Human Capital and Economic Growth: The Role of Governance

Ali Muhammad[1], Abiodun Egbetokun[2], Manzoor Hussain Memon[3]

Abstract

In this paper we endeavour to assess the role of governance as a precondition to human-led growth. To the best of our knowledge, the study is first of its kind attempt to introduce the role of governance in the human capital and growth literature. Specifically, we used rule of law, control of corruption, regulatory quality and government effectiveness as indicators of governance in addition to a variable representing average of the four governance indicators. We divided our data sample into three parts; 'low', 'medium' and 'high' based on governance indicators. Empirical models Benhabib & Spiegel (1994) and Cohen & Soto (2007) were used for the purpose of core analysis. Using the data for 134 countries for the period 1996-2011 we found strong evidence in support of the research hypothesis that relationship between human capital and growth is much less pronounced in countries with low level of governance. We also found that magnitude of the coefficient of human capital was much higher for countries with medium level of governance vis-à-vis countries with high level of governance. This finding hints towards the threshold level of governance after which diminishing returns might prevail. Findings of this paper suggest that preconditions in the form of good governance are necessary for educated labor force in order to contribute to the economic growth of the country.

Keywords: Human Capital, Growth, Unemployment, Inflation, Pakistan
JEL classification: E24, E30, O40, J24, J60

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Introduction

Economists' agrees that human capital is an important determinant of economic growth (Arrow, 1962; Romer, 1986; Aghion and Howitt, 1992). Using theoretical and empirical approaches, studies generally present a common conclusion of human-led growth by stating that human capital positively affects economic growth. The main empirical prediction of the traditional model is that a country's economic growth depends on its initial per capita income and on the factors that drive its steady state. The result is driven by the assumption of catching-up hypothesis i.e. a country will grow faster the further it is from its steady state (i.e. conditional convergence).

The standard empirical result of a direct relationship between human capital (however measured) and economic growth, however, has been criticised on several fronts. First, the impact of other growth related endogenous variables like quality of education, health of the labour force, inflation, corruption, unemployment and rule of law etc. should not be ignored. These endogenous characteristics of a country are included in Becker's (1993) definition of human capital. In addition, as noted by Abramovitz (1986), social capabilities are important in the adoption and diffusion of technologies but countries differ in social capabilities. Therefore, to the extent to which human capital contributes to economic growth through innovation, its effect is conditioned by the country's social capabilities which include issues like quality of institutions as reflected, for instance, in the quality of governance.

The effect of human capital (as a resource) on growth could be influenced by the environment within which it is deployed. For instance, factors like rule of law, government effectiveness, corruption, and education quality may influence the relationship between education and economic growth. In short, the relationship between human capital and growth might be different for countries with different governance frameworks. Such conditionality is largely ignored in the literature. In fact, the stylised fact in the literature is that, all else being equal, higher levels of human capital – particularly the proportion of the population that is educated – leads to higher economic growth.

The literature on governance presents two kinds of strategies to improve governance; market-enhancing and growth-enhancing. On one hand, market-enhancing strategy aims at improving market efficiency and on the other hand growth-enhancing strategy deals with governance issues at a broader scale and covers areas outside the boundary of market efficiency to ensure sustainable long term growth. However, sustainable productivity growth requires creation or at-least understanding of existing technologies. In order to achieve this, only market efficiency is not enough. Appropriate incentives are required to facilitate the learning and development of new technologies. The adoption, learning, implementation and development of technologies require adequate human capital and the literature of governance suggests that growth-enhancing policies will not be effective in the absence of proper governance preconditions.

This paper, therefore, aims to explore the potential role of governance in the relationship between human capital and economic growth. We divided our sample based on 'low', 'medium' and 'high' level of governance using three similar but different methodologies. Using Benhabib & Spiegel (1994) model on data for 134 countries we found that human capital has highest impact on growth of countries with medium level of governance. The countries with low level of governance showed insignificant impact of human capital on growth while countries with high level of governance showed significant but smaller magnitude of coefficient relative to the countries in medium governance group.

The layout of this paper is as follows. First we present a short review on previous studies on relationship between human capital and growth. Second the conceptual framework of this study where we theoretically underpin the role of governance in human capital and growth nexus. Third, the discussion is on the applied model and a brief note on the data used in this study. Fourth, we present empirical setup and estimation results and the last section concludes.

Human Capital and Economic Growth

It is not possible to ignore the importance of human capital despite increase in automation and technology which is an embodiment of a human. While the field of automation and robotics has been increasing at a faster pace since the beginning of 21st century, no one can avoid the human behind such innovations and technological advancements. Thus the vital role of human capital in the current and future scenario remains intact in economic activities and output growth. In the literature on economic growth and development, knowledge and the human capital are considered as major endogenous sources and drivers of macroeconomic growth. Human capital, in particular, has been the subject of much theorising and empirical investigations. The general understanding is that it is a very important - if not the most important - source of growth (Arrow, 1962; Romer, 1986; Aghion and Howitt, 1992).

Despite being recognised as an important factor in the growth and development of nations, the concept of human capital does not lend itself to a uniform theoretical or empirical definition. For simplicity, we stick to the very generic conceptualisation offered by Becker (1993) of human capital as referring to the resources found in people. These resources would typically include knowledge, skills, competences and other attributes embodied in humans "that are relevant to economic activity" (OECD, 1998). As simple as it seems, the aforementioned definition of human capital leads easily to two observations which are important in the discussion of the role of human capital in economic growth.

The first, and perhaps most important, is that human capital transcends education and encompasses all forms of investments made to improve human skills (including schooling, informal education, training on the job, learning by doing, etc) as well as other factors that

facilitate the productive use of human skills (e.g. health). Besides formal education, nearly all of the foregoing components of human capital are very difficult to measure; thus, most studies linking human capital to economic growth have been restricted to studying the impact of formal education on economic growth. The common understanding is that education is an important ingredient in sustainable economic growth and that better education in the country ensures smooth economic growth over time (Lucas, 1988; Barro, 1991).

The standard neoclassical growth model (Solow, 1956) was the cornerstone of growth theorizing in the 50s and 60s. The model is basically an aggregate production function of the Cobb-Douglas type and is characterized by constant returns to scale of all inputs, decreasing returns to each input and a constant positive elasticity of input substitution.

$$Y_t = A_t \cdot f(K_t \cdot L_t)$$

K is physical capital
L is labour (sometimes interpreted as population)
t is time
A is a technology or efficiency index

The main empirical prediction of this model is that a country's economic growth depends on its initial per capita income and on the factors that drive its steady state. This arises from the theoretical expectation that a country will grow faster the further it is from its steady state (i.e. conditional convergence). Subsequent models of economic growth extend the canonical Solow model in two broad ways. In the first approach, human capital is introduced as an additional factor of production and in the second approach human capital enters as an input into the innovation process which brings about growth.

Review of Selected Literature

The common assumption of a balanced growth path among countries is also contended. In Owen's et al (2009) analyses of a sample of developed and developing countries, it was shown that countries do not necessarily follow similar growth paths; rather countries can be sorted into categories, each with its own unique growth processes. The major source of heterogeneity in this respect is the quality of institutions, proxied by the degree of law and order. This influences the growth environment and affects the growth process, determining the effects the usual factors of production, including human capital accumulation. In Gemmel (1996), it was shown that the country's level of development significantly determines its human capital needs: primary education is most important in least developed countries (LDCs), secondary education for intermediate countries and tertiary education for OECD countries. Similarly, in a series of multi-country analyses by Sunde and Vischer, the balanced growth path assumption was confronted. In Sunde and Vischer (2011), the authors states 'given that countries follow similar and balanced growth paths, human capital, either as a factor of production or as a pre-requisite for innovation, directly influences growth'. However, these results collapse once the balanced growth path

assumption is removed. In such deficiency, human capital as a production factor or an innovation input no longer directly influence growth. The effect is essentially conditioned by living conditions: when favourable, the contribution of human capital to growth is amplified (Sunde and Vischer, 2012).

The quality of the educational system has also shown as a condition for the effect of human capital on growth. For instance, Dessus (1999) using panel data on 83 countries demonstrated that differences in the quality composition of human capital across nations must be taken into account when analyzing the effect of human capital on growth. Ignoring such differences creates a significant estimation bias. The result of such biased estimation using panel data is that human capital is presented as playing a negative role in growth models (e.g. Islam, 1995). After correcting for such bias, a positive effect of human capital on growth was found. Additionally, using a varying parameter method, he traced the heterogeneity among countries to the differences in the quality of their human capital. In particular, the difference of education infrastructure, initial endowment in developing human capital. Such difference affects the human capital quality and the capacity of the education system to equitably distribute educational services. These are reported to condition the effect of human capital on growth in the specified sample of countries. Similarly, Banerjee (2012) used data on 55 countries for the period from 1980 to 2007 to show that quality composition of human capital is important for growth. His argument is that the stock of human capital affects economic growth through its effect on capital productivity as well as technological diffusion. This comes from his finding that while the stock of tertiary educated persons is not a significant determinant of growth, the stock of secondary and primary educated persons are important. Consequently, basic education – though maybe not sufficient for research and development (R&D) - is necessary to absorb existing technologies and its quality therefore plays a key role in conditioning the effect of human capital on growth.

