Growth
Vol. 1, No. 1, 1-9, 2014
http://asianonlinejournals.com/index.php/Growth

Links between Structural Changes and Economic Growth in India

***M.R.Singariya*[1]**

[1]Lecturer in Economics Govt. College Jaitaran (Raj), India

Abstract

The structural changes of an economy that entail the dynamics of sector shares (industrial, agricultural and services) are related to each other and to economic growth as well. Using panel data collected from CSO for states and UTs of India for the period of 2004-05 to 2011-12 at the constant prices of 2004-05, the present paper highlights the effect of population change on economic growth in India. As statistical method we have used OLS and after panel diagnostics random effect was found unbiased. Further year dummies and state dummies have been used for an in-depth analysis.The growth pattern of different sectors of the economy shows an emergence of the service sector as the major contributor, decline in the share of agriculture sector and industry sector has seen a steep decline during this period. It indicates that some states were able to shift their labour force from low – productivity agriculture to higher productivity industry and service sectors, and to increase productivity within those sectors, despite the rapid growth of populations. Results of Random Effects Model suggest that states & UTs like Chandigarh, Delhi, Goa, Haryana, Maharashtra, A&N Islands and Pondicherry have statistically significant at the 5 % level positive association between a logarithm value of the population and logarithm value of per capita NSDP, while Assam, Bihar, Madhya Pradesh, Uttar Pradesh, Rajasthan, Orissa, Manipur, Chhattisgarh and Jharkhand have significant at the 5 % level negative association in this period. Thus the impact of population change is not automatic and homogenous throughout the Indian States during the study period. Whether India will be able to capitalize on its favorable age structure depends on how well the EAG states are able to reform their economies.

Keywords: Population change, Structural change, Economic growth, Agriculture, Industry, Service, random effects, States, India.

Contents

1. Introduction

The significance of economic structure and sectoral composition gained prominence through the seminal work of Lewis (1955). Kuznets, Rostov, Chenery and Syrquin claim that growth is brought by the changes in economy's sectoral composition. These researchers showed that economic structure matters in the development process. In the literature, the term "structural change" most commonly refers to long-term changes in the composition of an aggregate; this is attributable to changes in the relative significance of sectors in the economy, to changes in the location of economic activity (urbanization), and to other concomitant aspects of industrialization which, taken together, are referred to as structural transformation. Syrquin (2007) referring to Kuznets elaborates the concept:
"For Kuznets growth and structural change are strongly interrelated. Once we abandon the world of homothetic preferences, neutral productivity growth with no systematic sectoral effect, perfect mobility, and markets that adjust instantaneously, structural change emerges as a central feature of the process of development and an essential element in accounting for the rate of pattern of growth. It can retard growth if its pace is too slow or its direction inefficient, but it can contribute to growth if it improves the allocation of resources…"

There have been other attempts to study structural change and to establish some stylized facts, i.e., the patterns of development followed by most countries. The most well known study include Chenery and Syrquin (1975), who aimed to demonstrate the shifts in production (from the primary to the secondary to the tertiary sector), which occur as economies grow.

Timmer and Akkus (2008) argue that raising productivity in agricultural is an utmost need to sustain a rapid transition. The process involves a successful structural transformation where agriculture sector, through higher productivity, provides food, raw material, and even savings to the process of urbanization and industrialization. A dynamic agriculture through new innovations raises labour productivity in the rural economy, and pulls up wages. The process also leads to a decline in the relative importance of agriculture and its allied sector to the overall economy, as the industrial and service sectors grow even more rapidly, partly through stimulus from a modernizing agriculture sector and migration of rural workers to urban for an appropriate job.

Researchers have provided evidence that as GDP per capita in a nation rises, the share of agriculture sector in their GDP falls. One of the questions that will be addressed in this study is whether this holds true for Indian economy. In other words, is there a systematic relationship between agriculture, industry and service sector and the level of development? As Chenery and Syrquin (1975) pointed out, "a development pattern may be defined as a systematic variation in any significant aspect of the economic or social structure associated with a rising level of income or other index of development". This study analyzes the pattern of agricultural growth along the definition of Chenery and Syrquin by utilizing data for Indian economy from 2004-05 to 2011-12, a period that registered higher average growth rates in GDP of over seven percent. It is interesting to know what happened to the structural pattern of agriculture, industry and service sector during this period of high growth.

2. Objectives

The overall objective of this study is to establish simple stylized facts on relationships between population size, per capita income and the shares of agriculture, industry and service sector in GSDP. Our specific objective is to see what has happened in high income states in comparisons to low income states and especially in EAG states of India during 2004-05 to 2011-12. We expected a significant negative relationship between the shares of agriculture in GSDP with per capita NSDP and significant positive relationship between the shares of industry sector & service sector with NSDP per capita.

3. Literature Review

Modern analysis of sectoral transformation originated with Fisher (1939) and Clark (1940), who dealt with sectoral shifts in the composition of the labour force. However, they were probably the first to deal with the process of reallocation of the factors of production in the economic growth, and use the form of sectoral division (primary-secondary-tertiary) which, in one way or another, is still with us today. The most traditional measures of economic structure are sectoral shares of the labour force. Kuznets (1966) examined these three categories in more detail and added the analysis of sectoral shares of GDP and was able to empirically demonstrate that growth is brought about by changes in sectoral composition. He provided the historical empires and conceptual framework for the structural transformation, although he used no econometric techniques. The first quantitative analysis of patterns in the transformation process was provided by Chenery and Lance (1968) and Chenery and Syrquin (1975).

Historical patterns of economic development of today's developed countries has, no doubt, followed a common pattern and this is well documented by Kuznets (1966) and others. The share of agriculture has seen a steady decline in total output while the industry sector registered an increase for a considerably long period, and then it has shown a decline. And the share of services has steadily increased all through, but the rate of increase seems to have accelerated in the latter half of the twentieth century, the period during which industry has seen a decline in its share and, therefore, is often described as a period of 'deindustrialization' in the developed countries.

