Structural Transformation and Economic Growth: A Fresh Empirical Assessment of SAARC Countries

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Abstract

The economic structure of countries, whether conceptualized as composition of relative sectoral output shares or as sectoral employment shares changes as countries develop. However, it is hard to find empirical studies using labor relocation across sectors along with urbanization to explain the economic growth in SAARC region. This study firstly uses Shift-share technique and finds that Maldives and India have experienced more structural change in terms of sectoral labor relocation than other countries such as Bangladesh, Nepal, and Pakistan. Further, by application of panel data estimation techniques it is found that structural change (i.e. labor relocation) is a not a statistically significant determinant of economic progress in SAARC – that hints towards possible labor market imperfections and socio-economic hindrances that deter labor movement across sectors. Our findings also confirm that capital per worker, urbanization, and trade openness ceteris paribus have positive influences on economic progress, though with different magnitudes. From policy perspective, labor relocation may be facilitated by promotion of appropriate skilling opportunities for migration across sectors.

Introduction

Shifts in the sectoral composition of an economy, whether in employment or value added output, have been a focus of researchers for quite some time. Such shifts which are commonly referred to as 'structural changes' 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 & Szirmai, 2000). However, "for a long time, this body of work was dormant" (Felipe, Kumar, Abdon, & Bacate, 2012) despite its importance. The interest in the process of structural change has re-emerged in recent years after demise of the so-called Washington Consensus; please see Lin (2011), McMillan, Rodrik, and Verduzco-Gallo (2014), Storm (2015), and Vu (2017), for example and arguments.

A keen reader of economic history realizes that the South Asian region has not been able to experience sustained economic progress and "a South Asian tiger never emerged ……" (Naseem, 2004). A dominant challenge is that of low regional trade and economic integration within South Asia (Rahman, Khatri, & Brunner, 2012). This challenge, among others, remains high despite promising economic progress of South Asian countries in the recent past. Although one can find some studies related to interrelationship between economic growth and structural change in the context of SAARC countries (such as Nabi et al. (2010) and Haq, Naqvi, and Luqman (2016)), however the role of structural change and urbanization in this process is very hard to find and is less explored despite its importance.

This study especially picks up this question of the role of structural change in economic growth alongside urbanization in case of South Asian economies in order to contribute to the relevant empirical literature. The choice of 1991 as starting period of this study is made owing to