Elias and Fernandez (2000)[4] emphasized on role of human capital and income levels on sustained growth in Latin American Countries. The major variables taken to analyze the impact of human capital and growth were education indicators (primary, secondary and high school gross enrolment ratios), dummy variables for low and middle incomes as per the classification of income per capita of the World Bank indicators and variable of life expectancy. These were regressed with GDP per capita for the period between 1965 and 1996. The regression result reveals that the countries which invested more on primary education in 1965 had a tendency to grow more. While the insignificance is observed for the secondary and high schooling, argued in the paper with probable poor investment levels in the category. Similarly with inclusion of high life expectancy variable, the result exhibits the positive high significance on growth regression.

[4] Lic. Silvina Elias and Lic. M. del R. Fernandez, "Human Capital Investment, Income Levels and Economic Grotwh in Latin American Countries", Departamento de Economics. Universidad Nacional Del Sur, 2000

The study states that together with high level of skill, high life expectancy and better work habits the improvement in the performance of growth is likely. The model with the inclusion of income levels differentiation amongst the countries inferred that countries with low and middle low incomes should have grown little due to a low investment rate in education. The paper however concluded the importance of use of panel data instead of simple cross-section regression used in the study; mainly to capture the heterogeneity arising out with the cultural, institutional and technological differences amongst the observed countries.

Toche (2001)[5] in his discussion paper highlights the important aspect of trade-off between unemployment and growth. The basic model surrounds the determination of wage which is central to such trade-off. The model combines the two-sector theory of endogenous growth with the matching theory of unemployment.

Hoti (2003)[6] in his paper empirically analyzed the key issues of high unemployment and large-scale emigration in the transition economy of Kosova; a post-war Kosova. The logit specification model developed to explore the probability of being unemployed and emigrating. The variables taken were residence (rural/urban), gender, age, marital status and level of education. The empirical results reveals that there is high probability of being unemployed in rural areas vis-à-vis population residing in urban areas. Consequently, people residing in rural area also tend to emigrate more. The finding also reveals the gender based unemployment probability as males faces lower probability of being unemployed though the emigration found to be also higher in male members. Similarly, they found less probability of being unemployed by educated individual however they are tend to emigrate more than less educated people. The paper necessitate that there is an immediate and urgent need to reintegrate the highly unemployed people into employment, otherwise this would have a negative impact on growth.

Khan (2005)[7] in his paper focused on the factors that may explain the growth performance of Pakistan, particularly the quality of human capital. The paper pointed out that despite relatively high growth rates of Pakistan's economy during the period 2004-05, the social development in the country remained weak and poverty levels widespread with about an estimated 30 percent of the population. He argued that investing in human capital, by creating a more productive work force, will led to higher future growth and incomes. The paper mainly emphasized on investment on education and health care providing opportunity to people under poverty to improve their

[5] Patrick Toche, "Is there a Growth –Unemployment Trade-Off?", Department of Economics, University of Oxford, 2001

[6] Avdullah Hoti, "Human Capital and Unemployment in Transition Economies: The Case of Kosova", International Conference of The Faculty o Economic Sarajevo, 2003

[7] Mohsin S. Khan, "Human Capital and Economic Growth in Pakistan", The Pakistan Development Review 44:4, Part I (Winter 2005) pp. 455-478

current living standards and also future prospects. The empirical analysis is based on cob-douglas production function augmented with education and health indicators as a quality of human capital. The measure used in the model includes literacy rates, average years of secondary school enrolment and life expectancy. The model also used rate of inflation as a proxy for sound economic policies and the overall quality of institutions. The model was estimated for a group of 72 developing countries including Pakistan. The beta coefficient findings from the model suggest specifically the sizeable impact of population's health and education on the output and are interestingly independent of each other. A strong relationship also found between the economic policies, quality of institutions such as law and order, absence of corruption and protection of property rights on growth.

Farida and Ahmadi (2006)[8] provided empirical evidence on impact of corruption on human capital productivity and growth. The paper mainly hypothesise that the corruption reduces the standards of living as measured by real per capita GDP. The paper argued on patronage for assuming positions rather than ability and tested the neo-classical growth model that explicitly includes the direct and indirect effects of corruption on economic growth in Lebanon. The paper uses the Solow growth model by extending with the inclusion of corruption as an important determinant in the existing model. The study found significance of this new variable, the magnitude of coefficients which affect positively on growth have reduced considerable stating that corruption leads to inefficiency in the economy. The study concludes that corruption lowers investment, while the effectiveness of government expenditure and the productivity of human capital are also reduced in the case of Lebanon.

Stark and Fan (2007)[9] has extended the existing literature on 'brain drain' and 'brain gain' by analyzing the negative and positive impacts of migration by skilled and educated individuals in a unified framework. He stated that the international migration in developing countries is largely on the back of over-education creating educated unemployment situation. The analytical framework considers two countries as home country and foreign country, i.e. from where the migration takes place and to the country the immigration is possible, respectively. Based on two period scenario i.e. current and future; the short run and the long run (one generation down the road), the result reveals temporary negative impact in short run for migration of educated individuals. The first negative impact is the reduction of stock of skilled and educated human capital. Since the possibility of migration motivates individual to acquire higher education, in turn reduces average income in the economy, and output shrinks. If some of them remain in the

[8] Moe Farida and Fredoun Z. Ahmadi-Esfahani, "Corruption and Economic Growth in Lebanon", Australian Agricultural and Resource Economics Society, 52nd Annual Conference (2006)
[9] Oded Stark, and C. Simon Fan., "The Brain Drain, Educated Unemployment, Human Capital Formation and Economic Betterment", ZEF-Discussion Papers on Development Policy No. 114, Centre for Development Research, Bonn, July 2007, pp. 36

home country, the returns to their education fall short of the cost incurred for higher education. However, the entire scenario is beneficial for the long run (one generation down the road), by improving to a higher average level of human capital in the home country. This can prompt to 'take-off' of the economy, and is conducive to achieving the benefit of long-run growth

Sunde and Vischer (2011)[10] argued on reasons behind the weal empirical effect of human capital on growth in existing cross country studies. He elaborated on the model approach which does not account for the important variables through which human capital affects growth. A total of three different datasets for average years of schooling from more than 80 countries collected for the period ranging from 1970 to 2000. The paper identified the two distinct channels, changes in human capital and the initial levels in human capital. The affect on growth by human capital can only be identified when the initial levels and the changes in human capital are correlated. The results suggested that the effect of human capital is likely to be underestimated and biased in empirical specification that do not account for both channels. The study explained the weak growth effects found in previous studies were on account of heterogeneity exist in the cross country data and also other measurement issue.

[10] Uwe Sunde and Thomas Vischer, "Human Capital and Growth: Specification Matters", Institute ofr the Study of Labor (IZA), Discussion Paper No. 5991, 2011

Governance and Economic Growth

Importance of governance being one of the critical factors that explain performance differences across countries is widely recognized in economics. The contradiction arises generally on two points, first is related to the identification of important governance capacities necessary for economic development and second is related to the relative importance of governance as a determinant of economic growth.

Evidence suggests that countries that converged to advanced economies had governance capacity that facilitated the implementation of sound policies to encourage the acquisition, learning and development of new technologies rapidly. Testing for the second area of disagreement, Sachs et al. (2004) found that when differences in development are accounted for, the effect of governance on differences in performance disappears.

The pressure on countries to improve quality of governance i.e. to be more accountable and transparent is generally higher from external sources through international trade and globalization. Policy makers are either forced or incentivized to introduce policy reforms to facilitate international capital flows, technology and information as public spending in the past have been failed to achieve meaningful results such as poverty reduction due to lack of proper governance measures. The countries that wish to attract international capital and technology are encouraged to improve governance framework of their economy, as weak rule of law leads to rent seeking and corruption (IMF, 2002).

From policy point of view, governance can be viewed as market-enhancing or growth-enhancing. Market-enhancing growth is a narrow concept which only deals with the efficiency of market. Primary argument being efficient market attracts technology and capital and eventually improves economic development of the country. On the contrary, growth-enhancing governance suggests that markets are inherently inefficient. Specific governance capacities are required for efficient allocation of resources and to accelerate growth using both market and non-market mechanisms so that productivity, as well as absorptive capacity, can be increased (Khan, 2007). In short, growth-enhancing and market-enhancing governance capacities are substantially different from each other but they are not necessarily mutually exclusive.

Market-enhancing governance relates to development through market efficiency i.e. tools of governance are used to increase the efficiency of markets which attracts technology and capital and therefore increase growth. However, evidence suggests that it is very expensive to improve governance in poor countries and most of the times these issues are persistent regardless of the efforts and/or political will (Khan, 2005). In other words, market-enhancing governance focuses on role of governance in reducing transaction costs to make markets more efficient while growth enhancing governance focuses on role of governance. Thus catching-up of developing countries

by increasing the effectiveness of institutions to accelerate transfer of resources to productive sectors and accelerate absorption and learning of potentially highly productive technology.

If policy attempts to attract technology and capital through increasing efficiency of the market then it is less likely to be successful because capital and technology will be attracted to countries with adequate human capital to understand, use and sometimes develop the technology. Moreover, there is no universal strategy for technology acquisition as high growth countries have used very different strategies to achieve high growth rates.

Empirical evidence shows at best, weak support for market-enhancing governance as an important ingredient for convergence strategy towards developed countries. Both high and low growth developing countries did not manage to meet governance conditions of market enhancing governance.

Growth enhancing strategies require growth enhancing governance. However, specific governance capacities can be quite diversified depending on country specific characteristics. Rapid catching up strategies required growth enhancing capacities in order to ensure effective implementation.

