Structural Transformation in South Asia

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ABSTRACT

We model the evolution and determinants of shares of agriculture, manufacturing and services to GDP for 4 South Asian countries (Bangladesh, India, Sri Lanka and Pakistan) for 41 years (1974-2014) to understand their structural transformation pattern. Determinants of shares were classified into three broad categories "country fundamentals", "policy" and "decadal dummies". This is the first paper to investigate the empirical regularities of structural transformation pattern and their determinants for this region. Generalized Least Square estimation technique for panel data was applied. We find mixed evidence in support of structural transformation. With increase of per capita income the share of agriculture decreases and that of services increases, supporting the Kuznets hypothesis; however the share of manufacturing sector shows a more tepid rise and even decreases in some model specifications. Thus, the Kuznets model of structural *transformation is supported to some extent, but not strongly in these countries.*

Keywords: South Asia, Structural Transformation, Economic Growth, xtreg panel estimation

JEL Classification Code: C22, C23, O11.

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ABSTRACT

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Structural Transformation in South Asia

"Since the industrial revolution, no country has become a major economy without becoming an industrial power."
Lee Kuan Yew, delivering the Jawaharlal Nehru Memorial Lecture in New Delhi, 2005.

"…Industry does not emerge out of cumbrous bureaucratic planning, but from close human contact between small farmers and industrialists that released the latter's latent entrepreneurial talent."
H. Myint

"The slow take-off of India's manufacturing sector compared with many of its Asian neighbors is the source of a considerable amount of consternation and mystery." OECD (2010)

I. Introduction and review of the literature

Long-term economic growth characterized by sustained rises in per capita income has had several economic and social changes associated with it. One of the most significant ones is the transformation in the composition of gross domestic product (GDP) and in the shares of the non-agricultural sectors in employment and, as such, these have been recognized as key aspects of the structural change associated with long term economic growth. Fisher (1939) was the first to put forward this hypothesis. This was later refined and elaborated by Rostow (1960), who argued that that the economy passes through various stages of development from a traditional society to an age of high mass consumption. Lewis (1954) in his model of dualistic development considers the transformation of a developing economy with "unlimited supply of labour" in the rural sector to a modern industrialized society, thus presenting a model of exiting from the agricultural sector. Since the service sector was relatively unimportant at that time, not much emphasis was placed on it. Kuznets (1966, 1973) provided the most comprehensive empirical evidence in support of the hypothesis of structural transformation of output and employment associated with economic growth. The principal work of Simon Kuznets on structural transformation during economic growth was completed in the 1950s. A lucid summary is available in his Nobel Memorial Lecture (Kuznets, 1971).

Economists working at the World Bank, particularly, Chenery and Syrquin (1975) formalized the contribution of Kuznets and postulate that as an economy grows production shifts from the primary (agriculture, fishing, forestry, mining) to secondary (manufacturing and construction) and finally to the tertiary sector (services). Empirically, then, these changes will imply that the shares of the respective sectors in Gross Domestic Product (GDP) as well as in total employment will follow the same pattern, i.e., first the shares of agriculture in employment and output fall and those in manufacturing rise followed by rises in the shares of services and drops in the shares of the manufacturing sector.

This basically supply side argument has been complemented with a demand side argument by Laitner (2000). He develops a theoretical model with agriculture and manufacturing where agriculture alone uses land. When per capita income is low, land is an important source of wealth. As technological progress occurs and incomes rise Engel's Law comes into effect and demand shifts towards manufactured goods and away from agriculture. As a result, land's role as a source of value and wealth declines and manufacturing sector capital becomes an increasingly important store of wealth. A consequence of this is that the shares of agriculture in aggregate output and employment fall and those in the manufacturing sector rise.

A more integrative approach is taken by Timmer et al. (2012) who argue that structural transformation is both the cause and the effect of economic growth. For them, structural transformation is a process by which (a) shares of agriculture in GDP and employment fall over time, (b) there is increased migration as people move from rural to urban areas, (c) an agriculture and rural sector based economy is replaced by an industrial and urban sector based economy, and (d) a demographic transformation whereby high birth and death rates are replaced by low birth and death rates. This process will gradually lead to the disappearance over time of any existing dualism between the agricultural and the non-agricultural sectors.

Thus, this literature views a symbiotic relationship between economic growth and attendant changes in the composition of output and the pattern and distribution of employment across different sectors of the economy. Traditional agriculture is viewed as forming the economic base of less developed countries where land and labour productivity are low and not much surplus is saved for investment. As labour productivity rises, some labour is freed up for employment in manufacturing sector which has higher labour productivity and, therefore, higher wages. The resultant higher incomes lead to increased savings and, hence, investment. This further spurs up economic growth, thus generating a virtuous cycle, with the accompanying rise in labour productivity facilitating movement of labour from manufacturing to services, which has still higher labour productivity. This view of economic growth and attendant changes is cast in a long-term framework and should be differentiated from annual or even quarterly growth figures which are widely reported in media and other outlets.

An empirical regularity that this literature seeks to explain is the fact that, over long periods of time, most of the developed countries of today went from being primarily agricultural economies to primarily manufacturing and, then, primarily services dominated economies in terms of the shares of these sectors in aggregate output and employment. Associated with these changes were movements in labour productivity across the three sectors, as discussed above. Indeed, it is argued, this change is essential for sustained economic growth and rising incomes.

Most current developed countries have followed this pattern of structural change. Even the Newly Industrialized Countries of Asia (including China) have experienced structural changes along these lines. All these countries raised their per capita incomes manyfold during short periods of time and are now in or close to being post-industrial societies.

However, there are two schools of thoughts in the literature on the links between economic growth and structural composition of output and/or employment. We have discussed above the view that structural change accompanies long-term economic growth. However, the neoclassical school of economic growth would argue that the structure of output hardly matters for economic growth.

There is widespread consensus now that these two schools of thought are not mutually contradictory. In this context Echeveria (1997) builds a dynamic general equilibrium model to show that growth affects sectoral composition of output and vice versa. Thus, there is a mutual cause and effect relation between economic growth and composition of aggregate output.

The empirical evidence on structural transformation of an economy during the process of economic development is quite convincing. Historical data on most of the developed countries of today show that they went from being primarily agricultural economies to primarily manufacturing and, then, primarily services. At early stages of development when a country is heavily specialized in agriculture, labour productivity is low and the economy is largely stagnant. With increasing labour productivity there is economic growth and higher wages. However, the prospects for rapid productivity growth in agriculture are limited so that labour migrates to the manufacturing sector where there is greater scope for higher productivity and economic growth. This enhanced productivity and wages, in due course of time, lead to a shift of labour to services where there is greater scope for productivity growth. Thus, rising GDP per capita is associated with a decreasing share of agriculture, and increasing share of value added, first in manufacturing, and then services. Similar trend applies to sectoral shares of employment to total employment for these three sectors. Empirical evidence in support of this transition has been well explored in a number of contributions starting with the pioneering work of Simon Kuznets. Other notable contributors to this literature include Hollis Chenery (1960), Arthur Lewis, Syrquin and Baumol. For a review of this literature and the evidence see Kuznets (1966, 1973).