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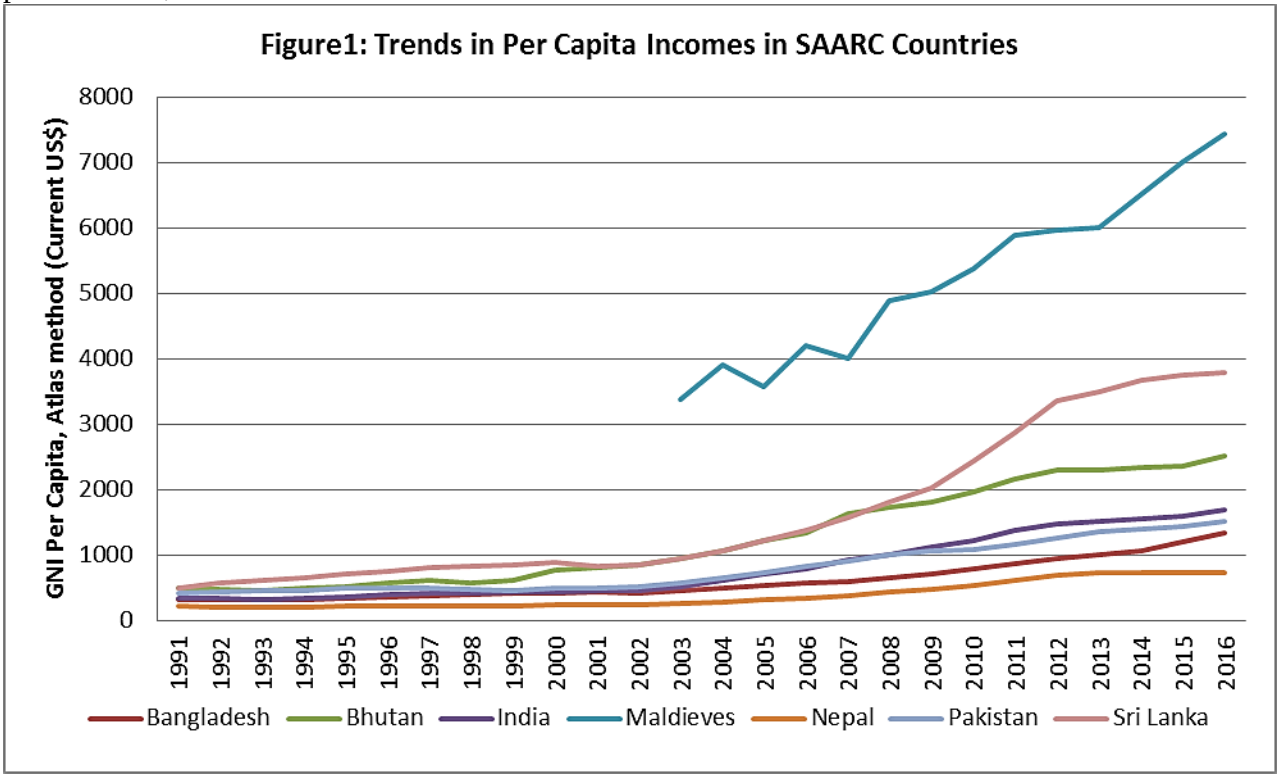
the compelling data constraints, and it is worth mentioning that all of the seven SAARC member countries were classified as Low Income Countries by the World Bank in 1991. Only one country i.e. Nepal is still an LIC while others have progressed to the middle income status, though at different times and paces. The following figure 1 illustrates a comparative performance;



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

Here we can see that Maldieves, Sri Lanka, and Bhutan have surpassed other countries of the region despite the fact that in 1991 (the starting period of this study) all of these were clustered at or below 500$ per capita. In this paper, an attempt is made to identify the relationship between economic growth and structural change (conceptualized as labor relocation among sectors), amidst other independent variables. The main research question is that whether there exists a positive relation between sectoral labor relocation and economic progress in the context of South Asian countries under study? This question has sparsely been answered in the relevant literature, especially using the variables of labor relocation across sectors and urbanization at the same time.

2. Literature Review

A keen reader of relevant literature can find prominent studies (Chenery, 1960; Chenery, Robinson, & Syrquin, 1986; Clark, 1940; Fisher, 1939; Kuznets, 1971; Lewis, 1954; Syrquin, 1984, 1986, 1988). The works of Simon Kuznets that center 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. Owing to his contributions in data based analysis, he is regarded as a pioneer in this field (Chenery & Taylor, 1968). 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. Echevarria (1997) suggests that most of structural economists opine that growth is brought about by changes in sectoral composition. On the similar lines, McMillan et al. (2014) argue that movement of labor from low-productivity sectors to high-productivity sectors can be a source of an increase in overall labor productivity in the economy. And resultantly, structural change "can retard growth if its pace is too slow or its direction inefficient" (Syrquin, 2010). This resonates the seminal work of Lewis (1954) highlighting the migration of labour across sectors.

The ***empirical studies*** featuring quantitative analysis can be grouped into two clusters i.e. Decomposition Studies and 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 labor productivity and reallocation of labor 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 referred to as effects of structural change (Timmer & 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, as also mentioned by de Vries et al. (2015, p. 687) who use following notation;

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

Where,

ΔP = change in aggregate labor productivity, P_i^T and P_i^0 are labor productivities of *i*th sector in current and initial time periods respectively.

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.

