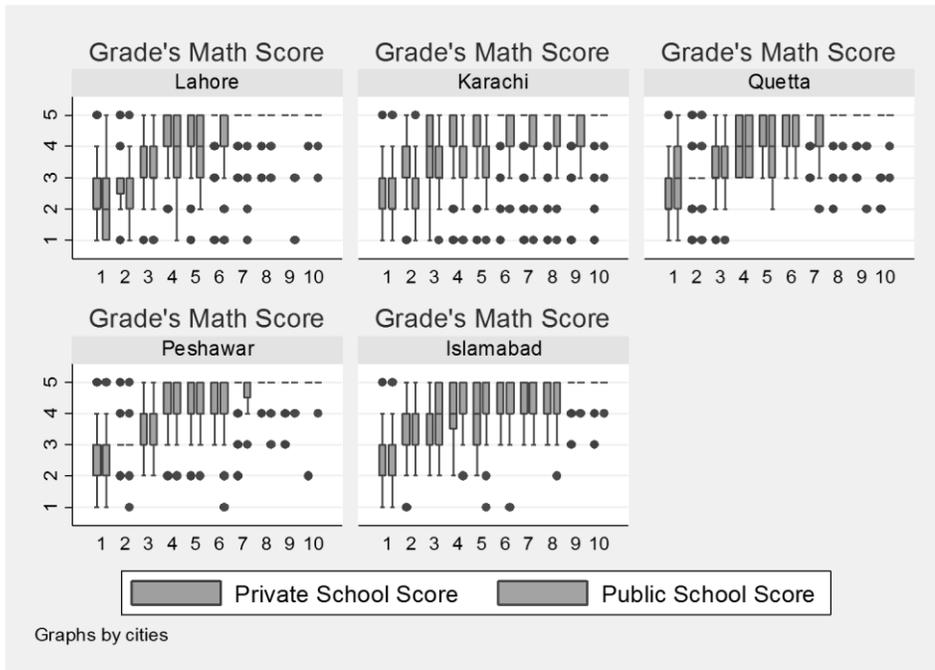
Data Source: ASER Pakistan (2014).

**Fig. A39. ASER—Overall Reading Score by City**



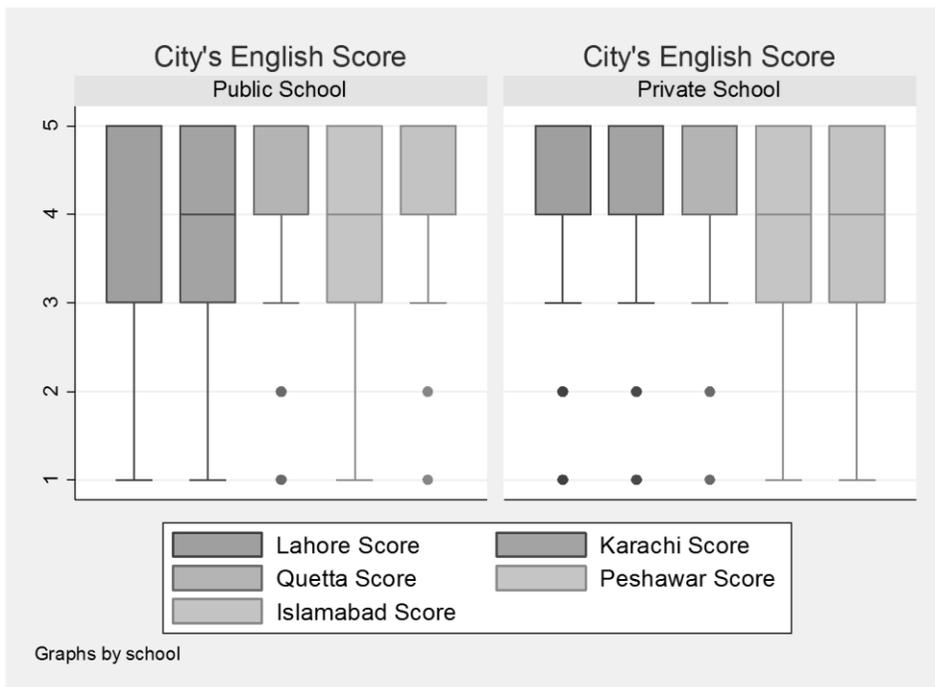


**Fig. A42. ASER—Math Score by City**

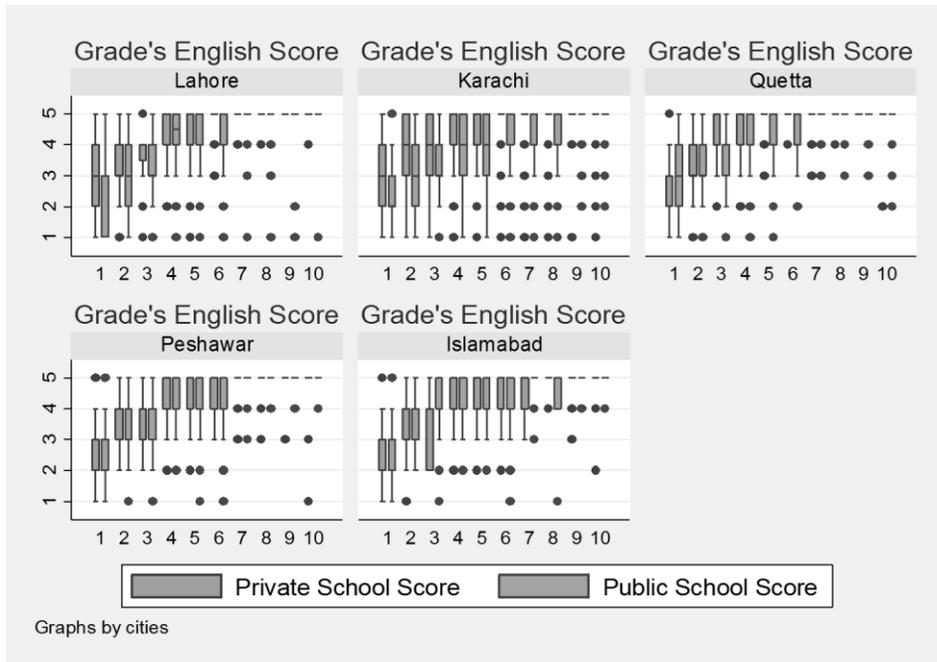


Data Source: ASER Pakistan (2014).

**Fig. A43. ASER—Overall English Reading Score by City**

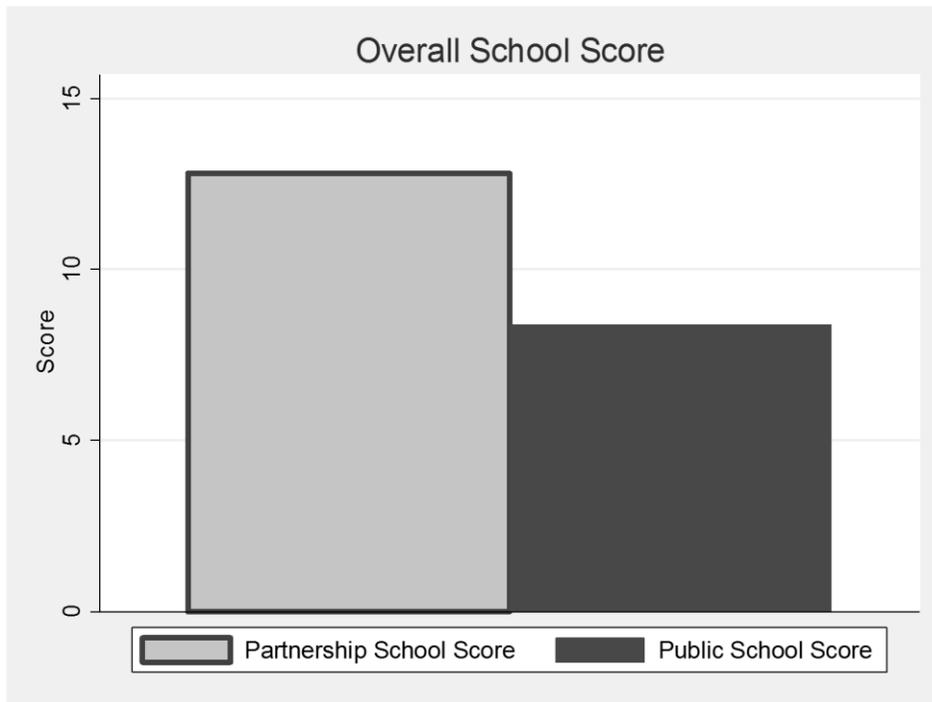


**Fig. A44. ASER—Reading Score by City**

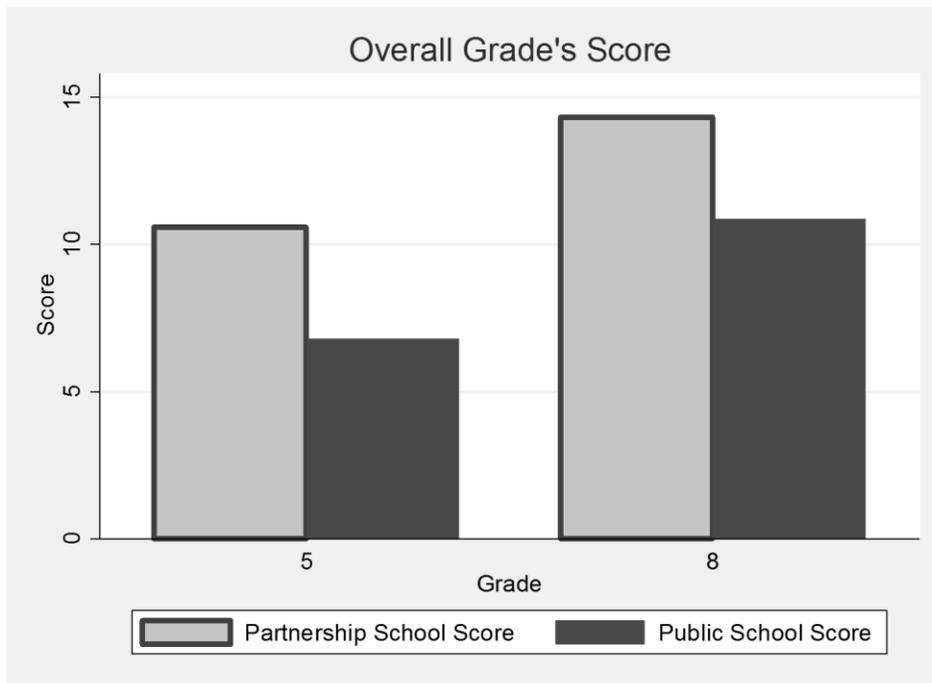


Data Source: ASER Pakistan (2014).

**Fig. A45. Zindagi Trust—Overall School Score (On Average)**

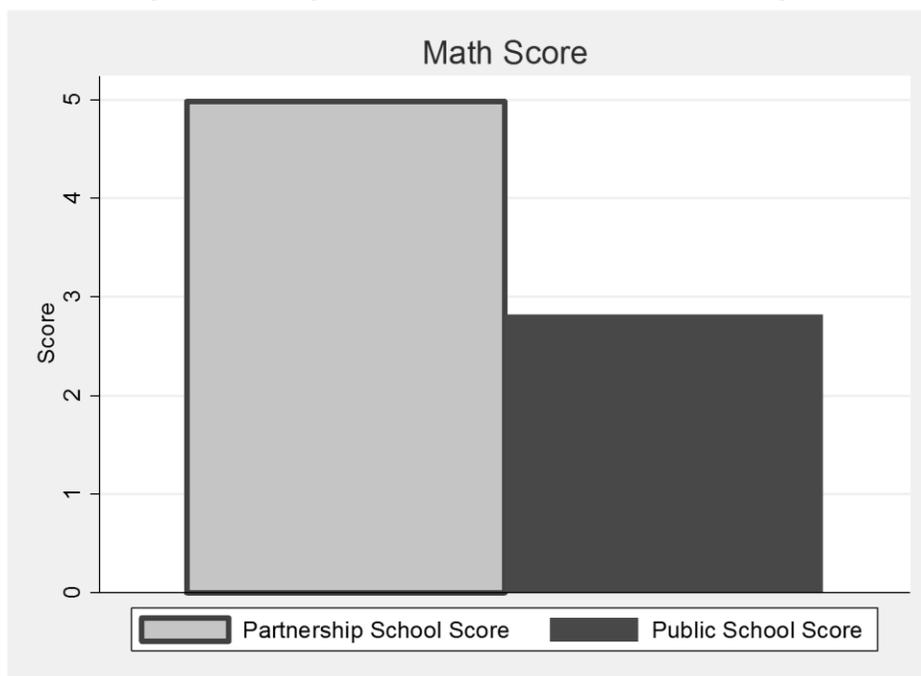


**Fig. A46. Zindagi Trust—School Score (On Average)**

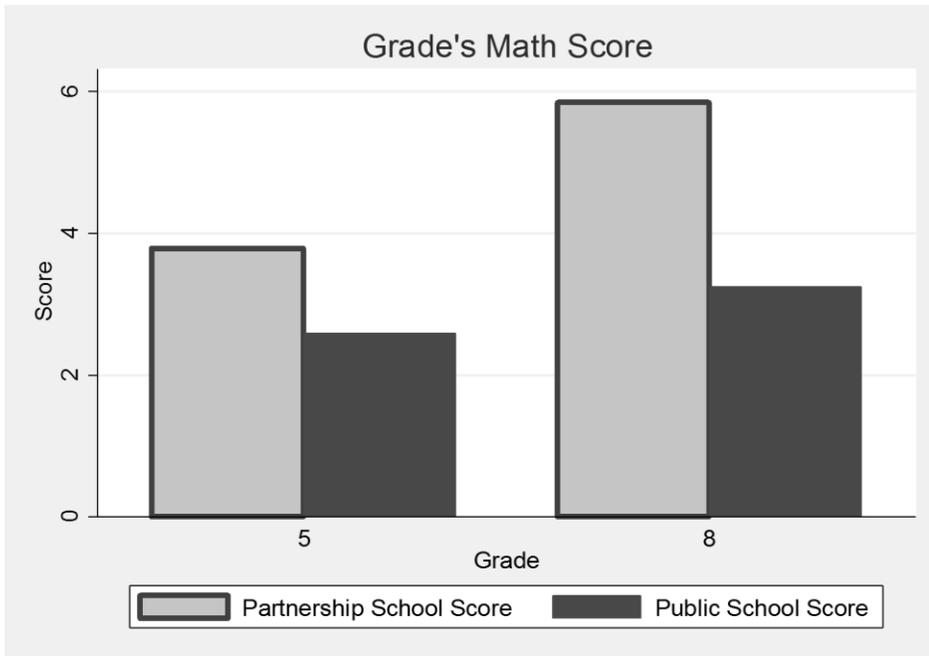


Data Source: SMB Fatima School, 2014.