In more recent times Timmer et al. (2012) take the work of Echeveria (1997) as a point of departure and underscore the fact that structural transformation is both the cause and effect of economic growth. They define structural transformation as a process by which (a) the shares of agriculture in GDP and employment fall over time, (b) there is increased migration as people move from rural to urban areas, (c) an agriculture and rural sector based economy is replaced by an industrial and urban sector based economy, and (d) a demographic transformation whereby high birth and death rates are replaced by low birth and death rates. Any existing dualism between the agricultural and the non-agricultural sectors gradually disappears over time.

This view of structural transformation argues that economic growth is a process that changes the composition of output as well as the pattern and distribution of employment across different sectors of the economy. Traditional agriculture is thought of as the base for less developed countries (LDCs). In such societies land and labour productivity are low and not much surplus is saved for investment. With the improvement of labour productivity, however, some labour is freed up for employment in the manufacturing sector which has higher labour productivity and, hence, higher wages. Higher incomes lead to increased savings and, hence, investment. This then further spurs up economic growth and the accompanying rise in labour productivity facilitates movement of labour from manufacturing to services.

A key characteristic of this narrative is that economic growth is viewed as a long-term phenomenon which engineers structural change in the economy and is, in turn, affected by these changes. This is to be differentiated from annual or even quarterly growth figures which are widely reported in media and other outlets. Figure 1 provides a visual representation of the structural transformation described by the above arguments.

The x-axis in Figure 1 measures time and GDP per capita in the long run. The y-axis indicates sectoral shares in output/employment.   Over time as GDP per capita rises the share of agriculture declines and those of services and manufactures rise. After reaching a threshold level of GDP per capita, the share of manufactures starts to plateau out (indicating industrial stagnation) and could even decline (indicating de-industrialization). The share of the services sector, however, continues to rise.

Many developed countries have followed this pattern of structural change. Even the Newly Industrialized Countries of Asia (including China) have experienced structural changes along these lines. All these countries raised their per capita incomes manyfold during short periods of time and are now in or close to being post-industrial societies.

However, this pattern of sectoral transformation has not been followed in a number of LDCs. Particularly in South Asia, the relative decline of the share of agriculture in GDP has been accompanied by a huge rise in the share of the services sector whereas the manufacturing sector has more or less stagnated. It would be desirable to alter the sectoral share pattern towards greater share of manufacturing, given unrealised higher productivity in manufacturing and the prospects of higher employment growth in the manufacturing sector compared to both agriculture and services, not to mention the fact that the current state of the South Asian economies represents arrested or incomplete industrialization.

The role of what may be called fundamentals of the economy (such as GDP, population, land etc.) and policy measures (such as trade openness) in facilitating this structural transformation can be best understood in a formal model of the determinants of the shares of the value added of various sectors in total value added. Taking a cue from Dabla-Norris et al.

(2013) the present paper examines the determinants of the sectoral share of value added in four countries of South Asia (Bangladesh, India, Sri Lanka and Pakistan). The sectors considered are agriculture, manufacturing and services. The determinants of structural transformation are analysed based on sectoral value added to total GDP only. We introduce a number of additional policy variables on the right hand side of the regression equations in order to better understand possible policy levers that affect transitions in sectoral shares in the continent as well as country dummies.

The plan of this paper is as follows. Section II discusses recent history of the manufacturing sector using South Asia data. South Asia is considered to be synonymous with undivided India for the period before 1947. Section III presents the methodology and results and section IV concludes.

II. A brief history of Manufacturing in South Asia/Undivided India

By all accounts India was a major manufacturing country prior to the arrival of the East India Company (Jha, 2018, vol. I, chapter 5). However, the country experienced an extended phase of deindustrialization after the onset of British rule.

Table 1 presents select data on India's share in world manufacturing output from just before the onset of EIC rule in India to just before the beginning of the Second World War. In 1750 India had almost a quarter share of world manufacturing despite the breakdown of central authority. China's share was close to a third. The developed core of Western countries had 27 per cent of world manufacturing whereas the rest of the periphery had 15.7 per cent.

With the onset of colonialism India's share of world manufacturing collapsed steadily to reach 1.4 per cent in1913 just before the First World War. The needs of war production raised its share to 2.4 per cent in 1938. Shares of other countries/groups also changed substantially over this period. China's share started to fall precipitously from 1800 to reach 3.1 per cent in 1938. The rest of the periphery consisting largely of countries that were colonised by one European power or another saw their shares drop sharply too whereas the share of the developed core rose steadily from 27 per cent in 1750 to 92.8 per cent in 1938. This was wholesale decimation of non-Western manufacturing.

The data are graphed in Figure 2 to assist in visualization of the information in Table 1. The transformation in the global manufacturing landscape from the mid-18th century to the beginning of the Second World War was truly spectacular.

Starting in 1750 there was a major break in the time series presented in Table 1 and graphed in Figure 2. The shares of India, China, and the Rest of the Periphery fell sharply whereas that of the developed core of nations rose even more sharply since all the increase in their share was coming at the expense of the shares of the other three groups. Mazumdar (2012) notes that by 1757 India was not only a dominant manufacturing nation but also had a flourishing and sophisticated system of markets and credits along with a thriving commercial class and service providers and rich and discerning patrons of the products of Indian industry. In other words had the Industrial Revolution come to India in 1757 or thereabouts the country would rapidly have grown into a major industrial power. However, under British rule, India was destined not for industrialization, but deindustrialization (Jha, 2018, vol. I, chapter 5).

For more recent times Appendix Table 1 provides descriptive statistics for the variables used in the analysis. The data are from World Development Indicators of the World Bank.

Notation for the variables used in the analysis is as follows: cid =country code (1 for Bangladesh, 2 for India, 3 for Sri Lanka and 4 for Pakistan); Time (year); $agriculture$ = share of agriculture in total value added; $manufacturing$=share of manufacturing in total value added; $service$=share of services in total value added; $Log(Land\ per\ capita)$ = log of land area per capita in square kilometers; $Arable$ = arable land as percentage of total land; $Age\ dependency$ = age dependency ratio, overall; $Log(GDP\ per\ capita)$= log of GDP per capita (GDP is measured in constant 2005 USD); $Log(Power)$ = log of electricity consumption per capita in Kwh; FDI=FDI inflows as percentage of GDP; $Trade$ = trade as percentage of GDP; $Capital$ = gross capital formation as percentage of GDP; and decadal dummies.

These variables are grouped into three different categories: (a) Fundamentals ($Log(Land\ per\ capita)$, $Arable, Age\ dependency,\ and\ Log(GDP\ per\ capita)$); (b) Policy variables ($Log(Power)$, $Trade,\ FDI\ and\ Capital$); and (c) Decadal dummies (D70, D80, D90, D00, D10). We use data from 1974 to 2014, which yields 41 data points giving a potential total of $164\ (41 * 4)$ observations for each variable.

Panel variation in the variables is described in Appendix Table 2 where "overall", "between" and "within" variations for each variable are depicted. In this Table *N* refers to the total number of observations across countries and across time, *n* refers to the number of countries for which observations are available and T refers to time period for which the data are available. Clearly, N = n*T. For those variables for which data is not available for all time periods and/or all counties N=n*T-bar where T-bar again refers to the time period for which data are available. Table 1 summarizes the data gaps in the variables. Thus, for the variable *Power* a total of 156 data points are available for the four countries.