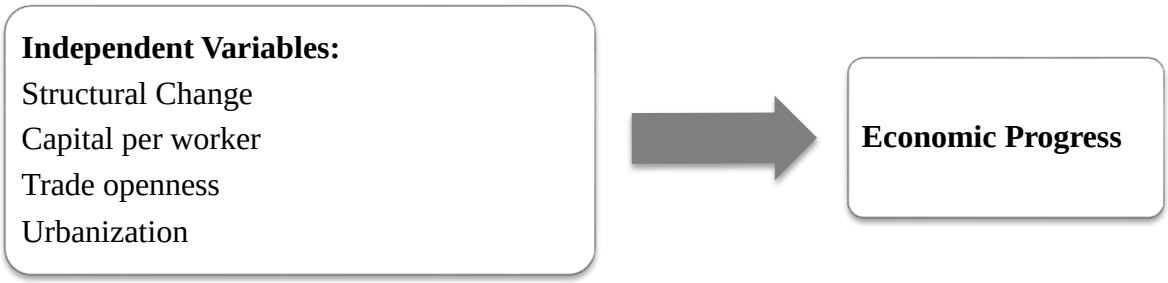
In equation 1 above, the first term on the right-hand side is the within-effect, same as the two components approach mentioned earlier. The second term is 'static shift effect' or may also be called the 'between-static effect' and it measures whether workers move to sectors with above-average productivity levels. The third term 'dynamic shift effect', also called 'between-dynamic effect' represents the joint effect of changes in sector employment and productivity levels. One major finding from the SSA is that the 'within effect' appears to dominate in almost all such studies (for example, please 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 to explain the phenomenon of structural change by 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 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. Recently, Vu (2017) has also found a positive relation between structural change and economic growth in case of 19 Asian countries from 1970-2012, but it does not include the urbanization variable, and also misses Maldives and Bhutan from SAARC region which have shown good growth compared with other countries.

3. Research Objectives and Theoretical Framework

As discussed in literature review part, the importance of structural change for economic progress cannot be undermined, especially from the 'structuralist viewpoint'. Furthermore, the study of urbanization and structural changes in South Asia at the same time is scant, so this study has taken it up as its objective and seeks to address this gap in empirical literature. 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 urbanization. The following schematic diagram presents the theoretical framework used in this study;



Source: Authors' conceptualization

The choice of these variables is made on the basis of economic theories such as standard growth theory (emphasizing the role of capital formation), trade-growth nexus (for trade as an engine of growth), and urbanization (emphasizing 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.

4. Variable Measurement and Data Sources

The present study has adopted the operational definition of structural change as 'labor relocation across sectors' which is akin to McMillan et al. (2014) and more recently M. Timmer,

Vries, and Vries (2016). Shift-share technique used by de Vries et al. (2015), discussed earlier in the review of empirical studies, is applied here for quantification of labor relocation. For econometric modelling, the between static and between dynamic effects have been summed up for each time period to calculate the structural change term. 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 harmonized with other variables by omitting 1991 value of other variables for all countries.

Definitions and data sources of other variables used in this study are as following; for calculating the structural change variable, the sectoral employment data and sectoral output data are extracted from International Labor Organization'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 harmonization and consistency. The starting year i.e. 1991 was selected on the basis of data constraint available from a consistent and reliable source i.e. ILO-WESO. Finally, the data for urbanization defined as percentage of total population living in urban areas is taken from World Development Indicators Online.

5. 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. Other independent variables have also been added in model specification to obtain unbiased parameter estimates. These variables are capital formation, urbanization, 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. The estimable model can be presented as;

RPCY= f(SCeffect, GFCFTemp, Topen, Urban). . . . . (2)

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

Econometric specification of the model is as follows:

$RPCY_{i,t} = \beta_0 + \beta_1 SC_{i,t} + \beta_2 GFCFTemp_{i,t} + \beta_3 Topen_{i,t} + \beta_4 Urban_{i,t} + \varepsilon_{i,t}$ . .. . (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 11 countries averaged over 23 time periods included in this article;

Table 1: Country-wise average results (1991-2015)

Countries	I= Within Effect	II= Between Static	III= Between Dynamic	Labor relocation or Structural Change Effect =II+III
Maldive	10.34	176.70	-67.33	109.37

s				
India	75.61	17.67	-0.27	17.40
Bangladesh	21.61	10.83	-1.55	9.28
Nepal	4.39	8.82	-1.14	7.68
Pakistan	19.17	8.23	-4.38	3.85
Sri Lanka	127.01	20.29	-22.48	-2.20
Bhutan	149.69	258.65	-320.67	-62.03