The timing of the different phases of structural changes and speed of such changes has, of course, being different between different countries. In the 'pre-modern' era, according to a Kuznets's assessment ended at different points of time during the nineteenth century in different countries, agriculture accounted for a half to two-thirds of the total output in these countries. It seems to have taken about 75 to 100 years for this share to decline to about one-fourth in the case of most European countries, though similar shift was achieved more swiftly in North America and Japan.

In spite of differences in time of entering into the era of modern development and in the speed of sectoral transformation, the share of agriculture sector had declined to less than 15 percent in most of these countries by the middle of the twentieth century and has seen a further continuous decline since then, reducing it to less than 5 percent in all of them, by the end of the twentieth century.

Industry sector held a share of around 25 per cent at the beginning of the modern development process in the most of the developed countries of today. It grew steadily and reached the peak of about one-half by 1950's in all these countries, irrespective of the period when they entered the industrialization phase. All the developed countries have seen a decline in the share of the industry sector in their total output since the 1950's. By and large, the changes in the share of the industry sector in total output have been observed to be hump-shaped (Kuznets, 1966) and Echevarria (1997). In most of the developed countries, industry sector has the same share in total output in the beginning of the twenty-first century as it had in the beginning of their journey to modern economic growth. In 2002, the share of the industry sector in total national output in the United Kingdom was 26 per cent, comparable to 23 per cent in 1801; in France, 25 per cent, the same as in 1841; in Germany, 23 per cent compared to 24 per cent in 1841; in Italy, 29 per cent compared to 22 per cent in 1901; and in the USA, 23 per cent compared to 20 per cent in 1841 (Kuznets, 1966).

The services sector has experienced a secular increase in its share right through the period of modern economic growth in all countries. The share of the service sector to total national output crossed the 50 per cent mark by 1901 in Great Britain, saw a decline till about mid-1950's and crossed 50 per cent again by 1960, by when most other countries, France, Germany, Italy and Japan had crossed this mark for the first time. The United States had hit a 50 per cent mark for services in its GDP earlier. There has been a continuous, and a relatively fast increase in the share of services since the 1960's, and by now, it stands at 68 to 75 per cent in all the countries; the highest being 75 per cent in the case of the United States, followed by the United Kingdom at 73 per cent, France at 72 per cent and Japan at 68 percent in 2002.

In a comparative study of Papola (2005) agriculture, expectedly, registered a decline in its share in GDP in Thailand, Korea, India, China and Malaysia during 1960-2002, the largest decline being in the case of Thailand (from 40 to 9 per cent) and Korea (from 37 per cent to 4 per cent). Thus, while the GDP share of agriculture sector in China declined from 30 per cent in 1980 to 15 per cent in 2002, its employment share of total employment declined from 69 to 47. Corresponding shifts between 1960 and 2002 were: from 50 to 18 per cent in GDP and from 75 to 44 per cent in employment was observed in Indonesia; and from 40 to 9 per cent of GDP and 84 to 46 per cent in employments was seen in Thailand. Only in Malaysia the decline in the labor force in agriculture has been commensurate with that in GDP from 63 to 18 per cent in the labor force. In India, relatively slow shifts have been observed during 1960-2002. It was from 55 percent to 24 percent of GDP and from 74 to 60 percent in total labor force.

Kuznets (1971) saw income elasticity of demand as the primary reason for changes in economic structure, but recognized that other factors, technological and institutional, also play an important role in accelerating these changes. Emphasizing primarily the supply side, Kaldor (1966) considered manufacturing as the engine of growth: agriculture being subject to diminishing returns is not able to sustain an increasing level of production and income, and, therefore, manufacturing, without such limitations on expansion of production, is the key to sustained economic growth. The growth of services was induced both by requirements of expanding industrial sector and rising levels of income.

Victor (1968) in his classical study of the emergence of domination of services sector in the United States finds that income elasticity of demand for services is only slightly higher (1.07) than for goods (0.93) and that for non-food goods are similar to that of services. The persistence in development pattern implies that structural differences remain relevant for understanding the development process.

However, none of the above mentioned papers discussed about structural change or directly examine its empirical link to India's economic growth. Cortuk and Singh (2011), using standard definitions of structural change indices, examine the connection between measures of structural change and growth in India, for the period 1951-2007. They find that there is a structural break in the two time series, and this break occurs in 1988. Furthermore, there is a one-way causal relationship between structural change and growth, but only for the 1988-2007 periods. Hence, this analysis provides more objective empirical support for previous informal assertions in the literature.

Ghate and Wright (2012) also examine state-level data, and their analysis and conclusions are worth summarizing here for later comparison with our own results. They do not estimate convergence regressions, but examine the time series of per capita income for 16 states over the period 1960-2003. Results suggest that a subset of nine states "diverges" from the others from 1985 onward, in the sense of moving to a higher growth path. Therefore, the Ghate-Wright analysis does not provide straightforward implications for convergence or divergence among the entire group of states. The grouping of states obtained by Ghate and Wright will be of interest for comparison with our results.

4. Methodology and Data Sources

Using panel data collected by the Central Statistical Organization for thirty two states and UTs of India for the most recent period of 2004-05 to 2011-12 at the constant prices of 2004-05, the present paper highlights the effect of structural change in economic growth in India and discusses state specific impact of structural change on the economic growth of India. As statistical method we have used OLS and after panel diagnostics random effect was found unbiased. Further year dummies and state dummies have been used for an in-depth analysis.

