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How Far, How Different: A Fresh Assessment of Structural Transformation in South Asia

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The academic and policy interests in the process and outcomes of structural transformation have re-emerged in recent years. However, it is hard to find empirical studies using the sectoral data of labour relocation and its impact on growth along with urbanisation in South Asia. To address this gap, we apply Shift-share technique which is a kind of accounting techniques used to decompose the change in labour productivity into 'within effects' and 'relocation or structural change effects'. We find that Maldives and India have experienced comparatively more structural change in terms of sectoral labour relocation as compared with other countries such as Bangladesh, Nepal, and Pakistan in the region. Furthermore, by application of panel data estimation techniques it is found that structural change (i.e. labour relocation) is not a statistically significant determinant of economic progress in South Asia. It hints towards structural rigidities such as labour movement across sectors. Our findings also confirm that capital per worker, urbanisation, and trade openness ceteris paribus have positive influence on the economic progress, though with different magnitudes. From policy perspectives, labour relocation may be facilitated by promotion of appropriate skilling opportunities for migration across sectors and also promotion of off-farm activities in the rural areas.

JEL Classification: O15, O53, O57, N10
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1. INTRODUCTION

Structural transformation or structural change, commonly conceptualised as shifts in the sectoral composition of an economy, whether in employment or value added output, has been a focus of researchers for quite some time. Development economists recognise that such shifts are essential conditions as well as a connected phenomenon of economic growth [Abramovitz, (1983)]; and these shifts may be an "extra source of aggregate productivity growth" [Timmer and Szirmai (2000)]. Moreover, a keen reader of relevant literature about can find prominent studies for example [Fisher (1939); Clark (1940); Lewis (1954); Chenery (1960); Kuznets (1971); Syrquin (1984); Chenery,

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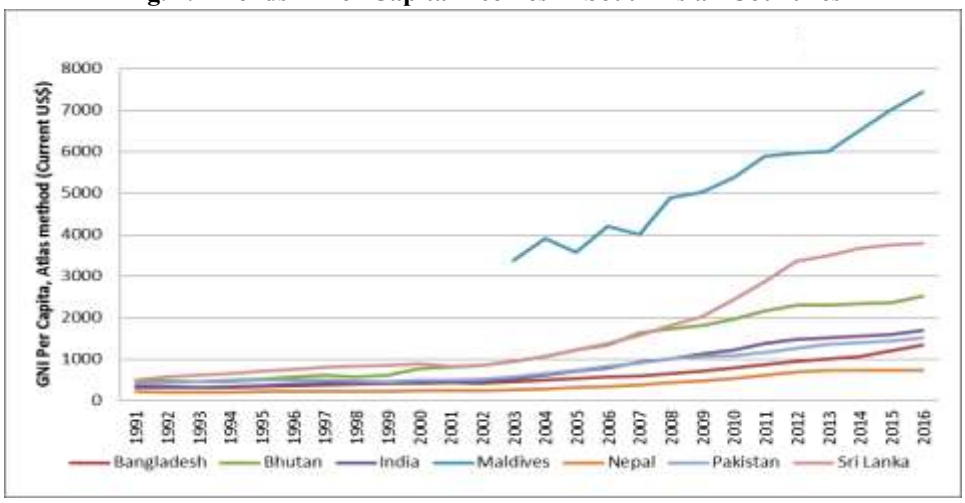
Robinson, and Syrquin (1986), and Syrquin (1988)], yet "for a long time, this body of work was dormant" [Felipe, Kumar, Abdon, and Bacate (2012)]. And the interest in the process of structural change has re-emerged in recent years owing to its importance in the process of economic development [see Lin (2011); McMillan, Rodrik, and Verduzco-Gallo (2014); Storm (2015) and Vu (2017), for example and arguments].

Although one can find some studies related to interrelationship between economic growth and structural change in the context of South Asian countries [such as Nabi, *et al.* (2010) and Haq, Naqvi, and Luqman (2016)], however it is very hard to find such studies that empirically explain the role of labour relocation (as a measure of structural change) and urbanisation at the same time in economic growth. Therefore, in order to contribute to the relevant empirical literature, this study picks up the sample of seven South Asian countries to explore the nature and extent of structural change and uses empirical models to draw results. More specifically, how far the structural change or lack of it can explain the growth performance of South Asian countries? This question has sparsely been answered in the relevant literature, especially using the variables of labour relocation across sectors and urbanisation at the same time.

South Asian region has not been able to experience sustained economic progress and 'a South Asian tiger never emerged' [Naseem (2004)]. Comparing the East-Asia's performance with that of the South Asia during 1970s and 2000s, Nabi, *et al.* (2010) remark that "manufacturing, by contrast, was lacklustre in the three decades when East Asia was galloping away". The following figure gives a snapshot of comparative economic growth performance of the South Asian countries in past two decades or so.