Figure 3 provides scatter plots of sectoral value added (in percent in y-axis) against log of GDP per capita (x-axis) for South Asia and each of the four countries for all years.

For South Asia and each of the constituent countries the share of agriculture value added to total GDP falls steadily with the growth of GDP per capita. The share of manufacturing rises and then reaches a plateau of about 20 per cent in the case of South Asia. A similar pattern is observed for Bangladesh but not for Pakistan and Sri Lanka. For India the shares fluctuate quite a bit, and resemble a double hump. The share of services rises with per capita GDP growth in South Asia as a whole and in each constituent country.

Thus, evidence for a Kuznets-type structural transformation, even in the raw data, in South Asia is weak. This pattern is being followed for the agricultural and services sectors but not for manufacturing. The latter is particularly true for Pakistan and Sri Lanka. The South Asian regional transformation patterns for agriculture and services sectors are same as those in developing Asia and advanced economies groups (see Dabla-Norris et al. 2013 for more) during the same period. However, manufacturing share for advanced economies appear with a gradual declining trend while that of developing Asia is in rising trend, similar to South Asia. An important issue to address here is whether the patterns observed in Figure 3 persist when control variables in the form of country fundamentals, policy variables and time (decade) dummies are introduced. We now investigate this.

III. Methodology and results

The issue of structural transformation is analyzed based on the transformations in three sectors such as agriculture, manufacturing and service. These relations can be described as,

$$Y_{i,t} = \beta_1 GDP_{it} + \beta_2 fundamentals_{it} + \beta_3 policy_{it} + \beta_4 decades_{it} + \beta_{2\times4} GDP_{it} \times decades_{it} + \epsilon_{it} \quad (1)$$

where *i=1,…N* is the number of panels and *t=1….T* is the number of observation for each panel *i*. The right hand side variable $Y_{i,t}$ can be replaced with agriculture share to total value added, manufacturing sector share to total value added and service sector share to total value added to denote three different equations. The data set consists of 4 countries' (N) data for 41 years (T). Since the time dimension (T) of the data is much larger than the number of countries (N<T), dynamic panel data models may not be efficient. Given the pattern of the data, we apply feasible Generalised Least Square (feasible GLS) technique (see Greene, 2012 for detail GLS technique) for panel data. This allows to estimate the model in presence of AR(1) autocorrelation within panels and heteroskedasticity across panels. An important aspect of the GLS estimation, which is also the common point of criticism of the method, is the assumption made about structures of autocorrelation and heteroskedasticity to the model. Depending on the assumptions, magnitudes of the estimated parameters may vary. Therefore, tests for heteroskedasticity and serial correlation are done before estimation, which serve as the basis for model assumptions.

Panel data heteroskedasticity test (LR test) and autocorrelation test have been done and the results are reported in Table 2. For all three sectors we reject the null hypothesis of homoscedasticity and no autocorrelation. As indicated in Table 2 we detect the presence of heteroskedasticity and first order serial correlation in the data. Based on these tests and our perception of the region, the GLS model structure assumed has heteroskedastic error structure with no cross-sectional correlation; and there are AR(1) autocorrelation and that the coefficient of the AR(1) process is specific to each panel. However, Jha and Afrin (2017) in their work on structural transformation in Africa find that panel fixed effects estimation is adequate.

The panel data GLS estimation results are presented in Table 3 for agriculture; Table 4 for manufacturing and Table 5 for services. We also present the fixed effect estimates for the three sectors in the Appendix for the sake of comparison. Five different versions of the model are estimated. We begin with the most parsimonious version of the model (with only log GDP) and then keep adding further variables. Model 2 introduces decadal dummies - dummies for the four decades covered in the sample; Model 3 controls for country fundamentals: *Land per capita*, *Arable land*, *Age dependency ratio* and policy variables: *Trade*, *Capital*, *Power*, *FDI,* and retains the decadal dummies; Model 4 augments 1 to include decadal dummies and interaction of dummies with *GDP*; and Model 5 includes all variables.

The fixed effect estimates for the three sectoral shares are reported in the Appendix Table 3, Appendix Table 4 and Appendix Table 5. Before discussing the GLS estimation results in detail, we present a brief comparison of GLS results with panel fixed effect estimates. The fixed effect results move mostly in the same direction as the GLS estimates, with only a few exceptions. As expected, the magnitudes of the estimated parameters are different and numbers of significant estimates are fewer in fixed effect estimates than the corresponding GLS estimates. For agriculture sector in Appendix Table 3, except Model 3 the coefficients of *GDP per capita* move in the same direction in affecting the share of agriculture sector as in the GLS estimation. Compared to GLS, the coefficients of *Land per capita* have opposite sign and are insignificant. It is interesting to note that coefficients of *FDI* become positive and significant in fixed effect model contrary to GLS models.

For manufacturing sector in Appendix Table 4, the coefficients of *GDP per capita* appear with same sign as in GLS estimates but are mostly insignificant. Similar to the agriculture sector, the coefficients of *Land per capita* have opposite sign than the corresponding GLS estimates and they are significantly positive. Consistent with GLS estimation, the *Power* consumption has positive and significant impacts on manufacturing share.

The share of service sector moves in the same direction as in GLS results with *GDP per capita* except for Model 3 in Appendix Table 5. The coefficients of *Land per capita* appear positive in contrast to corresponding GLS results but are insignificant. Interestingly, *Age dependency ratio* and *Trade* has negative and significant effects on service sector share, different from the insignificant effects in GLS models. Overall the fixed effect estimates do not alter the main insights of the GLS estimates, which are considered as the baseline results.

However, in view of the heteroscedasticity and serial correlation results reported in Table 2, the GLS results have greater credibility than the fixed effects estimation. Hence, this paper concentrates on the GLS results.

In Table 3 all five models are supported by the Wald test. The coefficient of *Log GDP* in the regression of share of agriculture in total value added is negative and significant for all models. The coefficient of *Log Land per capita* is positive and significant in Models 3 and 5 whereas the coefficient of *Arable land* is significant only in Model 3. The pattern of population, captured by *Age dependency ratio,* and *Trade* are insignificant throughout. Although age dependency ratio of the region is pretty high, the study does not find any significant impacts of this population characteristic on agriculture share.

The coefficients of *Capital* formation and *Power* or electricity usage are negative and significant as expected wherever they appear; *FDI* has negative and insignificant coefficient in both Models 3 and 5. Some decadal dummies are significant (D70 for Model 4, where the coefficient is positive, and D80 and D90 for Model 5, where the respective coefficients are negative). Among the interaction terms of decadal dummies with GDP per capita, only the coefficient of D70 interacted with GDP per capita is significant in Model 4. After controlling for country fundamentals and policy variables, the interaction coefficients of both D80 and D90 become significant in Model 5, however, the interaction of D70 turns insignificant.

It is interesting to note that the signs of these significant coefficients alternate between D70 and the other decades for the level dummy and the dummy's interaction with GDP per capita. D70 increased the share of agriculture but in interaction with GDP per capita it lowered agriculture's share. On the other hand, D90 reduced the share of agriculture and but, when it was interacted with GDP per capita, it increased this share.