The data used in the analysis were drawn from data book for DCH; 18th October 2013 published by Central Statistical Organization (CSO). Data on shares of agriculture and agriculture allied sector, industrial sector, service sector, NSDP per capita, population size were all obtained from the same source. The data used in this study range from 2004-05 to 2011-12, a period when India registered comparatively higher average growth rates. This period is also a period when India experienced relative stability in macroeconomic variables and political situation.

5. Results

5.1. Trend Analysis

Figure 5.1 shows that the share of the overall agriculture in GSDP has a downward trend when compared with service sector that had an upward trend. The share of agriculture and allied sector declined from 51.88% in 1950-51 to 14.45% in the year 2010-11. The steady and significant slow decline in the share of agriculture in total output as a result of its much slower growth has one of the singular features of the process of structural change in India since

independence. However, the change within the industrial sector shows the different phases of growth and structural changes. The period till the mid -1960s was characterized by a rising industrial output and the period between 1960 - 1980 was marked as stability in the industrial product. The pattern change in industrial output shifted again in mid 1990s, it saw a reappearance of a trend of declining input productivity in the industrial sector. The size of India's service sector relative to its industrial one started increasing only around 1980. 1980 marked a clear upward shift in the pace of growth of the service sector, the share of service sector increased steadily from the end of 1950s, when it stood at around 30 percent and by 2011 it was close to 57%.

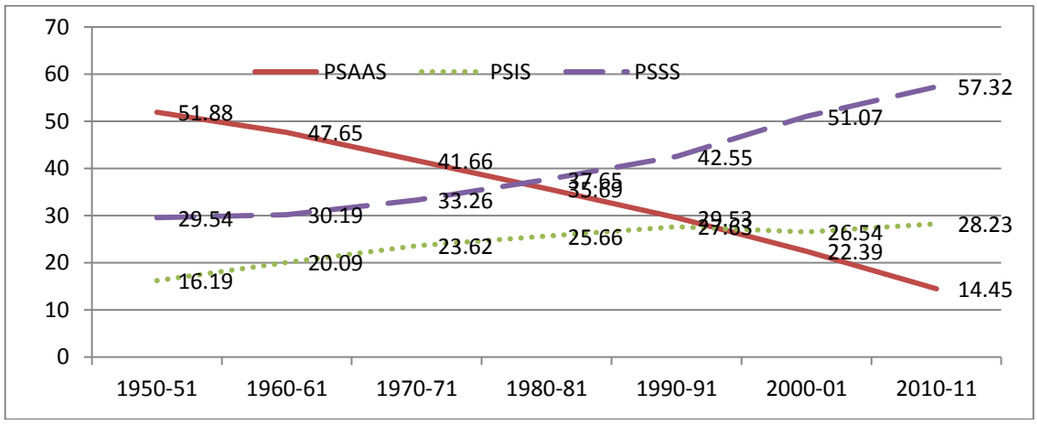

Figure-1. Trends of % Share of Agriculture, Industry and Service Sectors in Total GSDP in India during 1950-2011.

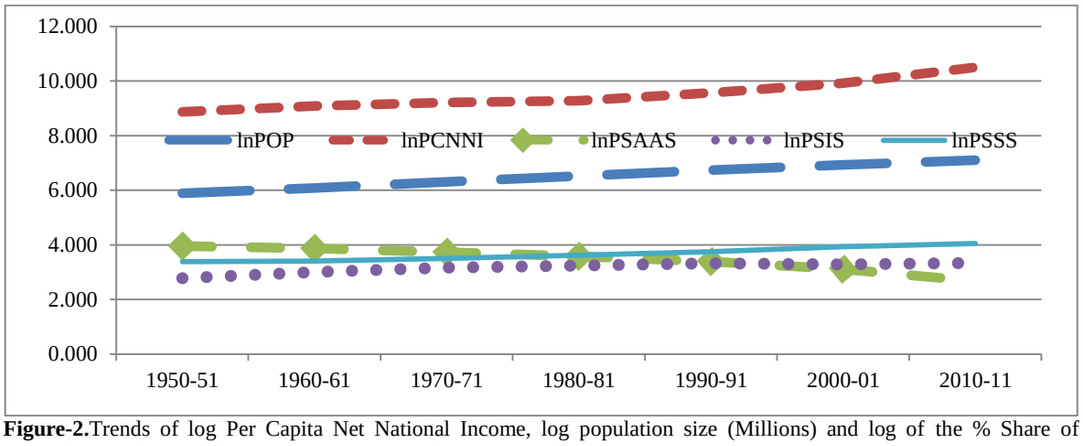

Figure-2. Trends of log Per Capita Net National Income, log population size (Millions) and log of the % Share of Agriculture, Industry and Service Sectors in Total GSDP in India during 1950-2011.

Figure 2 shows that share of agriculture and agriculture allied sector has a downward trend when compared with per capita net national income that had an upward trend during 1950-51 to 2010-11. This observation is consistent with earlier findings which show that as GDP per capita rises, the share of agriculture in GDP falls (Papola, 2005). It can be observed that the share of the industry sector has very slow progress while service sector has noted an upward trend. There are some other observations like, after nineteen ninety population size increasing with diminishing rate and per capita income increasing with an increasing rate, which can be also associated with a speedy decline in agriculture sector

Figure 3 shows year wise contribution of agriculture, industry and the service sector during the study period only. It can be observed that the service sector has grown up from 53% to 59.5%, while industry sector has slightly declined from 27.93% in 2004-05 to 26.75% in 2012-13. The trend is much steeper for agriculture sector compared to industrial sector during this period.