**Fig. A47. Zindagi Trust—Overall Math Score (On Average)**

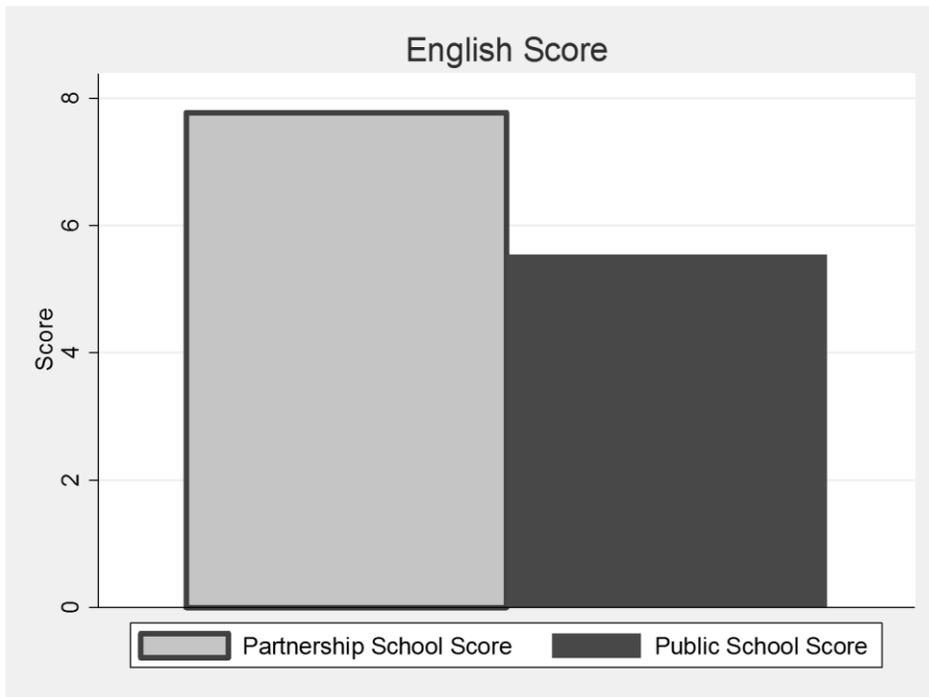


**Fig. A48. Zindagi Trust—Math Score (On Average)**

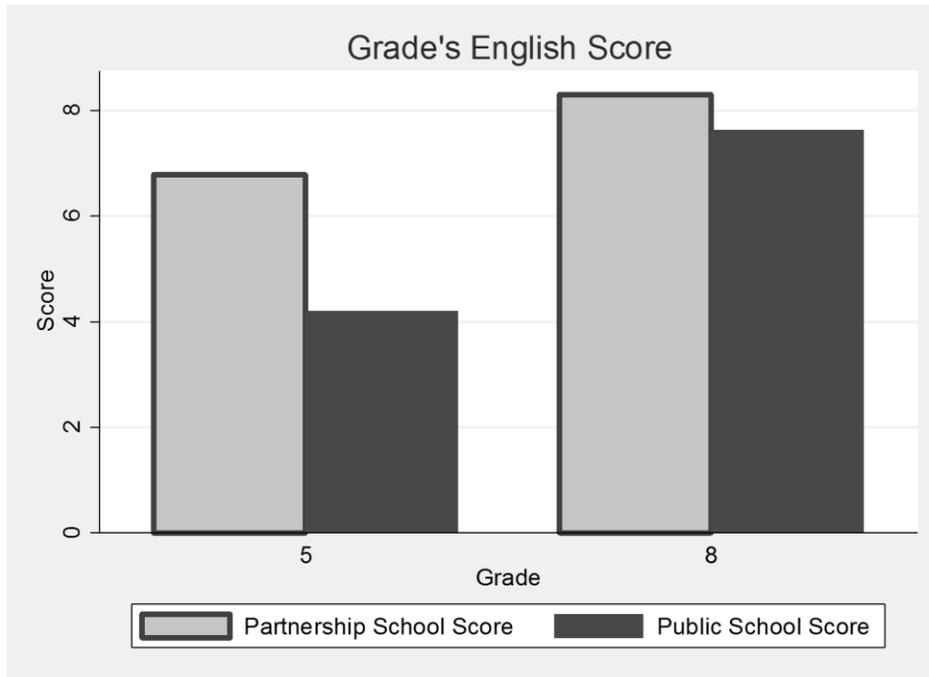


Data Source: SMB Fatima School (2014).

**Fig. A49. Zindagi Trust—Overall English Score (On Average)**

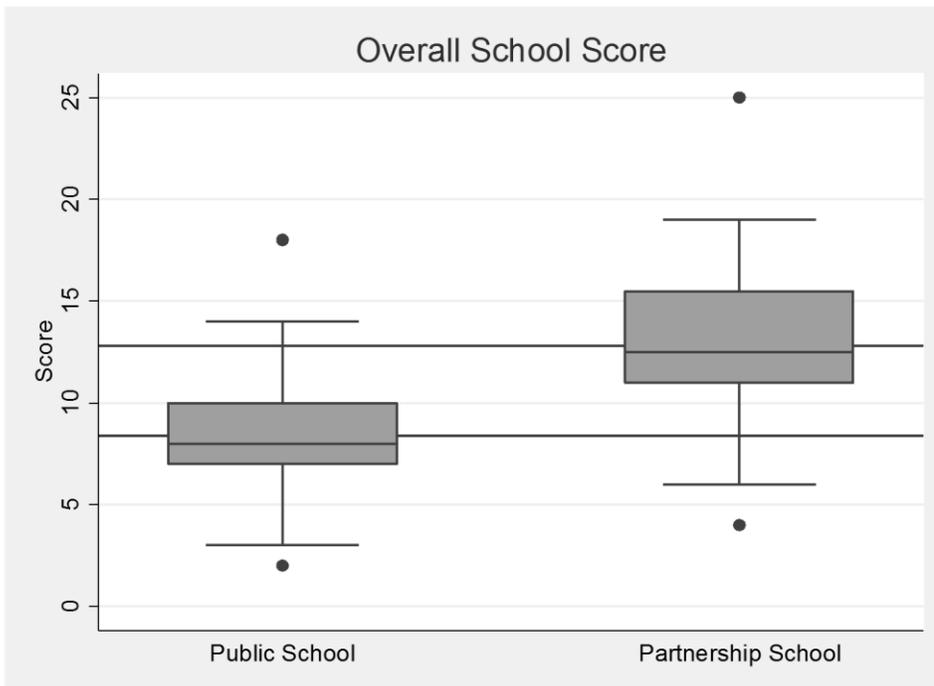


**Fig. A50. Zindagi Trust—English Score (On Average)**

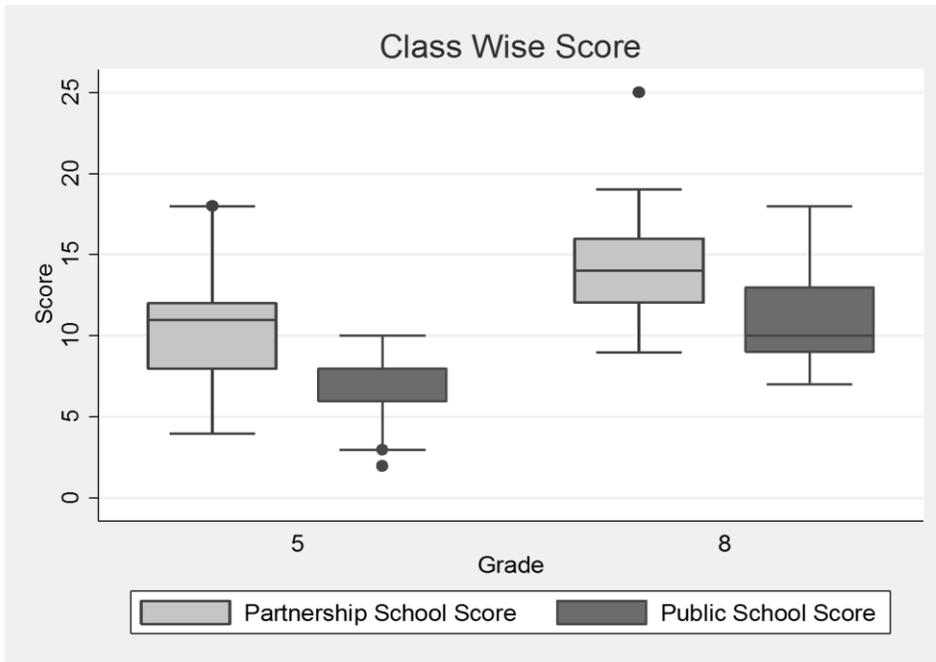


Data Source: SMB Fatima School (2014).

**Fig. A51. Zindagi Trust—Overall School Score**

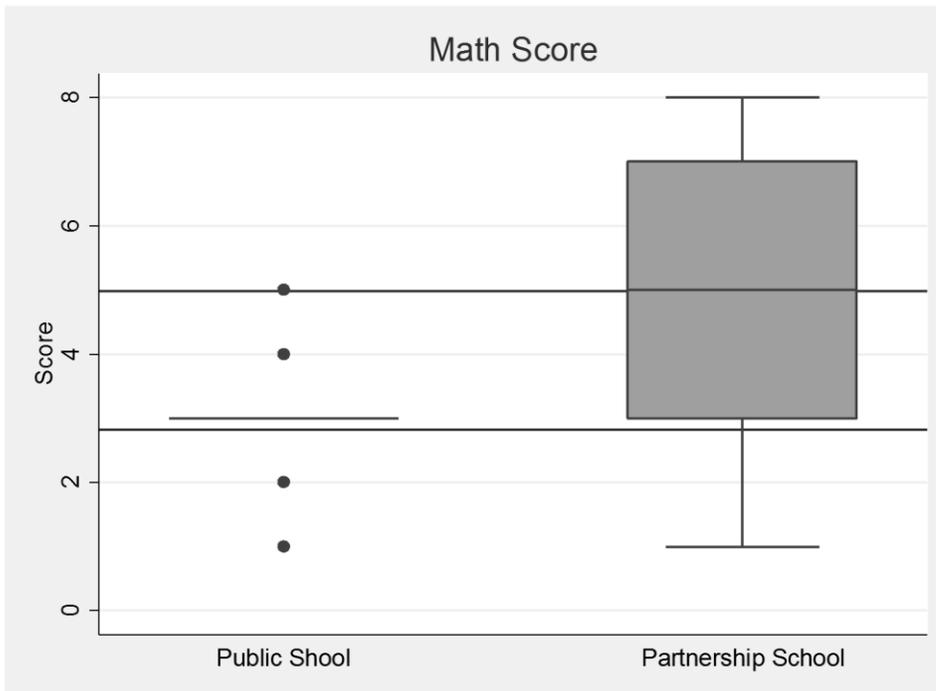


**Fig. A52. Zindagi Trust—School Score**

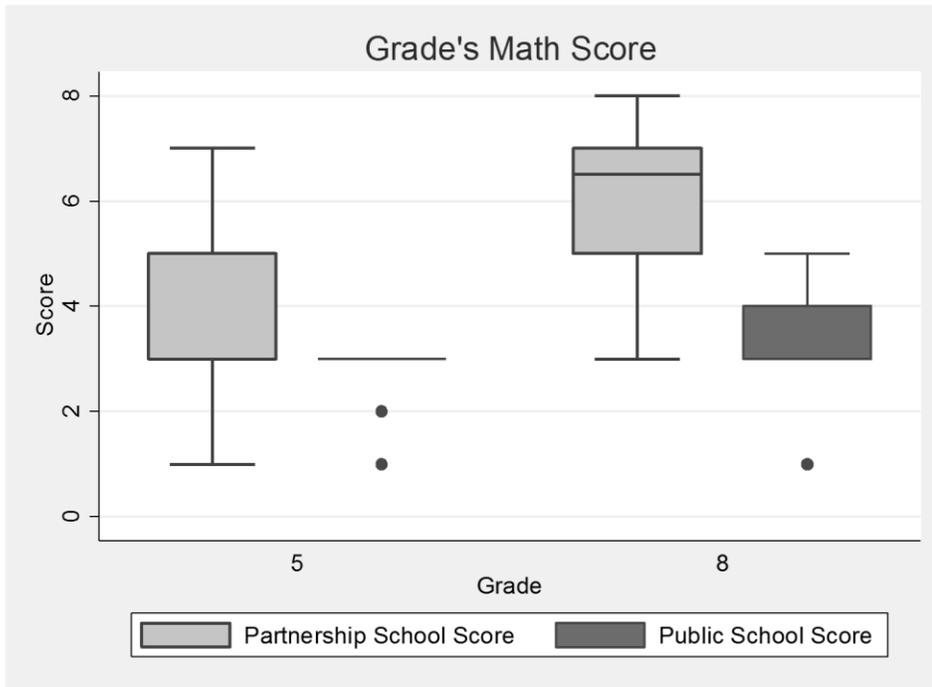


Data Source: SMB Fatima School (2014).