Table 4 shows results for the share of manufacturing sector. In the case of manufacturing, Model 2 is not supported by the Wald test, hence the results for this model are not relevant. *GDP* has positive and significant coefficients in Models 1 and 4. However, when controlling for country fundamentals and policy variables this coefficient becomes negative in Model 3. In Model 5, where we include interaction term of *GDP* with dummies, it becomes positive but insignificant. We argue that this finding is not inconsistent with the empirical observation of the region's arrested growth of manufacturing sector. *Arable land* has negative and significant coefficients in Models 3 and 5 whereas *Age dependency ratio* is significant (and positive) only in Model 5. *Trade* appears to have significant positive but smaller impacts on manufacturing share. Coefficient of *Power* is positive and significant in both Models 3 and 5 whereas gross *Capital* accumulation is significant (and positive) only in Model 3. The coefficient of *FDI* is negative and insignificant in both models 3 and 5.

Table 5 presents results for the services sector. The Wald test supports all five models. Coefficients of *GDP* are positive and strongly significant in all 5 models. The coefficients of *Land per capita* are negative and significant whereas the coefficients of *Arable land* are negative and insignificant in all models where they exist. In both models 3 and 5 *Age dependency ratio*, *Trade*, *FDI* and *Capital* have insignificant coefficients but *Power* has positive and significant coefficient. Among the dummies, only D70 is significant (in Model 4) and it is negative. The coefficient of D70 interacted with log GDP per capita however is positive and significant. This follows a pattern observed in all three tables where, if the coefficient of a dummy is significant, the coefficient of its interaction with log GDP per capita has the opposite sign and is significant. Interestingly, *FDI* received by South Asia appears to have little or no contribution in the structural transformation of the region in terms any of these sectoral shares.

IV. Conclusion

This paper models the evolution and determinants of the shares of agricultural, manufacturing and services sectors' to total value added for 4 South Asian countries for 41 years: 1974-2014. The quantitative analysis is done independently for each of the sectors and we find mixed evidence in support of the empirical regularities of the patterns of structural transformation for the South Asia region. Both panel fixed effects and GLS estimation are carried out. However, statistical tests indicate that the GLS results are more credible.

With increases in per capita income, the paper finds that the contribution of agriculture sector as a percent of total output decreases across all model specifications. Again, with the increase of per capita income, the percent share of service sector output to total output increases across all model specifications. These two findings offer some supports of basic structural transformation in the region in favor of economic growth. However, the findings for manufacturing sector suggest that it has not followed the pattern of transformation observed in high income countries in their processes of economic growth.

The relationships of the shares with GDP per capita are fragile and, sometimes, counter-intuitive for the manufacturing sector. It seems that South Asia has undergone a period of arrested industrial development. Therefore, we do not find strong support for Kuznet's structural transformation in case of these four countries of South Asia. There is urgent need for policy intervention if this condition is to be redressed. Consequently, the determinants that have significant influence on the variation of manufacturing sector share deserve especial attention in terms of policy making. In this paper we find that enhanced availability of electrical power and higher capital investment are central to the enhancement of the share of the manufacturing sector in total output.

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Figure 1: Sectoral Share of Output and GDP growth