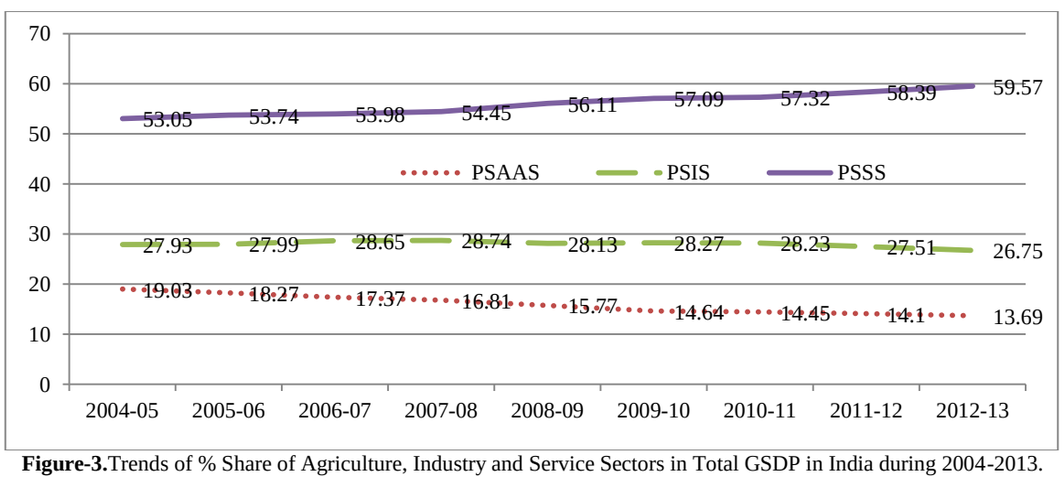

Figure-3. Trends of % Share of Agriculture, Industry and Service Sectors in Total GSDP in India during 2004-2013.

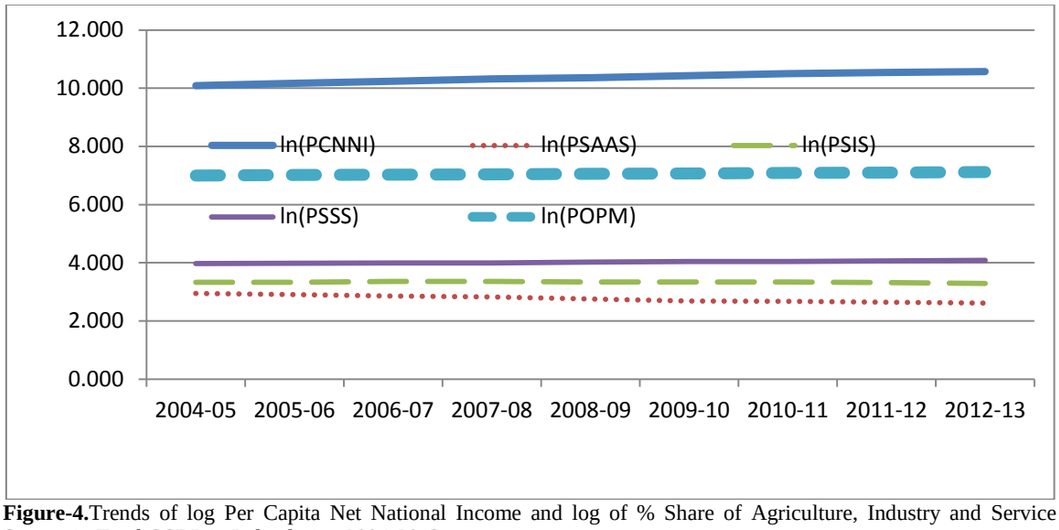

Figure-4. Trends of log Per Capita Net National Income and log of % Share of Agriculture, Industry and Service Sectors in Total GSDP in India during 2004-2013.

At the next step, we tried to associate shares of agriculture, industry and the service sector to per capita net national income and population size (Millions). We calculated the logarithm value of all the variables, so as find out trends and their association with per capita net national income and population changes occurred during the study period. It can be observed from the figure 4 that share of the service sector is an outlier sector in contributing Per capita NNI. It also shows the downward trend of agriculture and allied sector with per capita NNI as expected, but industrial sector showing the stagnant trend in this period. Although the observations made under trend analysis are revealed, they need to be confirmed by regression analysis.

5.2. Regression Results

The study aimed at establishing simple stylized facts on the relationship between the log value of population size and the log value of the share of agriculture and agricultural allied sector for thirty two states and UT's of India for the period of 2004-05 to 2011-12.

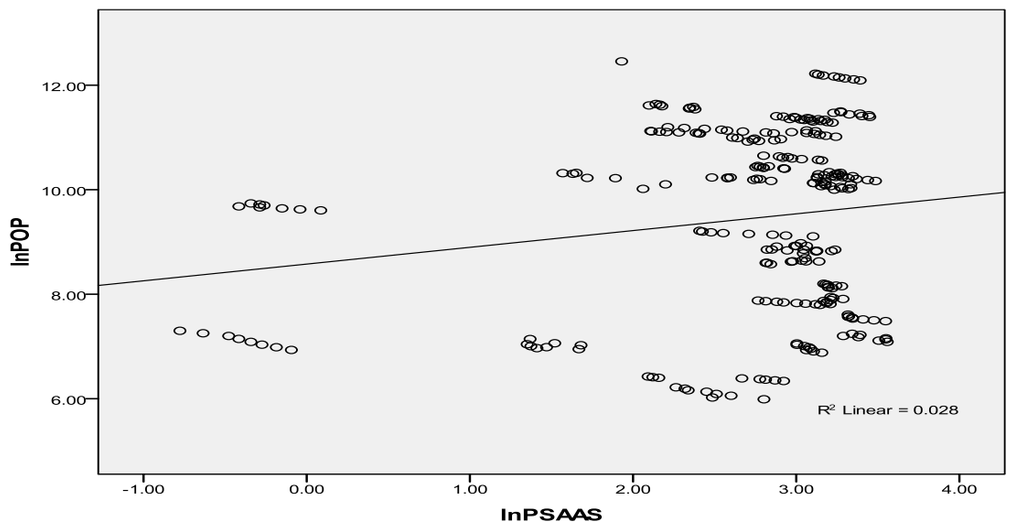

Figure-5. Relationship between log PSAAA and log population size (Million) in Indian States during 2004-012