Fig. 1. Trends in Per Capita Incomes in South Asian Countries



Source: Authors' own presentation based on data from World Development Indicators online.

In 1991 all of these seven South Asian countries were classified as Low Income Countries (LICs) by the World Bank (using atlas method of GNI per capita) and had around 500$ per capita income each. Over the period of time 1991-2016, all the countries except Nepal have moved into the Middle Income category though at different paces and times. Here one can also see that Maldives, Sri Lanka, and Bhutan have performed better

than other countries of the region. The growth in India and Pakistan has also picked up in recent past. In this paper, an attempt is made to identify the relationship between economic growth and structural change (conceptualised as labour relocation among sectors), amidst other independent variables. The main research question is 'whether there exists a positive relationship between structural change and economic progress in the context of South Asian countries under study?'

The present study is organised into five sections. The Section 1 presents introduction, research gap and motivation for the study. Section 2 offers literature review by highlighting the theoretical, and empirical researches focusing on their findings. Section 3 provides theoretical framework used in this study, and construction of variables with sources of data and methodology. The empirical findings based on econometric estimations are discussed in Section 4, and the Section 5 presents conclusions, and some policy recommendations.

2. LITERATURE REVIEW

The seminal work of Simon Kuznets that centres around structural transformation is quite remarkable in the context of developed countries; he conducted detailed studies in 1950s and 1960s on the patterns of aggregate changes and structural shifts by using historical data of advanced countries undergoing modern economic growth[1]. Owing to his contributions in data based analysis, he is regarded as a pioneer in this field [Chenery and Taylor (1968)]. He also put forth the 'six characteristics' of modern economic growth, that can be found in Kuznets (1973, p. 248), and the third of these characteristics is 'structural transformation' i.e. profound changes in production, employment, scale of productive units, trade etc. For theoretical explanations of interrelationship between economic growth and structural changes, given the works of economists cited in the introduction part, the 'structural change school' of thought is more relevant here. It is because most of the structural economists opine that economic growth is brought about by structural changes, as opposed to the balanced school that considers structural changes as 'unimportant by-product of growth [Echevarria (1997)]. On the similar lines, McMillan, *et al.* (2014) argue that movement of labour from low-productivity sectors to high-productivity sectors can be a source of an increase in overall labour productivity in the economy. And resultantly, structural change "can retard growth if its pace is too slow or its direction inefficient" [Syrquin (2010)].

During the literature review, we came across two major kinds of *empirical studies* featuring quantitative analysis; (i) Decomposition Studies, and (ii) Econometric Studies. The decomposition studies primarily feature the use of 'Shift-share Analysis' (SSA henceforth) which is a kind of accounting technique [Hartwig (2012)] that helps investigate how aggregate growth is linked to differential growth of labour productivity and reallocation of labour across sectors [Peneder (2003)]. There are different versions of the SSA, and recently de Vries, Timmer, and de Vries (2015) have used three components for decomposition i.e. within effect, static (or between-) shift effect, and dynamic shift effect. The static shift effect and dynamic shift effect may be jointly

[1]For details, please see the articles of Kuznets from 1956 to 1967 under the title 'Quantitative Aspects of the Economic Growth of Nations' published in the journal 'Economic Development and Cultural Change' [Kapuria-Foreman and Perlman (1995), p. 1537].

referred to as effects of structural change [Timmer and Szirmai (2000), p. 390]. In essence, the second component in the two component approach i.e. between effect actually combines the static shift effect and dynamic shift effect, which are separated in the three component approach, as also mentioned by de Vries, *et al.* (2015, p. 687)[2] who use following notation;

$$\Delta P = \sum_i (P_i^T - P_i^0)\, S_i^0 + \sum_i (S_i^T - S_i^0)\, P_i^0 + \sum_i (P_i^T - P_i^0) * (S_i^T - S_i^0) \quad \ldots \quad (1)$$

Where, ΔP = change in aggregate labour productivity, P_i^T and P_i^0 are labour productivities of *i*th sector in current and initial time periods respectively. Similarly, S_i^T and S_i^0 are the employment shares of *i*th sector in overall employment in current and initial time periods respectively. In Equation 1 above, the first term on the right-hand side is the within-effect, same as in the two components approach mentioned earlier. The second term is 'static shift effect' or may also be called the 'between-static effect' and it measures whether workers move to sectors with above-average productivity levels. The third term 'dynamic shift effect', also called 'between-dynamic effect' represents the joint effect of changes in sector employment and productivity levels. It is positive (negative) if workers are moving to sectors that are experiencing positive (negative) productivity growth. One major finding from the SSA is that the 'within effect' appears to dominate in almost all such studies [for example, see Roncolato and Kucera (2013); McMillan and Harttgen (2014); McMillan, *et al.* (2014); de Vries, *et al.* (2015)].

