REGIONAL DIVERGENCE AMONG INDIAN STATES: A SECTORAL DECOMPOSITION

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ABSTRACT

Various studies have examined the interregional disparities for the Indian regions from different perspectives and for time zones. Sectoral composition of output and rate of growth of sectors for states play a major role in deciding the extent of convergence/divergence. Following to the foreign exchange crisis of 1991, India adopted the LPG Policy of 1991 where the Indian economy opened up and liberated itself from various private & international restrictions. Recently, in 2016 our economy faced a major change of the events after the adoption of the demonetization policy in 2016. Between this time frame, what has been the extent of regional divergence in India, specially from the perspective of sectoral divergence will be explored in this study. The methodology used in the study is similar to that which is used by Kar and Sakhtivel 2006. As per Kar and Sakhtivel, the framework adopted by them facilitates them to decompose the rate of regional divergence into contribution made by various sectors. This paper has analyzed the regional disparity between 16 main Indian states using panel data analysis to examine the contribution of various sectors to the rate of regional divergence across the states.

KEYWORDS: *Regional Divergence in India*

INTRODUCTION

Bhardwaj (1982) in this study has examined the composition of economic activities in the Indian regions to understand the factor influencing the accumulation process. Various determinants at the aggregate level have been studied imperatively form around 1860's to 1980's. The periodisation, confirming the growth situation is taken as four broad periods as: colonial period till war, inter-war until Independence, post Independence up to mid sixties and after mid sixties. As far as the first period is concerned, the major differences arose in the way colonial mechanisms operated in regions. Different imperial policies for land settlement and penetration into agrarian economy along with differential public investment policies had an adverse impact of regional differences. In inter war period, agglomeration growth along with weak dispersal effects was observed. During post Independence, the industrial development mainly concentrated in port-cities and their periphery.

Pattern of growth within states has also been uneven. In mid sixties the differentiation in regions was due to slackening public investment and tardiness of private investment. Also, uneven impact of the ' green revolution' was responsible for this. The new technology was adopted in the regions of high level of producer's well-being. Concluding, it was analyzed that the regions where the rate of growth of agriculture is low are the regions with greater disparities. However, the regions with industrial vitality are the ones where agriculture is also performing well. More importantly, general level of well being is seen to be vital precondition for productive utilization of surplus and for forgoing the agriculture- industry linage.

OVERVIEW OF LITERATURE

Kumar and Managi (2012) examines the efficiency and its determinants at the state level on the basis of 17 Indian states, that account for 85% of national GDP approximately. Analyzing the state-level data from 1993 to 2005, the prevalent regional disparity in productivity changes is found. In the years right away subsequent to the economic liberalization, it is seen that the productivity increase enhanced technical competence. Though, in the following years, the productivity expansion was boosted by technological growth. A trend in the direction of convergence is found, as far as the productivity growth among states is concerned. Though, the states that were technically competent when the economic reforms took place, stayed to be innovative afterwards. It is observed that the average level of inadequacy in India decreased in the post-liberalization period. Calculating the transformation in state-level productivity, the authors produce disaggregated outcomes that show the subsistence of extensive regional disparity. Ten states showed progress in efficiency from 1993 to 2005. In the years subsequent to the economic liberalization, TFP expansion was chiefly because of upgrading in technical competence. In the following period, nevertheless, TFP enlargement was pushed by increase in technical advancement. Even if only proficient states stay innovative, the authors recognize a propensity in the direction of convergence in productivity enlargement amid the states throughout liberalization. It is also seen that the states that benefit from a better quality of life make use of resources extra competently. The robustness of the outcomes is examined with the help of the growth accounting framework. This method shows that there exists a high correlation among the two measures, although they are dissimilar at the state rank.

Gille (2014) empirically analyses that should countries support a more uneven or a more equivalent allocation of human capital. The author evaluates the link amid the distribution of education and income per capita with panel dataset from 29 Indian States. The data is obtained from five national sample survey rounds ranging from 1987–88 to 2009–2010. Because of the high correlation between the Gini of education and the mean education level for every state, the author has used the methodology proposed by Berthélemy (2006) to split the Gini the level effect and the concentration effect. By the means of the fixed-effects and System GMM to evaluate the relation, the results show that parity of education is negatively linked to income per capita and also the link is stronger in better-off states. The above findings are vigorous to the use of a Theil index to determine the allocation of education and to the adding up of consumption Gini. While investigating the channels, the author discovers that the three channels- i.e., firstly, the non-linear outcomes of education, secondly, the externalities and lastly, the complementarities among workers, possibly will be at risk in the explanation of the negative association between the parity of education and per capita income. The above results prove that the approach with which an education system is planned has an influence on the per capita income of an economy. It also shows the approach to additional research. In specific, it is vital to examine the extra non-linearities. The link among the allocation of education and per capita income might for instance depend on the production configuration of the country.