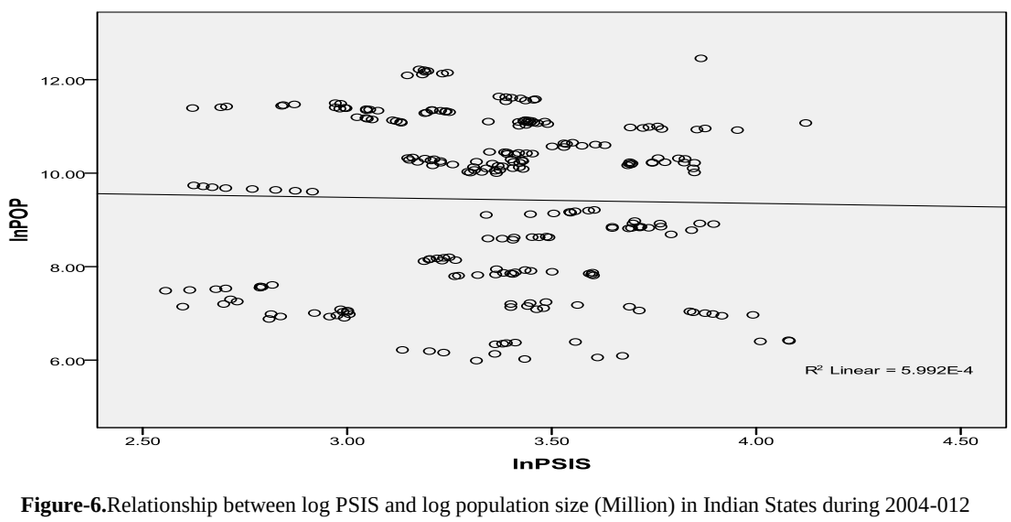

Figure-6. Relationship between log PSIS and log population size (Million) in Indian States during 2004-012

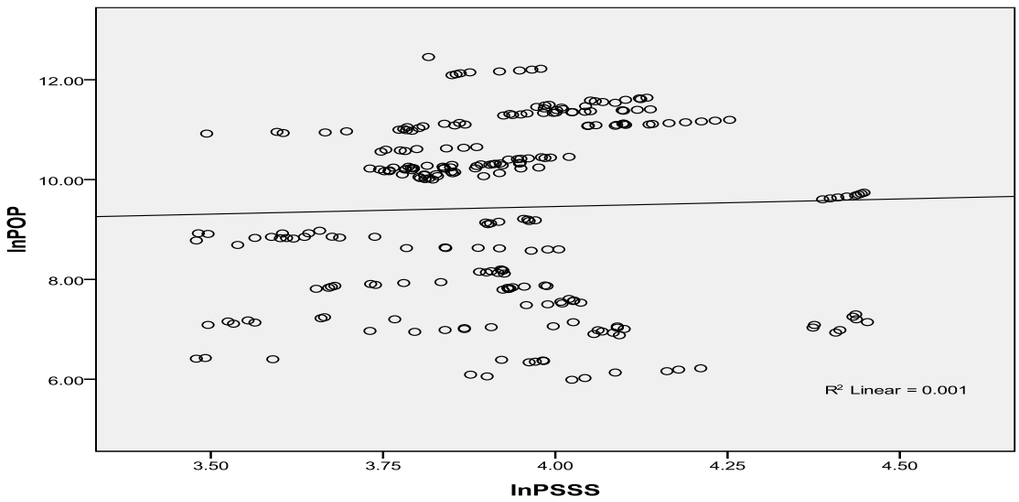

Figure-7. Relationship between log PSSS and log population size (Million) in Indian States during 2004-012

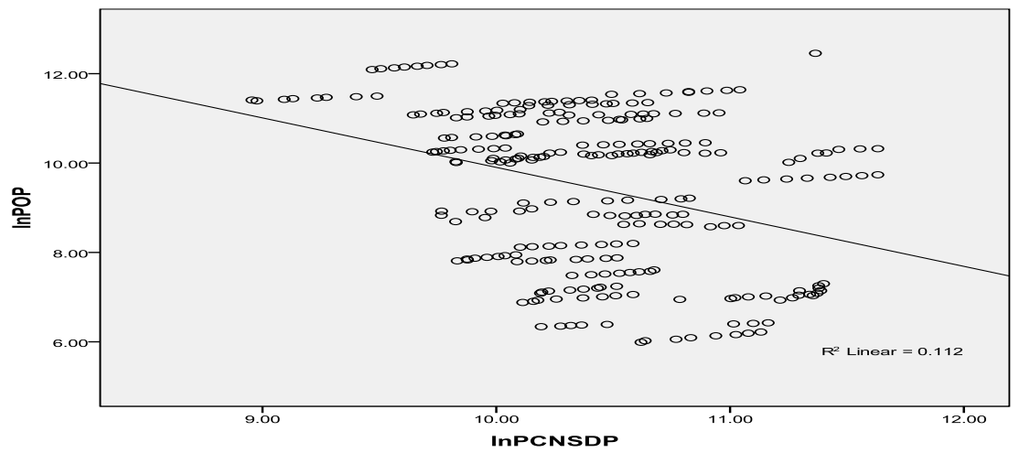

Figure-8. Relationship between log PCNSDP and log population size (Million) in Indian States during 2004-012