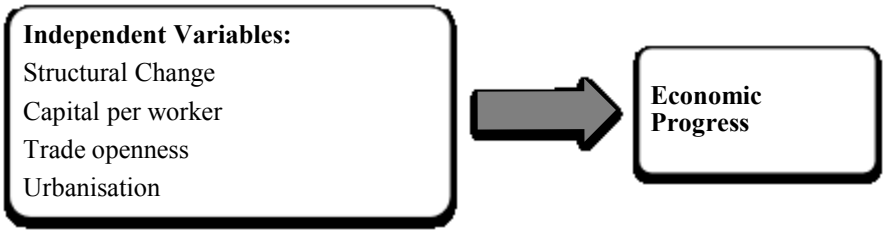
The other practice within empirical approach is of using econometric models. Wang, Dong, Yin, and An (2014) submit that such quantification began with Chenery, *et al.* (1986). Some studies have used SSA in combination with other econometric techniques, for example McMillan, *et al.* (2014). By using One-step GMM, Silva and Teixeira (2011) find that structural change positively influences productivity growth in the context of 20 OECD countries and Japan. Dietrich (2012) applied the Granger causality test in panel environment on seven (07) OECD countries and discover structural change supported the aggregate economic growth regardless of the measure of structural change. McMillan, *et al.* (2014) included the 'structural change term' derived from SSA in a regression model in their study on selected Asian, Latin American, and African countries. They establish that structural change has been growth reducing in selected African and Latin American countries, but growth enhancing in case of Asian countries under their study. Carmignani and Mandeville (2014), on the other hand, applied Two-step efficient GMM estimator in the context of several African countries and found that reallocation from agriculture to non-manufacturing industry (especially mining) seemed to retard growth. In a comparatively recent study, Zulkhibri, *et al.* (2015) applied Panel co-integration techniques on data of four emerging economies i.e. Turkey, Malaysia, Nigeria and Indonesia. They confirm the presence of long-run equilibrium relationship between structural change and economic growth. On a final note, the empirical findings are not conclusive, however. Some studies prove that structural change is a significant and positive explanatory variable in economic growth while others found it to be insignificant or negative as noted by Chen, Jefferson, and Zhang (2011), Dong, Song, and Zhu (2011). Practically, the empirical results seem to be influenced by model specifications and choice of indicators, on one side and the usage of different estimation techniques on the other.

[2]Please see end note 11 in original.

Recently, Vu (2017) has also found a positive relation between structural change and economic growth in case of 19 Asian countries over a period of 1970-2012, but it does not include the urbanisation variable, and also misses Maldives and Bhutan from South Asian region.

3. THEORETICAL FRAMEWORK, DATA SOURCES, AND METHODOLOGY

As discussed in literature review, the importance of structural change for economic progress cannot be undermined, especially from the 'structuralist viewpoint'. Furthermore, as this research is primarily concerned with role of structural change as a predictor of economic progress, hence it is treated as the primary variable of interest along with other variables on interest especially urbanisation. The following schematic diagram presents the theoretical framework used in this study;



Source: Authors' conceptualisation.

The choice of these variables is made on the basis of economic theories such as standard growth theory (emphasising the role of capital formation), trade-growth nexus (for trade as an engine of growth), and urbanisation (emphasising the cities as engines of growth). For the purpose of a parsimonious model, the present authors have used the above configuration, while other variables such as institutional quality, human capital, innovation and R&D, role of governments etc. have not been explicitly included in it. It is not that they are unimportant, but that they can be studied in some other research setting.

3.1. Variable Measurement and Data Sources

The present study uses the operational definition of structural change as 'labour relocation across sectors' which is akin to McMillan, *et al.* (2014) and more recently M. Timmer, Vries, and Vries (2016). For quantification of labour relocation the Shift-share technique used by de Vries, *et al.* (2015), discussed earlier in the review of empirical studies, is applied here. This specific technique is more useful for the present study that is concerned with the effect of labour relocation across sectors and over time. Finally, the between static and between dynamic effects have been summed up for each time period to calculate the SC term and it is used in econometric modelling. Moreover, as the structural change term is calculated between two years (e.g. from 1991 to 1992) and all other variables at yearly basis; therefore the data for SC term were harmonised with other variables by omitting 1991 value of other variables for all countries—in this way 1992 data for other variables were used against 1991-1992 data for SC term and the same procedure was followed for all subsequent years.