Growth strategies are also hampered by the so called ‘pyramid groups’ as identified in Morck et al (2004). Under pyramidal controls, elite families control the corporations without substantial capital investments. Since these families assume power over many big corporations, eventually they control their countries’ economies to considerable extent. Major problem with such control is the transfer of resources for private benefits. Political influence allows them to control public policy, such as property rights. This favours the private and personal objectives which results in inefficient allocation of resources, decrease in innovation and weakens economic development. These families not only try to sustain their positions under status quo but also use political power to erect significant entry barriers in capital markets (Morck et al. 2004).

Conceptual Framework

As exhibited in the figure, the adequate governance attempts to attract technology and innovation augmented by the quality of human capital for the improvement and absorption of these technologies, eventually improves economic development of the country.

Figure 1: Governance as an important factor in human capital-led growth

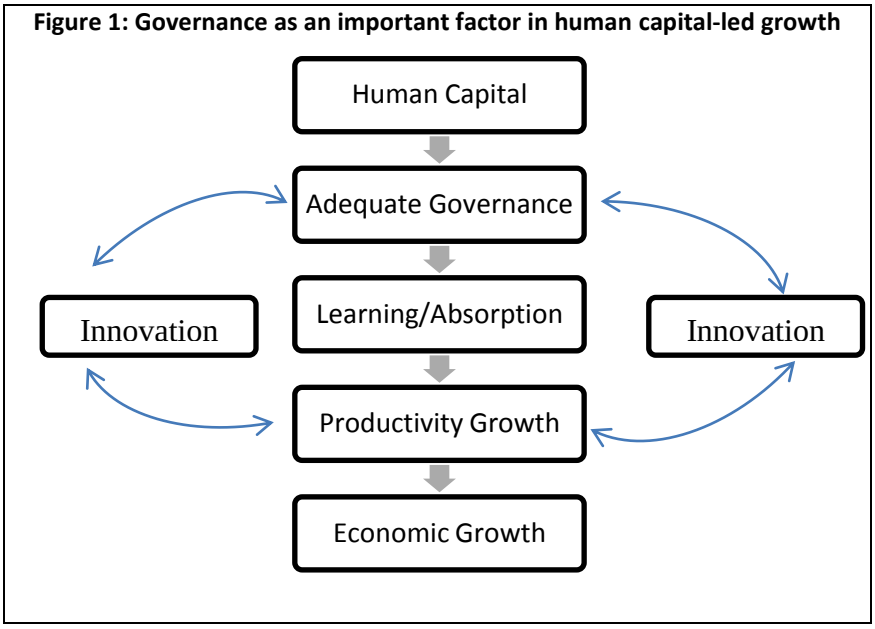
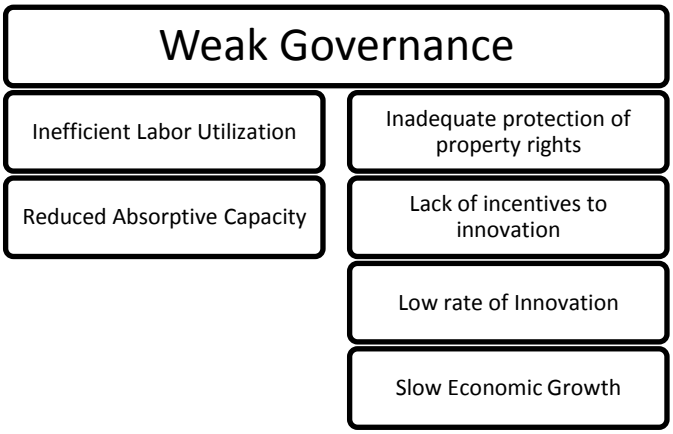


Figure 2, states the slow economic growth resulting from the weak governance that indicates from deteriorated law and order conditions, corruption, ineffective governance resulting in inefficient utilization of human resource. The weak governance in-turn reflected from lack of incentives and investment in the economy which further weakens the economic growth and slowed down both in short run and in the long run.

Figure 2: Consequences of Weak Governance in context of human-led growth



Hypothesis

The relationship between human capital and economic growth, as discussed before, has been studied in various different settings by many authors especially since the 1990s. Some of them were case studies while others were cross country comparisons under different settings. A caveat of these studies, especially in panel data studies, is the universal treatment of countries with respect to quality of governance. We propose that positive and significant relationship between human capital and economic growth might not be universal and that it might depend on the quality of governance in the country. We expect that countries with low quality governance might not be able to utilize its human capital to its potential. In language of econometrics, we expect the relationship between human capital and economic growth to be insignificant for countries with low level of governance.

Hypothesis 1: Relationship between human capital and economic growth is insignificant for countries with low level of governance.

Model

Human capital-led growth literature provides various different model specifications for empirical estimations. In this paper we used models proposed by Benhabib & Spiegel (1994) (equation 1) and Cohen and Soto (2007) (equation 2).

$$\Delta lnY_{it} = \beta_0 + \beta_1 lnHC_{it-1} + \beta_2 \Delta lnK_{it} + \beta_3 lnY_{it-1} + \beta_4 \Delta ln\, n_{it} + \varepsilon_{it} \quad \text{---------- (1)}$$

Y = GDP at current PPP
HC = human capital index
K = capital stock at current PPP
n = population

$$\Delta lny_{it} = \beta_0 + \beta_1 lnHC_{it-1} + \beta_2 \Delta lnK_{it} + \beta_3 lny_{it-1} + \varepsilon_{it} \text{ ---------- (2)}$$

y = GDP per capita at current PPP
HC = human capital index
K = capital stock at current PPP

Equation 1 models growth in absolute GDP while equation 2 uses growth in GDP per capita as dependent variable. Both studies used different variants of their main model for estimations. Some variants included change in human capital as independent variable to capture instantaneous impact of change in human capital stock on economic growth while others included first lag of stock variable of human capital to analyze the lagged impact overall human capital base in the country. Since qualification and experience reflect in output after some time lag, we used the second variant in this study (as it is shown in the equations above).

Data

Data used in this study was taken from two sources; Penn World Tables v.8 and World Governance Indicators of World Bank. Short data descriptions and sources can be found in Appendix Table A1.

Governance Indicators

Governance indicators used in this study are taken from World Governance Indicators (WGI) of World Bank. WGI provides six broad types of governance indicators which are generated using various secondary data sources. WDI aims to quantify the aspects of traditions and institutions being exercised in a country which includes the process of government selection, its monitoring and replacement; the ability of government of design and effectively implement sound policies as well as respect of state and citizens. These indicators are rescaled to follow normal distribution within the range of -2.5 and +2.5 (except for political stability which exceeds +2.5 bound). An important note should be made here that higher numbers indicate better 'control' of government not vice versa. For example, value of 2.0 under corruption index compare to 1.5 would suggest better control of corruption and not that corruption is higher. The six governance indicators are defined below as defined in WDI documentation[11].

Voice and Accountability

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Political Stability and Absence of Violence/Terrorism

Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

Government effectiveness

Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

[11] Definitions are provided in the full dataset of WGI under following link (accessed September 8th, 2014) http://info.worldbank.org/governance/wgi/wgidataset.xlsx

Regulatory quality

Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Rule of law

Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Control of Corruption

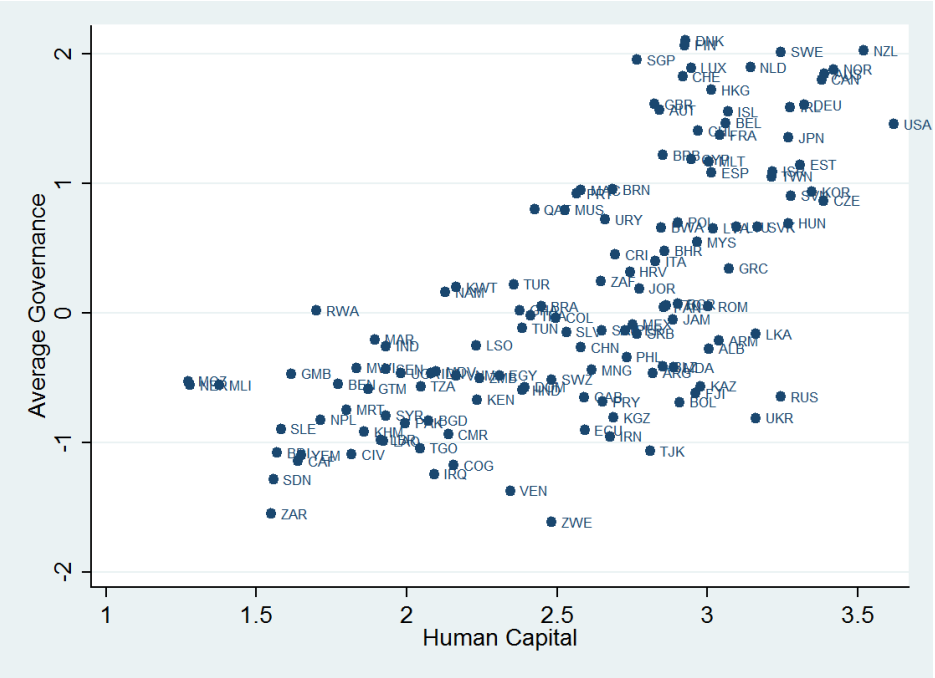
Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

'Voice and accountability' and 'political stability and absence of violence' are least likely to have any influence on effect of human capital and growth. This is mainly because they have had no relation to technical efficiency.[12] Therefore we excluded these indicators from our analysis. An additional overall governance indicator was also generated by taking average of government effectiveness, regulatory quality, rule of law and control of corruption to give the broader picture of governance.