Figure 5 shows a positive association between these two variables. The percentage share of the industry sector has declining trend with population size (figure 6) while service sector has risen trend population size (figure 7). Figure 8 demonstrates negative relationship between the log value of population size and the log value of per capita NSDP that is expected and the observation is consistent with earlier findings which show that as GDP per capita rises, the share of agriculture in GDP falls (Chenery and Syrquin, 1975). Results of random effects models with log per capita NSDP as dependent variable and a log percentage share of agriculture, industry and the service sector as a dependant variable show that remaining other things constant one percentage point increase in the percentage share of agriculture and its allied sector in GSDP will decline per capita NSDP by 0.69 points while industry sector and service sector would increase per capita Victor (1968) NSDP by 0.28 and 0.52 points respectively (Table 1). Results are consistent with earlier studies, like Victor (1968) and Bamoul (1967), who concluded that income elasticity of demand for services, is only slightly higher than for goods. When we run regression of log of percentage share of all sectors of the log value of population size in millions in table 2, we found significant at the 5 % level negative association with agriculture sector, insignificant negative associated with industry sector while insignificant but positive association with the service sector.

Results (Table 3) show log per capita NSDP has statistically significant 1% level negative association while log population size has an insignificant negative associated with a percentage share of agriculture and its allied sector in all specifications. Time trend has negative yet insignificant association in four specifications. Coefficient of dummy for high income states is negative while the coefficients of low income states and EAG states are positive, but all these are insignificantly associated with a percentage share of agriculture and its allied sector for thirty two states and UTs during 2004-12.

Empirical results for structural changes in industry sector shows statistical significant positive association with log per capita NSDP, dummy for low income states and dummy for EAG states while time trend and dummy for high income states have a significant negative association. Size of the population seems to have inconstant and insignificant association with a percentage share of the industry sector in India during 2004-12 (Table 4).

Regression results for the share of the service sector have been presented in table 5, log % share of the service sector has positive and significant at 1% level association with log per capita NSDP in India, but its coefficient has changed in negative when we include time trend in the second specification of the model. Table 3, column 1 shows fixed effects while another four specifications are deals with random effects. There is an insignificant negative association between log values of population and log the value of % share of the service sector in all specifications excluding first specification that is without any dummy variable.

As far as the dummy of high income states is concerned its coefficient is positive while the coefficient of the log of per capita NSDP is negative and statistical significant at the 1 % level. It suggests that high income states have positive associations with service sector, yet it has influenced negatively to the economic growth in India during the

study period. On the other hand the dummy for low income states and EAG states have negative associations with a service sector and have influenced negatively to the economic growth of India. Hence EAG states have not performed well in the growth of service sector during the study period. Coefficient of time trend in column 2 is positive and significant suggested that there was significant growth in service sector during 2004-11 thirty two states and UT's of India. Column 5 includes dummy of EAG which has negative and statistically significant at 1% level association with service sector in India. The coefficient's of dummy for EAG states and log of per capita NSDP are negative and significant at the 1 % level while the time trend is positive. Here it is an interesting to highlight that high income states have a highest positive influence on service sector during 2004-11, while low income states have highest negative influence on the service sector.

At the next step, we tried to analyze state dummies with log per capita net state domestic product at constant prices as dependent variable and population size (Million) with some state dummies splitting in high and low per capita NSDP as independent variables. Results of Random Effects Model suggest that states & UTs like Chandigarh, Delhi, Goa, Haryana, Maharashtra, A&N Islands and Pondicherry have statistically significant at the 5 % level positive association between a logarithm value of the population and logarithm value of per capita NSDP (Table 6), while Assam, Bihar, Madhya Pradesh, Uttar Pradesh, Rajasthan, Orissa, Manipur, Chhattisgarh and Jharkhand have significant at the 5 % level negative association in this period (Table 7). Some states have sound policies and created productive job opportunities for its population and able to reap benefits. Some other traditional and slow growing states performed poorly of different accounts on social and physical infrastructure are still far from the benefits of demographic window. Thus the impact of population change is not automatic and homogenous throughout the Indian States during the study period. Whether India will be able to capitalize on its favorable age structure depends on how well the EAG states are able to reform their economies.

6. Conclusions

The growth pattern of different sectors of the economy shows an emergence of the service sector as the major contributor, decline in the share of agriculture sector and industry sector has seen a steep decline during this period. It indicates that some states were able to shift their labour force from low – productivity agriculture to higher productivity industry and service sectors, and to increase productivity within those sectors. Results of Random Effects Model suggest that agriculture and its allied sector have statistically significant at 1% level negative association with per capita income, while industry sector and service sectors have a significant positive association with per capita income in India during the study period.

As far as the dummy of high income states is concerned its coefficient is positive while the coefficient of the log of per capita NSDP is negative and statistical significant at the 1 % level. It suggests that high income states have positive associations with industrial sector, yet it has influenced negatively to the economic growth in India during the study period. On the other hand the dummy for low income states have positive associations with industrial sector and have influenced positively to the economic growth of India. Here it is an interesting to highlight that EAG states have a highest positive influence on industrial sector during 2004-11. High income states population have influenced positively while EAG state's population have influenced negatively to the industry sector in India during the study period. Low income states time trend is negative while high income states time trend is positive, suggesting that industrial growth has been captured by high income states only.

The findings also show that the service sector has a highest positive influence on per capita income. State dummies show significant positive relationship between service sector and per capita income in Delhi, Chandigarh and Kerala while Arunachal Pradesh, Chattishgarh and Himachal Pradesh have shown significant negative coefficient. Thus the impact of structural change is not automatic and homogenous throughout the Indian States during the study period. Whether India will be able to capitalize on its favorable growth depends on how well the EAG states are able to reform their economies.

References

Bamoul, W.J., 1967. Macroeconomics of unbalanced growth: The anatomy of urban crisis. American Economic Review, 57.

Chenery, H.B. and T. Lance, 1968. Development patterns: Among countries and over time. Review of Economics and Statistics, 50(4): 391–416.

