Growth and Interstate Disparities in India

This paper offers analytical description of the economic performance of Indian states as reflected in their per capita (net) state domestic product. Statistical analysis of data for the period 1960-61 to 1995-96 shows a clear tendency for Indian states to diverge in per capita SDP, but converge in shares of different sectors in the SDP.

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In his seminal paper on the mechanics of economic development, Robert Lucas (1988) observed that "...the problem of economic development..." is "...simply the problem of accounting for the observed pattern across countries and across time in levels and rates of growth of per capita income". While this definition addresses explicitly the issue of comparative economic development of countries, it is equally relevant for the comparative study of development of regions within a given country, especially so for a country as large as India, which is easily viewed as a collection of interconnected sub-economies, viz, the states which comprise the country. The economic progress of a large country needs, so to speak, to be studied both from without as well as within. The first compares the country with others, while the second might suggest explanations, should the first indicate large discrepancies in the country's relative economic performance. In other words, the presence of homogeneous development or otherwise over regions making up countries could well provide important 'accounting' clues on disparities across nations.

The very first step in the search for a clue lies in observation, i e, in establishing whether the regions in question are truly diverse from the economic point of view. The issue here is more controversial than one might suppose. For example, a time honoured evidence of divergence amongst regions lies in observed differences in growth rates in per capita incomes. Yet, the so-called convergence hypothesis raises doubts on this score [Barro and Sala-i-Martin 1995]. Following the dictates of the neo-classical growth model [Solow 1956], it claims that, two regions differing mainly in the levels and growth rates of per capita income may actually be approaching closer, provided that the lower growth rate region was richer than the higher growth rate region at some initial point of time.

To the extent that economic development is largely concerned with capital accumulation, this conclusion follows from the law of diminishing returns to capital. Sustainable growth rates fall as the capital stock expands relative to other factors, thereby allowing poorer regions to catch up with richer ones over time. Although the hypothesis has been questioned and subsequently modified, it has turned into an important point of departure for most investigations on inter-regional diversities.

The purpose of the present paper is to offer analytical description of the manner in which the Indian states have behaved vis-a-vis one another over the period 1960-61 to 1995-96. As with most other recent studies on the subject, the investigation begins with reference to the convergence hypothesis. The findings here are similar in certain respects to previous contributions. Thus, we discover a clearly divergent pattern amongst the states over time. However, our convergence analysis differs from these in certain other important respects. For one thing, the data used in the paper is probably cleaner than that utilised by some of the existing papers. More importantly, the convergence analysis pursued here is more disaggregative in nature. For example, we attempt to provide a clear picture of the behaviour of the primary, secondary and tertiary sectors (defined appropriately) to try to draw conclusions about the contribution to the overall divergence by each of these sectors. In the process, a rather unexpected conclusion emerges, viz, that the divergence between states is least in terms of infrastructural development and largest with respect to agriculture.

The scope of the paper is broader, however, than convergence analysis. The question of interstate disparities can be posed in a multitude of ways and the paper takes a look at the problem from some of the other viewpoints also. In particular, it analyses the ranks enjoyed by the Indian states with respect to the levels of their per capita (net) state domestic product (PCSDP) at 1980-81 prices over the chosen period. In this connection, a rank correlation matrix is constructed to arrive at conclusions about the manner in which the rank structure has changed over time. The conclusion here is that this structure has been remarkably stable, the correlation between the ranks enjoyed by the states in any chosen pair of years (irrespective of the closeness of the years) being pretty close to unity.

In connection with the rank analysis, the paper also provides a picture of the manner in which a state's ranking has behaved over time, both with respect to its own average ranking as well as the average per capita SDP over the chosen time period. Once more, the observation is that a state's position has tended to remain stable over time. A weaker state has remained worse off and a stronger state better off compared to the average.

Further, the paper goes on to study the degree of concordance which gives an overall measure of agreement or disagreement of several rankings. In addition, the rank concordance measures are also calculated which corroborates the finding of very little mobility of the states over time.

Finally, we provide some insights into the structural characteristics of the Indian states, where structure is defined in terms of the shares enjoyed by the sub-sectors indicated above in the state domestic products. Curiously enough, the conclusion here goes against the picture of divergence that emerges from the other tests mentioned above.

As already noted, the paper is concerned largely with description. As such, it represents a halfway house, an initial exploration towards fact finding. The ultimate purpose, needless to say, is to explain or 'account' for the observed discrepancies or otherwise across the states. The explanations, once they come along, are likely to serve a dual purpose. First, they will help us understand the disparities, in itself a well-defined objective of study. Secondly, they are likely to throw some light on the overall performance of the Indian economy, thereby acting as an aid to explaining its achievements relative to economies it hopes to catch up with. And, more importantly, they will throw up more light and provide guidance to policy initiation.