Since this study attempts to connect human-led growth with governance, it is useful to visually asses the data to compare where countries stand with respect to their human capital as compared to their level of governance. In the following figures, human capital is plotted against all governance indicators used in this study for the year 2011. A first look at all these comparisons clearly shows a similar pattern in all figures. This pattern suggests that country with high level of governance have high level of human capital. However, same is not true for countries with relatively low level of governance. The distribution at lower level of governance is quite widely spread which suggests that in presence of medium and low level of governance, countries can still have high or low levels of human capital. The impact of the level of human capital on growth in presence of different levels of governance still remains an open question which is the objective of this study. Scatter plots of rest of the governance indicators are available in the appendix.

[12] Hurryvansh Aubeeluck, "Institutional Governance and Economic Growth, with special reference to Sub-Saharan Africa", African Studies Association of Australasia and the Pacific - AFSAAP, Conference Proceedings, 36th Annual Conference, 2013

Figure 3: Average Governance Index and Human Capital (2011)



Methodological Framework

Since the objective of this study is to ascertain whether human capital effects economic growth differently in countries with better or worse level of governance, we split the sample in three groups for each variable i.e. 'low', 'medium' and 'high' level of control. Since WGI warns against over interpretation of minor differences in countries (Kaufmann et al. 2010), we used three slightly different schemes to split the sample. If borders of the sections are defined strictly with a number then two countries on left and right of that border will be assigned to different sections but in reality they might not be very different (as warned by WGI). In order to account for this, we used three different schemes; 'Overlapping' (figure 4), 'Separated' (figure 5) and 'Strictly Separated' (figure 6).

Figure 4: Scheme 1 - Overlapping Sections

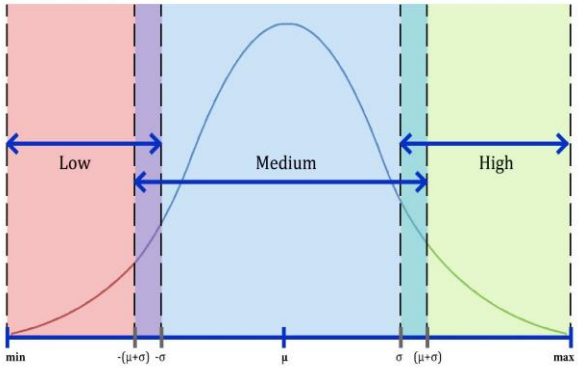


Figure 5: Scheme 2 - Separated Sections

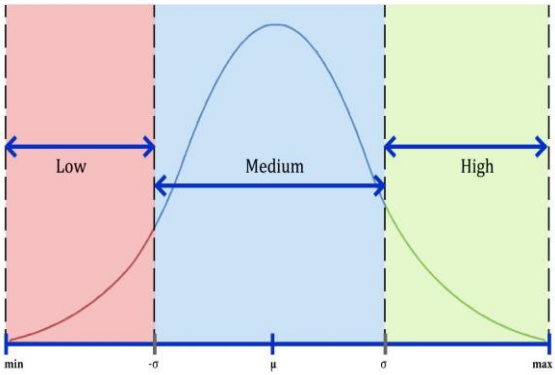
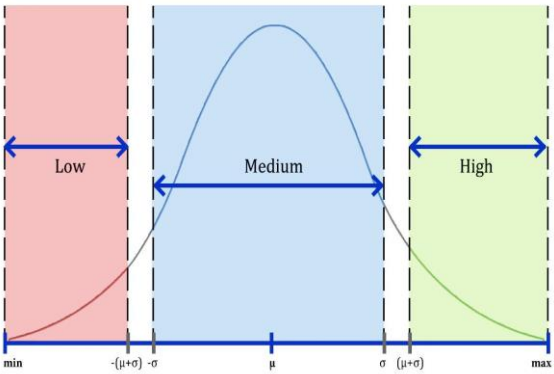


Figure 6: Scheme 3 – Strictly-Separated Sections



Empirical Setup

Our sample includes data for 134 countries from 1996 to 2011. The standard empirical methods used for panel data analysis with stationary variables are pooled OLS, fixed effects and random effects models. If the sample includes large number of countries, some of which are significantly different from each other, one should take country specific effects very seriously. Contrary to pooled OLS approach, fixed effects and random effects models attempt to account for country specific effects under different set of assumptions. Using hausman specification test, one can determine whether fixed or random effects should be used for estimation of given model. Using hausman test, we determined that fixed effects model was efficient and consistent for our model and was used to estimate the parameters of the models.

Sensitivity of the results is checked using two different model specifications provided by the literature as well as using different schemes to distribute the data in three sections. Expectedly there were minor differences in the estimated coefficients and standard errors when different procedures were used however results as a whole did not change. Therefore, results of scheme 2, "Separated Sections" for Benhabib & Spiegel (1994) model will be reported and interpreted in the text. Rest of the models can be found in the appendix.

Estimation Results

The unrestricted base models of Benhabib & Spiegel (BS) and Cohen & Soto (CS) models are replicated before turning to the restricted models specific to our hypothesis. The results of fixed effects, random effects and pooled OLS estimations are presented in table 1. The signs of the coefficients were in accordance with the economic theory. One striking feature of the results is very low coefficient of determination as compared to the original studies of these models. However, R-squared improves when sub-samples are analyzed in later models. Although signs and significance did not change with different estimation methods, the coefficients of human capital and some other variables increased significantly when fixed effects were used i,e. for human capital from 0.020 to 0.622, from pooled OLS and fixed effect, respectively in BS model. It suggests that controlling for country specific effects is necessary which is also suggested by Hausman test. The null hypothesis of Hausman test states that fixed effects method is consistent and random effects is efficient while alternate hypothesis states that fixed effects is consistent but random effects is inconsistent. The result of the test suggests that it is better to use fixed effects compared to random effects model as results from random effects model will be inconsistent.

Effect on Human capital on economic growth under different levels of governance

In order to test our hypothesis, as explained earlier, we divided our dataset into three categories (schemes) based on different levels of governance. These schemes serve as the tool for sensitivity analysis of our results. The scheming is also necessary because small changes in values of governance should not be over interpreted therefore hard division of the distribution would result in two countries being in different groups even when their differences are quite low. We used three schemes to account for this potential caveat; scheme1: "overlapping sections" where boundaries of the sections overlap with each other, scheme 2: "separated sections" where sections are created with hard division and scheme 3: "strictly separated sections" where there is a gap between the sections to exclude countries with very small differences. While estimations are carried out for all three schemes, we use scheme 2 as our base scheme and the other two schemes as extensions of this scheme for sensitivity analysis. Since results were not sensitive to the schemes, we will interpret the results of both BS and CS models estimated under the base scheme (scheme 2).

Benhabib & Spiegel (BS) model with Scheme 2

Estimation results of BS model under scheme 2 are reported in table 2 where for each governance indicator, results are reported for three sub-samples based on 'low', 'medium' and 'high' levels of governance. An important clarification is due at this point. All governance variables are constructed in a way that high numbers represent better governance. For example, high number for corruption means high level of control for corruption instead of high of level of corruption. Results for the average governance support our hypothesis. The insignificance of human capital in low governance countries clearly states that countries with low level of governance human capital don't affect economic growth. Another observation is that magnitude of coefficient of human capital for medium level of governance is more than twice as large as its coefficient for high level of governance. Additionally, significance level was also much higher for countries with medium level of governance. These observations hint towards a threshold level of governance after which higher levels are not beneficial anymore. This also indicates the diminishing returns of human capital investment from a particular threshold level which to some extent can be observed in countries with high level of governance. Similar results were found for regulatory quality and government effectiveness with the exception that coefficient of human capital for countries with medium level of regulatory quality was higher but less than twice the magnitude for countries with high level of regulatory quality.

We did not find support for our hypothesis for control of corruption and rule of law. We found that, contrary to our expectations, human capital had positive and significant coefficient for countries with low level of rule of law and control of corruption. This result suggests that level of corruption and rule of law does not matter for human-led growth. Similar to the findings discussed in last paragraph, we found much higher magnitude of the coefficient of human capital for countries with medium level of rule of law and control of corruption vis-à-vis countries with high level governance.

Cohen & Soto (CS) model with Scheme 2

Similar to the previous exercise, the estimations were carried out for CS model under scheme 2; the results are presented in table 3. Contrary to the results of BS model, we found support of our hypothesis for all governance indicators in CS model. We found that the relationship between human capital and growth is insignificant for countries with low level of 'governance (average)', 'rule of law', 'control of corruption', 'regulatory quality' and 'government effectiveness'. This finding suggests that human capital in countries with low level of governance will not increase economic growth unless it is combined with the policy of improving governance. While coefficients of countries with medium level governance reveals similar results as in BS model and are highly significant in all governance indicators vis-à-vis countries with high level of governance.

Concluding Remarks

Empirical literature on relationship between human capital and economic growth provides contradictory results. Many authors have studied this relationship using different settings, countries and time periods. The cross country comparisons implicitly assume homogenous governance systems/quality in all countries which, in our opinion, is a strong assumption. In this study we used data for 134 countries and divided the sample based on the level of governance in the countries. Using fixed effects model for estimation, in most of the cases we found that the relationship between human capital and economic growth is insignificant (or weaker) for countries with low level of governance. We also found that coefficient of human capital was larger for countries with medium level of governance vis-à-vis countries with high level of governance. This finding hint towards the threshold level of governance after which there might be diminishing returns. The results were robust to the method of data division.