**Fig. A53. Zindagi Trust—Overall Math Score**

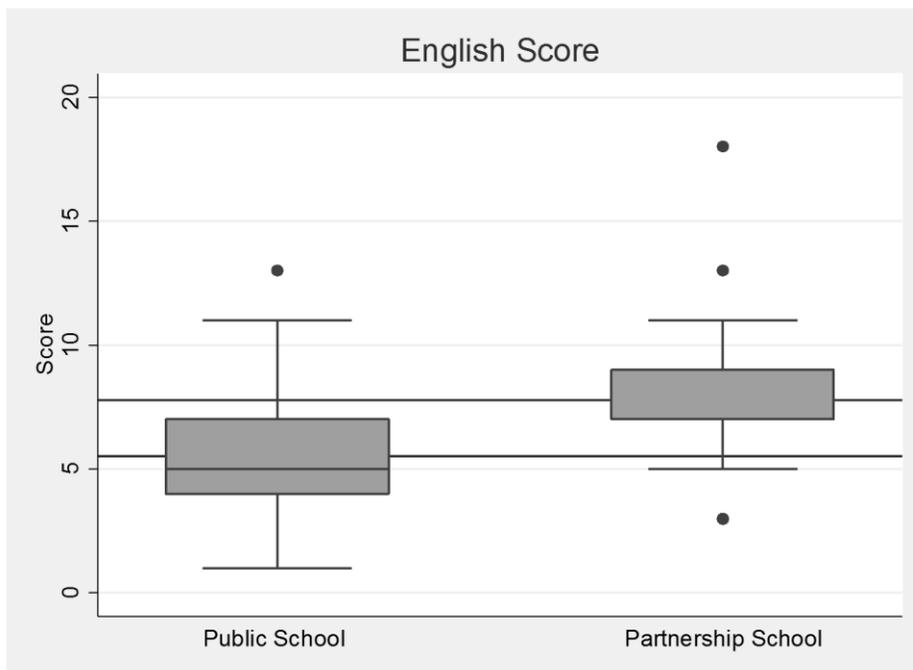


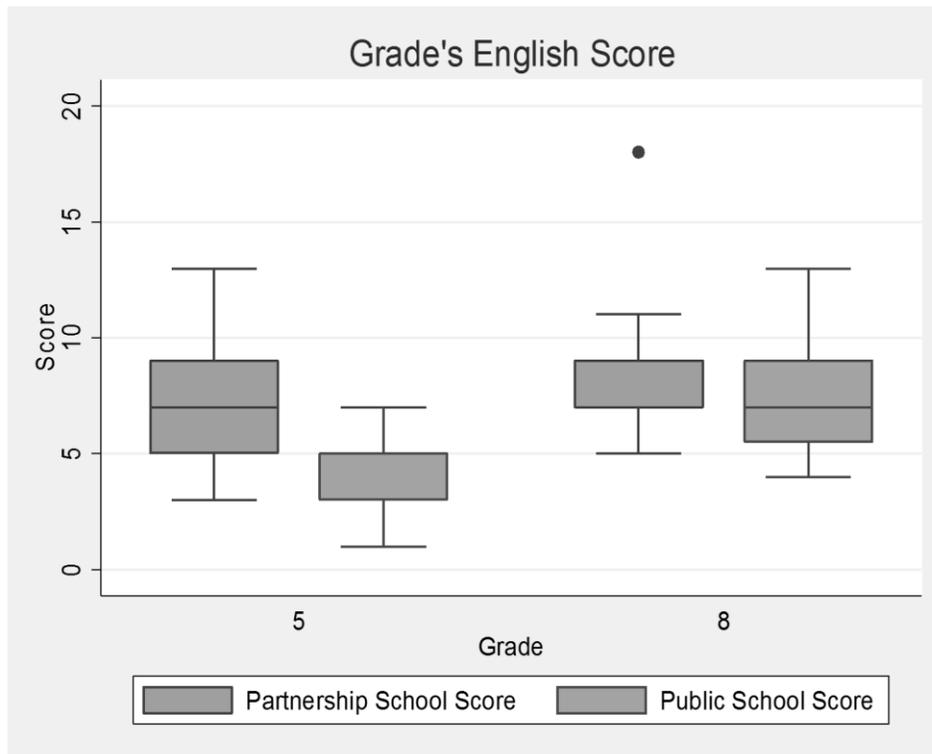
**Fig. A54. Zindagi Trust—Math Score**



Data Source: SMB Fatima School (2014).

**Fig. A55. Zindagi Trust—Overall English Score**



**Fig. A56. Zindagi Trust—English Score**

Data Source: SMB Fatima School (2014).

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# **Socio-Economic Analysis of Household Energy Security: Evidence from 3D Energy Losses Surface Maps (ELSMs) of a Town Using Conjunction of Factors Matrix, Digital and Mathematical Analysis**

EJAZ GUL and IMRAN SHARIF CHAUDHRY

Pakistan is facing perpetual and worsening energy crisis. For vision 2025, the most important litmus test is to overcome energy crisis and ensure energy security by imaginative and innovative energy alternatives. In the same context, scientists, experts and researchers have been focusing on renewables and non-renewable energy generation alternatives, but have largely ignored the flip side. The extravagant use of energy, unlawful connections and losses in distribution system are contributors to ongoing energy crisis. For energy security in a developing country like Pakistan, elimination of energy losses seems a viable option, alongside generation of energy. Therefore, there is a need to have socio-economic analysis of energy losses. In this paper, energy losses for electricity were estimated for Lali Bagh Town of Peshawar, Khyber Pakhtunkhwa Province using a versatile and innovative socio-economic framework. This framework was based on factors matrix comprising socio-economic, environmental and energy factors pertaining to households. Within the factors matrix approach, three methods were used for analysis of energy losses; the statistical analysis to obtain trend and ratings of electricity losses, digital analysis of the data by computer assisted qualitative data analysis software (CAQDAS) to get the digitally iterated and attenuated models along with representative equations and mathematical analysis of equations by Newton-Leibniz integration process to obtain numerical value of the ratings. Based on the results obtained, three dimensional energy losses surface maps (ELSMs) were prepared for Lali Bagh Town of Peshawar, Khyber Pakhtunkhwa Province. At the end, policy recommendations have been given in the context of vision 2025. Paper is a unique combination of theoretical, mathematical and digital cum spatial economics.

*JEL Classification:* O22, Q21, Q31, Q41.

*Keywords:* Socio-economic, Analysis, Energy, Security, Electricity, Losses, Factors, Matrix, Digital, Maps.

## **1. INTRODUCTION**

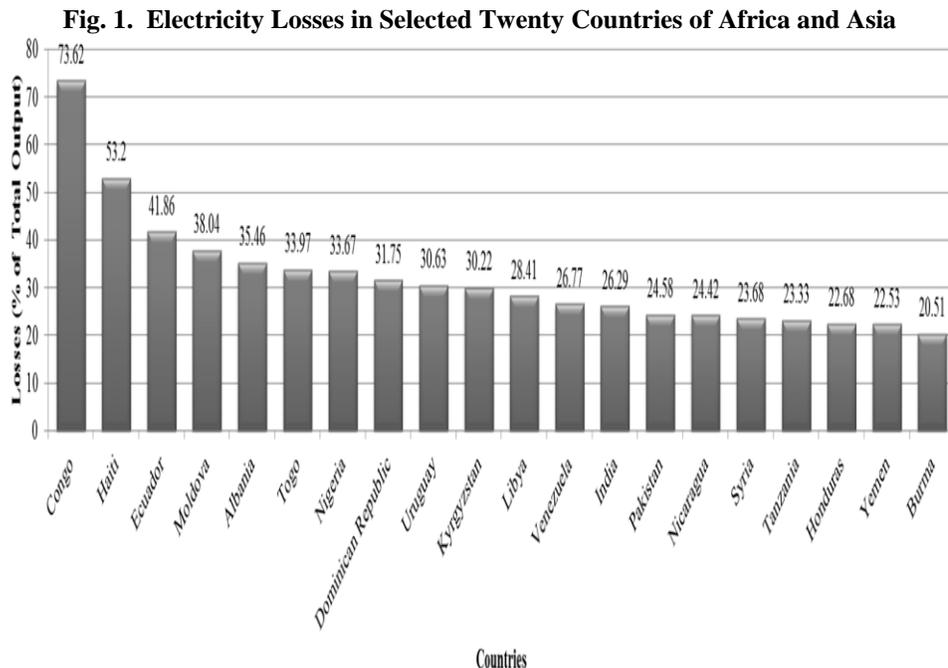
There are two rationales for the current energy crisis in Pakistan; firstly, we don't have energy due to lack of efforts to produce energy albeit we are blessed with almost all renewable and non-renewable energy sources, secondly, we have huge energy losses owing to profligate and wasteful use, unlawful connections by consumers and faults in

Ejaz Gul <ejazgul@bzu.edu.pk> is affiliated with the School of Economics, Bahauddin Zakariya University, Multan. Imran Sharif Chaudhry <imran@bzu.edu.pk> is Director, School of Economics, Bahauddin Zakariya University, Multan.

transmission and distribution system. These losses aggravate the crisis further. Recently it has been established that losses and leakages in the transmission and distribution lines coupled with illegal connections by consumers are both energy and economic burdens. This paper is about socio-economic analysis of losses of electricity in a small town Lali Bagh located in the center of Peshawar city, the capital of Khyber Pakhtunkhwa Province of Pakistan. From the estimated energy losses of Lali Bagh town, the magnitude and severity of crisis can be understood at the national level. The use of factors matrix for analysis of energy losses and the innovation of 3D ELSMs maps have proved to be useful as these tools can be used by energy planners for formulation and implementation of energy policy.

## 2. LITERATURE SURVEY

According to Auffhammer electricity is a secondary source of energy and is generated from the primary renewable and non-renewable sources like hydro, solar, wind, biomass, geothermal, gas, oil, coal and nuclear [Auffhammer (2008)]. Alam has indicated that developing countries have twofold dilemmas in the context of electricity. On the one hand, supply of electricity is reducing due to lack of comprehensive energy generation efforts, while on the other, demand is escalating owing to increasing population and industries [Alam (2004)]. Moreover Katiyar has investigated that countries around the globe are suffering from electricity losses due to faults in transmission and distribution system, unlawful connections by consumers and over consumption which further intensifies the ongoing crisis [Katiyar (2005)]. Countries in Africa and Asia have losses in excess of 20 percent of the total electricity output as shown in Figure 1.

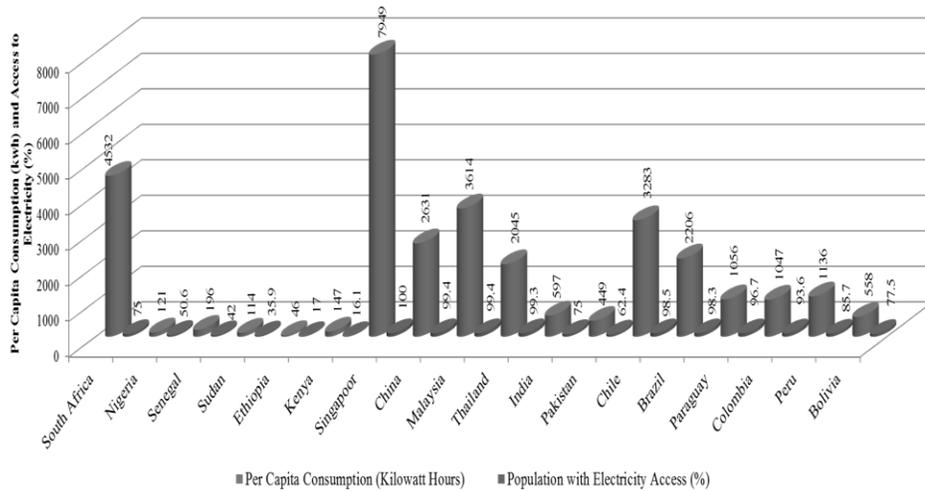


Source: <http://www.nationmaster.com/country-info/stats/Energy/Electric-power>.

The selected twenty countries in Figure 1 are those topping the list of electricity losses at the global level. These countries have losses more than 20 percent of the total electricity output. India and Pakistan are included in the list with losses 26.29 percent and 24.58 percent respectively. These losses have grave socio-economic implications. For instance, in Pakistan only 75.42 percent of the total electricity output is reaching the end users and electricity losses are not billed causing huge economic forfeiture to national exchequer [Pakistan (2014)]. According to Jamil an estimated Rupees (Rs) 50 billion are being lost per year due to electricity losses in Pakistan [Jamil (2013)].

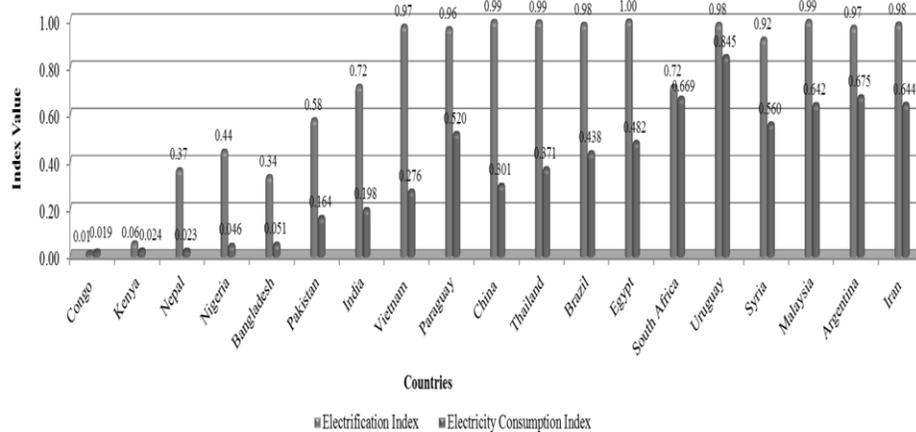
The issue of access to electricity has also been highlighted by many researchers. International Energy Agency (IEA) has clearly specified that access to 120 kilowatt hours (kWh) of electricity per capita per year for lighting is a basic need [IEA (2014)]. Kanagawa has explained that in developing countries substantial population still lives without access to electricity affecting their standard of life [Kanagawa (2005)]. According to IEA, in Pakistan 62.4 percent of the population has electricity access and the per capita electricity consumption by this 62.4 percent of population is only 449 kilowatt hours per year [IEA (2014)]. Statistics about electricity access and consumption for developing countries of Africa, Asia and Latin America are shown in Figure 2.