The paper is organised as follows. Section I is concerned with a very short review of relevant literature on the subject. Section II examines the growth performance of the states over different time periods in terms of different measures of growth. Section III presents analysis of data such as the verification of the convergence hypothesis, the so-called σ- convergence and β-convergence in the Indian context; the relative position of the states; the intertemporal mobility of the states over time measured in terms of the ranked concordance; and an examination of structural variations of the states. Section IV concludes the paper.

I
Review of Literature

The literature on disparities across Indian states is relatively scanty. Sarker (1994) studies the link between regional imbalances and plan outlays. He discovers a strong link between development (measured in terms of 14 variables including per capita consumption of electricity, percentage of villages electrified, per capita expenditure on health, effective literacy rates, etc) and the per capita plan outlays for the different states. He employs principal component analysis to construct a composite index of development according to which Punjab scores the highest and Bihar the lowest. The analysis is based on a study of 15 Indian states.

Dholakia (1994) concludes in terms of a study of 20 Indian states over the period 1960-61 to 1989-90 that there are marked tendencies of convergence of long-term economic growth rates for the states. He identifies 1980-81 to be the year of break in the trend of real incomes of Indian states. Several of the lagging states started growing after this date while the leaders began to stagnate. Cashin and Sahay (1996) too claim absolute convergence on the basis of data relating to 20 Indian states over the period 1961-91, at the same time that the dispersion of real per capita income increased during the period.

The present study does not seem to support the observations of Dholakia and Cashin and Sahay. Conclusions similar to ours are reached by Raman (1996), Marjit and Mitra (1996), as well as Ghosh et al (1998). They report significant divergence across Indian states. There are, however,

Table 2: Estimated Annual Percentage Growth Rate of Per Capita SDP of Each State at 1980-81 Prices

State	Annual Percentage Growth Rate		
	1960-61 to 1995-96	1968-69 to 1995-96	1970-71 to 1995-96
Andhra Pradesh	1.5	1.9	1.9
Arunachal Pradesh	–	–	5.0
Assam	–	–	1.7
Bihar	1.4	1.8	1.8
Gujarat	2.1	2.6	2.7
Haryana	–	3.0	3.1
Himachal Pradesh	–	1.7	1.8
Jammu and Kashmir	1.4	1.2	1.1
Karnataka	1.9	2.1	2.2
Kerala	1.4	1.6	1.7
Maharashtra	2.3	2.9	3.0
Manipur	2.3	2.1	2.2
Orissa	1.9	1.3	1.4
Punjab	–	3.0	3.0
Rajasthan	1.5	2.0	1.9
Tamil Nadu	1.8	2.3	24
Tripura	1.7	2.9	2.5
Uttar Pradesh	1.4	1.7	1.8
West Bengal	1.4	2.1	2.3
Delhi	2.3	2.7	2.8
Pondicherry	–	–	2.0

Table 1: Estimated Semi-In Trend Equation for PCSDP of Each State at 1980-81 Prices for Three Alternative Time Periods