There is a potentially important role of Human Capital in supporting countries economic growth. However, these findings suggest that increase in human capital might not reflect in the economic growth if the country has bad governance. The system will not utilize its human capital to its full potential in absence of proper regulatory framework and control of corruption. The study is one of its kinds that reveal the importance of strengthening the link between human capital and economic growth however that is subject to a threshold level as discovered in comparison of countries having medium level governance with countries having high level governance.

Table 1: Base Models with Hausman test for Method Selection

Dependent variable: Annualized Difference in log GDP			
Benhabib & Spiegel (1994)			
	Pooled OLS	Fixed Effects	Random Effects
lnHC(t-1)	0.0209*	0.622***	0.0215*
	(2.21)	(9.44)	(2.12)
ΔlnK	0.360***	0.345***	0.362***
	(12.37)	(10.06)	(12.16)
Δlnn	0.741***	1.222***	0.721***
	(4.89)	(4.88)	(4.54)
lnY(t-1)	-0.00188+	-0.127***	-0.00216+
	(-1.72)	(-13.03)	(-1.83)
Constant	0.0140	0.860***	0.0169
	(1.09)	(10.68)	(1.21)
N	2010	2010	2010
R-sq	0.099	0.135	-
adj. R-sq	0.098	0.071	-
Hausman test	Chi-Squared: 169.87, P-value: 0.000		
Dependent variable: Annualized Difference in log GDP per capita			
Cohen & Soto (2007)			
	Pooled OLS	Fixed Effects	Random Effects
lnHC(t-1)	0.0521***	0.470***	0.0573***
	(4.25)	(8.23)	(4.32)
ΔlnK	0.360***	0.355***	0.362***
	(12.55)	(10.41)	(12.32)
lnY(t-1)	-0.00730*	-0.148***	-0.00853*
	(-3.17)	(-14.12)	(-3.42)
Constant	0.0262+	0.887***	0.0323*
	(1.92)	(11.37)	(2.18)
N	2010	2010	2010
R-sq	0.075	0.144	-
adj. R-sq	0.073	0.082	-
Hausman test	Chi-Squared: 188.69, P-value: 0.000		

Hausman test Ho: FE consistent, RE efficient; Ha: FE consistent, RE inconsistent.

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001

Table 2: Fixed Effects Estimation Results: Scheme 2- Separated Sections (BS Model)

	Dependent variable: Annualized Difference in log GDP								
	Benhabib & Spiegel (1994)								
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.566	0.641***	0.284*	0.542*	0.661***	0.303*	0.735*	0.711***	0.282*
	(1.62)	(8.80)	(2.38)	(2.18)	(8.64)	(2.53)	(1.99)	(9.48)	(2.32)
$\Delta \ln K$	0.629*	0.355***	0.244***	0.524***	0.335***	0.221***	0.609*	0.358***	0.227***
	(2.80)	(9.14)	(5.68)	(4.67)	(7.42)	(5.17)	(2.05)	(9.10)	(4.97)
$\Delta \ln n$	6.606***	0.688*	-0.0730	5.755***	0.768*	2.064*	8.004***	0.919*	-0.168
	(4.44)	(2.51)	(-0.12)	(5.18)	(2.66)	(2.60)	(4.70)	(3.17)	(-0.47)
$\ln Y_{(t-1)}$	-0.156*	-0.103***	-0.187***	-0.130*	-0.114***	-0.208***	-0.116*	-0.123***	-0.184***
	(-3.61)	(-9.39)	(-9.37)	(-3.94)	(-9.77)	(-9.99)	(-2.66)	(-10.62)	(-9.47)
Constant	1.021*	0.587***	2.008***	0.832*	0.688***	2.248***	0.560	0.732***	2.004***
	(2.99)	(6.57)	(11.77)	(3.27)	(7.11)	(12.59)	(1.46)	(7.85)	(11.80)
N	221	1357	432	292	1300	418	193	1418	399
R-sq	0.233	0.133	0.279	0.238	0.124	0.312	0.213	0.138	0.283
adj. R-sq	0.112	0.059	0.213	0.134	0.045	0.241	0.049	0.063	0.207

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table 2: Fixed Effects Estimation Results: Scheme 2- Separated Sections (BS Model) (Continued)

Dependent variable: Annualized Difference in log GDP						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.474	0.657***	0.406*	0.459	0.587***	0.349*
	(1.53)	(8.69)	(3.37)	(1.17)	(8.26)	(2.89)
$\Delta \ln K$	0.477*	0.386***	0.215***	0.614*	0.308***	0.213***
	(3.06)	(8.76)	(5.16)	(2.73)	(7.99)	(4.79)
$\Delta \ln n$	6.522***	0.794*	0.695	6.674***	0.621*	0.511
	(4.70)	(2.77)	(1.01)	(4.12)	(2.48)	(0.76)
$\ln Y_{(t-1)}$	-0.108*	-0.112***	-0.192***	-0.139*	-0.0947***	-0.190***
	(-3.08)	(-9.39)	(-10.15)	(-2.91)	(-8.93)	(-9.48)
Constant	0.650*	0.671***	1.907***	0.891*	0.545***	1.976***
	(2.28)	(6.85)	(12.40)	(2.40)	(6.35)	(11.68)
N	215	1279	516	194	1364	452
R-sq	0.228	0.134	0.256	0.198	0.113	0.258
adj. R-sq	0.126	0.057	0.185	0.079	0.040	0.187

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table 3: Fixed Effects Estimation Results: Scheme 2- Separated Sections (CS Model)

Dependent variable: Annualized Difference in log GDP per capita									
Cohen & Soto (2007)									
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.345	0.534***	0.324*	0.352	0.547***	0.268*	0.441	0.561***	0.339*
	(1.10)	(8.45)	(2.91)	(1.59)	(8.24)	(2.41)	(1.25)	(8.79)	(2.92)
ΔlnK	0.686*	0.361***	0.253***	0.541***	0.346***	0.238***	0.758*	0.363***	0.244***
	(2.98)	(9.36)	(6.05)	(4.66)	(7.74)	(5.70)	(2.46)	(9.28)	(5.48)
$lny_{(t-1)}$	-0.221***	-0.124***	-0.263***	-0.165***	-0.142***	-0.256***	-0.172*	-0.141***	-0.266***
	(-4.45)	(-10.80)	(-11.31)	(-4.48)	(-11.43)	(-11.00)	(-3.23)	(-11.84)	(-10.87)
Constant	1.384***	0.607***	2.360***	1.002***	0.755***	2.349***	0.983*	0.731***	2.380***
	(4.10)	(7.30)	(13.59)	(4.16)	(8.20)	(13.71)	(2.65)	(8.42)	(13.02)
N	221	1357	432	292	1300	418	193	1418	399
R-sq	0.163	0.147	0.326	0.160	0.145	0.343	0.109	0.153	0.322
adj. R-sq	0.036	0.076	0.266	0.049	0.069	0.277	-0.070	0.081	0.253

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table 3: Fixed Effects Estimation Results: Scheme 2- Separated Sections (CS Model) (Continued)

Dependent variable: Annualized Difference in log GDP per capita						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.289	0.514***	0.396*	0.174	0.492***	0.382*
	(1.00)	(7.92)	(3.53)	(0.50)	(7.97)	(3.39)
$\Delta \ln K$	0.546*	0.392***	0.231***	0.726*	0.318***	0.228***
	(3.41)	(8.93)	(5.69)	(3.22)	(8.28)	(5.29)
$\ln y_{(t-1)}$	-0.152*	-0.132***	-0.239***	-0.210*	-0.116***	-0.263***
	(-3.77)	(-10.55)	(-11.52)	(-3.94)	(-10.26)	(-11.20)
Constant	0.944*	0.684***	2.022***	1.380*	0.574***	2.290***
	(3.53)	(7.47)	(13.68)	(3.82)	(7.07)	(13.28)
N	215	1279	516	194	1364	452
R-sq	0.142	0.147	0.289	0.128	0.128	0.303
adj. R-sq	0.034	0.072	0.222	0.004	0.057	0.239

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

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Appendix

Table A1

Variable	Description/Unit	Source
Y	Output-side real GDP at current PPPs (in mil. 2005US$)	Penn World Tables 8.0
n	Population (in millions)	Penn World Tables 8.0
y	Y/n	Penn World Tables 8.0
HC	Index of human capital per person, based on years of schooling (Barro/Lee, 2012) and returns to education (Psacharopoulos, 1994)	Penn World Tables 8.0
K	Capital stock at current PPPs (in mil. 2005US$)	Penn World Tables 8.0
ROL	Rule of Law index (range -2.5 to 2.5)	World Governance Indicators (WDI)
COR	Control of Corruption index (range -2.5 to 2.5)	World Governance Indicators (WDI)
Govt.Eff	Government Effectiveness index (range -2.5 to 2.5)	World Governance Indicators (WDI)
REG	Regulatory Environment index (range -2.5 to 2.5)	World Governance Indicators (WDI)
Gov	Average Governance (ROL+COR+Govt.Eff+REG)/4	World Governance Indicators (WDI)