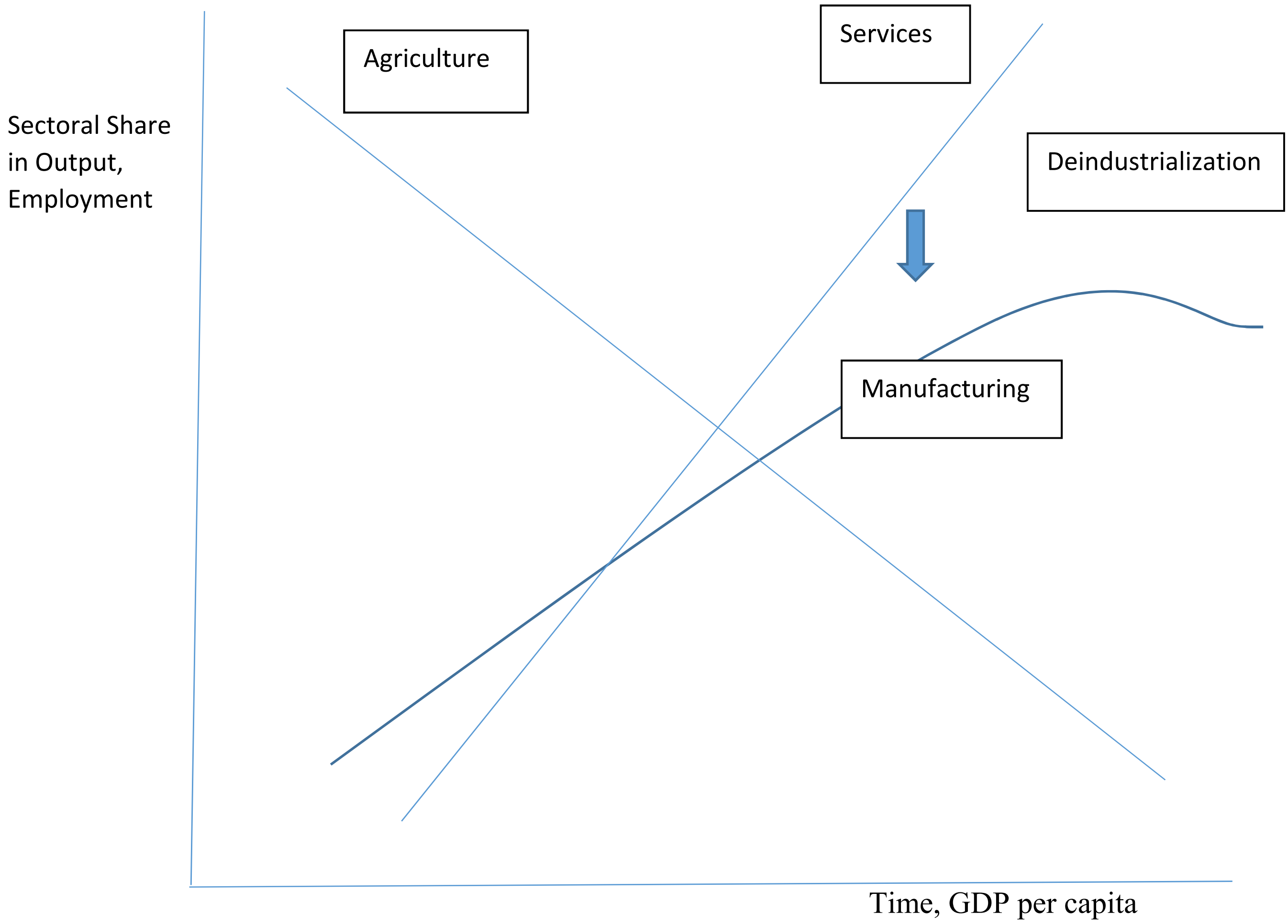
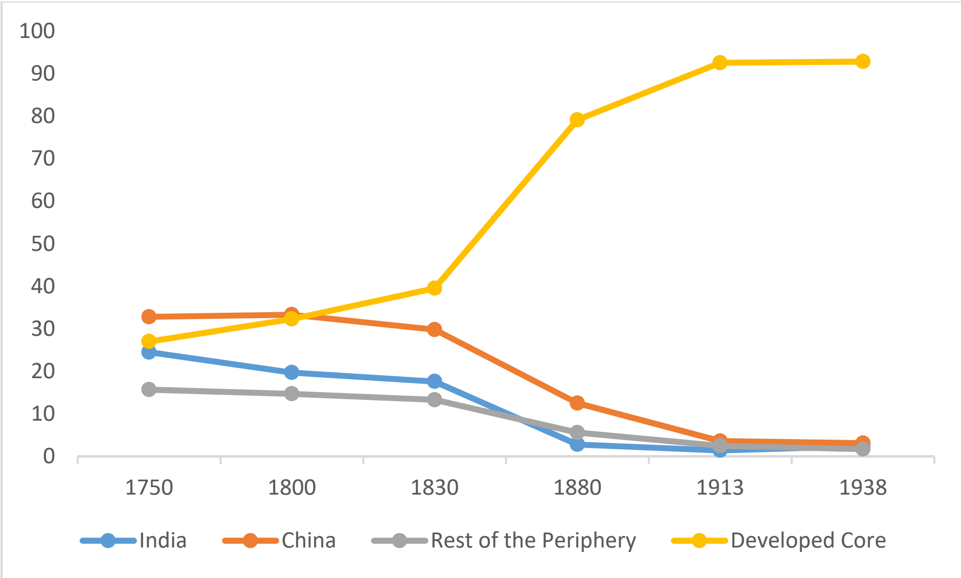
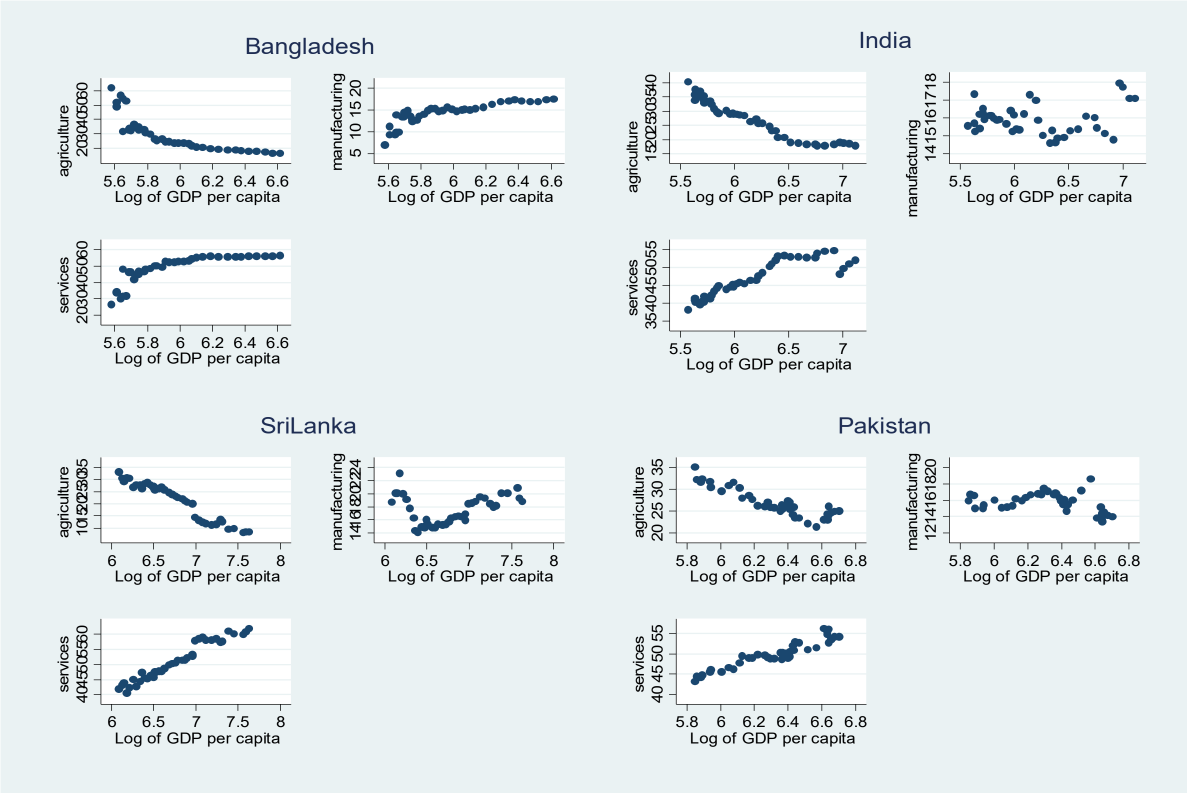


Figure 2: World Manufacturing Output 1750-1938 (in percent)



Source: Same as in Table 1.

Figure 3: Links between sectoral shares of output and GDP per capita: South Asia regional and individual countries.



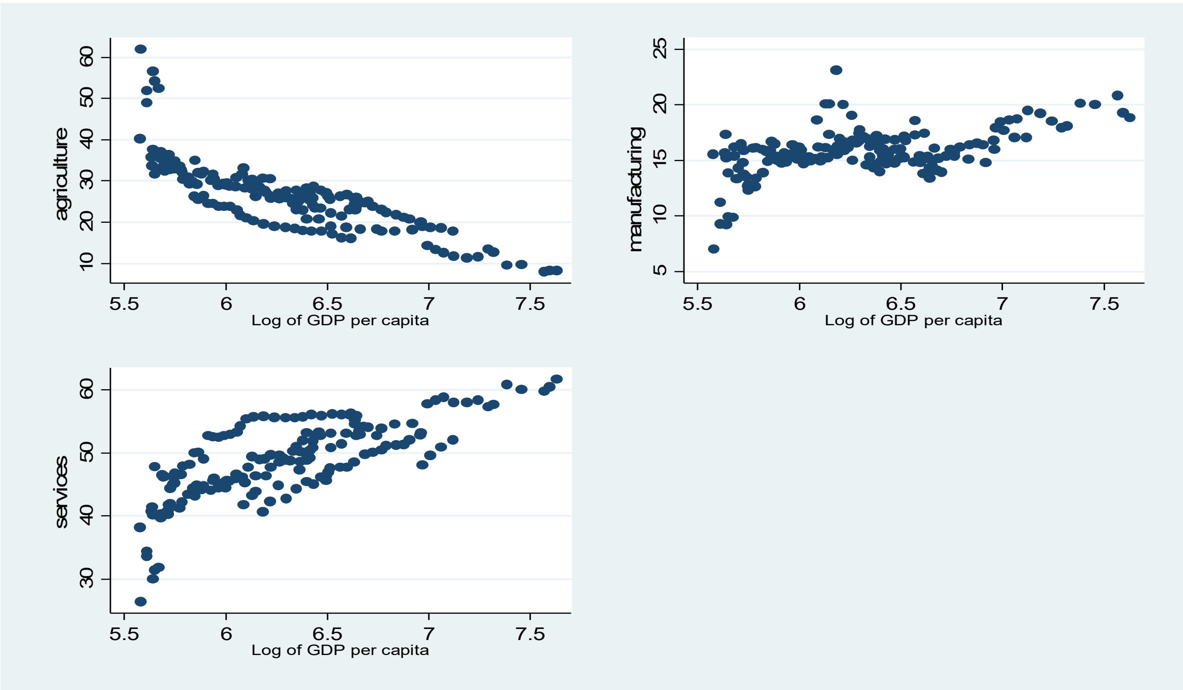


Table 1: World Manufacturing Output 1750-1938 (in per cent)

Year	India	China	Rest of the Periphery	Developed Core
1750	24.5	32.8	15.7	27.0
1800	19.7	33.3	14.7	32.3
1830	17.6	29.8	13.3	39.5
1880	2.8	12.5	5.6	79.1
1913	1.4	3.6	2.5	92.5
1938	2.4	3.1	1.7	92.8

Source: Clingingsmith and Williamson (2005) quoting Simmons (1985), Table 1, p. 600. N.B. India refers to the current Indian sub-continent.