Definitions and data sources of other variables used in this study are as follows; for calculating the structural change variable, the sectoral employment data and sectoral output data are required that are extracted from International Labour Organisation's World Employment and Social Outlook (ILO-WESO) and United Nations Statistics Division (UNSD) respectively. To calculate capital per worker, the gross fixed capital formation data is extracted from "GDP and its breakdown at constant 2005 prices in US Dollars" available from UNSD and it is divided by total employment extracted from ILO-WESO. Output data and employment data from these sources were available as per International Standard Industrial Classification of All Economic Activities (ISIC Rev.3.1). The data for real per capita GDP, and trade (imports and exports of goods and services) for calculation of trade openness is also from UNSD—all at 2005 constant dollars—in order to maintain harmonisation and consistency. The starting year i.e. 1991 was selected on the basis of data constraint from labour related available from a consistent and reliable source i.e. ILO-WESO. Finally, the data for urbanisation defined as percentage of total population living in urban areas is taken from World Development Indicators Online.

3.2. Methodology, Estimations and Results

This section discusses the model and methodology to be employed in this study. Referring to the theoretical framework, "structural change" is the main variable of interest whose effect is to be explored in this study for the economic progress of selected countries. However other independent variables have also been added in model specification to obtain unbiased parameter estimates. These variables are capital formation, urbanisation, and trade openness which have been selected on the basis of relevant economic theories and review of seminal empirical works carried out in this area such as Syrquin (1986), Silva and Teixeira (2011), Dietrich (2012), McMillan, *et al.* (2014), Zulkhibri, Naiya, and Ghazal (2015), for example. The variable of urbanisation has been introduced owing to its relevance but not much coverage in the relevant empirical literature.

The estimable model can be presented as;

$$RPCY = f(SCeffect, GFCFTemp, Topen, Urban) \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Where 'RPCY' is real per capita income, 'SCeffect' is a proxy of structural change (as labour relocation), 'GFCFTemp' is gross fixed capital formation per worker, 'Topen' is trade openness, and 'Urban' is a proxy for urbanisation.

Econometric specification of the model is as follows:

$$RPCY_{i,t} = \beta_0 + \beta_1 SC_{i,t} + \beta_2 GFCFTemp_{i,t} + \beta_3 Topen_{i,t} + \beta_4 Urban_{i,t} + \varepsilon_{i,t} \quad \ldots \quad (2a)$$

Here the subscripts '*i*' and '*t*' refer to countries and years respectively; β_0 is the overall intercept of the model, other βs are slope coefficients to be estimated, and $\varepsilon_{i,t}$ is the *iid* term, assumed to have zero mean and constant variance = σ^2_{ε} .

To start the estimation process, first of all, the variable 'structural change' is calculated by applying the equation 1 i.e. Shift-share analysis. Country-wise summary of structural change is presented in the Table 2 for all 07 countries averaged over 23 time periods included in this article;

Table 1

Shift-share Analysis— Country-wise Average Results (1991-2015)

Countries	Col. 1 Overall	Col. 2 Within Effect	Col. 3 Between Static Effect	Col. 4 Between Dynamic Effect	Col 5 = Col. 3 + Col. 4 Labour relocation or Structural Change Effect
Sri Lanka	124.81	127.01	20.29	–22.48	–2.2
Maldives	119.71	10.34	176.7	–67.33	109.37
India	93.01	75.61	17.67	–0.27	17.4
Bhutan	87.66	149.69	258.65	–320.67	–62.03
Bangladesh	30.89	21.61	10.83	–1.55	9.28
Pakistan	23.02	19.17	8.23	–4.38	3.85
Nepal	12.07	4.39	8.82	–1.14	7.68

Source: Authors' own calculations.

The column 1 in the above table gives country-wise average gain per year in labour productivity—and by using the SSA it has been decomposed into Within Effect, Between Static, and Between Dynamic Effects—which are presented in Columns 2, 3 and 4 respectively. The Column 5 which captures the change in labour productivity conceptually attributed to relocation of labour. Overall, it can be seen that performance of Maldives, Sri Lanka, India, and Bhutan is comparatively better than other countries in terms of average yearly gains in labour productivity.

The first finding from the above table is that 'within effect' (Col. 2) is larger than 'structural change effect' (Col. 5) in case of most of the countries under study except Maldives and Nepal; and it corroborates with the relevant literature (though not necessarily related to South Asian countries) such as McMillan and Harttgen (2014), McMillan, *et al.* (2014), de Vries, *et al.* (2015) and Martins (2015). The reason for this tendency is the weighting scheme used in the SSA. Secondly, Maldives and India have experienced more structural change in terms of sectoral labour relocation than other countries such as Bangladesh, Nepal, and Pakistan where structural change has remained comparatively low. Thirdly, over a period of two decades, most of the countries are showing 'static gains' as evident from positive figures of 'between static', but 'dynamic losses' i.e. negative figures of 'between dynamic'. This finding is especially comparable with de Vries, *et al.* (2015) in case of several African countries. Fourthly, the positive 'between static gains' outweigh 'between dynamic losses', therefore the net effect captured by the structural change term is positive for all countries. Fifthly, Bhutan and Sri Lanka have undergone negative structural change which means that in their cases the change in average labour productivity is not because of labour relocation across sectors but because of sector specific developments.