**Fig. 2. Per Capita Consumption of Electricity (Kilowatt Hours) and Population with Access to Electricity (%)**



Source: IEA (2014).

Figure 2 clearly indicates the shortfalls for Pakistan. According to Trujillo 37.6 percent of the population in Pakistan is still without electricity access and the per capita per year consumption is far below compared to developed countries [Trujillo (2006)]. As shown in Figure 3, World Energy Outlook (WEO) has indicated that Pakistan has electrification index of 0.58 and electricity consumption index of 0.164 which are low compared other developing and developed countries. For instance Richard has investigated that Vietnam has higher electrification and electricity consumption indexes than Pakistan [Richard (2013)].

**Fig. 3. Electrification and Electricity Consumption Indexes of Selected Countries**

Source: WEO (2014).

Similarly, according to Afia standard of living and human development index (HDI) has direct linkage with access to electricity. Therefore, the low access and low per capita per year consumption of electricity are contributing to the low HDI (0.57) of Pakistan [Afia (2007)]. As elucidated by Gul, there are many reasons for the ongoing energy crisis in Pakistan. Failure to select the best energy alternatives and lack of comprehensive planning for optimum utilisation of these alternatives for energy generation are the major reasons of energy crisis [Gul (2014)].

Joseph has indicated that increase in population, construction activities and industrialisation has further intensified the issue [Joseph (2010)]. Rossi has stressed that wasteful use, thefts and losses in distribution system have badly impacted the availability of electricity to all sectors of economy [Rossi (2007)]. Researchers have investigated the impact of illegal connections on the economy. Smith has elucidated that by having unlawful connections of electricity, we have become part of the problem instead of solution (Smith, 2004). Davoodi has clearly indicated that theft and unlawful use of electricity increases inequality and poverty [Davoodi (2002)]. McKechnie has investigated that poverty increases with electricity theft [McKechnie (2000)]. Joskow studied the economics of electricity networks and concluded that transmission and distribution losses cost heavily to the national exchequer [Joskow (2008)]. He also explained that such losses need to be eradicated by administrative and legal actions [Joskow (2013)]. Nagayama has investigated the impacts of power sector reforms on energy investments and transmission/ distribution losses and concluded that effective reforms can reduce transmission and distribution losses and boost the investments [Nagayama (2010)].

Sheikh in his work on energy has indicated that in Pakistan, the supply of electricity is approximately 14000 megawatts which is not matching with the demand of approximately over 20000 megawatts and gap between supply and demand is increasing with time [Sheikh (2010)]. Loughran has highlighted that frequent power shut down has been accepted as a viable strategy for demand management to cater for the widening gap [Loughran (2004)]. The average power shut down duration in Pakistan in the summer of

2014 was approximately 8 to 10 hours. Nakano has elaborately explained that power breakages have become the real economic challenge as these are causing social disruptions and hitting real GDP growth rate [Nakano (2008)].

Sheikh has also indicated that in the context of electricity generation in Pakistan, current energy mix is heavily reliant of non-renewables and is, therefore, highly uneconomical [Sheikh (2010)]. Asif in his work on energy has clearly elaborated that in Pakistan more than 40 percent of the electricity is generated from gas and more than 30 percent is generated by oil leaving only 30 percent to be generated by renewables like hydro, solar and wind [Asif (2009)]. Gas resources are depleting fast and electricity generation from oil is costly as oil is mostly imported causing huge dent on the economy. We need to think about the flipside of the situation. If the 25 percent losses are controlled, it may ease up situation to some extent and will also eliminate huge loss of Rs 50 billion per year to the national economy.

### 3. RESEARCH AREA

Peshawar is the capital city of Khyber Pakhtunkhwa located in the north west of Pakistan at a distance of 160 kilometers from capital city of Islamabad. Peshawar lies between 33° 44' and 34° 15' north latitude and 71° 22' and 71° 42' east longitude. Historically, Peshawar was the center of Gandhara civilisation. It's a city with rich traditions and social life. As per current demographic data, the population of Peshawar is approximately 3.6 million. Pakhtuns are the main inhabitants of Peshawar with Pashtu being the main language spoken in the city. Socio-economic indicators of Peshawar are shown in Table 1.

Table 1

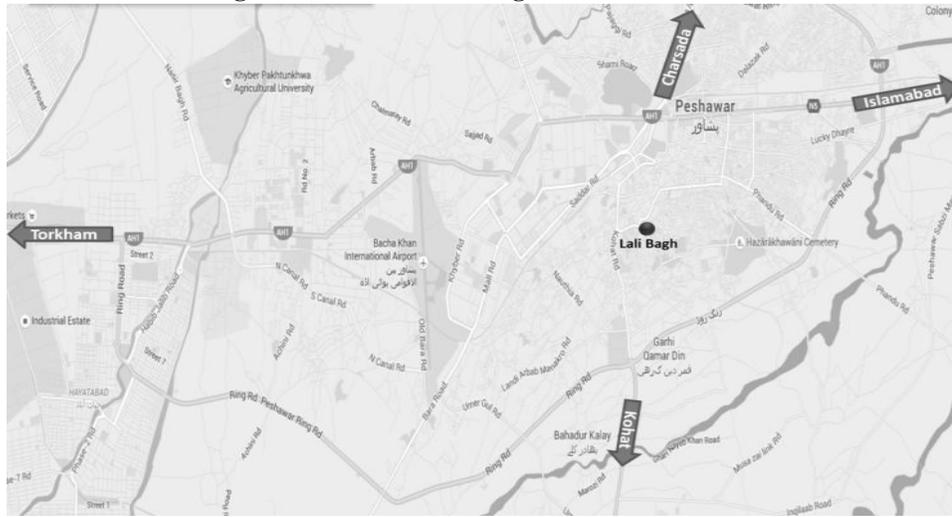
#### *Socio-economic Profile of Peshawar, Pakistan*

| Indicators                          | Calculation                      |
|-------------------------------------|----------------------------------|
| Population                          | 3.6 million approximately (2014) |
| Growth Rate                         | 9.5%                             |
| Per Capita Income (Rupees per year) | 125450 approximately (2014)      |
| Literacy Rate                       | 59%                              |
| Gender Ratio                        | Males are 15% more than females  |
| Bed Patients Ratio                  | 1040 patients per bed            |
| Doctor Patients Ratio               | 3123 patients per doctor         |
| Total Area                          | 1257 square kilometers           |

*Source:* Khyber Pakhtunkhwa, Bureau of Statistics available at [kpbos.gov.pk/publications.php](http://kpbos.gov.pk/publications.php)

Presently an estimated quantity of approximately 550 megawatts of electricity is provided to the consumers of Peshawar on daily basis. The city suffers from frequent break downs of electricity in summers (May to August) each year.

Lali Bagh is a central town of Peshawar. Total area of Lali Bagh town is 10 square kilometers. A google map showing location of Lali Bagh town in Peshawar is given as Figure 4. It has total population of approximately 30 thousands. There are three health centres in the town with a 10-20 beds capacity. Inhabitants of the town are living in about 1000 concrete houses of varying sizes and overall outlook of the town is congested as reflected by satellite image shown in Figure 5.

**Fig. 4. Location of Lali Bagh Town in Peshawar****Fig. 5. Satellite Image of Lali Bagh Town, Peshawar**

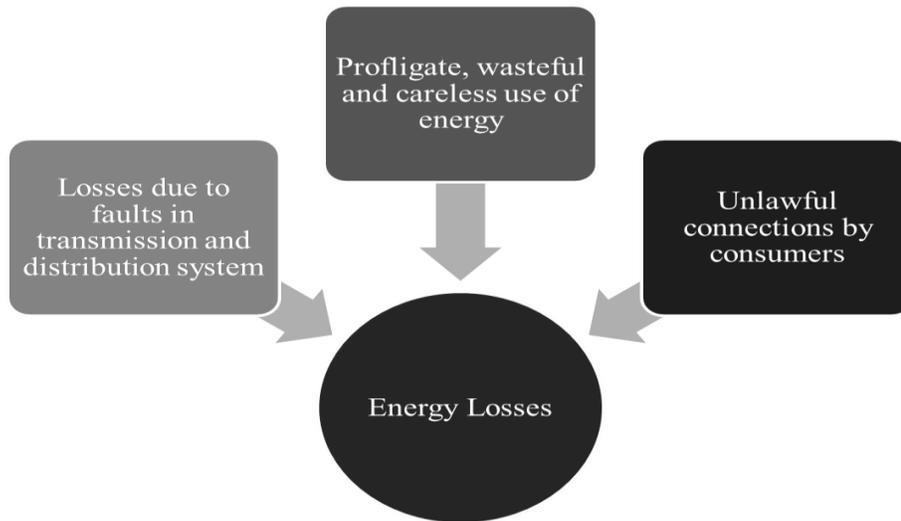
Large numbers of the houses are double storey occupying vertical space. There are two parks and playing grounds in town. There are seven high schools, ten middle schools and 20 primary schools in the town. Sanitation and waste disposal is mostly done on self-help basis. Central clean water facility from a community filtration plant is not available and inhabitants have installed kitchen filters for clean water availability. People mostly speak Pashto language with a small proportion of Hindko speaking community. Literacy rate is estimated as 55 percent.

Electricity is available in the town. Every house has electricity connection with unit counting device called meters. Electricity is provided through 11 kilovolt (1440 kilowatt hours) aerial distribution lines. Users are provided with single phase and three phase supply depending on the size of the house and number of occupants.

**4. BENCH MARK CASE FOR SOCIO-ECONOMIC ANALYSIS**

Our energy behaviour resulting into wastage of energy, mistaken norms to allow for unlawful electricity connections and lack of maintenance of electricity distribution system are all contributors to energy losses. We normally speak of non-availability of energy but we use energy as if we have it in excess. There are three folds losses of energy in Pakistan as shown in Figure 6. Overall electricity losses in Pakistan are in excess of 25 percent of the total electricity output. Taking 14000 megawatts as the output, the losses come to 3500 megawatts which is a huge amount of electricity. It means that the net total output is 10500 megawatts which can fulfil 50 percent of the increasing electricity demand which is currently more than 20000 megawatts. In terms of cost, it comes to over Rs 50 billion. As per National Electric and Power Regulatory Authority (NEPRA), losses up to 13 percent of the total output (1820 megawatts) are acceptable in the current vintage electricity distribution system. The remaining about 12 percent (1680 megawatts) out of estimated 25 percent are attributed to over consumption and theft. These losses cannot be justified by any standard.

**Fig. 6. Three Folds Losses of Energy**



To estimate electricity losses in Lali Bagh town, the electricity load of a hypothetical house, with all possible electric gadgets and appliances, was calculated for a month in summer as per Equation (1).

$$\text{Monthly units (kilowatt hours)} = \frac{\text{Quantity of electric gadget} \times \text{Power in watts} \times \text{Daily use in hours} \times 30}{1000} \dots \quad (1)$$

This was taken as the bench mark case for estimation of the losses in Lali Bagh Town. Calculation of electricity load of bench mark case is shown in Table 2.

Table 2  
*Electricity Load of a Hypothetical House Taken as Bench Mark Case*

| Electricity Items  | Quantity | Power (Watts) | Total Power (Watts) | Daily Use (Hours) | Energy Consumption (Watt Hours) | Energy Consumption per Day (Kilowatt Hours) | Units Consumed per Month (Kilowatt Hours) |
|--|----------|---------------|---------------------|-------------------|---------------------------------|---|---|
| Tube lights  | 8        | 50            | 400                 | 8                 | 3200                            | 3.2   | 96  |
| Bulbs  | 8        | 100           | 800                 | 8                 | 6400                            | 6.4   | 192                                       |
| Energy Savers  | 8        | 20            | 160                 | 8                 | 1280                            | 1.28  | 38.4                                      |
| Colour Televisions                                       | 2        | 150           | 300                 | 6                 | 1800                            | 1.8   | 54  |
| Light Emitting Diode (LED)/ Liquid Crystal Display (LCD) |          |               |                     |                   |                                 |   |   |
| Televisions  | 2        | 220           | 440                 | 8                 | 3520                            | 3.52  | 105.6                                     |
| Split Air Conditioner                                    | 2        | 1000          | 2000                | 8                 | 16000                           | 16  | 480                                       |
| Window Air Conditioner                                   | 1        | 2000          | 2000                | 6                 | 12000                           | 12  | 360                                       |
| Pressing iron  | 2        | 300           | 600                 | 4                 | 2400                            | 2.4   | 72  |
| Fans   | 10       | 50            | 500                 | 16                | 8000                            | 8   | 240                                       |
| Electric Cooking   |          |               |                     |                   |                                 |   |   |
| Range  | 1        | 200           | 200                 | 3                 | 600                             | 0.6   | 18  |
| Microwave  | 1        | 150           | 150                 | 2                 | 300                             | 0.3   | 9   |
| Vacuum Cleaner   | 1        | 500           | 500                 | 2                 | 1000                            | 1   | 30  |
| Toaster  | 1        | 50            | 50                  | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Water Dispenser  | 1        | 50            | 50                  | 12                | 600                             | 0.6   | 18  |
| Juicer   | 2        | 50            | 100                 | 0.25              | 25                              | 0.025                                       | 0.75                                      |
| Blender  | 2        | 50            | 100                 | 1                 | 100                             | 0.1   | 3   |
| Washing Machine  | 1        | 400           | 400                 | 3                 | 1200                            | 1.2   | 36  |
| Desktop Computers  | 1        | 100           | 100                 | 6                 | 600                             | 0.6   | 18  |
| Laptops  | 2        | 50            | 100                 | 6                 | 600                             | 0.6   | 18  |
| Well Pump  | 1        | 500           | 500                 | 0.5               | 250                             | 0.25  | 7.5                                       |
| Mobile Phones  |          |               |                     |                   |                                 |   |   |
| Rechargers   | 6        | 2             | 12                  | 6                 | 72                              | 0.072                                       | 2.16                                      |
| Refrigerator   | 1        | 500           | 500                 | 8                 | 4000                            | 4   | 120                                       |
| Freezer  | 1        | 500           | 500                 | 8                 | 4000                            | 4   | 120                                       |
| Electric Shavers   | 3        | 15            | 45                  | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    |
| Total  | -        | -             | 10507               | -                 | 67970.75                        | 67.97                                       | 2039.12                                   |

Table 2 clearly indicates that with all possible electric gadgets and appliances, a house can consume 2039.12 units (kilowatt hours) per month. Effect of load shedding was taken into consideration in the daily use of electric appliances while calculating electricity load for the bench mark case.