It is well recognized that our planning and economic strategies have been unsuccessful in producing inclusive growth to facilitate sizeable parts of the economy to acquire the gains of development. In a huge country like India, with considerable regional disparities in physical endowments, climatic circumstances, social traditions and the initial levels of development, growth rates are ought to differ between regions (Chelliah and Shanmugam 2007).

There is paucity of economic literature that examines the persistent disparity across Indian states following sectoral decomposition approach. This study strives to fill this gap in economic literature.

METHODOLOGY

The time period considered for the study is the post reform period and India's major 16 states considered for the analysis are mentioned in Table 1.

Table 1: States Selected for Analysis

States	Abbreviations
Andhra Pradesh	AP
Bihar	BR
Chhattisgarh	CG
Gujarat	GJ
Haryana	HR
Jharkhand	JH
Karnataka	KR
Kerala	KL
Madhya Pradesh	MP
Maharashtra	MH
Orissa	OR
Punjab	PB
Rajasthan	RJ
Tamil Nadu	TN
Uttar Pradesh	UP
West Bengal	WB

The paper starts with an introduction and an overview of literature. It then offers a discussion of analysis of regional diversity in India. Under this section, it examines the rate of regional divergence and evaluation of the regional dimension of employment and diversification over the time period. Next, the paper discusses conclusion and policy implications for the same.

The Rate of Regional Divergence among the States over the Time Period from 1991-92 to 2013-14: A Sectoral Decomposition

This section examines the rate of regional divergence across the states from 1991-92 to 2013-14. The methodology used in the study is similar to that which is use by *Kar and Sakhtivel 2006*. As per Kar and Sakhtivel, the framework adopted by them facilitates them to decompose the rate of regional divergence into contribution made by various sectors. That is, by using this process they have paid attention to the way the agriculture, industrial and service sector of the Indian economy has led to the changes in the level of regional disparity. The methodology used by them is as follows. "Denoting per capita regional output by X_i, its coefficient of variation by $C(X_i)$, and the rate of regional divergence by D, we have equation (1) as:-

$$D = \frac{C(X_i^{'})}{C(X_i)}$$

The further methodology is as follows:-

Let there be n regions such that the output of each region is given by X_i, i = l....n. Let there be m sectors that contribute to each region's output Xi, such that the output of each sector in each region is given by X_{ij}, i =1...n, j = ...m.

Then, equation (2) is: - $X_i = \Sigma_j X_{ij}$

Let $\overline{X}$ is the arithmetic mean of X_i and X_j be the $\overline{\text{arithmetic}}$ mean of X_{ij}. Next, define P_j as the ratio between the average output of the jth sector and the average output of the economy. Thus, equation (3) is:- $P_{j=} X_j /X$

Let us also assume that $\underline{\sigma(X_i)}$, $\underline{V}ar(X_i)$, $Cov(X_{ij},X_{ik})$ and $r_{ij,ik}$ are the symbols for the standard deviation, variance, covariance and the correlation coefficient of the corresponding variables, respectively. Then, using percentage decomposition of inequality by income source [*De Janvry and Sadoulet, 2001*], the regional inequality and its components can be derived from this following equation (4):-

$$\left[\frac{\Sigma_j P_j \text{x } r_{ij,i} \text{x} C(X_i^{\cdot})}{C(X_i)} \right] = 1$$

Rearranging equation (4) we can write $C(X_i) = \Sigma_j(C(X_{ij}) \text{ x } P_j \text{ x } r_{ij,i})$, this is equation (5).