Fig. 2. Sri Lanka

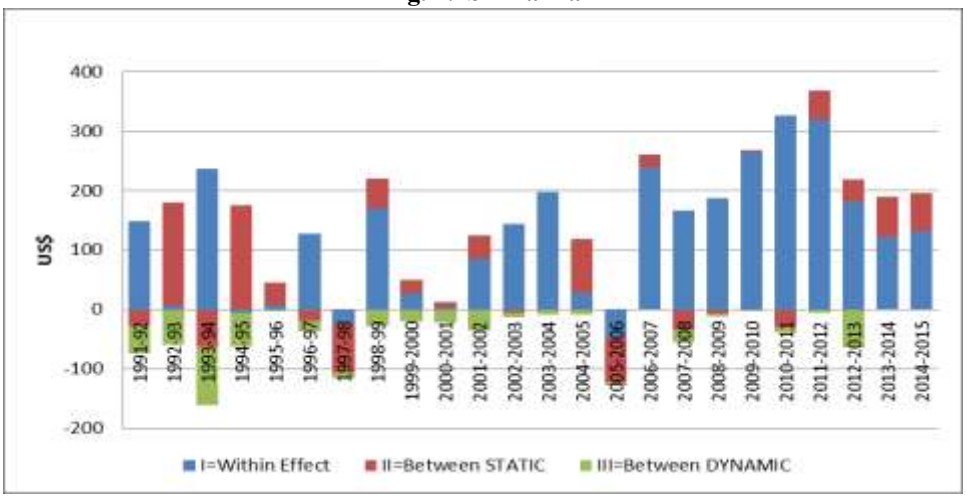


Fig. 3. Maldives

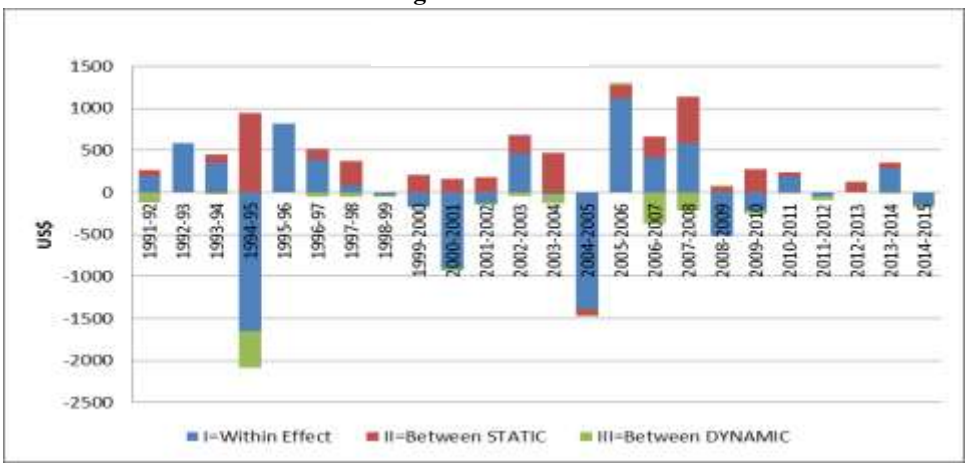


Fig. 4. India

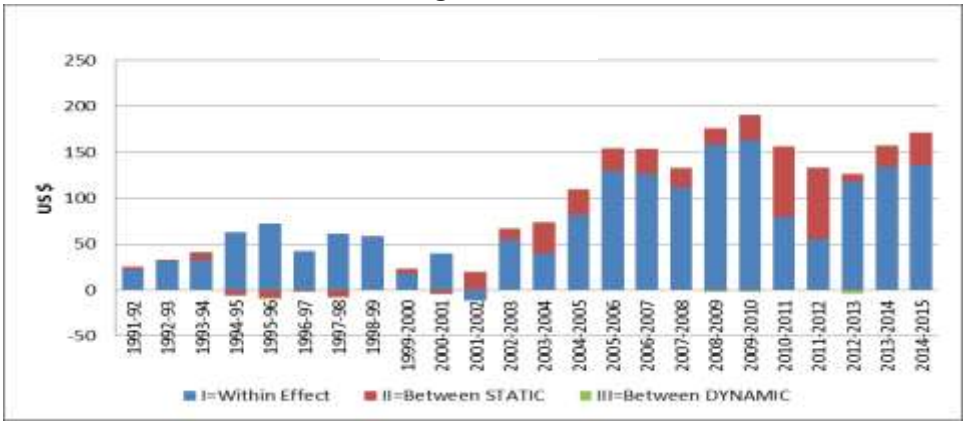


Fig. 5. Bhutan

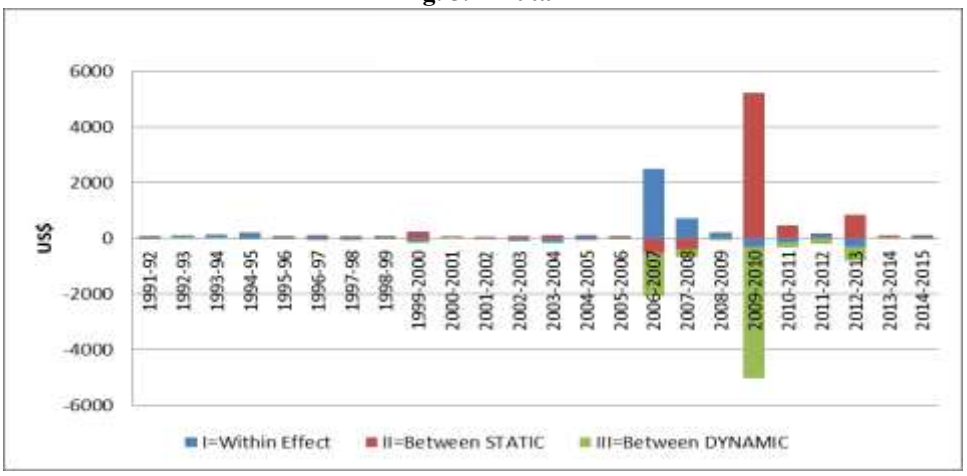


Fig. 6. Bangladesh

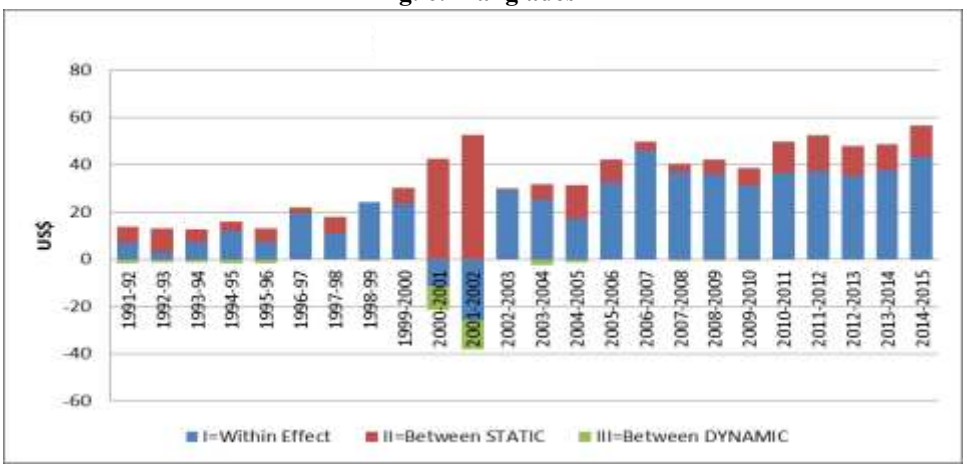


Fig. 7. Pakistan

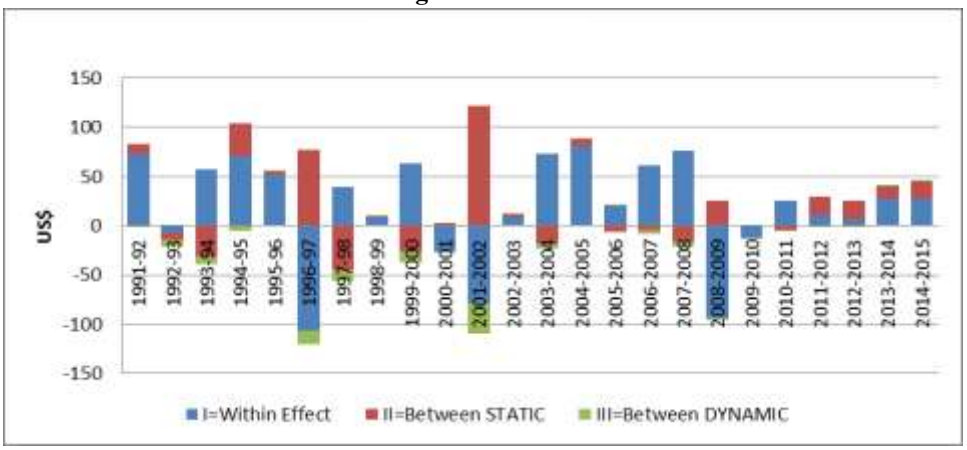
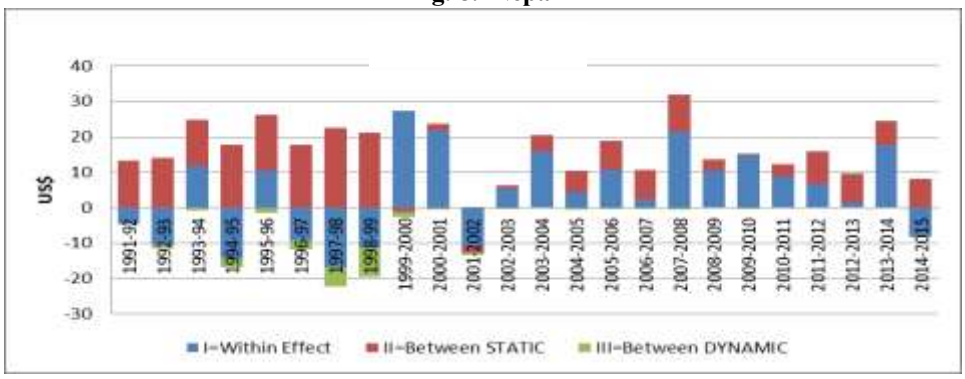


Fig. 8. Nepal



Source: Authors' own presentation based on SSA calculations.

The two terms (i.e. between static and between-dynamic) are added to calculate the structural change term (SC) presented in Col. 5, in line with relevant literature cited above, for econometric modeling purposes. This leads to next step i.e. empirical estimation for measuring the connection between structural change and economic progress in terms of per capita income gains in the presence of other variables.

3.3. Panel Data Estimation

For estimation of the panel dataset, firstly the standard regression method of Pooled OLS is applied to estimate the regression model given in Equation 2a. The standard post-estimation tests to detect possible problems such as Heteroscedasticity, Multicollinearity, and Incorrect Model Specification have been performed. For identifying the heteroscedasticity problem, Cook-Weisberg Test (H_0: Constant variance) is used and its value χ^2 (1) = 48.49 with (Prob. = 0.0000) led to the conclusion that the model suffers from heteroscedasticity. The Mean of Variance Inflation Factor is 2.20, which is