Table 2 Tests for Heteroskedasticity and Serial correlation of order 1.

Test	Results
LR test for heteroscedasticity, chi2(3)	143.82 (0.00)
Wooldridge test for autocorrelation (in panel data), F(1, 3)	19.521 (0.0215)

Note: p- values are for vce(robust) option.

Table 3: Determinants of the share of agriculture in total value added in South Asia.

Panel GLS regression:	Agriculture share in total value added				
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	-13.235 (0.00)	-11.539 (0.00)	-2.053 (0.457)	-13.768 (0.00)	-7.904 (0.009)
Log (Land per capita)			5.195 (0.009)		4.046 (0.054)
Arable land			0.201 (0.009)		0.123 (0.136)
Age dependency ratio			-.0835 (0.386)		0.0079 (0.937)
Trade			.014 (0.751)		.036 (0.369)
Capital formation			-.201 (0.01)		-0.236 (0.005)
Log (Power)			-4.782 (0.001)		-4.495 (0.004)
FDI			-.212 (0.533)		-0.105 (0.756)
D70		3.676 (0.021)	2.779 (0.141)	47.350 (0.043)	45.21 (0.145)
D80		1.96 (0.157)	1.724 (0.278)	-19.668 (0.308)	-50.00 (0.047)
D90		1.077 (0.346)	1.573 (0.213)	-22.502 (0.204)	-45.42 (0.033)
D00		-0.495 (0.829)	-.072 (0.935)	-15.457 (0.282)	-26.875 (0.114)

D10					
Log (GDP per capita) *D70				-7.493 (0.044)	-7.82 (0.112)
Log (GDP per capita) *D80				3.395 (0.246)	7.857 (0.041)
Log (GDP per capita) *D90				3.669 (0.161)	7.02 (0.027)
Log (GDP per capita) *D00				2.274 (0.272)	3.931 (0.111)
Constant	110.607 (00)	97.70 (0.00)	94.59 (00)	112.83 (0.00)	121.89 (0.00)
Wald chi^2 test	129.26 (0.00)	270.56 (0.00)	234.59 (00)	341.98 (0.00)	399.87 (0.00)

Note: p-value of the respective coefficient in parenthesis.

Table 4: Determinants of the share of manufacturing in total value added in South Asia.

Panel GLS regression:		Manufacturing share in total value added			
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	1.688 (0.012)	1.787 (0.032)	-4.576 (0.00)	4.219 (0.00)	0.518 (0.702)
Log (Land per capita)			-0.941 (0.20)		-2.256 (0.002)
Arable land			-0.077 (0.037)		-0.105 (0.001)
Age dependency ratio			0.0236 (0.497)		0.0702 (0.042)
Trade			0.0568 (0.015)		.039 (0.055)
Capital formation			0.0729 (0.075)		.0468 (0.247)
Log (Power)			1.963 (0.001)		2.911 (0.00)
FDI			-0.153 (0.405)		-.318 (0.107)
D70		0.509 (0.561)	-0.179 (0.852)	-25.50 (0.022)	2.324 (0.871)
D80		0.561 (0.457)	0.0383 (0.962)	28.35 (0.001)	52.055 (0.00)
D90		0.341 (0.584)	-0.208 (0.743)	24.70 (0.002)	40.776 (0.00)
D00		0.0678 (0.882)	-0.361 (0.426)	9.384 (0.193)	17.997 (0.049)
D10					
Log (GDP per capita) *D70				4.973 (0.005)	.468 (0.838)
Log (GDP per capita) *D80				-4.293 (0.001)	-8.094 (0.00)
Log (GDP per capita) *D90				-3.711 (0.002)	-6.26 (0.00)
Log (GDP per capita) *D00				-1.33 (0.205)	-2.656 (0.05)
Constant	5.065 (0.231)	4.159 (0.455)	27.11 (0.002)	-12.204 (0.053)	-20.40 (0.091)
Wald chi2 test	6.33 (0.011)	5.77 (0.329)	68.34 (0.00)	79.97 (0.00)	213.61 (0.00)

Note: p-value of the respective coefficient in parenthesis.

Table 5: Determinants of share of service in total value added in South Asia.

Panel GLS regression:		Service share in total value added			
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	10.225 (0.00)	7.263 (0.00)	5.968 (0.012)	7.341 (0.00)	7.746 (0.005)
Log (Land per capita)			-4.180 (0.022)		-3.906 (0.048)
Arable land			-0.109 (0.104)		-.0832 (0.277)
Age dependency ratio			0.105 (0.241)		.0899 (0.338)
Trade			-0.0535 (0.158)		-.0537 (0.157)
Capital formation			-0.00254 (0.973)		.0648 (0.411)
Log (Power)			2.677 (0.047)		2.721 (0.061)
FDI			0.373 (0.276)		.352 (0.281)
D70		-5.848 (0.00)	-3.570 (0.062)	-57.805 (0.008)	-41.10 (0.149)
D80		-4.3112 (0.00)	-2.48 (0.123)	9.324 (0.597)	28.52 (0.213)
D90		-2.940 (0.003)	-1.840 (0.139)	9.531 (0.560)	17.72 (0.366)
D00		-0.334 (0.666)	0.199 (0.821)	13.391 (0.33)	16.343 (0.298)
D10					
Log (GDP per capita) *D70				8.782 (0.012)	6.627 (0.142)
Log (GDP per capita) *D80				-2.108 (0.436)	-4.765 (0.172)
Log (GDP per capita) *D90				-1.867 (0.443)	-2.899 (0.319)
Log (GDP per capita) *D00				-2.047 (0.305)	-2.391 (0.294)
Constant	5.065 (0.231)	4.988 (0.485)	-26.56 (0.229)	4.733 (0.702)	-38.644 (0.157)
Wald chi2 test	76.52 (0.000)	243.95 (0.00)	212.90 (0.00)	211.13 (0.00)	248.90 (0.00)

Note: p-value of the respective coefficient in parenthesis.