Table A2: Base Models with Hausman test for Method Selection

	Dependent variable: Annualized Difference in log GDP		
	Benhabib & Spiegel (1994)		
	Pooled OLS	Fixed Effects	Random Effects
lnHC(t-1)	0.0209*	0.622***	0.0215*
	(2.21)	(9.44)	(2.12)
ΔlnK	0.360***	0.345***	0.362***
	(12.37)	(10.06)	(12.16)
Δlnn	0.741***	1.222***	0.721***
	(4.89)	(4.88)	(4.54)
lnY(t-1)	-0.00188+	-0.127***	-0.00216+
	(-1.72)	(-13.03)	(-1.83)
Constant	0.0140	0.860***	0.0169
	(1.09)	(10.68)	(1.21)
N	2010	2010	2010
R-sq	0.099	0.135	
adj. R-sq	0.098	0.071	
Hausman test	Chi-Squared: 169.87, P-value: 0.000		

Hausman test Ho: FE consistent, RE efficient; Ha: FE consistent, RE inconsistent.
t statistics in parentheses
+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001

	Dependent variable: Annualized Difference in log GDP per capita		
	Cohen & Soto (2007)		
	Pooled OLS	Fixed Effects	Random Effects
lnHC(t-1)	0.0521***	0.470***	0.0573***
	(4.25)	(8.23)	(4.32)
ΔlnK	0.360***	0.355***	0.362***
	(12.55)	(10.41)	(12.32)
lnY(t-1)	-0.00730*	-0.148***	-0.00853*
	(-3.17)	(-14.12)	(-3.42)
Constant	0.0262+	0.887***	0.0323*
	(1.92)	(11.37)	(2.18)
N	2010	2010	2010
R-sq	0.075	0.144	
adj. R-sq	0.073	0.082	
Hausman test	Chi-Squared: 188.69, P-value: 0.000		

Hausman test Ho: FE consistent, RE efficient; Ha: FE consistent, RE inconsistent.

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001

Table A3: Fixed Effects Estimation Results: Scheme 1- Overlapping Sections (BS Model)

	Dependent variable: Annualized Difference in log GDP								
	Benhabib & Spiegel (1994)								
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.566	0.641***	0.284*	0.542*	0.670***	0.303*	0.735*	0.686***	0.282*
	(1.62)	(9.24)	(2.38)	(2.18)	(8.99)	(2.53)	(1.99)	(9.58)	(2.32)
$\Delta \ln K$	0.629*	0.368***	0.244***	0.524***	0.337***	0.221***	0.609*	0.364***	0.227***
	(2.80)	(9.96)	(5.68)	(4.67)	(7.65)	(5.17)	(2.05)	(9.57)	(4.97)
$\Delta \ln n$	6.606***	0.670*	-0.0730	5.755***	0.688*	2.064*	8.004***	0.824*	-0.168
	(4.44)	(2.55)	(-0.12)	(5.18)	(2.45)	(2.60)	(4.70)	(3.15)	(-0.47)
$\ln Y_{(t-1)}$	-0.156*	-0.105***	-0.187***	-0.130*	-0.115***	-0.208***	-0.116*	-0.116***	-0.184***
	(-3.61)	(-10.03)	(-9.37)	(-3.94)	(-10.08)	(-9.99)	(-2.66)	(-10.84)	(-9.47)
Constant	1.021*	0.605***	2.008***	0.832*	0.686***	2.248***	0.560	0.680***	2.004***
	(2.99)	(7.13)	(11.77)	(3.27)	(7.30)	(12.59)	(1.46)	(7.83)	(11.80)
N	221	1462	432	292	1354	418	193	1505	399
R-sq	0.233	0.141	0.279	0.238	0.126	0.312	0.213	0.143	0.283
adj. R-sq	0.112	0.070	0.213	0.134	0.050	0.241	0.049	0.073	0.207

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A3: Fixed Effects Estimation Results: Scheme 1- Overlapping Sections (BS Model) (Continued)

Dependent variable: Annualized Difference in log GDP						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.474	0.633***	0.406*	0.459	0.608***	0.349*
	(1.53)	(8.93)	(3.37)	(1.17)	(8.70)	(2.89)
$\Delta \ln K$	0.477*	0.390***	0.215***	0.614*	0.351***	0.213***
	(3.06)	(10.25)	(5.16)	(2.73)	(9.30)	(4.79)
$\Delta \ln n$	6.522***	0.648*	0.695	6.674***	0.668*	0.511
	(4.70)	(2.49)	(1.01)	(4.12)	(2.61)	(0.76)
$\ln Y_{(t-1)}$	-0.108*	-0.112***	-0.192***	-0.139*	-0.107***	-0.190***
	(-3.08)	(-10.15)	(-10.15)	(-2.91)	(-10.23)	(-9.48)
Constant	0.650*	0.683***	1.907***	0.891*	0.655***	1.976***
	(2.28)	(7.59)	(12.40)	(2.40)	(7.74)	(11.68)
N	215	1448	516	194	1471	452
R-sq	0.228	0.148	0.256	0.198	0.135	0.258
adj. R-sq	0.126	0.074	0.185	0.079	0.062	0.187

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A4: Fixed Effects Estimation Results: Scheme 2- Separated Sections (BS Model)

	Dependent variable: Annualized Difference in log GDP								
	Benhabib & Spiegel (1994)								
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.566	0.641***	0.284*	0.542*	0.661***	0.303*	0.735*	0.711***	0.282*
	(1.62)	(8.80)	(2.38)	(2.18)	(8.64)	(2.53)	(1.99)	(9.48)	(2.32)
ΔlnK	0.629*	0.355***	0.244***	0.524***	0.335***	0.221***	0.609*	0.358***	0.227***
	(2.80)	(9.14)	(5.68)	(4.67)	(7.42)	(5.17)	(2.05)	(9.10)	(4.97)
Δlnn	6.606***	0.688*	-0.0730	5.755***	0.768*	2.064*	8.004***	0.919*	-0.168
	(4.44)	(2.51)	(-0.12)	(5.18)	(2.66)	(2.60)	(4.70)	(3.17)	(-0.47)
$lnY_{(t-1)}$	-0.156*	-0.103***	-0.187***	-0.130*	-0.114***	-0.208***	-0.116*	-0.123***	-0.184***
	(-3.61)	(-9.39)	(-9.37)	(-3.94)	(-9.77)	(-9.99)	(-2.66)	(-10.62)	(-9.47)
Constant	1.021*	0.587***	2.008***	0.832*	0.688***	2.248***	0.560	0.732***	2.004***
	(2.99)	(6.57)	(11.77)	(3.27)	(7.11)	(12.59)	(1.46)	(7.85)	(11.80)
N	221	1357	432	292	1300	418	193	1418	399
R-sq	0.233	0.133	0.279	0.238	0.124	0.312	0.213	0.138	0.283
adj. R-sq	0.112	0.059	0.213	0.134	0.045	0.241	0.049	0.063	0.207

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A4: Fixed Effects Estimation Results: Scheme 2- Separated Sections (BS Model) (Continued)

Dependent variable: Annualized Difference in log GDP						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.474	0.657***	0.406*	0.459	0.587***	0.349*
	(1.53)	(8.69)	(3.37)	(1.17)	(8.26)	(2.89)
ΔlnK	0.477*	0.386***	0.215***	0.614*	0.308***	0.213***
	(3.06)	(8.76)	(5.16)	(2.73)	(7.99)	(4.79)
Δlnn	6.522***	0.794*	0.695	6.674***	0.621*	0.511
	(4.70)	(2.77)	(1.01)	(4.12)	(2.48)	(0.76)
$\ln Y_{(t-1)}$	-0.108*	-0.112***	-0.192***	-0.139*	-0.0947***	-0.190***
	(-3.08)	(-9.39)	(-10.15)	(-2.91)	(-8.93)	(-9.48)
Constant	0.650*	0.671***	1.907***	0.891*	0.545***	1.976***
	(2.28)	(6.85)	(12.40)	(2.40)	(6.35)	(11.68)
N	215	1279	516	194	1364	452
R-sq	0.228	0.134	0.256	0.198	0.113	0.258
adj. R-sq	0.126	0.057	0.185	0.079	0.040	0.187

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A5: Fixed Effects Estimation Results: Scheme 3- Strictly Separated Sections (BS Model)

	Dependent variable: Annualized Difference in log GDP								
	Benhabib & Spiegel (1994)								
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.625	0.641***	0.323*	0.542+	0.661***	0.363*	1.392*	0.711***	0.300*
	(1.12)	(8.80)	(2.57)	(1.83)	(8.64)	(2.90)	(2.22)	(9.48)	(2.32)
$\Delta \ln K$	0.379	0.355***	0.230***	0.536***	0.335***	0.222***	0.348	0.358***	0.214***
	(1.07)	(9.14)	(4.95)	(4.32)	(7.42)	(5.13)	(0.85)	(9.10)	(4.45)
$\Delta \ln n$	7.417***	0.688*	0.898	5.723***	0.768*	2.124*	11.76***	0.919*	0.0626
	(4.19)	(2.51)	(1.26)	(4.79)	(2.66)	(2.64)	(5.20)	(3.17)	(0.10)
$\ln Y_{(t-1)}$	-0.149*	-0.103***	-0.195***	-0.132*	-0.114***	-0.217***	-0.124*	-0.123***	-0.186***
	(-2.70)	(-9.39)	(-9.36)	(-3.62)	(-9.77)	(-10.18)	(-2.08)	(-10.62)	(-8.70)
Constant	0.910*	0.587***	2.062***	0.851*	0.688***	2.303***	0.137	0.732***	2.009***
	(2.10)	(6.57)	(11.37)	(3.08)	(7.11)	(12.63)	(0.26)	(7.85)	(10.75)
N	153	1357	395	259	1300	397	123	1418	382
R-sq	0.224	0.133	0.273	0.234	0.124	0.320	0.296	0.138	0.262
adj. R-sq	0.099	0.059	0.202	0.121	0.045	0.254	0.132	0.063	0.185