Equation (5) indicates that the level of regional inequality (measured by the coefficient of variation of regional output) is equal to the sum of each sectors contribution. The contribution of each sector is equal to the product of (i) the regional inequality at the sectoral level, i.e., the inequality in the distribution of a particular sector's output amongst the regions (ii) the average regional output of the sector as a proportion of the average regional output and (iii) the correlation coefficient between the sector and the whole economy. This means that the regional inequality for the economy is affected not only by the regional inequalities at the sectoral level, but also by the relative size of the sectors and their interlink age with the economy. The size of the sectors add a scale effect to the sectoral inequality, i.e., a larger sector adds more to the economy's inequality compared to a smaller sector. The interlink ages of a sector with the whole economy - represented by the correlation coefficient between the two - also has an important role. This is due to the fact that a high correlation between any sector and the economy implies that a region that has a relatively high output from that sector also has a relatively high aggregate output, while a region that has a relatively low output from that sector also has a relatively low aggregate output. Thus, for a given level of inequality in the sector, an increase in the correlation coefficient increases the economy's inequality. Equation (5) breaks up the coefficient of variation of regional output into its sectoral components. However, in order to derive the rate of divergence, we need to derive the growth rate of the coefficient of variation. Differentiating both sides of equation (5) with respect to time and dividing by $C(X_i)$ we get, equation (6) as :-

$$\frac{C(X_i^{\cdot})}{\overline{C(X_i)}C(X_{ij})P_j r_{ij,I}} = \Sigma_j C(X_{ij}^{\cdot}) \left\{ \left[\frac{+ \ P_j^{\cdot} + r_{ij,i}^{\cdot} \text{x} C(X_{ij}) \text{ x } P_j \text{x } r_{ij,I}}{C(X_i)} \right] \left[\quad \right] \right\}$$

Equation (6) implies that the regional divergence is equal to the weighted sum of growth rates of the three components in equation (5). In each case, the weights are the sectors contribution to the economy's initial levels of regional inequality, as a ratio of economy's initial levels of regional inequality. It should be noted here that equation (6) follows from equation (5) only in continuous time, when certain cross products arising out of an expansion of equation (5) take up negligible values and are assumed to be equal to zero. However when we will use these equations to undertake some measurement in discrete time (in the next section), errors creep in due to non-negligible values of the cross products. In that case, the right hand side of equation (6) becomes approximately equal to the left hand side of the equation." Kar and Sakhtivel (2006).

Following the methodology for finding the rate of regional divergence as explained above by Kar and Sakhtivel (2006), we have calculated the value of D, which is the rate of regional divergence using the equation (6) as mentioned above. The value of D is calculated for primary, secondary and tertiary sector respectively. The time periods used for this is four different years namely, 1993-94, 1998-99, 2003-04, 2008-09 and 2013-14. Since we have calculated the rate of regional divergence starting from 1993-94, the rate of divergence is shown since 1998-99 compared to the previous chosen time phase.[1]

Table 2: Rate of Regional Divergence Over the Time Period

S. No.	Time Period	Rate of Regional Divergence (D)
1	1998-99	0.83
2	2003-04	0.95
3	2008-09	-0.88
4	2013-14	1.39

Source: Author's Own Calculations

The Table 2 and Figure 1 show the rate of regional divergence across states from 1998-99 to 2013-14. as per the formula on the right hand side of equation (6).
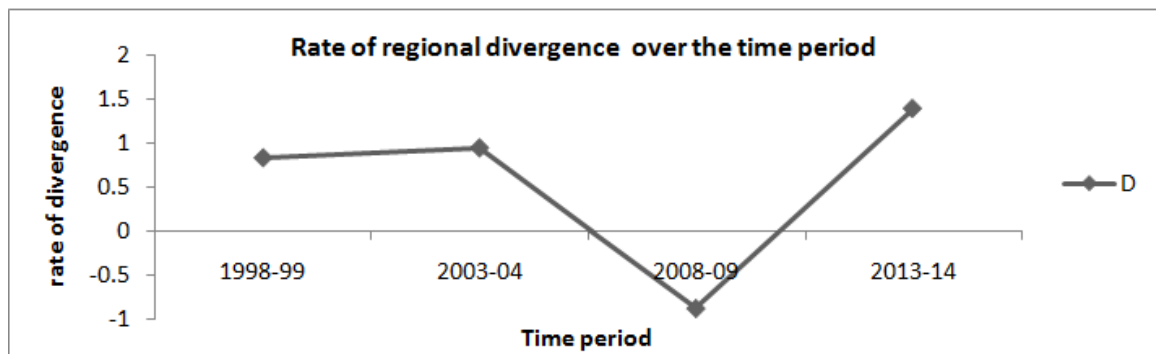

Figure 1: Rate of Regional Divergence over the Time Period.