Appendix

Appendix Table 1: Summary Statistics of Variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Agriculture share	164	26.16	8.55	7.99	61.95
Manufacturing share	164	15.77	2.11	7.04	23.13
Service share	164	48.95	6.16	26.43	61.66
Log (GDP per capita)	164	6.31	0.48	5.58	7.63
Log (Land per capita)	164	-5.78	0.67	-7.11	-4.43
Arable land	160	43.87	19.21	13.30	73.39
Age dependency ratio	164	70.89	13.39	48.02	93.29
Trade	160	38.47	20.68	10.66	88.64
Capital formation	160	21.83	5.89	6.15	38.16
Log (Power)	156	5.16	0.89	2.83	6.61
FDI	163	0.71	0.74	-0.05	3.67

Appendix Table 2: Basic panel specific statistics for the four countries

Bangladesh

Variable		Mean	Std. Dev.	Min	Max	Observations
country id	overall	1.00	0.00	1.00	1.00	N = 41
	between		.	1.00	1.00	n = 1
	within		0.00	1.00	1.00	T = 41
Time	overall	1994	11.98	1974	2014	N = 41
	between		.	1994	1994	n = 1
	within		11.98	1974	2014	T = 41
Agriculture	overall	29.72	12.06	16.11	61.95	N = 41
	between		.	29.72	29.72	n = 1
	within		12.06	16.11	61.95	T = 41
Manufacturin g	overall	14.14	2.44	7.04	17.43	N = 41
	between		.	14.14	14.14	n = 1
	within		2.44	7.04	17.43	T = 41
Service	overall	48.19	8.24	26.43	56.28	N = 41
	between		.	48.19	48.19	n = 1
	within		8.24	26.43	56.28	T = 41
Log(GDP pc)	overall	5.95	0.30	5.58	6.62	N = 41
	between		.	5.95	5.95	n = 1
	within		0.30	5.58	6.62	T = 41
Log(Land pc)	overall	-6.76	0.26	-7.11	-6.29	N = 41
	between		.	-6.76	-6.76	n = 1
	within		0.26	-7.11	-6.29	T = 41
Arable land	overall	66.21	4.63	58.92	73.39	N = 40
	between		.	66.21	66.21	n = 1
	within		4.63	58.92	73.39	T = 40
Age depend	overall	76.50	13.33	53.69	93.29	N = 41
	between		.	76.50	76.50	n = 1
	within		13.33	53.69	93.29	T = 41
Trade	overall	26.90	9.93	11.00	48.11	N = 41
	between		.	26.90	26.90	n = 1
	within		9.93	11.00	48.11	T = 41
Capital	overall	19.61	6.06	6.15	28.58	N = 41
	between		.	19.61	19.61	n = 1
	within		6.06	6.15	28.58	T = 41
Log(Power)	overall	4.14	0.89	2.83	5.63	N = 39
	between		.	4.14	4.14	n = 1
	within		0.89	2.83	5.63	T = 39
FDI	overall	0.35	0.47	-0.05	1.45	N = 41
	between		.	0.35	0.35	n = 1
	within		0.47	-0.05	1.45	T = 41

India

Variable		Mean	Std. Dev.	Min	Max	Observations
country id	overall	2	0	2	2	N = 41
	between		.	2	2	n = 1
	within		0	2	2	T = 41
Time	overall	1994	11.98	1974	2014	N = 41
	between		.	1994	1994	n = 1
	within		11.98	1974	2014	T = 41
Agriculture	overall	26.83	6.72	17.74	40.31	N = 41
	between		.	26.83	26.83	n = 1
	within		6.72	17.74	40.31	T = 41
Manufacturing	overall	15.89	0.83	14.60	17.92	N = 41
	between		.	15.89	15.89	n = 1
	within		0.83	14.60	17.92	T = 41
Service	overall	46.79	4.98	38.22	54.64	N = 41
	between		.	46.79	46.79	n = 1
	within		4.98	38.22	54.64	T = 41
Log(GDP pc)	overall	6.20	0.46	5.58	7.12	N = 41
	between		.	6.20	6.20	n = 1
	within		0.46	5.58	7.12	T = 41
Log(Land pc)	overall	-5.74	0.23	-6.08	-5.32	N = 41
	between		.	-5.74	-5.74	n = 1
	within		0.23	-6.08	-5.32	T = 41
Arable land	overall	54.22	0.74	52.65	55.03	N = 40
	between		.	54.22	54.22	n = 1
	within		0.74	52.65	55.03	T = 40
Age depend	overall	67.55	7.66	53.14	77.82	N = 41
	between		.	67.55	67.55	n = 1
	within		7.66	53.14	77.82	T = 41
Trade	overall	25.65	14.75	10.66	55.55	N = 41
	between		.	25.65	25.65	n = 1
	within		14.75	10.66	55.55	T = 41
Capital	overall	25.92	6.22	18.04	38.16	N = 41
	between		.	25.92	25.92	n = 1
	within		6.22	18.04	38.16	T = 41
Log(Power)	overall	5.66	0.56	4.65	6.61	N = 39
	between		.	5.66	5.66	n = 1
	within		0.56	4.65	6.61	T = 39
FDI	overall	0.70	0.86	-0.03	3.55	N = 40
	between		.	0.70	0.70	n = 1
	within		0.86	-0.03	3.55	T = 40

Sri Lanka

Variable		Mean	Std. Dev.	Min	Max	Observations	
country id	overall	3	0	3	3	N =	41
	between		.	3	3	n =	1
	within		0	3	3	T =	41
Time	overall	1994	11.98	1974	2014	N =	41
	between		.	1994	1994	n =	1
	within		11.98	1974	2014	T =	41
Agriculture	overall	21.31	7.67	7.99	33.16	N =	41
	between		.	21.31	21.31	n =	1
	within		7.67	7.99	33.16	T =	41
Manufacturing	overall	17.38	2.18	14.01	23.13	N =	41
	between		.	17.38	17.38	n =	1
	within		2.18	14.01	23.13	T =	41
Service	overall	50.90	6.33	40.64	61.66	N =	41
	between		.	50.90	50.90	n =	1
	within		6.33	40.64	61.66	T =	41
Log(GDP pc)	overall	6.77	0.44	6.09	7.63	N =	41
	between		.	6.77	6.77	n =	1
	within		0.44	6.09	7.63	T =	41
Log(Land pc)	overall	-5.63	0.14	-5.81	-5.36	N =	41
	between		.	-5.63	-5.63	n =	1
	within		0.14	-5.81	-5.36	T =	41
Arable land	overall	15.28	2.02	13.30	20.73	N =	40
	between		.	15.28	15.28	n =	1
	within		2.02	13.30	20.73	T =	40
Age depend	overall	57.40	8.35	48.02	72.81	N =	41
	between		.	57.40	57.40	n =	1
	within		8.35	48.02	72.81	T =	41
Trade	overall	70.73	9.71	46.36	88.64	N =	37
	between		.	70.73	70.73	n =	1
	within		9.71	46.36	88.64	T =	37
Capital	overall	24.26	4.12	14.45	33.77	N =	37
	between		.	24.26	24.26	n =	1
	within		4.12	14.45	33.77	T =	37
Log(Power)	overall	5.25	0.61	4.22	6.27	N =	39
	between		.	5.25	5.25	n =	1
	within		0.61	4.22	6.27	T =	39
FDI	overall	0.98	0.60	-0.03	2.85	N =	41
	between		.	0.98	0.98	n =	1
	within		0.60	-0.03	2.85	T =	41