lower than conservative threshold value of 4, and suggests that the model does not potentially suffer from the problem of multicollinearity. To test for model specification, Ramsey RESET Test (H_0: Model has no omitted variables) has been applied and its probability also indicates the rejection of the null hypothesis concluding that there are potential omitted variables in model.

Owing to the heterogeneity of countries in the panel of 7 countries under study, the Pooled OLS may be an inappropriate estimation strategy as also indicated by the above mentioned tests. Ranging from Maldives (a small island country) to India (a country with over 1 billion population) alongside the presence of cultural and social differences among these countries, which are not directly included in the model, the Pooled OLS results may not be reliable. For this purpose, Breusch-Pagan Lagrange Multiplier Test to choose between Pooled OLS and Random Effects is applied. The null hypothesis of the B-P LM test states that variances across countries are zero. Here the significance of Test Statistic $\bar{\chi}^2(01)=528.87$ leads us to the rejection of the null hypothesis and conclude that random Panel effects are present. Hence the signals of the presence of panel effects lead towards making a choice between two Models i.e. Fixed Effects or Random Effects. This is done by using Hausman Test, and its probability value (0.1056) which can be seen from the Table 2 directs towards the assertion that the random effects model is preferable.

The results of FE model are also presented for comparison. The coefficient estimates for 'SCeffect' of the FE Model are positive but statistically insignificant meaning that the role of structural change in South Asian countries in this study is negligible and not statistically significant. Other coefficients have positive and significant effects, and depict the expected positive direction of the relationship. However again to check the validity of the FE Model, diagnostics have been applied. Testing for the cross sectional independence of residuals by using Breusch-Pagan LM Test of independence (as T>N in this study) with the null hypothesis that residuals across entities are not correlated, is applied. The value of statistic $\chi^2(21)=171.769$ with significant probability indicated the rejection of null hypothesis and the presence of cross sectional dependence in Model. Moreover, for detecting the serial correlation, the Wooldridge Test with null hypothesis that there is no first-order autocorrelation in Model, is applied and the value of Test statistic i.e $F(1, 6)=5.826$ with insignificant probability indicates the non-rejection of H_0 and it can be concluded that autocorrelation is not a problem in this model. Furthermore, for testing the heteroscedasticity, Modified Wald test is applied with the null hypothesis of constant variances. And the significant value of Chi square $\chi^2(7)=70171.53$ pointed out that variances are not constant and Model suffers from heteroscedasticity.