The outcome of the analysis of Table 2 and Figure 1 shows that over the time period the rate of regional divergence has risen. These results are based on the sectoral composition of output for each region and with this we have found that the divergence in these terms is still persisting. However, if we look at the Table 2 and the Figure 1, we observe that initially the rate of divergence is rising, then it falls and after a certain phase, it shoots up immensely. Hence, with all this we can prove that as compared to initial phase of post- reform period, the rate of regional divergence has increased from 0.83 for 1998-99 to 1.39 for 2013-14. This in other words gives us a crystal clear proof on the diverging trend among the Indian states and also confirms the augmenting regional disparities for the nation.

Now, using the formula for rate of regional divergence as follows, we have calculated the rate of regional divergence based on output for each sector separately.

$$D = \frac{C(X_i^{\cdot})}{C(X_i)}$$

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[1]As per the availability of data, the states considered for calculating the D value are Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Jharkhand, Chhattisgarh and Bihar.

For this, we calculate the above mentioned value of D as the difference of previous value of coefficient of variation of output upon the previous value of output share. This exercise is done for each sector separately, over the time phase of 1993-94, 1998-99, 2003-04, 2008-09 and 2013-14. Since we have calculated the rate of regional divergence starting from 1993-94, the rate of divergence is shown since 1998-99 compared to the previous chosen time phase.[2] For this, the Table 3 and Figure 2 show the rate of regional divergence based regional output share of each sector i.e., primary, secondary and tertiary respectively from 1998-99 to 2013-14.

Table 3: Rate of Regional Divergence based on the Interstate Sectoral Share of Output

Time Period	Rate of Regional Divergence		
	Primary	Secondary	Tertiary
1998-99	0.01	-0.07	-0.03
2003-04	0.09	-0.10	0.03
2008-09	-0.08	0.27	0.17
2013-14	0.00	0.01	0.00

Source: Author's Own Calculation

For this we calculate the rate of divergence (D) using the formula mentioned in equation (1) previously. This value of D is calculated over the above mentioned time frame and the twelve sampled states; for all three sectors separately.

Analyzing the rate of regional divergence for each sector separately, we found that; firstly as far as the primary (agriculture) sector is concerned, the rate of regional divergence was quite low in the initial years of the post reform period. After the time period of 2003-04, there was an immense fall in the rate of regional divergence. However, after 2008-09, the rate of divergence has shown an increase till 2013-14. But, the rate of regional divergence for this sector in the 2013-14 is still lower than the starting phase of 1998-99. This proves that on the whole there has been a falling trend in the rate of regional divergence as far as share of output in primary sector for the sample states is concerned.

Further, when we examine the trend of rate of regional divergence for secondary sector, there is an increasing trend observed over the time period. To prove this, we found that the initial value of D for this sector was negative till 2003-04. However, after 2003-04, there was a huge rise in the value of rate of regional divergence (D) for this sector and this kept on rising till 2008-09. After 2008-09, though there was a fall in the value of D, but the rate of divergence was still quite higher as compared to the initial phase value for 1998-99. Hence, overall the value of D has risen throughout the given phase.

Finally, when we observe the findings from the analysis of the tertiary sector, we found that the rate of regional divergence for it was quite low, almost negative for the initial phase of 1998-99. After that, the rate of divergence has shown a continuous sharp increase till 2008-09. After 2008-09, the value of D for this sector shows a fall. However, for the year 2013-14, the value of rate of regional divergence was still high as compared to the initial phase value. Thus, overall there has been an increasing trend of the rate of regional divergence for this sector.

After analyzing the sectoral share of output for each state and examining the rate of regional divergence over the time period for each sector, we can conclude that while the secondary and tertiary sectors are chiefly accountable for the divergence all through this period, the primary sector was counterbalancing a few of the divergence. Hence, we can

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[2]As per the availability of data, the states considered for calculating the D value are Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Jharkhand, Chhattisgarh and Bihar.

conclude that the regional disparity in terms of sectoral share of output has amplified over the time period, specifically in the case of secondary and tertiary sector. This has widened the disparities among the states since the reform period.
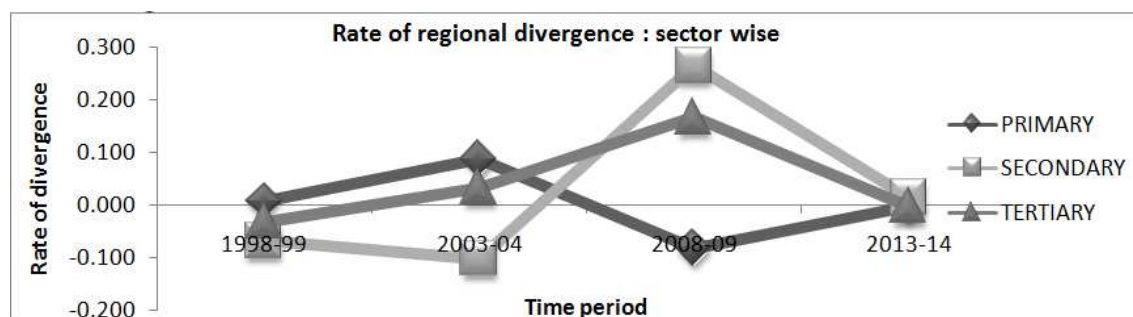