Pakistan

Variable	Mean	Std. Dev.	Min	Max	Observations

country id	overall	4	0	4	4	N =	41
	between		.	4	4	n =	1
	within		0	4	4	T =	41
Time	overall	1994	11.98	1974	2014	N =	41
	between		.	1994	1994	n =	1
	within		11.98	1974	2014	T =	41
Agriculture	overall	26.78	3.19	21.47	34.91	N =	41
	between		.	26.78	26.78	n =	1
	within		3.19	21.47	34.91	T =	41
Manufacturing	overall	15.69	1.15	13.39	18.56	N =	41
	between		.	15.69	15.69	n =	1
	within		1.15	13.39	18.56	T =	41
Service	overall	49.93	3.40	43.16	56.04	N =	41
	between		.	49.93	49.93	n =	1
	within		3.40	43.16	56.04	T =	41
Log(GDP pc)	overall	6.32	0.26	5.85	6.70	N =	41
	between		.	6.32	6.32	n =	1
	within		0.26	5.85	6.70	T =	41
Log(Land pc)	overall	-5.01	0.32	-5.48	-4.43	N =	41
	between		.	-5.01	-5.01	n =	1
	within		0.32	-5.48	-4.43	T =	41
Arable land	overall	39.78	1.01	38.13	42.99	N =	40
	between		.	39.78	39.78	n =	1
	within		1.01	38.13	42.99	T =	40
Age depend	overall	82.11	8.11	65.78	88.91	N =	41
	between		.	82.11	82.11	n =	1
	within		8.11	65.78	88.91	T =	41
Trade	overall	33.74	2.76	27.72	38.91	N =	41
	between		.	33.74	33.74	n =	1
	within		2.76	27.72	38.91	T =	41
Capital	overall	17.78	1.69	13.37	20.82	N =	41
	between		.	17.78	17.78	n =	1
	within		1.69	13.37	20.82	T =	41
Log(Power)	overall	5.60	0.50	4.68	6.19	N =	39
	between		.	5.60	5.60	n =	1
	within		0.50	4.68	6.19	T =	39
FDI	overall	0.82	0.83	0.05	3.67	N =	41
	between		.	0.82	0.82	n =	1
	within		0.83	0.05	3.67	T =	41

Appendix Table 3: Panel fixed effect estimates of the determinants of agriculture sector share

Panel Fixed effect regression:			Agriculture share in total value added		
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	-17.516 (0.013)	-7.749 (0.399)	5.086 (0.099)	-12.256 (0.214)	-6.312 (0.303)
Log (Land per capita)			-4.383 (0.339)		-5.581 (0.311)
Arable land			-0.292 (0.076)		0.162 (0.471)
Age dependency ratio			0.145 (0.39)		0.216 (0.072)

Trade			.0549		0.085
			(0.344)		(0.142)
Capital formation			-0.575		-0.512
			(0.149)		(0.124)
Log (Power)			-9.063		-6.204
			(0.176)		(0.160)
FDI			1.038		0.844
			(0.086)		(0.118)
D70		12.536	4.044	141.19	58.17
		(0.461)	(0.529)	(0.341)	(0.268)
D80		6.006	1.740	-.083	-77.016
		(0.566)	(0.424)	(0.998)	(0.067)
D90		3.639	1.026	-30.80	-64.30
		(0.609)	(0.529)	(0.344)	(0.060)
D00		-0.450	-1.368	-18.67	-24.93
		(0.900)	(0.306)	(0.329)	(0.400)
D10					
Log (GDP per capita)				-22.897	-10.48
*D70				(0.342)	(0.210)
Log (GDP per capita)				0.334	11.928
*D80				(0.958)	(0.077)
Log (GDP per capita)				5.017	9.604
*D90				(0.257)	(0.061)
Log (GDP per capita)				2.536	3.258
*D00				(0.295)	(0.452)
Constant	136.70	70.989	27.42	102.227	54.40
	(00)	(0.298)	(0.492)	(0.152)	(0.089)

Note: p- values in parenthesis correspond to robust standard errors.

Appendix Table 4: Panel fixed effect estimates of the determinants of manufacturing sector share

Panel Fixed effect regression:	Manufacturing share in total value added				
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	1.41	0.373	-5.022	2.58	2.13
	(0.315)	(0.906)	(0.025)	(0.49)	(0.20)
Log (Land per capita)			3.18		2.48
			(0.092)		(0.19)
Arable land			0.076		-0.19
			(0.701)		(0.18)
Age dependency ratio			0.125		0.095
			(0.153)		(0.05)

Trade			.038		0.030
			(0.034)		(0.42)
Capital formation			0.015		-.0051
			(0.11)		(0.95)
Log (Power)			6.46		5.14
			(0.11)		(0.032)
FDI			-0.36		-0.34
			(0.28)		(0.013)
D70		-1.238	0.48	-54.47	-1.26
		(0.82)	(0.83)	(0.278)	(0.97)
D80		-1.41	-0.80	14.82	61.43
		(0.73)	(0.11)	(0.55)	(0.002)
D90		-1.10	-1.51	17.01	46.05
		(0.73)	(0.13)	(0.41)	(0.007)
D00		-0.695	-0.67	7.71	23.60
		(0.692)	(0.24)	(0.48)	(0.05)
D10					
Log (GDP per capita)				9.54	1.34
*D70				(0.25)	(0.78)
Log (GDP per capita)				-2.36	-9.43
*D80				(0.527)	(0.00)
Log (GDP per capita)				-2.65	-6.98
*D90				(0.37)	(0.01)
Log (GDP per capita)				-1.16	-3.45
*D00				(0.42)	(0.05)
Constant	6.874	14.38	19.01	-0.97	11.90
	(0.421)	(0.543)	(0.41)	(0.97)	(0.55)

p- values in parenthesis correspond to robust standard errors.

Appendix Table 5: Panel fixed effect estimates of the determinants of service sector share

Panel Fixed effect regression:			Service share in total value added		
	Model 1	Model 2	Model 3	Model 4	Model 5
Log (GDP per capita)	13.32	4.52	-1.17	7.02	4.45
	(0.01)	(0.41)	(0.67)	(0.24)	(0.44)
Log (Land per capita)			1.85		2.98
			(0.59)		(0.47)
Arable land			0.22		-0.031
			(0.09)		(0.83)
Age dependency ratio			-0.26		-0.30
			(0.074)		(0.01)
Trade			-0.074		-0.10
			(0.10)		(0.062)
Capital formation			0.30		0.27
			(0.26)		(0.27)

Log (Power)			3.54		1.87
			(0.37)		(0.50)
FDI			-0.40		-0.29
			(0.24)		(0.43)
D70		-10.71	-3.21	-66.43	-47.72
		(0.28)	(0.50)	(0.46)	(0.24)
D80		-5.73	-0.66	8.38	35.08
		(0.31)	(0.79)	(0.76)	(0.48)
D90		-3.39	0.29	18.63	25.75
		(0.32)	(0.88)	(0.27)	(0.54)
D00		0.64	1.96	11.20	8.08
		(0.70)	(0.27)	(0.37)	(0.81)
D10					
Log (GDP per capita)				10.01	8.07
*D70				(0.50)	(0.21)
Log (GDP per capita)				-1.97	-5.47
*D80				(0.64)	(0.48)
Log (GDP per capita)				-3.25	-3.71
*D90				(0.18)	(0.56)
Log (GDP per capita)				-1.48	-0.79
*D00				(0.40)	(0.88)
Constant	-35.11	24.03	54.35	6.74	47.33
	(0.092)	(0.52)	(0.05)	(0.85)	(0.05)

p- values in parenthesis correspond to robust standard errors.