Table 2

Estimation Results

Independent Variables	Pooled OLS Dep=RPCY2005	Fixed Effects Dep=RPCY2005	Random Effects Dep=RPCY2005	GLS Dep=RPCY2005
SCeffect	0.321	0.103	0.110	0.103
	(0.194)	(0.130)	(0.131)	(0.135)
GFCFTemp	0.362***	0.285***	0.313***	0.433***
	(0.0700)	(0.0650)	(0.0600)	(0.0284)
Topen	19.39***	16.01***	17.56***	16.39***
	(1.575)	(2.190)	(1.854)	(0.714)
Urban	23.66***	54.07***	46.86***	21.23***
	(5.048)	(8.807)	(7.636)	(1.147)
Constant	–931.9***	–1445.5***	–1379.9***	–775.9***
	(137.2)	(152.6)	(198.3)	(47.83)
N	168	168	168	168
R^2	0.865	0.724		
adj. R^2	0.862	0.706		
F	262.1	102.8		
		Diagnostics		
Heteroskedasticity (Breusch-Pagan/Cook Weisberg Test)		χ^2 (1) = 48.49 Prob. = 0.0000	**Breusch-Pagan LM Test of Independence** χ^2 (21) = 171.769, Prob. = 0.0000	
Multicollinearity Test (Variance Inflation Factor)		2.20		
Wald Test		F(4, 163) = 262.09 Prob. = 0.0000	**Hausman Test** χ^2 (4) = 7.64 Prob. = 0.1056	
Model Specification Test (Ramsey RESET)		F(3, 160) = 36.57 Prob. = 0.0000		
			Autocorrelation (Wooldridge test using xtserial) F(1, 6) = 5.826 Prob. = 0.0523	
B-P LM test for random effects		$\bar{\chi}^2(01)$=528.87 Prob. = 0.0000		
			Modified Wald Test χ^2 (7) = 70171.53 Prob. = 0.0000	

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Now as Random effects is the preferred model according to the Hausman test, and there is not a problem of autocorrelation in panel data, but heteroscedasticity and cross-sectional dependence can be problematic for valid results. To address these problems, we have applied the Generalised Least Squares (GLS) method using *xtgls, panels(correlated)* command in Stata. This technique allows better estimation in the presence of cross-sectional correlation and panel heteroscedasticity. The results of this final model are presented in the last column of Table 2.

4. KEY FINDINGS AND POLICY IMPLICATIONS

Key findings of the final Model using GLS suggest that;

(i) Though there is a positive relationship between 'structural change' and the real per capita income in case of the South Asian panel under study, yet the results are not statistically significant. It implies that, on average, this relation is quite weak or may be absent in case of some countries. Hence, the South Asian region is not making much use of structural change for its growth.

(ii) The role of capital formation is found to have a positive effect on per capita income. In quantitative terms, *ceteris paribus* one dollar increase in the capital per worker leads to 0.43$ gain in real per capita income on average. It is statistically significant at 1 percent. This finding is in line with standard growth theory which predicts a positive association between capital formation and per capita income.

(iii) Trade Openness (% of GDP) is also found to have a positive relationship with the dependent variable, and this result is statistically significant at 1 percent. Though empirical studies in the literature find mixed evidence, yet more are inclined towards a positive relationship [Irwin and Terviö (2002); Lee, Ricci, and Rigobon (2004); Wacziarg (2001)].

(iv) Finally, urbanisation, another variable of interest in this model configuration shows a positive significant relation with real per capita income at 1 percent level of significance. Cities have a positive impact on economy owing to their contribution in services as well as consumers of industrial and agriculture sectors.

4.1. Policy Implications

From policy perspectives, labour relocation amongst sectors can be seen as an area of interest of public policy as it is considered to be important for economic progress and as an indicator of meaningful structural change. As found in this study, in South Asian region this is not the case in relation to per capita incomes—one possible reason is that owing to different factors, much of labour is occupied in agriculture and its relocation is still a challenging question for example in Pakistan where around 45 percent of labour is engaged in agriculture contributing around 20 percent in GDP. Rural industrialisation or off-farm services may be a solution. For such purposes, appropriate skilling schemes may be introduced that can help workers move from low productivity sectors to high productivity sectors. Capital formation is important for growth both as an input a. However, any public policy for macroeconomic progress should be based on detailed

systemic analysis in the particular economy's context and the instruments of policy may be unique to the context.

Future areas of research may include other variables which could not be covered in this research. The role of institutions and government in the process of structural change and their impact on economic growth may be a useful enquiry.

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