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A5: Fixed Effects Estimation Results: Scheme 3- Strictly Separated Sections (BS Model) (Continued)

Dependent variable: Annualized Difference in log GDP						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.756+	0.657***	0.370*	0.702	0.587***	0.270*
	(1.73)	(8.69)	(2.79)	(1.45)	(8.26)	(2.16)
ΔlnK	0.376	0.386***	0.190***	0.434	0.308***	0.173*
	(1.24)	(8.76)	(4.12)	(1.18)	(7.99)	(3.74)
Δlnn	7.130***	0.794*	0.468	6.651*	0.621*	0.885
	(4.28)	(2.77)	(0.68)	(3.66)	(2.48)	(1.31)
$lnY_{(t-1)}$	-0.159*	-0.112***	-0.168***	-0.188*	-0.0947***	-0.177***
	(-3.26)	(-9.39)	(-8.18)	(-3.11)	(-8.93)	(-8.60)
Constant	0.977*	0.671***	1.674***	1.184*	0.545***	1.912***
	(2.58)	(6.85)	(9.82)	(2.64)	(6.35)	(10.81)
N	161	1279	401	147	1364	392
R-sq	0.241	0.134	0.218	0.225	0.113	0.250
adj. R-sq	0.139	0.057	0.133	0.102	0.040	0.172

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A6: Fixed Effects Estimation Results: Scheme 1- Overlapping Sections (CS Model)

Dependent variable: Annualized Difference in log GDP per capita									
Cohen & Soto (2007)									
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.345	0.535***	0.324*	0.352	0.553***	0.268*	0.441	0.548***	0.339*
	(1.10)	(8.94)	(2.91)	(1.59)	(8.54)	(2.41)	(1.25)	(8.90)	(2.92)
ΔlnK	0.686*	0.374***	0.253***	0.541***	0.349***	0.238***	0.758*	0.369***	0.244***
	(2.98)	(10.20)	(6.05)	(4.66)	(7.97)	(5.70)	(2.46)	(9.76)	(5.48)
$lny_{(t-1)}$	-0.221***	-0.127***	-0.263***	-0.165***	-0.142***	-0.256***	-0.172*	-0.136***	-0.266***
	(-4.45)	(-11.57)	(-11.31)	(-4.48)	(-11.72)	(-11.00)	(-3.23)	(-12.19)	(-10.87)
Constant	1.384***	0.635***	2.360***	1.002***	0.746***	2.349***	0.983*	0.700***	2.380***
	(4.10)	(7.97)	(13.59)	(4.16)	(8.34)	(13.71)	(2.65)	(8.53)	(13.02)
N	221	1462	432	292	1354	418	193	1505	399
R-sq	0.163	0.158	0.326	0.160	0.146	0.343	0.109	0.158	0.322
adj. R-sq	0.036	0.088	0.266	0.049	0.072	0.277	-0.070	0.090	0.253

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A6: Fixed Effects Estimation Results: Scheme 1- Overlapping Sections (CS Model) (Continued)

Dependent variable: Annualized Difference in log GDP per capita						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$\ln HC_{(t-1)}$	0.289	0.510***	0.396*	0.174	0.499***	0.382*
	(1.00)	(8.40)	(3.53)	(0.50)	(8.25)	(3.39)
ΔlnK	0.546*	0.397***	0.231***	0.726*	0.359***	0.228***
	(3.41)	(10.50)	(5.69)	(3.22)	(9.58)	(5.29)
$\ln_{(t-1)}$	-0.152*	-0.135***	-0.239***	-0.210*	-0.129***	-0.263***
	(-3.77)	(-11.70)	(-11.52)	(-3.94)	(-11.70)	(-11.20)
Constant	0.944*	0.720***	2.022***	1.380*	0.681***	2.290***
	(3.53)	(8.49)	(13.68)	(3.82)	(8.53)	(13.28)
N	215	1448	516	194	1471	452
R-sq	0.142	0.165	0.289	0.128	0.152	0.303
adj. R-sq	0.034	0.093	0.222	0.004	0.082	0.239

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A7: Fixed Effects Estimation Results: Scheme 2- Separated Sections (CS Model)

Dependent variable: Annualized Difference in log GDP per capita									
Cohen & Soto (2007)									
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.345	0.534***	0.324*	0.352	0.547***	0.268*	0.441	0.561***	0.339*
	(1.10)	(8.45)	(2.91)	(1.59)	(8.24)	(2.41)	(1.25)	(8.79)	(2.92)
ΔlnK	0.686*	0.361***	0.253***	0.541***	0.346***	0.238***	0.758*	0.363***	0.244***
	(2.98)	(9.36)	(6.05)	(4.66)	(7.74)	(5.70)	(2.46)	(9.28)	(5.48)
$lny_{(t-1)}$	-0.221***	-0.124***	-0.263***	-0.165***	-0.142***	-0.256***	-0.172*	-0.141***	-0.266***
	(-4.45)	(-10.80)	(-11.31)	(-4.48)	(-11.43)	(-11.00)	(-3.23)	(-11.84)	(-10.87)
Constant	1.384***	0.607***	2.360***	1.002***	0.755***	2.349***	0.983*	0.731***	2.380***
	(4.10)	(7.30)	(13.59)	(4.16)	(8.20)	(13.71)	(2.65)	(8.42)	(13.02)
N	221	1357	432	292	1300	418	193	1418	399
R-sq	0.163	0.147	0.326	0.160	0.145	0.343	0.109	0.153	0.322
adj. R-sq	0.036	0.076	0.266	0.049	0.069	0.277	-0.070	0.081	0.253

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A7: Fixed Effects Estimation Results: Scheme 2- Separated Sections (CS Model) (Continued)

Dependent variable: Annualized Difference in log GDP per capita						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.289	0.514***	0.396*	0.174	0.492***	0.382*
	(1.00)	(7.92)	(3.53)	(0.50)	(7.97)	(3.39)
ΔlnK	0.546*	0.392***	0.231***	0.726*	0.318***	0.228***
	(3.41)	(8.93)	(5.69)	(3.22)	(8.28)	(5.29)
$lny_{(t-1)}$	-0.152*	-0.132***	-0.239***	-0.210*	-0.116***	-0.263***
	(-3.77)	(-10.55)	(-11.52)	(-3.94)	(-10.26)	(-11.20)
Constant	0.944*	0.684***	2.022***	1.380*	0.574***	2.290***
	(3.53)	(7.47)	(13.68)	(3.82)	(7.07)	(13.28)
N	215	1279	516	194	1364	452
R-sq	0.142	0.147	0.289	0.128	0.128	0.303
adj. R-sq	0.034	0.072	0.222	0.004	0.057	0.239

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A8: Fixed Effects Estimation Results: Scheme 3- Strictly Separated Sections (CS Model)

Dependent variable: Annualized Difference in log GDP per capita									
Cohen & Soto (2007)									
	Governance Average			Rule of Law			Control for Corruption		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.477	0.534***	0.354*	0.389	0.547***	0.343*	0.521	0.561***	0.343*
	(0.93)	(8.45)	(3.00)	(1.47)	(8.24)	(2.95)	(0.84)	(8.79)	(2.84)
ΔlnK	0.597	0.361***	0.247***	0.567***	0.346***	0.242***	0.761+	0.363***	0.236***
	(1.65)	(9.36)	(5.45)	(4.45)	(7.74)	(5.74)	(1.72)	(9.28)	(5.02)
$lny_{(t-1)}$	-0.231*	-0.124***	-0.266***	-0.177***	-0.142***	-0.271***	-0.183*	-0.141***	-0.264***
	(-3.59)	(-10.80)	(-10.95)	(-4.29)	(-11.43)	(-11.33)	(-2.39)	(-11.84)	(-10.61)
Constant	1.366*	0.607***	2.367***	1.058***	0.755***	2.428***	1.003+	0.731***	2.356***
	(3.11)	(7.30)	(12.96)	(4.01)	(8.20)	(13.93)	(1.91)	(8.42)	(12.68)
N	153	1357	395	259	1300	397	123	1418	382
R-sq	0.126	0.147	0.321	0.159	0.145	0.358	0.107	0.153	0.318
adj. R-sq	-0.006	0.076	0.257	0.040	0.069	0.297	-0.089	0.081	0.249

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Table A8: Fixed Effects Estimation Results: Scheme 3- Strictly Separated Sections (CS Model) (Continued)

Dependent variable: Annualized Difference in log GDP per capita						
Benhabib & Spiegel (1994)						
	Regulatory Quality			Government Effectiveness		
	Low	Medium	High	Low	Medium	High
$lnHC_{(t-1)}$	0.632	0.514***	0.386*	0.262	0.492***	0.296*
	(1.54)	(7.92)	(3.14)	(0.63)	(7.97)	(2.51)
ΔlnK	0.493	0.392***	0.204***	0.574	0.318***	0.191***
	(1.57)	(8.93)	(4.52)	(1.55)	(8.28)	(4.23)
$lny_{(t-1)}$	-0.230***	-0.132***	-0.222***	-0.285***	-0.116***	-0.240***
	(-4.09)	(-10.55)	(-9.71)	(-4.23)	(-10.26)	(-9.96)
Constant	1.307*	0.684***	1.870***	1.821***	0.574***	2.170***
	(3.73)	(7.47)	(11.32)	(4.19)	(7.07)	(12.15)
N	161	1279	401	147	1364	392
R-sq	0.149	0.147	0.261	0.160	0.128	0.293
adj. R-sq	0.042	0.072	0.184	0.034	0.057	0.222

t statistics in parentheses

+ p<0.10 * p<0.05 ** p<0.01 *** p<.0001"