Chenery, H.B. and M. Syrquin, 1975. Patterns of development: 1950–1970. New York: Oxford University Press for the World Bank.

Clark, C., 1940. Revised and reprinted in 1951, the conditions of economic progress. London: Macmillan.

Cortuk, O. and N. Singh, 2011. Structural change and growth in India. Economic Letters, 110: 178-181.

Echevarria, C., 1997. Changes in sectoral composition associated with economic growth. International Economic Review, 38(2): 431-452.

Fisher, A.G.B., 1939. Production: Primary, secondary and tertiary. The Economic Journal, 15(1): 24-38

Ghate, C. and S. Wright, 2012. The 'V - factor' distribution, timing and correlates of Great Indian growth turnaround. Journal of Development Economics, 99(1): 58-67.

Kaldor, N., 1966. Causes of slow rate of growth in the United Kingdom. Cambridge: Cambridge University Press.

Kuznets, S., 1966. Modern economic growth: Rate, structure and spread. New Delhi: Oxford and IBH Publishing Co.

Kuznets, S., 1966. Modern economic growth: Rate, structure, and spread. New Haven: Yale University Press.

Kuznets, S., 1971. Economic growth of nations: Total output and production structure. Cambridge, MA: Belknap Press of Harvard University Press.

Lewis, A.W., 1955. Economic development with unlimited supplies of labour. The Manchester School, 22: 139–191.

Papola, T.S., 2005. Structural changes in the indian economy: Some implications of the emerging pattern. Artha Beekshan, 13(4).

Syrquin, M., 2007. Kuznets and pasinetti on the study of structural transformation: Never the twain shall meet?, International Centre for Economic Research Working Paper, No. 46.

Timmer, P. and S. Akkus, 2008. The structural transformation as a pathway out of poverty: Analytics, empirics and politics. Working Paper No.150, Center for Global Development.

Victor, R.F., 1968. The service economy. National Bureau of Economic Research New York.

Bibliography

Chenery, H.B., 1960. Patterns of industrial growth. American Economic Review, 50 (3): 624–654.

Denison, E., 1985. Trends in American economic growth, 1929–82. Washington, D.C: The Brookings Institution.
Kuznets, S., 1967. Quantitative aspects of the economic growth of nations: X. Level and structure of foreign trade. Long-term Trends, Economic Development and Cultural Change, 15 (2): 1–140.
Lewis, A.W., 1955. The theory of economic growth, Homewood, Richard Irwin.
Linden, M. and T. Mahmood, 2007. Long run relationships between sector shares and economic growth: A panel data analysis of the schengen region. Economics and Business administration University of Joensuu, Finland.
Nachane, D.M., S.D. Sawant and C.V. Achuthan, 1989. Agriculture and industry: A study of selected linkages. Indian J. Agric. Econ, 44: 140-149.
Rostow, W.W., 1971. The stages of economic growth. Cambridge University Press, Cambridge.
Sundrum, R.M., 1991. Economic growth in theory and practice. New York: St. Martin's Press.
Syrquin, M. and H.B. Chenery, 1989. Patterns of development, 1950 to 1983. World bank discussion Papers, No. 41 Washington, D.C: World Bank.
Syrquin, M., T. Lance and L.E. Westphal, 1984. Economic structure and performance: Essays in honor of Hollis B. Chenery. Orlando: Academic Press.
Taylor, L., 1969. Development patterns: A simulation study. Quarterly Journal of Economics, 83 (1): 220–241.

Table-1. Random Effects estimator with dependent variable: l_PCNSDP

	Coef.	**(Standard Errors)**	**[P-values]**
Const:	9.2857	(0.95651)	[0.00]
l_AAS:	-0.69815	(0.04768)	[0.00]
l_IS:	0.2886	(0.09954)	[0.00]
l_SS:	0.52021	(0.15655)	[0.00]

H = 51.0347 with p-value = prob (chi-Square (3) > 51.0347) = 4.80953e-011

Table-2. Fixed effects estimator as dependent variable: l_Population

	Coef.	**(Standard Errors)**	**[P-values]**
Const:	9.4576	(1.3218)	[0.00000]
l_AAS:	-0.18793	(0.0769)	[0.01535]
l_IS:	-0.01863	(0.13999)	[0.89425]
l_SS:	0.13898	(0.212)	[0.51277]

H = 4.6767 with p-value = prob (chi-square (3) > 4.6767) = 0.19706

Table-3. Empirical results of the structural changes in agriculture and allied sector.

Model	**1 (RE)**	**2 (RE)**	**3 (RE)**	**4 (RE)**	**5 (RE)**
Variable	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error
Constant	9.7752* (0.45573)	9.5022* (0.92895)	9.3799* (0.9309	9.0163* (0.98313)	9.4475* (0.94777)
Log Per Capita NSDP	-0.67683* (0.0339)	-0.6515* (0.082382)	-0.61778* (0.08535)	-0.61778* (0.08535)	-0.64625* (0.084404)
Log Population Size (Million)	-0.00422 (0.0343)	-0.002317 (0.034904)	-0.00630 (0.034888)	-0.0063083 (0.034888)	-0.00565 (0.035641)
Dummy Time trend		-0.002010 (0.005961)	-0.004154 (0.006125)	-0.0041546 (0.0061257)	-0.002303 (0.006066)
Dummy High Income States			-0.36362 (0.24016)		
Dummy Low Income States				0.36362 (0.24016)	
Dummy EAG States					0.13077 (0.27675)
No. of Obs.	256	256	256	256	256
Cow Test	56.5138*	53.444*	55.3679*	55.3679*	60.5068*
Hausman	7.72885**	9.2214**	8.4288**	8.4288*	11.5583*
LM	813.902*	849.969*	835.369*	835.369*	838.407*

Table-4. Empirical results for the structural changes in industry sector.