For calculation of losses due to unlawful connections by consumers, visual observations during field visits, registered reports with local police station and office of Peshawar Electricity Supply Company (PESCO) were considered. For calculation of losses due to faults in distribution system, faulty transformers, loose connections, hanging/sagging wires, low quality of connectors and fallen poles and pylons were focused.

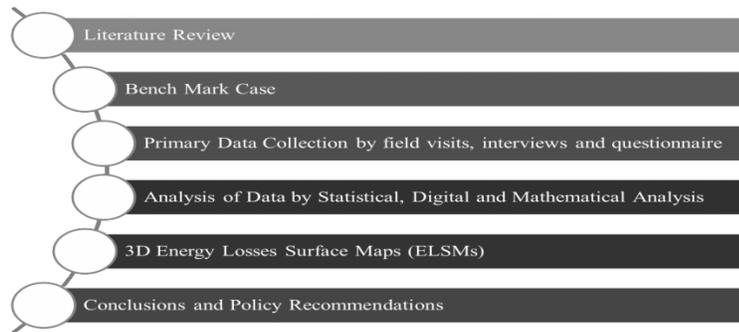
## 5. RESEARCH METHODS

Comprehensive research methodology was used for analysis of electricity losses. Primary data of socio-economic conditions and electricity losses was gathered by three methods; collection of observations during field visits, interview of experts and community leaders, and collection of households' opinion by questionnaire. Research design is shown in Figure 7.

During the field visits observations were noted about distribution system of electricity to households. Loose connections, quality of connectors, transformers, pylons and distribution cables were critically observed. Unlawful connections were also noted. 20 technical experts and 10 community leaders were interviewed. Data regarding socio-economic conditions and electric load was collected from 500 houses out of total 1000 houses using survey method.

Collected data was analysed by three methods; statistical analysis to determine ratings of and central tendencies of electricity losses, digital analysis using computer assisted qualitative data analysis software (CAQDAS) to get digitally iterated and attenuated models for the losses and mathematical analysis using Newton-Leibniz integration process to get numeral value of losses ratings.

**Fig. 7. Research Design for Calculation of Energy Losses of Lali Bagh Town**



Then, the results obtained from the three analyses were shifted to latest mapping software SURFER and three dimensional energy losses surface maps (ELSMs) were created.

## 6. DATA COLLECTION

For estimation of electricity losses in Lali Bagh town was divided into five zones; north, east, south, central and west as shown in Figure 8. The panoramic view of each zone is shown in Figure 9. North zone has commercial markets and residential accommodation. Schools, hospitals and community marriage and meetings halls are located in this zone. East and central zones are purely residential with congested houses of varying dimensions. South and west zones are comparatively open with modern houses.

**Fig. 8. Five Zones of Lali Bagh Town**



**Fig. 9. Panoramic View of the Five Zones of Lali Bagh Town**

Using a factors matrix, first the data was collected from 500 houses (100 houses each zone) to assess the socio-economic and environmental conditions which included detail about size of house, number of rooms, number of occupants, per capita income, lights hours, dark hours, load shedding, maximum temperature. Based on the collected data, average values were calculated for each zone as shown in Table 3.

Table 3

*Socio-economic and Environmental Conditions of Lali Bagh Town*

| Socio-economic and Environmental Factors              | North Zone | East Zone | South Zone | Central Zone | West Zone |
|---|------------|-----------|------------|--------------|-----------|
| Average size of House (square foot)                   | 1560       | 1520      | 1526       | 1380         | 1878      |
| Average number of rooms (all inclusive)               | 10         | 8         | 8          | 8            | 12        |
| Average number of occupants per house                 | 9          | 10        | 12         | 10           | 8         |
| Average per capita income (Rupees per year)           | 123020     | 110900    | 100943     | 163178       | 153220    |
| Average light hours (most of the lights are on)       | 6          | 5         | 4          | 6            | 8         |
| Average dark hours (most of the lights are off)       | 6          | 7         | 8          | 6            | 4         |
| Average duration of electricity load shedding per day | 8          | 8         | 8          | 8            | 8         |
| Average maximum temperature in summers                | 45         | 45        | 45         | 45           | 45        |

The average numbers of electric gadgets were determined for each zone after survey of 100 houses per zone. The purpose of this survey was to calculate the average electricity load for each zone. Data obtained is shown in Table 4.

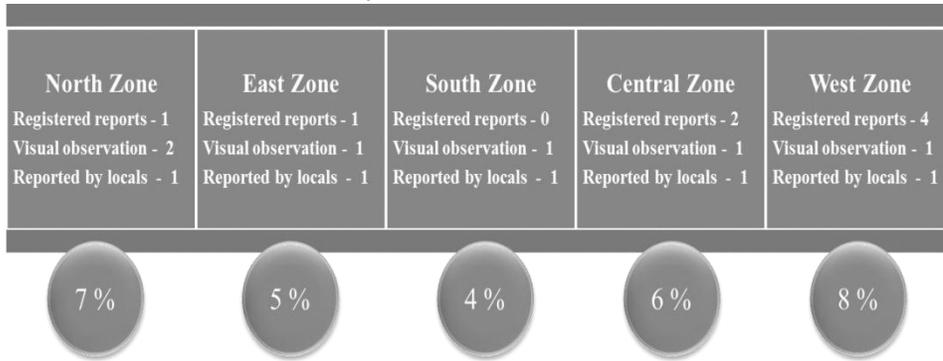
Table 4

*Average Number of Electric Gadgets Per Zone*

| Electricity Items  | North Zone | East Zone | South Zone | Central Zone | West Zone |
|--|------------|-----------|------------|--------------|-----------|
| Tube lights  | 4          | 4         | 3          | 4            | 5         |
| Bulbs  | 3          | 3         | 4          | 4            | 5         |
| Energy Savers  | 2          | 2         | 3          | 3            | 6         |
| Colour Televisions   | 1          | 1         | 1          | 1            | 1         |
| Light Emitting Diode (LED)/ Liquid Crystal Display (LCD) Televisions | 1          | 1         | 1          | 1            | 1         |
| Split Air Conditioner  | 0          | 0         | 1          | 1            | 2         |
| Window Air Conditioner   | 1          | 1         | 0          | 0            | 0         |
| Pressing iron  | 1          | 1         | 1          | 1            | 2         |
| Fans   | 4          | 5         | 5          | 6            | 8         |
| Electric Cooking Range   | 0          | 0         | 0          | 0            | 1         |
| Microwave  | 1          | 1         | 1          | 1            | 1         |
| Vacuum Cleaner   | 0          | 0         | 0          | 0            | 1         |
| Toaster  | 0          | 0         | 1          | 0            | 1         |
| Water Dispenser  | 0          | 0         | 0          | 1            | 1         |
| Juicer   | 1          | 0         | 1          | 1            | 2         |
| Blender  | 0          | 0         | 0          | 1            | 1         |
| Washing Machine  | 1          | 1         | 1          | 1            | 1         |
| Desktop Computers  | 1          | 0         | 1          | 0            | 1         |
| Laptops  | 1          | 1         | 2          | 1            | 2         |
| Well Pump  | 1          | 0         | 1          | 1            | 1         |
| Mobile Phones Rechargers   | 3          | 3         | 4          | 4            | 3         |
| Refrigerator   | 1          | 1         | 1          | 1            | 1         |
| Freezer  | 1          | 1         | 0          | 0            | 1         |
| Electric Shavers   | 0          | 0         | 0          | 0            | 2         |

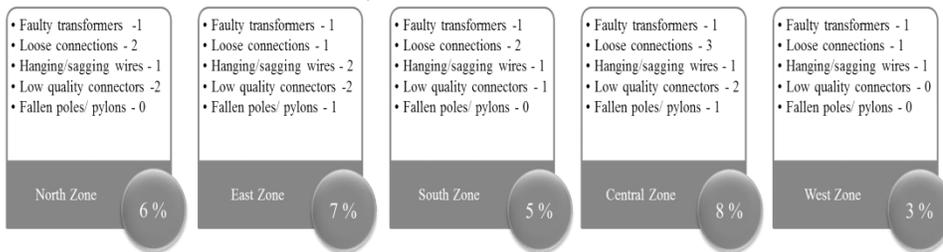
After this survey, data about theft and unlawful connections was collected by three methods; visual observation, number of registered reports with Peshawar Electric Supply Company and local police station and those reported by locals during field visits and survey of the zones. While calculating average electricity loss per zone due to unlawful connections by consumers, visual observation and unlawful connections reported by locals were taken as 2 percent loss of electricity while unlawful connections registered with Peshawar Electric Supply Company and local police station were taken as 1 percent loss. Average percentage of losses per zone is shown in Figure 10.

**Fig. 10. Percentage Electricity Losses Per Zone Due to Unlawful Connections by Consumers**



At the end, average electricity losses due to faults in distribution system were calculated for each zone. Each fault was taken as 1 percent loss to electricity as shown in Figure 11.

**Fig. 11. Percentage Electricity Losses Per Zone Due to Faults in Distribution System**



### 7. ELECTRICITY LOSSES ESTIMATION

• **Losses due to Over Consumption and Wastage.** After collection of data, electricity losses were estimated. First losses due to wastage and over consumption were ascertained. For this purpose, using Equation (1) average household electricity load in each zone was calculated based on the average holding of electric gadgets in the zones. The picture of calculation is shown in Appendix 1. This was followed by survey of electricity bills of the same 100 houses in each zone to know about the electricity units (kilowatt hours) for which those houses were billed. By this way the average units billed

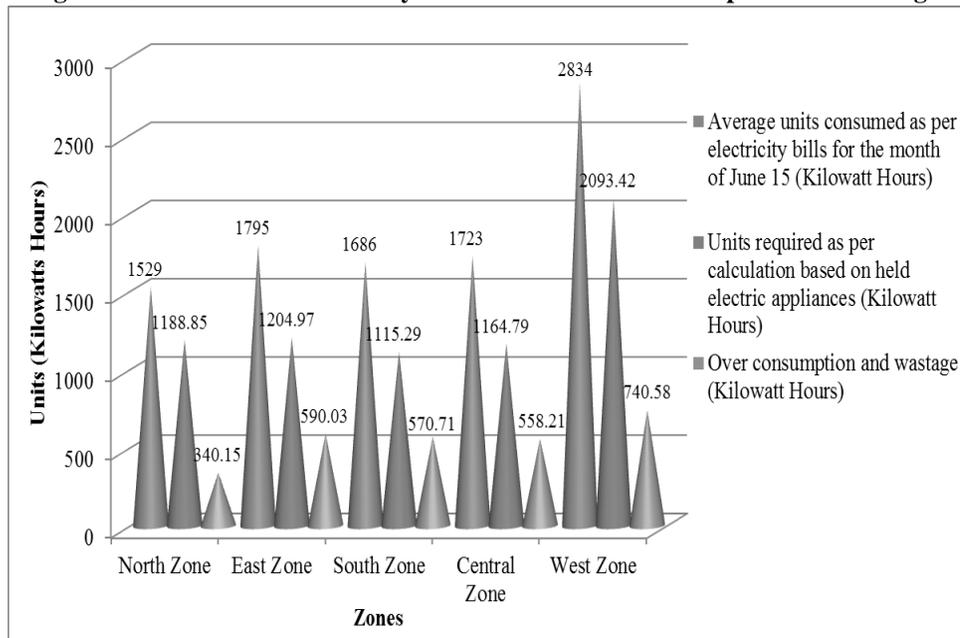
per zone were determined. This was compared with the actual average load per zone vide Appendix 1 and the difference was determined to ascertain the wastage and over consumption. Calculation is shown in table 5 while the graphical representation is shown in Figure 12.