State	1960-61 to 1995-96			1968-69 to 1995-96			1970-71 to 1995-96		
	Intercept	Slope	$\bar{R}^2$	Intercept	Slope	$\bar{R}^2$	Intercept	Slope	$\bar{R}^2$
Andhra Pradesh	6.96 (327.9)	0.0154 (15.46)	0.87	6.84 (240.1)	0.0192 (16.07)	0.90	6.87 (201.9)	0.0188 (13.65)	0.88
Arunachal Pradesh	-	-	-	-	-	-	6.38 (168.0)	0.0484 (31.45)	0.97
Assam	-	-	-	-	-	-	6.81 (200.0)	0.0167 (12.13)	0.85
Bihar	6.54 (256.4)	0.0138 (11.52)	0.79	6.44 (193.8)	0.0178 (12.84)	0.86	6.44 (161.5)	0.0178 (11.04)	0.83
Gujarat	7.20 (212.8)	0.0206 (12.90)	0.82	7.06 (139.3)	0.0262 (12.36)	0.85	7.04 (116.8)	0.0268 (10.97)	0.83
Haryana	-	-	-	7.16 (212.8)	0.0298 (21.19)	0.94	7.15 (191.9)	0.0301 (19.09)	0.94
Himachal Pradesh	-	-	-	7.13 (187.3)	0.0166 (10.41)	0.80	7.08 (169.1)	0.0182 (10.71)	0.82
Jammu and Kashmir	7.06 (333.1)	0.0141 (14.08)	0.85	7.11 (221.7)	0.0124 (9.25)	0.76	7.13 (194.2)	0.0114 (7.66)	0.70
Karnataka	7.06 (334.7)	0.0184 (18.55)	0.91	7.01 (203.1)	0.0204 (14.16)	0.88	6.98 (177.0)	0.0215 (13.48)	0.88
Kerala	7.05 (244.8)	0.0141 (10.42)	0.75	7.02 (131.8)	0.0154 (6.93)	0.63	6.98 (111.5)	0.0165 (6.51)	0.62
Maharashtra	7.36 (248.8)	0.0233 (16.71)	0.89	7.24 (170.7)	0.0283 (15.98)	0.90	7.20 (149.2)	0.0298 (15.21)	0.90
Manipur	6.82 (316.7)	0.0224 (22.12)	0.93	6.86 (213.1)	0.0208 (15.45)	0.90	6.82 (195.7)	0.0222 (15.72)	0.91
Orissa	6.72 (178.3)	0.0193 (10.84)	0.77	6.88 (176.6)	0.0126 (7.73)	0.68	6.86 (150.0)	0.0134 (7.25)	0.67
Punjab	-	-	-	7.32 (513.0)	0.0291 (48.78)	0.99	7.30 (501.4)	0.0299 (50.69)	0.99
Rajasthan	6.96 (180.4)	0.0145 (7.98)	0.64	6.84 (111.3)	0.0194 (7.56)	0.67	6.85 (93.73)	0.0188 (6.34)	0.61
Tamil Nadu	7.10 (214.7)	0.0176 (11.31)	0.78	6.97 (136.6)	0.0228 (10.69)	0.81	6.93 (117.1)	0.0242 (10.08)	0.80
Tripura	6.86 (219.6)	0.0167 (11.35)	0.78	6.67 (204.0)	0.0238 (17.41)	0.92	6.64 (181.8)	0.0251 (16.96)	0.92
Uttar Pradesh	6.89 (321.1)	0.0136 (13.46)	0.84	6.81 (248.5)	0.0171 (14.91)	0.89	6.78 (217.5)	0.0178 (14.11)	0.89
West Bengal	7.14 (219.7)	0.0144 (9.38)	0.71	6.97 (162.6)	0.0291 (13.28)	0.87	7.65 (135.4)	0.0280 (12.22)	0.86
Delhi	7.77 (259.5)	0.0233 (16.48)	0.88	7.68 (159.1)	0.0268 (13.28)	0.87	7.65 (135.4)	0.0280 (12.22)	0.86
Pondicherry	-	-	-	-	-	-	7.49 (120.3)	0.0197 (7.79)	0.70

Note: Figures in parentheses are t-ratios of the estimates.

a few data related issues in Marjit and Mitra (1996) and Ghosh et al that need commenting upon. In the first of these papers, the SDPs are converted to real terms by deflating nominal variables by the 1970-71 wholesale price level. In the second, the analysis is based on the real per capita SDP arrived at by deflating nominal variables by the consumer price index number for agricultural labourers, although the series of per capita SDP at constant prices is available. In both cases, interstate price variations are not corrected for. As opposed to these procedures, the present exercise finds it more prudent to use the available real SDP figures at 1980-81 prices from 1980-81 onwards. The conversion of the series of SDP at 1970-71 prices to those at 1980-81 prices for the earlier years has been done in the conventional way. Needless to say, the interstate price variation factor remains uncorrected for by this procedure. However, other possible biases which may be arise due to the two deflation procedures outlined above are avoided by our exercise.

Marjit and Mitra raise an interesting theoretical question also. In the presence of factor mobility (as should be the case between Indian states), they wonder how far the predictions of the convergence hypothesis are valid. With perfect factor mobility, technologically similar regions must instantaneously achieve equality of per capita incomes, thus removing any possibility of differential growth rates. Thus, the absence of imperfect factor mobility is a necessary condition for the convergence theory to hold.

Alternatively, in the presence of factor mobility, differential growth rates across regions do not imply convergence (on account of diminishing returns). In other words, even if a negative relationship between initial per capita income and the overall growth rate is observed, it may not indicate convergence.

Nagaraj et al (1997) consider the growth performance of Indian states during the 1960-94 period and find evidence of conditional convergence, i e, convergence relative to state specific steady states. They also assess the contribution of various indicators of physical, economic and social infrastructures to growth trends. Compared to this paper, our own viewpoint is rather mundane. In particular, we have not been able to come to any definite way of establishing or rationalising the existence of the state specific steady states [see in this connection Quah 1993].