Figure 7: Control of Corruption and Human capital (2011)

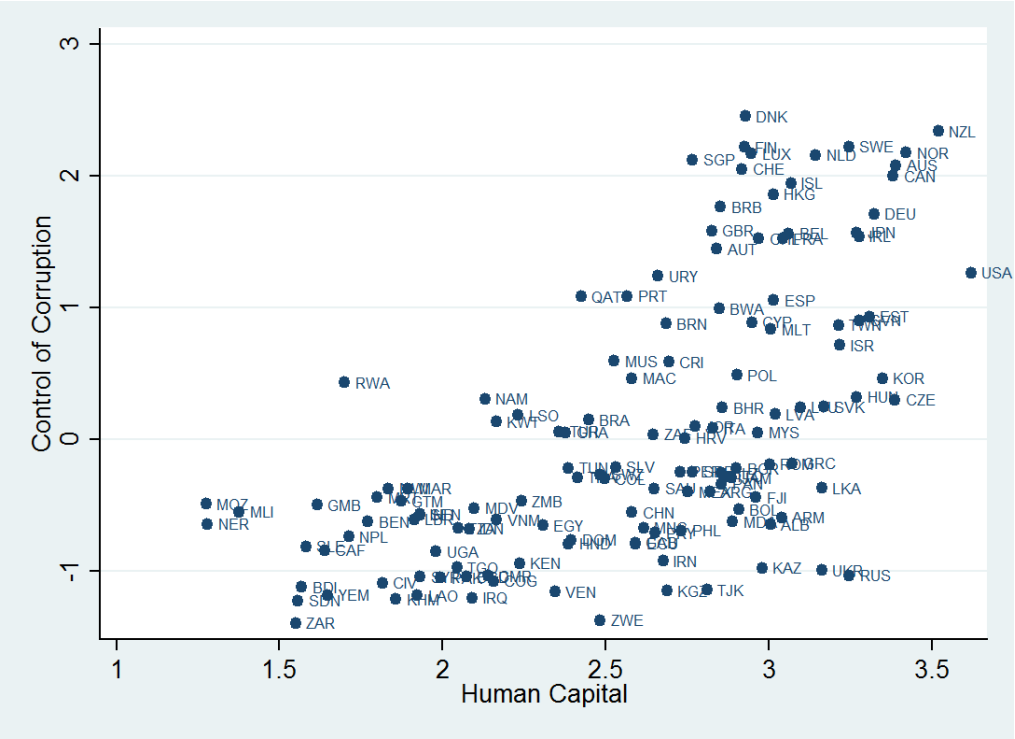


Figure 8: Regulatory Quality and Human capital (2011)

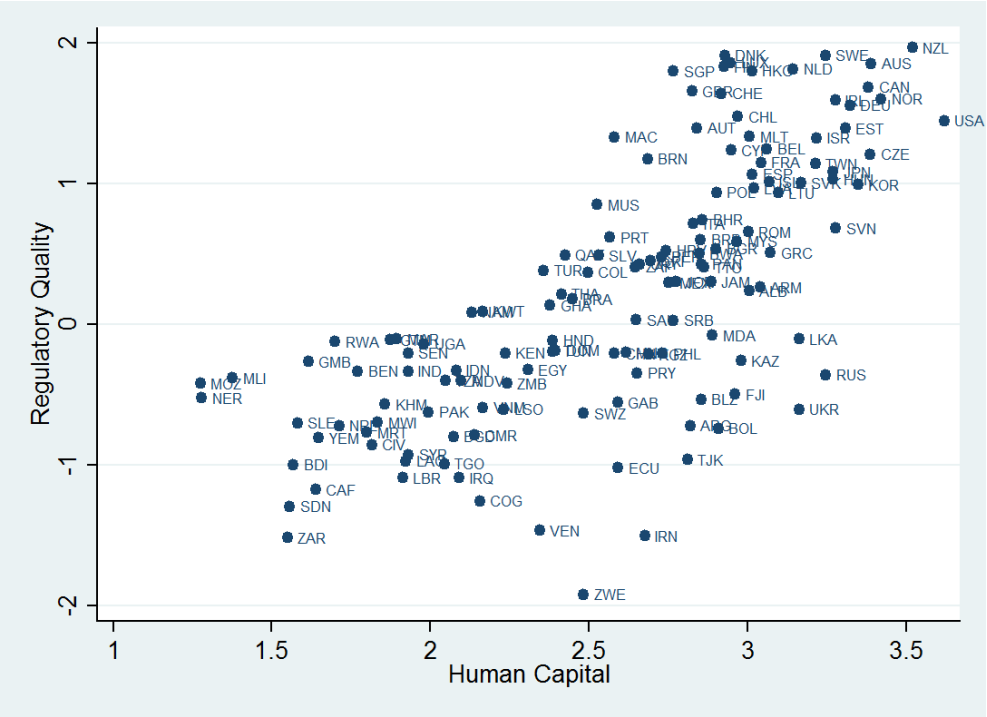
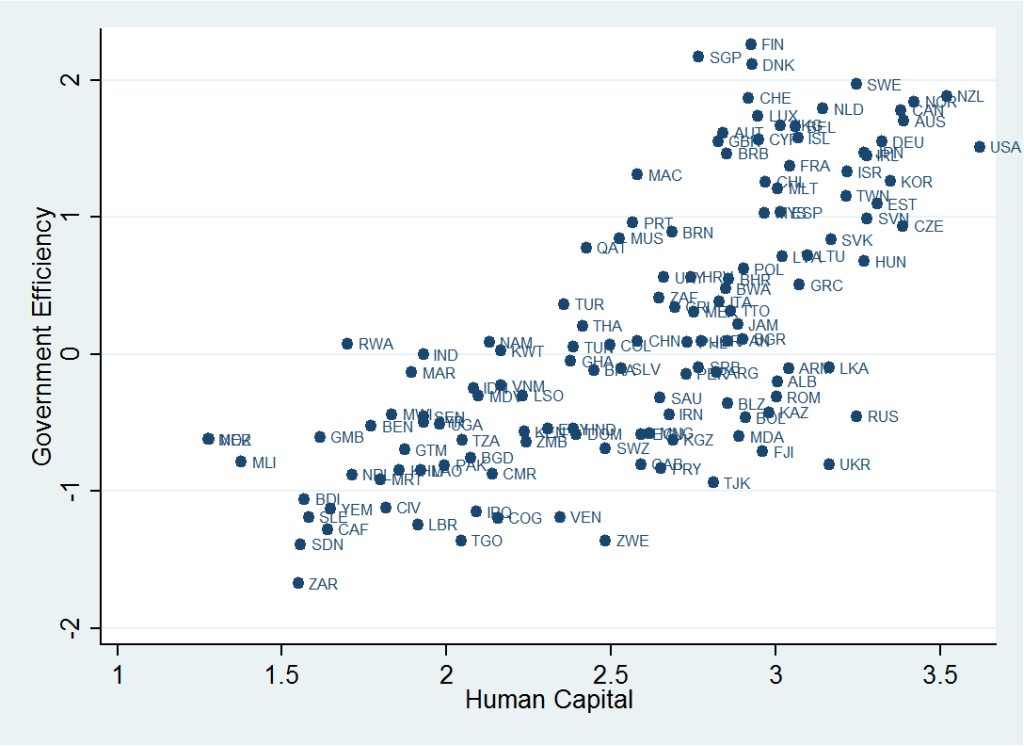


Figure 9: Government Efficiency and Human Capital (2011)



Correlation Matrix

	ΔlnY	Δlny	lnh(t-1)	Δlnck	Δlnn	lnY(t-1)	lny(t-1)
ΔlnY	1						
Δlny	0.9862	1					
lnh(t-1)	-0.0588	0.0249	1				
Δlnck	0.2937	0.2573	-0.1378	1			
Δlnn	0.1702	0.0044	-0.5027	0.2417	1		
lnY(t-1)	-0.0584	-0.0126	0.4433	-0.035	-0.2772	1	
lny(t-1)	-0.0497	-0.0031	0.779	-0.0327	-0.2811	0.5527	1

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ΔlnY	2010	0.041222	0.090408	-0.93698	1.12034
Δlny	2010	0.026929	0.089091	-0.94246	1.115328
lnh(t-1)	2010	0.869949	0.252762	0.127135	1.286128
Δlnck	2010	0.05291	0.067864	-0.4877	0.971869
Δlnn	2010	0.014293	0.014988	-0.01841	0.185883
lnY(t-1)	2010	10.99621	1.964236	5.704933	16.39151
lny(t-1)	2010	8.717786	1.334267	4.914746	11.60562
Avg.Governance	2010	0.116643	0.970479	-2.12292	2.201406

Rule of Law	2010	0.049999	1.002271	-2.22985	1.99964
Control of Corruption	2010	0.080258	1.042928	-2.05746	2.585616
Regulatory Quality	2010	0.187996	0.935579	-2.41273	2.247345
Government Effectiveness	2010	0.14832	0.998738	-1.98201	2.429652