Table 5

*Calculations of Electricity Losses Due to Overconsumption and Wastage*

| Electricity Items   | North Zone | East Zone | South Zone | Central Zone | West Zone |
|---|------------|-----------|------------|--------------|-----------|
| Average units consumed as per electricity bills for the month of June 15 (Kilowatt Hours) | 1529       | 1795      | 1686       | 1723         | 2834      |
| Units required as per calculation based on held electric appliances (Kilowatt Hours)      | 1188.85    | 1204.97   | 1115.29    | 1164.79      | 2093.42   |
| Over consumption and wastage (Kilowatt Hours)   | 340.15     | 590.03    | 570.71     | 558.21       | 740.58    |

**Fig. 12. Calculations of Electricity Losses Due to Overconsumption and Wastage**



• **Losses due to Unlawful Connections by Consumers.** The electricity is provided to consumers through an 11 kilovolt line which has power of 1440 kilowatts. Average percentage losses for each zone were worked out as shown in Figure 8. Losses due to unlawful connections by consumers were calculated by Equation (2) and calculation is shown in Table 6.

$$\begin{aligned} \text{Losses per Month due to Unlawful Connections (kilowatt hours)} \\ = \text{Power Line (kilowatts)} \times \text{Losses percentage} \times \text{Duration} \times 30 \quad \dots \quad (2) \end{aligned}$$

Table 6

*Calculations of Electricity Losses Due to Unlawful Connections*

| Zones   | Power Line<br>(Kilovolts/<br>Kilowatts) | %<br>Losses | Losses<br>(Kilowatt<br>Hours) | Duration<br>(Hours) | Loss of Units<br>(Kilowatt<br>Hours) | Loss of Units per<br>Month (Kilowatt<br>Hours) |
|---------|---|-------------|-------------------------------|---------------------|--------------------------------------|--|
| North   | 11/1440                                 | 6           | 86.4                          | 12                  | 1036.8                               | 31104  |
| East    | 11/1440                                 | 7           | 100.8                         | 12                  | 1209.6                               | 36288  |
| South   | 11/1440                                 | 5           | 72                            | 12                  | 864                                  | 25920  |
| Central | 11/1440                                 | 8           | 115.2                         | 12                  | 1382.4                               | 41472  |
| West    | 11/1440                                 | 3           | 43.2                          | 12                  | 518.4                                | 15552  |

• **Losses due to Faults in Distribution System.** Average percentage losses for each zone due to faults in distribution system were worked out as shown in figure 9. Electricity losses due to faults in distribution line of 11 kilovolts (1440 kilowatts) were calculated by Equation (3) and calculation is shown in Table 7.

$$\begin{aligned} & \text{Losses per Month due to faults in Distribution System (kilowatt hours)} \\ & = \text{Power Line (kilowatts)} \times \text{Losses percentage} \times \text{Duration} \times 30 \quad (2) \end{aligned}$$

Table 7

*Calculations of Electricity Losses Due to Faults in Distribution System*

| Zones   | Power Line<br>(Kilovolts/<br>Kilowatts) | % Losses | Losses<br>(Kilowatt<br>Hours) | Duration<br>(Hours) | Loss of Units<br>(Kilowatt<br>Hours) | Loss of Units per<br>Month (Kilowatt<br>Hours) |
|---------|---|----------|-------------------------------|---------------------|--------------------------------------|--|
| North   | 11/1440                                 | 7        | 100.8                         | 12                  | 1209.6                               | 36288  |
| East    | 11/1440                                 | 5        | 72                            | 12                  | 864                                  | 25920  |
| South   | 11/1440                                 | 4        | 57.6                          | 12                  | 691.2                                | 20736  |
| Central | 11/1440                                 | 6        | 86.4                          | 12                  | 1036.8                               | 31104  |
| West    | 11/1440                                 | 8        | 115.2                         | 12                  | 1382.4                               | 41472  |

**8. ANALYSIS OF ELECTRICITY LOSSES IN LALI BAGH TOWN**

First of all statistical analysis of the data was carried out. Table 8 shows the statistical analysis of the data. Results indicated that total of 308655.68 kilowatt hours of electricity is lost per month in Lali Bagh town. Average 599.936 kilowatt hours per month per zone are wasted; 30067.62 kilowatt hours per month per zone are lost due to faults in distribution system while 31104 kilowatt hours per month per zone are lost due to unlawful connections by the consumers. Statistics are indicated in Table 8.

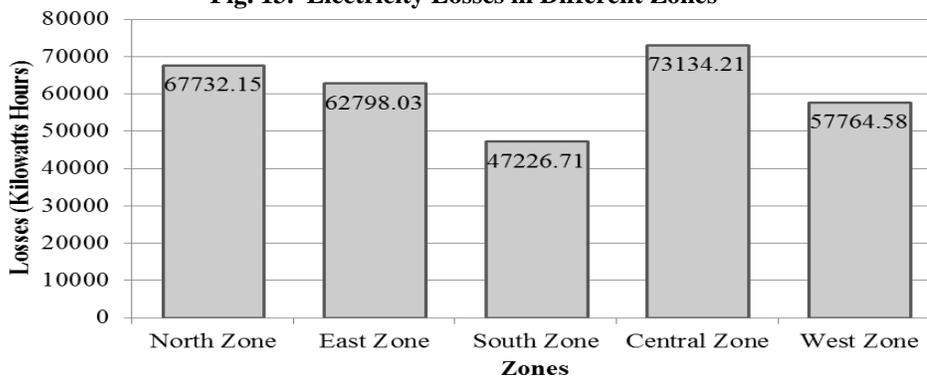
Table 8

Statistical Analysis of Electricity Losses

| Reasons of Losses                                | North Zone | East Zone | South Zone | Central Zone | West Zone | Total     | Average | Median | Standard Deviation | Variance | Skewness | Kurtosis |
|--|------------|-----------|------------|--------------|-----------|-----------|---------|--------|--------------------|----------|----------|----------|
| Profligate, wasteful and careless use            | 340.15     | 590.03    | 570.71     | 558.21       | 740.58    | 2799.68   | 559.936 | 570.71 | 143.14             | 16392.57 | -0.67    | 2.12     |
| Line losses due to faults in distribution system | 31104      | 36288     | 25920      | 41472        | 15552     | 150336    | 30067.2 | 31104  | 9971.62            | 79546614 | -0.59    | -0.021   |
| Unlawful connections by consumers                | 36288      | 25920     | 20736      | 31104        | 41472     | 155520    | 31104   | 31104  | 8196.62            | 53747712 | 0        | -1.2     |
| Total  | 67732.15   | 62798.03  | 47226.71   | 73134.21     | 57764.58  | 308655.68 | -       | -      | -                  | -        | -        | -        |

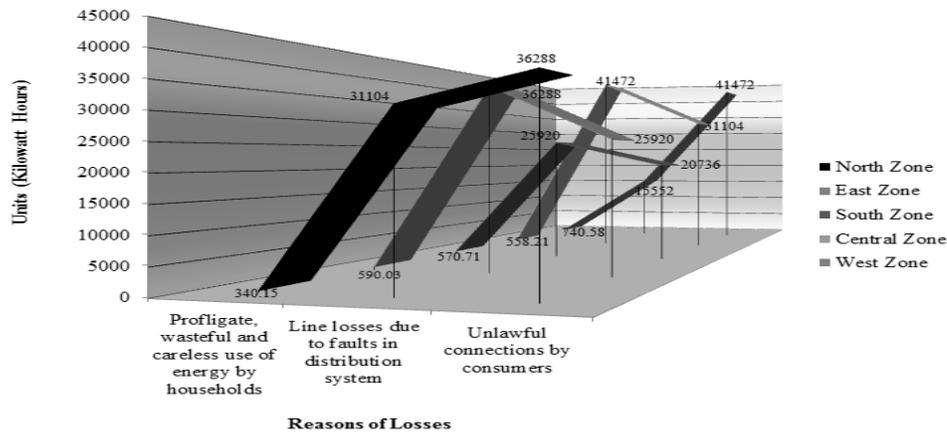
As per calculations, electricity losses are more in central zone, followed by north and east zones. Losses are comparatively less in south and west zones as shown in Figure 13.

Fig. 13. Electricity Losses in Different Zones



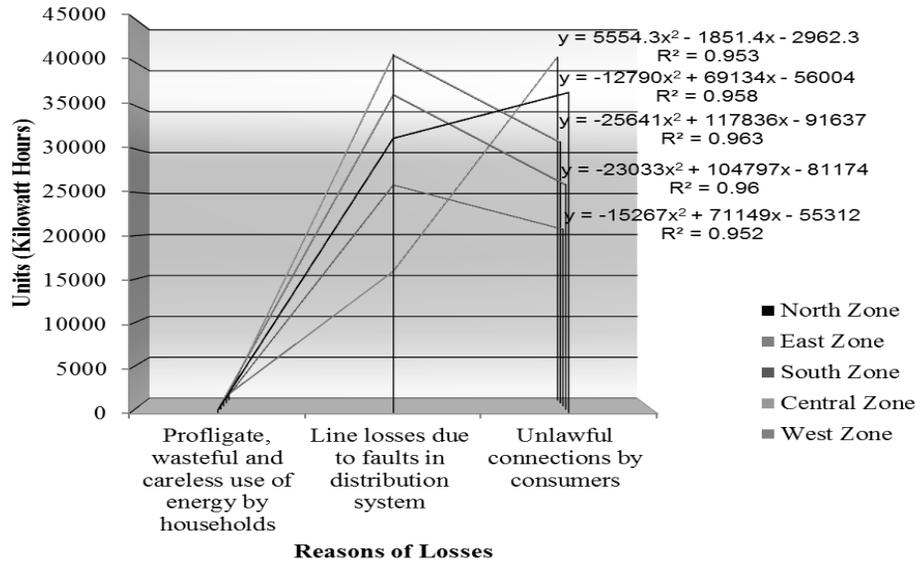
After statistical analysis, digital analysis was carried out to obtain the digitally iterated and attenuated model of electricity losses in Lali Bagh town. This was done by using computer assisted qualitative data analysis software (CAQDAS). The digital model obtained is shown in Figure 14.

Fig. 14. Digital Model of Electricity Losses



To get the exact ratings of electricity losses, digital model was converted into digitised mathematics mode (DMM) which gave the representative mathematical equations of aggregate electricity losses with  $R^2$  values. Equations for all zones were quadratic in nature with  $R^2$  values as 1. Digital model in the DMM is shown in Figure 15.

**Fig. 15. Digital Model in DMM Showing Representative Equations of Electricity Losses**



The representative equation of each zone obtained from digital analysis was solved using Newton-Leibniz integration process. For example the representative equation of north zone obtained from digital analysis is

$$\text{Electricity losses in north zone} = \int_{n=1}^{n=3} (\text{equation obtained from digital analysis}) dx \quad (4)$$

Where “n” is the category of losses under consideration which are 3 in this case (wastage, theft and faults in distribution system). Putting the representative equation in equation (4) we have

$$\text{Electricity losses in north zone} = \int_{n=1}^{n=3} (-12790x^2 + 69134x - 56004) dx$$

$$\text{Electricity losses in north zone} = \lim_{1 \rightarrow 3} \left[ -\frac{12790x^3}{3} + \frac{69134x^2}{2} - 56004x + C \right]$$

where “C” is a constant to account for errors in data and variables. By putting the limits in equation we obtained the quantified value of rating for the losses in north zone.

$$\begin{aligned} \text{Electricity losses in north zone} &= \left[ -\frac{12790(3)^3}{3} + \frac{69134(3)^2}{2} - 56004(3) + C \right] \\ &\quad - \left[ -\frac{12790(1)^3}{3} + \frac{69134(1)^2}{2} - 56004(1) + C \right] \end{aligned}$$

$$\text{Electricity losses in north zone} = [-115110 + 311103 - 168012 + C] - [-4263.33 + 34567 - 56004 + C]$$

$$\text{Electricity losses in north zone} = [27981 + C] - 25700.33 + C$$

$$\text{Electricity losses in north zone} = [27981 + C + 25700.33 - C]$$

$$\text{Electricity losses in north zone} = 53681.33$$

Similarly, equations were solved for remaining four zones and the values obtained are shown in Table 9. These values of aggregate electricity losses were almost in conformity with the values obtained from mathematical estimation and statistical analysis.

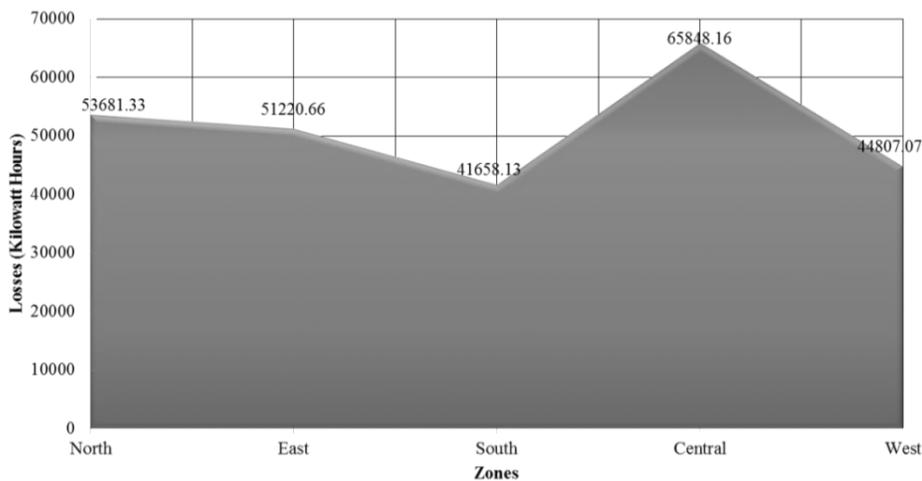
Table 9

*Values of Aggregate Electricity Losses Obtained from Newton-Leibniz Process*

| Zones   | Numerical Value of Digital Ratings of Losses (Kilowatt Hours) |
|---------|---|
| North   | 53681.33  |
| East    | 51220.66  |
| South   | 41658.13  |
| Central | 65848.16  |
| West    | 44807.07  |

The graphical representation of aggregate electricity losses is shown in figure 16. Figure clearly indicates that minimum losses were in south zone while maximum losses were in central zone.