More recently, Rao et al (1999) made an interesting study on the issue of interstate variation in growth. This study focused its attention not only on the question of convergence but also tried to examine the reasons for the observed pattern. They found the states to follow divergent growth paths, which they try to explain in terms of other variables besides the initial level of income. But this part of their analysis is beset with some problems. One may see the comments by Subrahmanyam (1999) in this context.

As the literature survey indicates, a consensus is yet to emerge on the convergence issue relating to the Indian states. It is therefore worth our while to take a fresh look into the question.

II
Behaviour of Growth Rates

We begin our analytical description with growth rates enjoyed by the respective states over time. Interestingly enough, even for a straightforward issue such as this, there seems to be no unique way of examining the matter.

For one thing, while the CSO estimates for SDP data are available from the year 1960-61, they do not cover all states, either because some of the present states did not exist at the time, or because a few of the existing states did not have the SDPs estimated. A better statewise data set can be found beginning 1970-71. In what follows, growth rates were computed for both series. However, a third intermediate series, beginning 1968-69, was also considered. This particular year was used as an alternative in view of the fact that it was around this time that the severe drought of the mid-1960s began to peter out and the effect of the green revolution became perceptible. The terminal year for all three series was taken to be 1995-96 and SDPs for each series were computed at 1980-81 prices.

The secular behaviour of per capita SDP was computed by fitting a linear ($y_t = \alpha + \beta t$) as well as a semilog ($\ln y_t = a+bt$) trend to the data for each state for all the three series. For both forms, the estimated coefficients of time are positive and significant. This means that for all the states, per capita SDP had an increasing trend, though the $\bar{R}^2$ values differ across them. We present in Table 1 the estimates of the semilog trend curve for each state for all three series.

The annual (compound) rates of growth for the states, as obtained from the semilog curve for all the three series, are given in Table 2. The purpose of this table is to identify the states which have grown relatively faster or slower than others. While the growth rate, on an average, appears to be around 2 per cent, the surprising results here are that Arunachal Pradesh, a relatively new state had shown a growth rate of around 5 per cent, while Kerala and West Bengal (for the period starting 1960-61) had evidenced growth rates below 1 per cent. A disturbing feature is that for some of the states, such as Haryana, Orissa and Jammu and Kashmir, the growth rates differed significantly across the three data sets. Thus, the growth rates of a given

Table 3: Mean and Other Summary Measures of the Year-to-Year Percentage Growth Rates in PCSDP of States, 1970-71 to 1995-96

State	Arithmetic Mean of Growth Rates	Standard Deviation of Growth Rates	Coefficient of Variation	Maximum Growth Rate	Minimum Growth Rate
Andhra Pradesh	1.97	7.06	358.38	16.75	-10.88
Arunachal Pradesh	5.09	6.71	131.83	26.56	-6.33
Assam	1.41	4.04	286.52	12.25	-7.44
Bihar	1.61	5.27	327.33	8.64	-8.12
Gujarat	3.13	13.28	424.28	39.73	-22.54
Haryana	2.80	7.30	260.71	22.11	-9.32
Himachal Pradesh	2.16	6.40	296.30	11.32	-11.67
Jammu and Kashmir	1.41	5.02	356.03	10.51	-13.16
Karnataka	2.15	5.95	276.74	12.67	-8.19
Kerala	2.09	3.71	177.51	8.91	-5.81
Maharashtra	3.48	5.50	158.04	17.53	-7.23
Manipur	2.53	4.86	192.09	17.87	-5.71
Orissa	1.67	10.53	630.54	18.36	-18.23
Punjab	2.88	2.41	83.68	6.47	-1.64
Rajasthan	2.03	12.69	625.12	38.30	-16.79
Tamil Nadu	2.72	6.94	255.15	16.16	-14.80
Tripura	3.01	6.70	222.59	20.02	-14.63
Uttar Pradesh	1.51	6.23	412.58	20.19	-16.01
West Bengal	2.70	5.24	194.07	19.01	-6.08
Delhi	3.18	11.13	350.00	41.97	-26.04
Pondicherry	1.92	5.97	310.94	10.06	-16.30

state seem to differ across the three sub-periods. However, one result appears to be quite robust, viz, that the growth rates for most states implied by the series beginning 1960-61 fall short of the corresponding growths displayed by the series starting 1968-69 and 1970-71. Clearly then, the green revolution had a special impact on the growth rates of all states (except Andhra Pradesh, Jammu and Kashmir, Manipur and Tripura). This observation leads one to expect that the agricultural sector must have played a significant role in the development of the states. It is tempting in fact to conjecture that the states which performed better in terms of the growth rates in Table 2, were perhaps better off in terms of their agricultural performance. This conjecture will receive some support from the results reported later.