Figure 2: Rate of Regional Divergence over the Time Period for Output Shares of Sectors.

SUMMARY OF FINDINGS AND POLICY IMPLICATION

Major Findings

Regional disparity is a crucial and burning problem of India. Moreover, the aim of covering everyone under the trajectory of growth is a chief priority. The main conclusions that can be drawn from the study are as follows:

By evaluating the rate of regional divergence across states with respect to the sectoral share of output, the analysis show that the rate of regional divergence has increased from 0.83 for 1998-99 to 1.39 for 2013-14. After investigating the rate of regional divergence for all the three sectors, we observed that the secondary and tertiary sectors are chiefly liable for the deviation all through the post reform period; the primary sector was compensating a few of the discrepancy.

Analyzing the rate of regional divergence for each sector separately, we found that; firstly as far as the primary (agriculture) sector is concerned, the rate of regional divergence was quite low in the initial years of the post reform period. After the time period of 2003-04, there was an immense fall in the rate of regional divergence. However, after 2008-09, the rate of divergence has shown an increase till 2013-14. But, the rate of regional divergence for this sector in the 2013-14 is still lower than the starting phase of 1998-99. This proves that on the whole there has been a falling trend in the rate of regional divergence as far as share of output in primary sector for the sample states is concerned.

Further, when we examine the trend of rate of regional divergence for secondary sector, there is an increasing trend observed over the time period. To prove this, we found that the initial value of D for this sector was negative till 2003-04. However, after 2003-04, there was a huge rise in the value of rate of regional divergence (D) for this sector and this kept on rising till 2008-09. After 2008-09, though there was a fall in the value of D, but the rate of divergence was still quite higher as compared to the initial phase value for 1998-99. Hence, overall the value of D has risen throughout the given phase.

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Implication for Policy

The major policy implications derived from the study are as follows:

- The less developed states should develop their secondary and tertiary sectors in terms of output shares of sectors, in order to have less regional divergence.

- The low income states should develop more educational institutions; both at the primary and secondary level, at shorter distances in order to improve the access to education for all.

  Other policy implications are as follows:

- Creation of labor force, employable and acquiescent to skill training and advancement is a mounting assignment for the states.

- The government has undertaken huge policy and budgetary provisions to promote inclusive development. But, the India's innovation policy is inconsistent with inclusive development measures. So, we need to emphasize on policies that promote more innovation rather than elite orientation. India's innovation policies are still inclined towards high technology and global competition.

- The need of the hour is to have a suitable institutional and governance arrangement that harmonizes and networks the formal R&D arrangement and universities with the requirements and demands of inclusive development programmes.

- An inclusive innovation network is also needed to which the development programmes are related. For instance, there is one in the form of National Innovation Foundation, by DST, Ministry of S&T.

Notes

- As per the availability of data, the states considered for calculating the D value are Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Jharkhand, Chhattisgarh and Bihar.

- As per the availability of data, the states considered for calculating the D value are Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Jharkhand, Chhattisgarh and Bihar.

- Mining, construction and electricity have been left out, while calculating the shares.

- Due to unavailability of data, the Figures for 1993-94 are from Ramaswamy 2007 (Table 7). Also, for this analysis; due to unavailability of data, fourteen states out of the sample were considered, except Chhattisgarh and Jharkhand.

- For this analysis; due to unavailability of data, fourteen states out of the sample were considered, except Chhattisgarh and Jharkhand.

- Due to unavailability of data for all the 16 sampled states, the states considered for this purpose are Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Jharkhand, Chhattisgarh and Bihar.

- For this analysis, due to unavailability of data, twelve states out of the sample were considered, except Andhra Pradesh, Kerala, Gujarat and West Bengal.

- For this analysis; due to unavailability of data, fourteen states out of the sixteen sampled were considered, except Chhattisgarh and Jharkhand.

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