Source: Authors' own calculations based on Equation (1)

The first finding from the above table is that overall performance of Maldieves, Sri Lanka, and Bhutan is remarkable in terms of average yearly changes in labor productivity (addition of column 2 and column 4). This coincides with the performance of these countries in terms of per capita incomes illustrated in figure 1 above. Secondly, the 'within effect' is larger than 'structural change effect' in case of most of the countries under study except Maldieves and Nepal; and it corroborates with the relevant literature (though not necessarily related to SAARC countries) such as McMillan and Harttgen (2014), and Martins (2015). Thirdly, Maldieves and India have experienced more structural change in terms of sectoral labor relocation than other countries such as Bangladesh, Nepal, and Pakistan where structural change has remained comparatively low. Finally, Bhutan and Sri Lanka experienced negative structural changes implying that the net positive change in average labor productivity is not because of labor relocation across sectors but because of sector specific developments. The two terms (i.e. between static and between-dynamic) are added to calculate the structural change term (SC), in line with relevant literature, 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.

5.1 Panel Data Estimation

For estimation of the panel dataset, firstly the standard regression method of Pooled OLS is applied to estimate the 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 after running the Model. For identifying the heteroscedasticity problem, Cook-Weisberg Test (H_0: Constant variance) is used and its value $\chi 2$ (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 indicates the non-rejection of the null hypothesis concluding that there are 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 model (RE) 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 model (FE) or RE. 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 RE model is preferable.

The results of FE model are also presented for sake of 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 right 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. For detecting the serial correlation, the Wooldridge Test with null hypothesis claiming that there is no first-order autocorrelation in Model, is applied and the value of Test statistic is 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 χ^2 (7)=70171.53 suggests 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	2.20	**Hausman Test** χ^2 (4) = 7.64		

(Variance Inflation Factor)		Prob. = 0.1056
Wald Test	F(4, 163) = 262.09 Prob > F = 0.0000	**Autocorrelation** (Wooldridge test using xtserial) F(1, 6) = 5.826 Prob > F = 0.0523
Model Specification Test (Ramsey RESET)	F(3, 160) = 36.57 Prob > F = 0.0000	
Breusch-Pagan LM Test	$\bar{\chi}^2$ (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 RE 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 this, we have employed the Generalized Least Squares (GLS) method using xtgls, panels(correlated) command in Stata software. 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.

6. Key Findings

The findings of the final Model using GLS suggest that; Though there is a positive relationship between 'structural change' and the real per capita income, yet the results are not statistically significant. Specifically, results suggest that *ceteris paribus* one dollar increase in the labor productivity owing to its relocation leads to 0.10$ gain in the real per capita income, on average. This result is in line with theory of structural change where labor relocation helps in productivity gains but in case of SAARC region this relation is quite weak or absent in some countries. This finding is in line with the intial analysis presented in Table 1 above.

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% and is positive. This finding is also in line with standard growth theory which predicts a positive association between capital formation and per capita income.

Trade Openness (% of GDP) is also found to have a positive relationship with the dependent variable. In more concrete terms, empirical results suggest that *ceteris paribus* 1% increase in trade openness leads to 0.16.39$ gain in real per capita income, on average. And this result is statistically significant at 1%. Though empirical studies in the literature find mixed evidence, yet more are inclined towards a positive relationship (Irwin & Terviö, 2002; Lee, Ricci, & Rigobon, 2004; Wacziarg, 2001).

Finally, urbanization, another variable of interest in this model configuration of SAARC region, shows a positive significant relation with real per capita income. It is found that 1% increase in the urban population is associated with increase in real per capita income worth 21.23$. Cities have a positive impact on economy owing to their contribution in services as well as consumers of industrial and agriculture sectors.

7. Policy Implications

From policy perspectives, labor 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 SAARC region this is not the case in relation to per capita incomes – one possible reason is that owing to different factors,

much of labor is occupied in agriculture and its relocation is still a challenging question for example in Pakistan where around 40% of labor is engaged in agriculture contributing around 20% in GDP. Rural industrialization or promotion of 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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