The analysis of the growth rates, was completed by computing the year-to-year growth rates for each state/union territory also. The features we noticed are: first, there are large fluctuations in these rates for each state and secondly, there is no state which did not experience a negative per capita SDP growth rate some year or the other.

To highlight these features further and to sharpen our understanding of the fluctuation in the year-to-year growth rates, we present in Table 3 the arithmetic averages of these growth rates for each state along with the standard deviations, coefficient of variations, the maximum and the minimum rates over the whole period. Looking at the CVs and the maximum and the minimum rates, we find large fluctuations for Orissa, Rajasthan, Gujarat, Uttar Pradesh and Delhi. On the other hand, Arunachal Pradesh, Punjab, Kerala, Maharashtra, Manipur and West Bengal display relatively uniform year-to-year growth.

The fact that there could be alternative ways of calculating the growth rate of a variable over a given period of time and that one may arrive at divergent results depending on the formula used need emphasis. We have presented four different rates in Table 4, the first three of which are respectively the arithmetic mean, the geometric mean and the median of the year-to-year rates and the fourth one is trend exponential growth rate reported in Table 2. It is seen that there are variations among the alternatives given though the ranking of the states in terms of the alternatives remains the same. It is important to note that the distribution of the year-to-year rates is considerably skewed as is evidenced by the considerable difference between the arithmetic mean and the median. Incidentally, the present exercise serves as a reminder and puts a caution against drawing conclusions regarding growth rates in a naive manner.

This preliminary investigation makes it evident that one should not hope to discover much homogeneity among the Indian states. Keeping this in mind, we proceed to investigate the convergence question à la Barro and Sala-i-Martin.

III
Analysis

σ-Convergence

As is well known, the concept of σ-convergence does not relate directly to the growth rates of economies. Instead, it focuses attention on the dispersion of per capita outputs over a cross-section of economies at each point of time. The economies are said to satisfy the condition of σ-convergence if this dispersion decreases over time. A homogeneous group of sub-economies, such as regional subgroups within a national economy, are less likely to differ from each other on account of differences in parametric specifications or random causes. Consequently, they are expected to be σ-convergent. This however, is not borne out by the Indian states.

We begin by calculating the CV of per capita SDP at 1980-81 prices across states for each year. Then, we fit a linear time trend over the series so generated. This part of the exercise is carried out for the period 1970-71 through 1995-96, though in doing so, the data for Andaman and Nicobar Islands, Arunachal Pradesh, Meghalaya, Nagaland and Sikkim have been left out, mainly because of missing observations.

The striking result that emerges here is that the trend of the CV is increasing. The adjusted $\bar{R}^2$ values are found to be high and t-ratios for the intercept as well as the slope coefficient are highly significant. It is clear therefore that for the period under review, the Indian states do not exhibit σ-convergence. In other words, there is strong evidence that the Indian states diverged in terms of per capita real SDP over the 25-year period under consideration. The details of the analysis are presented in Table 5.

In order to have deeper insight into the nature of divergence, the same CV-trend analysis was carried out for broad components of per capita SDP, viz, the agricultural, the manufacturing and the tertiary sectors, where the last one was defined to include all sectors other than agriculture and manufacturing. It was found that the CVs for per capita SDP originating in both agriculture and manufacture share the positive trend with total per capita SDP, but the same for the tertiary sector shows a negative trend. Further, the values of $\bar{R}^2$ were high in all cases. Interestingly enough, the time coefficient turns out to be the highest for the equation for agriculture. As in the last section, this leads to the conclusion that agriculture has an important role to play in explaining the increasing divergence of per capita SDP amongst states/union territories.