**Fig. 16. Aggregate Electricity Losses Obtained from Digital Analysis and DMM**



### 9. THREE DIMENSIONAL ENERGY LOSS SURFACE MAPS (ELSMS)

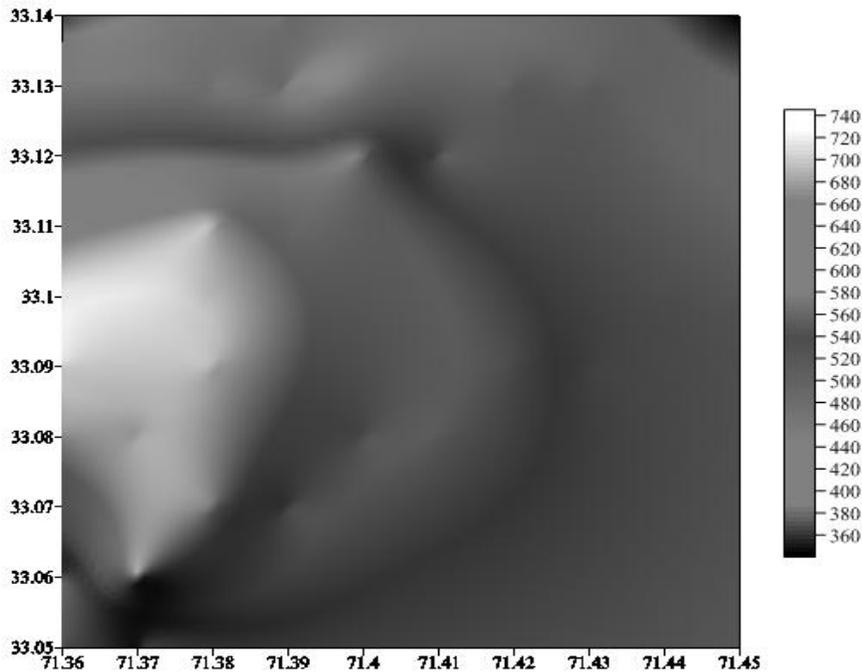
After analysis of losses, data was shifted to latest mapping software SURFER to create 3D energy losses surface maps (ELSMS). For this purpose, three steps were

followed. First, data grid was created in the grid module of software; second, grid map was created for electricity losses in each zone separately; third, grid map was converted into 3D energy losses surface maps showing electricity losses in each zone separately and also for the complete Lali Bagh town. Each map has longitude on x-axis and latitude on y-axis. Also each map has interactive key with it which shows values of losses as per the colour scheme. Elaboration of maps is as under:

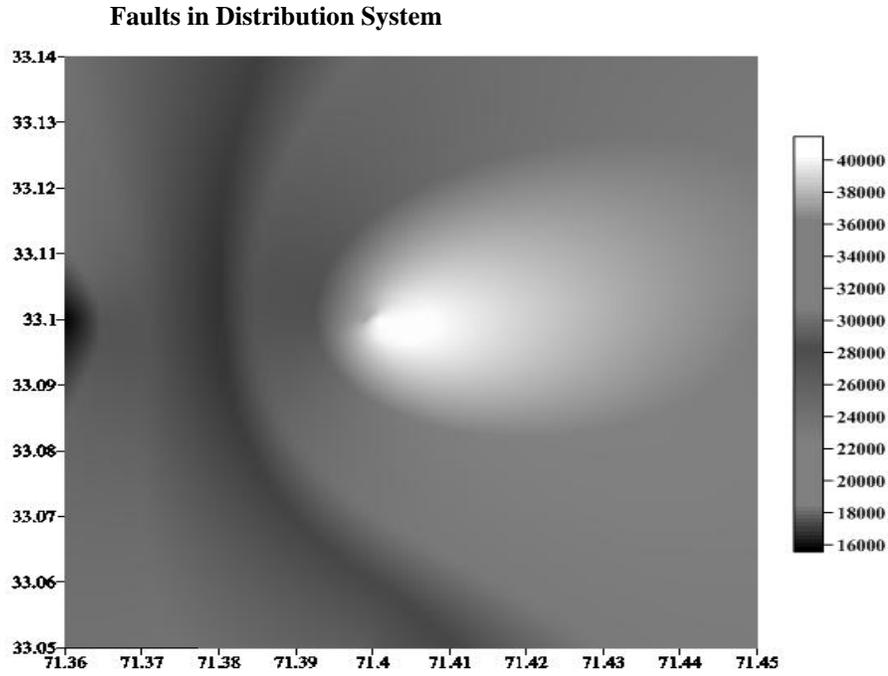
- Figure 17 shows 3D energy losses surface map (ELSM) for electricity losses due to over consumption and wastage. Map indicates that electricity losses due to over consumption and wastage are more in the west and central zones.
- Figure 18 shows 3D energy losses surface map (ELSM) for electricity losses due to faults in distribution system. Map indicates that electricity losses due to faults in distribution system are more in the central and east zones.
- Figure 19 shows 3D energy losses surface map (ELSM) for electricity losses due to unlawful connections by consumers. Map indicates that electricity losses due to unlawful connections are more in the west and north zones.
- Figure 20 shows 3D energy losses surface map (ELSM) for aggregate electricity losses in Lali Bagh town. Map indicates that aggregate electricity losses are more in the central and north zones.

All the maps are interactive and shows clear picture of electricity losses. These can be used as useful tool for energy policy formulation and implementation.

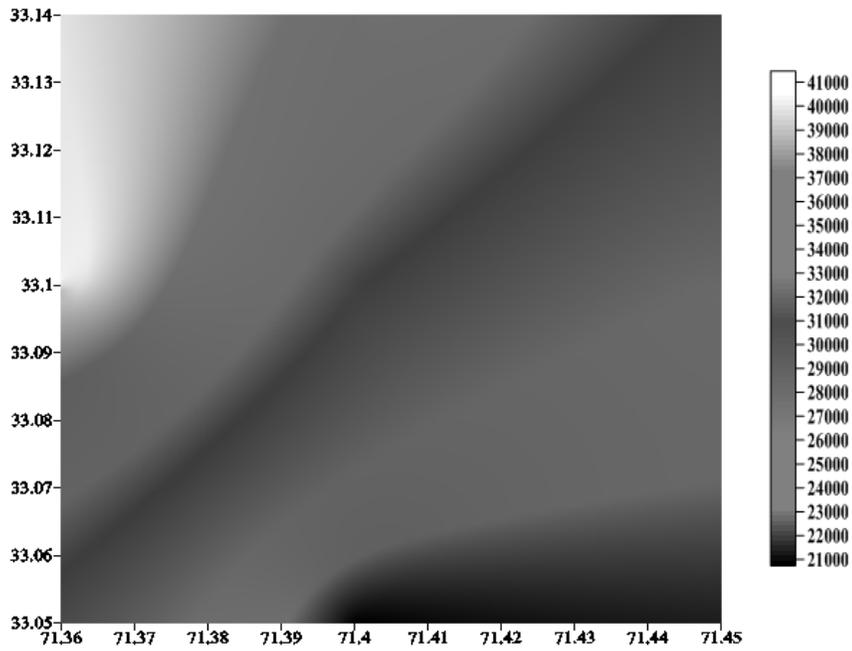
**Fig. 17. 3D Energy Losses Surface Map (ELSM) for Electricity Losses Due to Over Consumption and Wastage**



**Fig. 18. 3D Energy Losses Surface Map (ELSM) for Electricity Losses Due to**

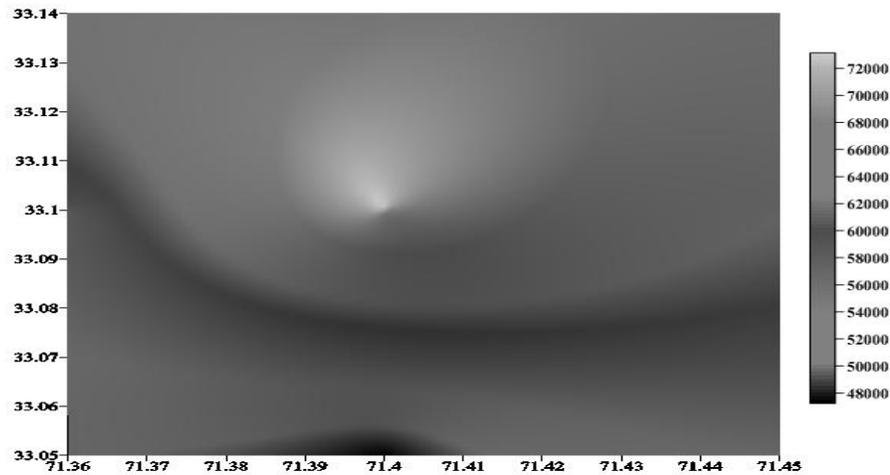


**Fig. 19. 3D Energy Losses Surface Map (ELSM) for Electricity Losses Due to Unlawful Connections by Consumers**



**Fig. 20. 3D Energy Losses Surface Map (ELSM) for Aggregate Electricity**

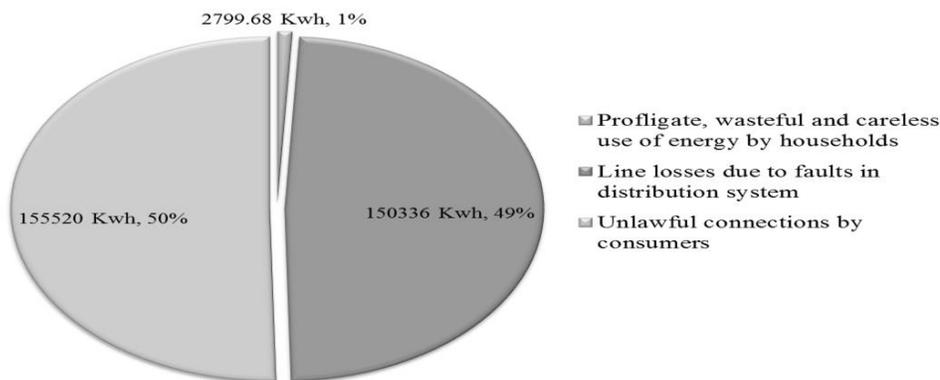
**Losses in Lali Bagh town**



**10. RESULTS AND DISCUSSION**

Results indicated that total of 308655.68 kilowatt hours of electricity is lost per month in Lali Bagh town. Figure 21 shows the overall share of three categories of losses. Losses due to over consumption and wastage are 2799.68 kilowatt hours which are just 1 percent of the total losses. The losses are less because households have the option of unlawful connections resulting into losses of 155520 kilowatt hours (50 percent of the total losses). Losses due to faults in distribution system were 150336 kilowatt hours (49 percent of the total losses). Combined together, consumers are responsible for 51 percent of losses (wastage and unlawful connections) and system is responsible for 49 percent of losses (faults in distribution lines). Therefore, we can not put complete responsibility of electricity losses on system. In fact we are more responsible for the losses than the system. If these losses are eliminated or atleast controlled, we shall have greater availability of electricity in our home.

**Fig. 21. Decomposition of Electricity Losses into Three Categories**



The calculated electricity load of a hypothetical house with all possible electric gadgets is 2039.12 kilowatts hours per month. This means that if we eliminate these losses, we shall be able to provide electricity to 151 more houses ( $308655.68/2039.12 = 151.36$ ) or else we can provide 308 additional units to each house of Lali Bagh town ( $308655.68/1000 = 308.65$  kilowatts hours) and free the households from the clutches of electricity load shedding. This will enhance energy security of the households at Lali Bagh town.

The economic impact of losses was also determined which indicated that substantial economic loss was incurring due to electricity losses. Calculations are as under:

- Total units provided to Lali Bagh Town =  $1440 \times 12 \times 30 = 518400$  kilowatt hours
- Units billed = 9567 kilowatt hours
- Public utilities (schools, hospital, street lights etc.) = 200177.32 kilowatt hours
- Units lost (wastage, thefts, faults in distribution) = 308655.68 kilowatt hours
- Cost of units lost (Rs 15 per unit) =  $15 \times 308655.6 = \text{Rs } 4629835.2$  (Rs 4.63 million)

This calculation indicated severity of the issue. For a town of 1000 houses the economic loss was Rs 4.63 million. Moreover, there was a gap between the units provided and the units billed. Out of 318222.68 kilowatt hours provided to households only 9567 kilowatt hours (3 percent of the total units provided) are billed while remaining 308655.68 kilowatt hours (97 percent of the total units provided) are lost due to wastage, unlawful connections and faults in distribution system. Because of this gap complete system of electricity provision is running into loss.

## 11. CONCLUSIONS AND POLICY RECOMMENDATIONS

3D electricity losses surface maps indicated that losses were experienced in the five zones of Lali Bagh town in varying proportions. Following pertinent conclusions can be drawn from the study:

- Total electricity losses in Lali Bagh town of 1000 houses were 308655.68 kilowatts hours per month costing Rs 4.63 million per month.
- Roughly Rs 0.5 billion is lost annually due to electricity losses in Lali Bagh town.
- Consumers and electricity providers both are responsible for electricity losses almost in equal proportion.
- Losses due to profligate and wasteful use of electricity are just 1 percent of the total losses because consumers have covert option of getting electricity through unlawful connections which are not billed.
- 3D electricity losses surface maps indicate precisely the magnitude of losses in different geographical locations. Such maps are useful for eradication of electricity losses at the country level and thus ensure greater energy security to households.

Following policy recommendations are proffered for energy security of the households in the context of vision 2025:

- Electricity losses are costing heavily to our country. While keeping focus on energy generation from different renewable and non-renewable energy alternatives, comprehensive campaign should be launched to eradicate electricity losses for greater energy security to households.
- Energy conservation drive could not be successful so far due to mind set of population and lack of administrative and legal back up. Following measures are required to be enforced with complete legal framework:
  - Use of energy friendly technologies like energy savers should be institutionalised. There should be complete ban on other sources of illuminations like bulbs and tube lights of more than 100 watts.
  - There should be scale of energy consumption (number of bulbs, fans, split coolers, iron etc.) as per number of inhabitants in a house/ dwellings, commercial plazas, offices and other infrastructure. Excessive illumination should be avoided. Violators should be strictly dealt with.
  - Optimum utilisation of daylight hours in the gatherings, offices, halls and other buildings by use of transparent roof tops. Maximum ceremonies should be planned in the day time. Dark light illumination should be minimised.
- At the country level 13 percent of the total production of electricity is lost due to faults in transmission and distribution system. These losses are costing Rs 50 billion per year. More than 60 percent of the transformers and aerial wires are outdated and needs replacement. Investment in this field will help reducing energy crisis and will ensure greater energy security of households.
- Unlawful connections by consumers account for more than 12 percent of electricity losses at the country level. These losses are related to consumers' behaviour and are against the social norms. Such losses not only put burden on the electricity consumption but also cost heavily in economic terms by increasing the quantity of unbilled units. These losses should be eradicated through strict legal and administrative actions.
- 3D energy losses surface maps are extremely useful for energy planning and implementation. These should be prepared at the country level and areas with high electricity losses should be immediately focused to rescue households from the paws of load shedding in peak summers.

Although, energy generation efforts are required to reduce the gap between energy supply and demand, eradication of electricity losses will ease up the situation to some extent. Economic cost of Rs 50 billion per year due to electricity losses should be avoided to achieve two fold advantages of greater energy security of households, and benefit of saving Rs 50 billion per year. The eradication of electricity losses is the most effective energy alternative for Pakistan.