Model	**1(FE)**	**2(RE)**	**3(RE)**	**4(RE)**	**5(RE)**
Variable	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error
Constant	2.7675 (0.552)	-1.3729 (0.8672)	-2.2553** (0.92394)	-2.596* (0.981)	-2.062** (0.891)
Log Per Capita NSDP	0.08495** (0.041242)	0.44297* (0.076648)	0.55102* (0.086629)	0.55102* (0.086)	0.52165* (0.080)
Log Population Size (Million)	-0.031624 (0.047809)	0.026465 (0.027742)	0.022028 (0.027734)	0.022 (0.027)	0.0037 (0.028)
Dummy Time trend		-0.03084* (0.00576)	-0.037837* (0.0063133)	-0.037837* (0.0063133)	-0.035* (0.005)
Dummy High Income States			-0.34069** (0.13575)		
Dummy Low Income States				0.34069* (0.13575)	
Dummy EAG States					0.421* (0.151)
No. of Obs.	256	256	256	256	256
Cow Test	26.4119*	21.2968*	22.3038*	22.3038*	20.13*
Hausman	0.405387	13.4738*	6.65917***	6.65917***	6.979***
LM	720.205*	726.532*	727.953*	727.953*	725.67*

Table-5. Empirical results for the structural changes in service sector.

Model	**1(FE)**	**2(RE)**	**3(RE)**	**4(RE)**	**5(RE)**
Variable	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error	Coefficient Std. Error
Constant	2.777* (0.352)	7.3441* (0.5003)	8.2349* (0.498)	8.6738* (0.529)	7.9188* (0.498)
Log Per Capita NSDP	0.0886* (0.0263)	-0.323* (0.0442)	-0.4388* (0.0466)	-0.438* (0.0466)	-0.389* (0.0451)
Log Population Size (Million)	0.0232 (0.030)	-0.022 (0.016)	-0.0158 (0.0158)	-0.015 (0.0158)	-0.0010 (0.0165)
Dummy Time trend		0.0348* (0.003)	0.0423* (0.003)	0.0423* (0.0033)	0.0388* (0.0032)
Dummy High Income States			0.4388* (0.0805)		
Dummy Low Income States				-0.43884* (0.0805)	
Dummy EAG States					-0.4214* (0.0923)
No. of Obs.	256	256	256	256	256
Cow Test	52.57*	44.04*	43.88*	43.88*	44.95*
Hausman	0.9077	67.70*	32.24*	32.24*	44.94*
LM	686.29*	690.01*	693.98*	693.98*	695.66*

Table-6. Links between economic growth and population in high income states of India during 2004-12

Coefficient	**Std Error**	**P value**	
Const:	10.192	(0.38099)	[0.00000]
l_Population:	-0.01614	(0.038345)	[0.67415]
du_ Andhra Pradesh:	0.4019	(0.30201)	[0.18455]
du_ Goa:	1.3974	(0.29736)	[0.00000]
du_ Gujarat:	0.65146	(0.29652)	[0.02899]
du_ Haryana:	0.74239	(0.29924)	[0.01380]
du_ Himachal Pradesh:	0.56625	(0.2981)	[0.05870]
du_ Karnataka:	0.60804	(0.29713)	[0.04182]
du_ Maharashtra:	0.79667	(0.30424)	[0.00940]
du_Nagaland:	0.46	(0.30796)	[0.13659]
du_Punjab:	0.55993	(0.29657)	[0.06024]
du_Sikkim:	0.52424	(0.32308)	[0.10600]
du_Tamil Nadu:	0.64178	(0.30045)	[0.03369]
du_Uttarakhand:	0.4607	(0.2969)	[0.12206]
du_A & N Island:	0.78598	(0.32743)	[0.01714]
du_Chandigarh:	1.2678	(0.31285)	[0.00007]
du_Delhi:	1.3268	(0.29603)	[0.00001]
du_Puducherry:	1.0432	(0.31405)	[0.00104]

LM = 213.863 with p-value = prob(chi-square(1) > 213.863) = 1.97316e-048
H = 17.5166 with p-value = prob(chi-square(1) > 17.5166) = 2.84813e-005

Table-7. Links between economic growth and population in low income states of India during 2004-12

Coefficient	**Std Error**	**P value**	
Const:	10.381	(0.3829)	[0.00000]
l_Population:	0.04701	(0.0409)	[0.25234]
du_ Andhra Pradesh:	-0.38148	(0.35775)	[0.28735]
du _ Assam:	-1.0082	(0.35205)	[0.00456]
du_Bihar:	-1.7247	(0.3616)	[0.00000]
du_Chattisgarh:	-0.86837	(0.34888)	[0.01349]
du_J & K:	-0.73021	(0.35115)	[0.03865]
du_Jharkhand:	-0.43864	(0.35685)	[0.22021]
du_Kerala:	-1.0574	(0.35846)	[0.00350]
du_ Madhya Pradesh:	-0.82792	(0.35097)	[0.01914]
du_Manipur:	-0.8032	(0.35239)	[0.02353]
du_Meghalaya:	-0.44873	(0.35264)	[0.20445]
du_Mizoram:	-0.37971	(0.35964)	[0.29214]
du_Odisha:	-0.91257	(0.35404)	[0.01055]
du_Rajasthan:	-0.86113	(0.35787)	[0.01688]
du_Tripura:	-0.43038	(0.35093)	[0.22126]
Du_Uttar Pradesh:	-1.3163	(0.37035)	[0.00046]
Du_West Bengal:	-0.69569	(0.36081)	[0.05503]

LM = 315.272 with p-value = prob (chi-square (1) > 315.272) = 1.55138e-070
H = 10.7685 with p-value = prob (chi-square (1) > 10.7685) = 0.00103241