Table 4: Various Averages of the Year-to-Year Percentage Growth Rates in PCSDP of States over 1970-71 to 1995-96

State	Arithmetic Mean	Geometric Mean	Median	Trend Exponential Growth Rate
Andhra Pradesh	1.97	1.02	2.13	1.9
Arunachal Pradesh	5.09	1.05	3.43	5.0
Assam	1.41	1.01	1.45	1.7
Bihar	1.61	1.01	2.46	1.8
Gujarat	3.13	1.02	1.23	2.7
Haryana	2.80	1.02	1.10	3.1
Himachal Pradesh	2.16	1.02	2.86	1.8
Jammu and Kashmir	1.41	1.01	1.17	1.1
Karnataka	2.51	1.02	1.44	2.2
Kerala	2.09	1.02	2.59	1.7
Maharashtra	3.48	1.03	3.31	3.0
Manipur	2.53	1.02	2.87	2.2
Orissa	1.67	1.01	3.87	1.4
Punjab	2.88	1.03	2.71	3.0
Rajasthan	2.03	1.01	1.29	1.9
Tamil Nadu	2.72	1.02	3.09	2.4
Tripura	3.01	1.03	2.21	2.5
Uttar Pradesh	1.51	1.01	1.59	1.8
West Bengal	2.70	1.02	2.25	2.3
Delhi	3.18	1.02	3.09	2.8
Pondicherry	1.92	1.02	2.51	2.0

Figure 1: Behaviour of CV of Per Capita SDP Across States, 1970-71 to 1995-96

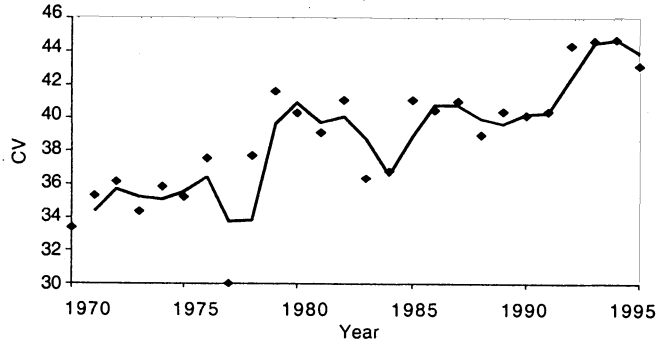
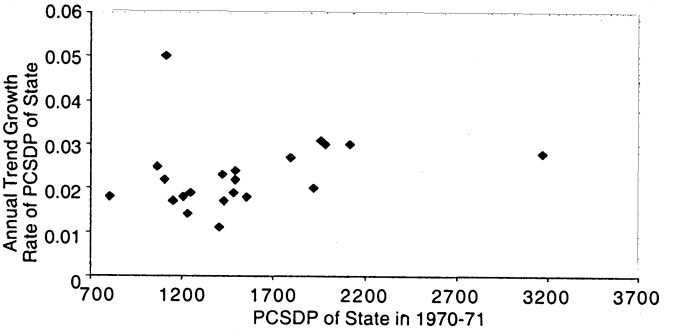


Figure 2: Scatter of States' Estimated Annual Trend Growth Rates of PCSDP during 1970-71 to 1995-96 and Values of Their PCSDP in 1970-71



Further, the tertiary sector is the only part of total SDP that has had a stabilising influence on across-state per capita SDPs (Table 5).

Since the tertiary sector represents a large aggregate, it was necessary to look into the behaviour of its different component separately. This was done by breaking it up further into the following four components (using SDP data): per capita SDP originating in (a) transport, storage and communication, (b) electricity, gas and water, (c) banking and insurance, and (d) others (i e, the residual).[1]

The CV trends were found to be increasing for (a) and (b) and falling for (c) and (d). However, in case of (a) and (b), while the estimated coefficients of time were significant, the adjusted $\bar{R}^2$ values were low. For (c) and (d) on the other hand, both the coefficient and the adjusted $\bar{R}^2$ values were encouraging. The results for (a) and (b) above being unsatisfactory, a new category, infrastructure, was defined to consist of (a), (b) and (c). In this case, the CV trend shows a significant decline and the t-ratios of the estimated time coefficient as well as the adjusted $\bar{R}^2$ values turn out to be good.

Although the CV of per capita SDP originating in the 'others' sector (a heterogeneous group) had a negative trend, not all its components shared this property. For instance, the estimated trend is observed to be positive for construction and trade, hotels and restaurants, but negative for real estate ownership as well as public administration.

The interesting findings of this section are, therefore, that the states have diverged primarily in terms of their per capita agricultural output but tended to converge in respect of infrastructure. This is especially important as it is commonly alleged that an imbalance in infrastructural development is the primary cause of diversity among the Indian states. Our findings are seen to negate this conclusion.

β-Convergence

As already noted neo-classical theory suggests that at low levels of per capita output, an economy grows at a high rate and vice versa. If two economies, similar in terms of parametric specifications, differ only with respect to their per capita output levels at some initial point of time, then at any subsequent point of time, the economy that started off with a higher per capita output should grow at a slower rate. This leads to the hypothesis of absolute or β-convergence, which predicts a negative relationship between the rates of growth enjoyed by a cross-section of economies and the levels of their per capita outputs at a given initial point of time.