Appendix 1

Collective Picture of Electricity Load Calculation for Different Zones

| Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) | Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) |
|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|
| Tube lights   | 4        | 50           | 200                | 8                 | 1600                            | 1.6   | 48  | Tube lights   | 4        | 50           | 200                | 8                 | 1600                            | 1.6   | 48  |
| Bulbs   | 3        | 100          | 300                | 8                 | 2400                            | 2.4   | 72  | Bulbs   | 3        | 100          | 300                | 8                 | 2400                            | 2.4   | 72  |
| Energy Savers   | 3        | 20           | 60                 | 8                 | 480                             | 0.48  | 14.4                                      | Energy Savers   | 3        | 20           | 60                 | 8                 | 480                             | 0.48  | 14.4                                      |
| Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  | Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  |
| Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      | Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      |
| Electric Cycles   | 0        | 500          | 0                  | 4                 | 0                               | 0   | 0   | Electric Cycles   | 0        | 500          | 0                  | 4                 | 0                               | 0   |   |
| Split Air Conditioner   | 1        | 1000         | 1000               | 8                 | 8000                            | 8   | 240                                       | Split Air Conditioner   | 1        | 1000         | 1000               | 8                 | 8000                            | 8   | 240                                       |
| Window Air Conditioner  | 1        | 2000         | 2000               | 6                 | 12000                           | 12  | 360                                       | Window Air Conditioner  | 1        | 2000         | 2000               | 6                 | 12000                           | 12  | 360                                       |
| Pressing Iron   | 4        | 300          | 1200               | 4                 | 4800                            | 4.8   | 144                                       | Pressing Iron   | 5        | 300          | 1500               | 4                 | 6000                            | 6   | 180                                       |
| Electric Heaters  | 0        | 500          | 0                  | 6                 | 0                               | 0   | 0   | Electric Heaters  | 0        | 500          | 0                  | 6                 | 0                               | 0   |   |
| Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  | Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  |
| Electric Cooling Range  | 0        | 200          | 0                  | 3                 | 0                               | 0   | 0   | Electric Cooling Range  | 0        | 200          | 0                  | 3                 | 0                               | 0   |   |
| Microwave   | 0        | 150          | 0                  | 2                 | 0                               | 0   | 0   | Microwave   | 0        | 150          | 0                  | 2                 | 0                               | 0   |   |
| Vacuum Cleaner  | 0        | 500          | 0                  | 2                 | 0                               | 0   | 0   | Vacuum Cleaner  | 0        | 500          | 0                  | 2                 | 0                               | 0   |   |
| Toaster   | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     | Toaster   | 0        | 50           | 0                  | 0.25              | 0                               | 0   |   |
| Water Dispenser   | 0        | 50           | 0                  | 12                | 0                               | 0   | 0   | Water Dispenser   | 0        | 50           | 0                  | 12                | 0                               | 0   |   |
| Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     | Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Blender   | 1        | 50           | 50                 | 1                 | 50                              | 0.05  | 1.5                                       | Blender   | 0        | 50           | 0                  | 1                 | 0                               | 0   |   |
| Washing Machine   | 1        | 400          | 400                | 3                 | 1200                            | 1.2   | 36  | Washing Machine   | 1        | 400          | 400                | 3                 | 1200                            | 1.2   | 36  |
| Desktop Computers   | 1        | 100          | 100                | 6                 | 600                             | 0.6   | 18  | Desktop Computers   | 0        | 100          | 0                  | 6                 | 0                               | 0   |   |
| Laptops   | 3        | 50           | 150                | 6                 | 900                             | 0.9   | 27  | Laptops   | 3        | 50           | 150                | 6                 | 900                             | 0.9   | 27  |
| Wet Pump  | 1        | 500          | 500                | 0.5               | 250                             | 0.25  | 7.5                                       | Wet Pump  | 1        | 500          | 500                | 0.5               | 250                             | 0.25  | 7.5                                       |
| Mobile Phones Rechargers  | 1        | 2            | 2                  | 6                 | 12                              | 0.012                                       | 0.36                                      | Mobile Phones Rechargers  | 1        | 2            | 2                  | 6                 | 12                              | 0.012                                       | 0.36                                      |
| Refrigerator  | 0        | 500          | 0                  | 8                 | 0                               | 0   | 0   | Refrigerator  | 0        | 500          | 0                  | 8                 | 0                               | 0   |   |
| Freezer   | 1        | 500          | 500                | 8                 | 4000                            | 4   | 120                                       | Freezer   | 1        | 500          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Electric Shavers  | 3        | 15           | 45                 | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    | Electric Shavers  | 3        | 15           | 45                 | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    |
| <b>Total</b>  | -        | -            | <b>7007</b>        | -                 | <b>39678.25</b>                 | <b>39.67825</b>                             | <b>1188.85</b>                            | <b>Total</b>  | -        | -            | <b>7007</b>        | -                 | <b>40165.75</b>                 | <b>40.16575</b>                             | <b>1204.97</b>                            |

Calculated electricity load of North Zone

Calculated electricity load of East Zone

| Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) |
|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|
| Tube lights   | 3        | 50           | 150                | 8                 | 1200                            | 1.2   | 36  |
| Bulbs   | 4        | 100          | 400                | 8                 | 3200                            | 3.2   | 96  |
| Energy Savers   | 3        | 20           | 60                 | 8                 | 480                             | 0.48  | 14.4                                      |
| Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  |
| Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      |
| Electric Cycles   | 1        | 500          | 500                | 4                 | 2000                            | 2   | 60  |
| Split Air Conditioner   | 0        | 1000         | 0                  | 8                 | 0                               | 0   | 0   |
| Window Air Conditioner  | 1        | 2000         | 2000               | 6                 | 12000                           | 12  | 360                                       |
| Pressing Iron   | 5        | 300          | 1500               | 4                 | 6000                            | 6   | 180                                       |
| Electric Heaters  | 0        | 500          | 0                  | 6                 | 0                               | 0   | 0   |
| Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  |
| Electric Cooling Range  | 0        | 200          | 0                  | 3                 | 0                               | 0   | 0   |
| Microwave   | 1        | 150          | 150                | 2                 | 300                             | 0.3   | 9   |
| Vacuum Cleaner  | 0        | 500          | 0                  | 2                 | 0                               | 0   | 0   |
| Toaster   | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Water Dispenser   | 0        | 50           | 0                  | 12                | 0                               | 0   | 0   |
| Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Blender   | 1        | 50           | 50                 | 1                 | 50                              | 0.05  | 1.5                                       |
| Washing Machine   | 2        | 400          | 800                | 3                 | 2400                            | 2.4   | 72  |
| Desktop Computers   | 1        | 100          | 100                | 6                 | 600                             | 0.6   | 18  |
| Laptops   | 4        | 50           | 200                | 6                 | 1200                            | 1.2   | 36  |
| Wet Pump  | 1        | 500          | 500                | 0.5               | 250                             | 0.25  | 7.5                                       |
| Mobile Phones Rechargers  | 0        | 2            | 0                  | 6                 | 0                               | 0   | 0   |
| Refrigerator  | 0        | 500          | 0                  | 8                 | 0                               | 0   | 0   |
| Freezer   | 1        | 500          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Electric Shavers  | 3        | 15           | 45                 | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    |
| <b>Total</b>  | -        | -            | <b>7475</b>        | -                 | <b>37116.25</b>                 | <b>37.11625</b>                             | <b>1113.39</b>                            |

| Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) |
|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|
| Tube lights   | 4        | 50           | 200                | 8                 | 1600                            | 1.6   | 48  |
| Bulbs   | 4        | 100          | 400                | 8                 | 3200                            | 3.2   | 96  |
| Energy Savers   | 3        | 20           | 60                 | 8                 | 480                             | 0.48  | 14.4                                      |
| Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  |
| Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      |
| Electric Cycles   | 1        | 500          | 500                | 4                 | 2000                            | 2   | 60  |
| Split Air Conditioner   | 0        | 1000         | 0                  | 8                 | 0                               | 0   | 0   |
| Window Air Conditioner  | 1        | 2000         | 2000               | 6                 | 12000                           | 12  | 360                                       |
| Pressing Iron   | 6        | 300          | 1800               | 4                 | 7200                            | 7.2   | 216                                       |
| Electric Heaters  | 0        | 500          | 0                  | 6                 | 0                               | 0   | 0   |
| Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  |
| Electric Cooling Range  | 0        | 200          | 0                  | 3                 | 0                               | 0   | 0   |
| Microwave   | 0        | 150          | 0                  | 2                 | 0                               | 0   | 0   |
| Vacuum Cleaner  | 1        | 500          | 500                | 2                 | 1000                            | 1   | 30  |
| Toaster   | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Water Dispenser   | 1        | 50           | 50                 | 12                | 600                             | 0.6   | 18  |
| Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Blender   | 0        | 50           | 0                  | 1                 | 0                               | 0   | 0   |
| Washing Machine   | 1        | 400          | 400                | 3                 | 1200                            | 1.2   | 36  |
| Desktop Computers   | 1        | 100          | 100                | 6                 | 600                             | 0.6   | 18  |
| Laptops   | 4        | 50           | 200                | 6                 | 1200                            | 1.2   | 36  |
| Wet Pump  | 1        | 500          | 500                | 0.5               | 250                             | 0.25  | 7.5                                       |
| Mobile Phones Rechargers  | 0        | 2            | 0                  | 6                 | 0                               | 0   | 0   |
| Refrigerator  | 0        | 500          | 0                  | 8                 | 0                               | 0   | 0   |
| Freezer   | 1        | 500          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Electric Shavers  | 3        | 15           | 45                 | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    |
| <b>Total</b>  | -        | -            | <b>7775</b>        | -                 | <b>38226.25</b>                 | <b>38.22625</b>                             | <b>1164.79</b>                            |

Calculated electricity load of South Zone

Calculated electricity load of Central Zone

| Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) |
|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|
| Tube lights   | 5        | 50           | 250                | 8                 | 2000                            | 2   | 60  |
| Bulbs   | 5        | 100          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Energy Savers   | 6        | 20           | 120                | 8                 | 960                             | 0.96  | 28.8                                      |
| Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  |
| Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      |
| Electric Cycles   | 2        | 500          | 1000               | 4                 | 4000                            | 4   | 120                                       |
| Split Air Conditioner   | 0        | 1000         | 0                  | 8                 | 0                               | 0   | 0   |
| Window Air Conditioner  | 2        | 2000         | 4000               | 6                 | 24000                           | 24  | 720                                       |
| Pressing Iron   | 8        | 300          | 2400               | 4                 | 9600                            | 9.6   | 288                                       |
| Electric Heaters  | 1        | 500          | 500                | 6                 | 3000                            | 3   | 90  |
| Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  |
| Electric Cooling Range  | 1        | 200          | 200                | 3                 | 600                             | 0.6   | 18  |
| Microwave   | 1        | 150          | 150                | 2                 | 300                             | 0.3   | 9   |
| Vacuum Cleaner  | 1        | 500          | 500                | 2                 | 1000                            | 1   | 30  |
| Toaster   | 2        | 50           | 100                | 0.25              | 25                              | 0.025                                       | 0.75                                      |
| Water Dispenser   | 1        | 50           | 50                 | 12                | 600                             | 0.6   | 18  |
| Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Blender   | 1        | 50           | 50                 | 1                 | 50                              | 0.05  | 1.5                                       |
| Washing Machine   | 2        | 400          | 800                | 3                 | 2400                            | 2.4   | 72  |
| Desktop Computers   | 1        | 100          | 100                | 6                 | 600                             | 0.6   | 18  |
| Laptops   | 3        | 50           | 150                | 6                 | 900                             | 0.9   | 27  |
| Wet Pump  | 1        | 500          | 500                | 0.5               | 250                             | 0.25  | 7.5                                       |
| Mobile Phones Rechargers  | 1        | 2            | 2                  | 6                 | 12                              | 0.012                                       | 0.36                                      |
| Refrigerator  | 2        | 500          | 1000               | 8                 | 8000                            | 8   | 240                                       |
| Freezer   | 1        | 500          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Electric Shavers  | 3        | 15           | 45                 | 0.25              | 11.25                           | 0.01125                                     | 0.3375                                    |
| <b>Total</b>  | -        | -            | <b>13387</b>       | -                 | <b>69780.75</b>                 | <b>69.78</b>                                | <b>2093.42</b>                            |

| Electricity Items   | Quantity | Power (Watt) | Total Power (Watt) | Daily Use (Hours) | Energy Consumption (Watt-Hours) | Energy Consumption per Day (Kilowatt-Hours) | Units Consumed per Month (Kilowatt-Hours) |
|---|----------|--------------|--------------------|-------------------|---------------------------------|---|---|
| Tube lights   | 5        | 50           | 250                | 8                 | 2000                            | 2   | 60  |
| Bulbs   | 5        | 100          | 500                | 8                 | 4000                            | 4   | 120                                       |
| Energy Savers   | 6        | 20           | 120                | 8                 | 960                             | 0.96  | 28.8                                      |
| Colour Televisions  | 1        | 150          | 150                | 6                 | 900                             | 0.9   | 27  |
| Light Emitting Diode (LED) Liquid Crystal Display (LCD) Televisions | 1        | 220          | 220                | 8                 | 1760                            | 1.76  | 52.8                                      |
| Electric Cycles   | 2        | 500          | 1000               | 4                 | 4000                            | 4   | 120                                       |
| Split Air Conditioner   | 0        | 1000         | 0                  | 8                 | 0                               | 0   | 0   |
| Window Air Conditioner  | 2        | 2000         | 4000               | 6                 | 24000                           | 24  | 720                                       |
| Pressing Iron   | 8        | 300          | 2400               | 4                 | 9600                            | 9.6   | 288                                       |
| Electric Heaters  | 1        | 500          | 500                | 6                 | 3000                            | 3   | 90  |
| Fans  | 1        | 50           | 50                 | 16                | 800                             | 0.8   | 24  |
| Electric Cooling Range  | 1        | 200          | 200                | 3                 | 600                             | 0.6   | 18  |
| Microwave   | 1        | 150          | 150                | 2                 | 300                             | 0.3   | 9   |
| Vacuum Cleaner  | 1        | 500          | 500                | 2                 | 1000                            | 1   | 30  |
| Toaster   | 2        | 50           | 100                | 0.25              | 25                              | 0.025                                       | 0.75                                      |
| Water Dispenser   | 1        | 50           | 50                 | 12                | 600                             | 0.6   | 18  |
| Juicer  | 1        | 50           | 50                 | 0.25              | 12.5                            | 0.0125                                      | 0.375                                     |
| Blender   | 1        | 50           |                    |                   |                                 |   |   |

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