Our next step in this paper is to test for β-convergence amongst Indian states. Clearly, the results obtained so far lead us to believe that the hypothesis will be rejected. Nevertheless, academic rigour demands that this be actually verified. The problem was studied in three different ways. First, we looked at the line of best fit through a scatter of estimated compound growth rates for the different states/union territories and their initial per capita SDPs, viz, per capita SDP in 1970-71 (Y_{70}). Denoting the per capita SDP at t by Y_t, this involves first estimating the relationship $\ln Y_t = a+bt$ for each region and then regressing the estimated value of b on Y_{70}. The phenomenon of β-convergence occurs if the latter regression line yields a negative coefficient for Y_{70}. The result of this regression and the corresponding scatter are shown in Table 6 and Figure 2 respectively. However, Y_{70} may be a weak indicator of initial conditions. Hence, an alternative indicator was tried, viz, the average of per capita SDPs for the first five years. The results are given in row 2 of Table 6 and the scatter is shown in Figure 3. A third measure of average growth rate per annum may be taken to be $1/T (\ln(Y_T/Y_0))$, where T refers to the length of the period and and Y_0 and Y_T to the initial and final per capita incomes. The growth rates so calculated may then be regressed on Y_{70} as well as the average per capita SDP for the first five years. The results are reported in rows 3 and 4 of Table 6 and shown in Figures 3, 4 and 5.

In all the cases, it is clear that there is no evidence of β-convergence. If anything, there is evidence of divergence. The coefficients of the indices of initial per

Table 5: Estimated Linear Trend Equations for Different Series of CVs of PCSDPs of States, 1970-71 to 1995-96

Row No	Dependent Variable	Estimated Value		$\bar{R}^2$	F-value
		Intercept	Coefficient of Time		
1	CV of states' per capita SDP	33.636	0.385	0.635	44.56
		(37.74)	(6.68)		
2	CV of states' per capita SDP originating in agriculture	28.930	1.156	0.938	381.90
		(33.56)	(19.54)		
3	CV of states' per capita SDP originating in manufacture	70.377	.0800	0.688	56.02
		(45.16)	(7.49)		
4	CV of states' per capita SDP originating in tertiary sector	74.067	-0.570	0.761	80.40
		(79.89)	(-8.97)		
5	CV of states' per capita SDP originating in infrastructure	86.434	-0.796	0.823	116.96
		(80.58)	(-10.82)		

Note: Figures in parentheses are t-ratios of the estimates.

Figure 3: Scatter of States' Average Annual Growth Rates of PCSDP during 1970-71 to 1995-96 and Averages of Their PCSDPs during 1970-71 to 1974-75

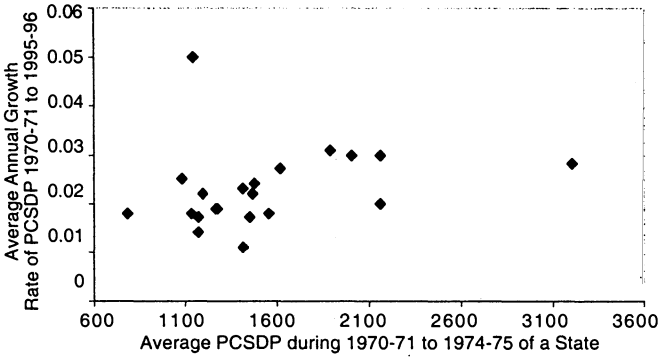
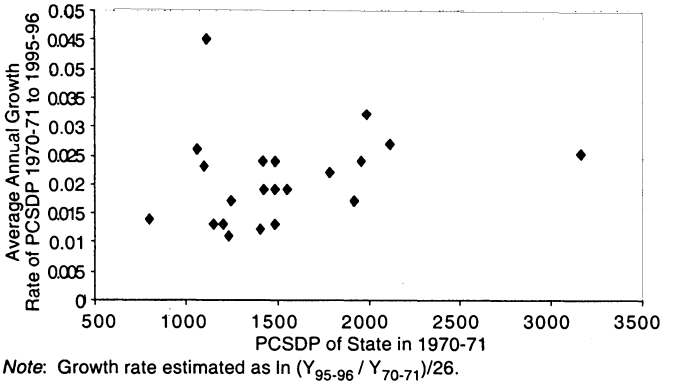


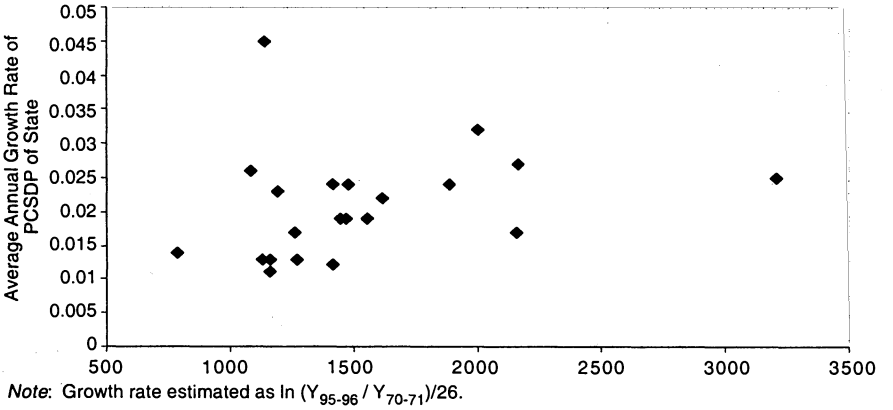
Figure 4: Scatter of Average Annual Growth Rates of PCSDP during 1970-71 to 1995-96 and Value of Their PCSDPs in 1970-71



Note: Growth rate estimated as ln $(Y_{95\text{-}96} / Y_{70\text{-}71})/26$.

capita income are positive and significant at the 5 per cent level in all the regressions. Of course, the relatively low values of $\bar{R}^2$ suggest that there are other important factors that need to be taken into account in explaining the behaviour of per capita SDP growth rates.[2] The scatter diagrams in Figure 2 to Figure 5 reveal, however, that there is an outlier state with a high initial value of per capita SDP and a growth rate of 2 per cent. The data reveal this to be the case of Delhi. Removal of this outlier leads to improvement in the regression results reported above. This strengthens our conclusion that there is no evidence of β -convergence across states in India.

Figure 5: Scatter of Annual Average Growth Rate of PCSDP during 1970-71 to 1995-96 and Average Value of PCSDPs during 1970-71 to 1974-75



Note: Growth rate estimated as ln $(Y_{95\text{-}96} / Y_{70\text{-}71})/26$.

Rank Analysis

We proceed now to study the behaviour of the states in terms of the ranking of their PCSDP's over time. The states are ranked in descending order of the PCSDP. The results are recorded in Table 7 for the period 1970-71 to 1995-96. A quick glance at the table reveals a rather stable pattern of rankings over time. States which had a low rank in 1970-71, continued to have a low rank throughout the period. This, for example, is the case with Andhra Pradesh, Assam, Bihar, Manipur, Orissa and so on. The opposite is the case with Delhi, Goa, Haryana, Maharashtra, Punjab, etc. Moreover, the regions which had a medium ranking, such as Himachal Pradesh, Karnataka and West Bengal maintained, by and large, the same relative position. Of course, there have been some fluctuations in the rank enjoyed by any given state, but the order of fluctuation has not been too large.

Ensuring that the rankings have not changed appreciably over time calls for the calculation of a rank correlation matrix. The results are shown in Table 8. It is seen that the correlation coefficients are all significantly high, indicating that there is a high degree of stability in the relative position of the states in different years. In particular, they have not changed appreciably with the passage of time.

In order to test stability of the degree of consistency or concordance between the rankings of the states in different years, taken as a whole, we calculated the coefficient of concordance W that is defined as

$$\text{Coefficient of concordance (W)} = \frac{12S_w}{m^2(n^2-n)}$$

where m is the number of rankings of the states (one for each of 26 years from 1970-71 to 1995-96), n is the number of individuals or objects (here the number of states, 22 in all, being ranked) and S_w is

Table 6: Estimated Linear Regression of Growth Rates of PCSDPs of States on Their Respective Initial Per Capita SDPs

Equation No	Dependent Variable	Estimated value			$\bar{R}^2$	F-value
		Intercept	Initial Value of Per Capita SDP			
			Y70	Average of PCSDP's for First Five Years		
1	Estimated trend growth rate	0.017	0.0000039	_	0.010	1.21
		(2.94)	(1.10)			
2	Estimated trend growth rate	0.171		0.0000038	0.011	1.23
		(3.08)	_	(1.11)		
3	$\{\ln(Y_T / Y_0)\}/T$	0.0156	0.0000034	_	-0.002	0.97
		(2.78)	(0.98)			
4	$\{\ln(Y_T / Y_0)\}/T$	0.0152		0.0000038	0.013	1.26
		(2.81)	_	(1.12)		

Note: Figures in parentheses are t-ratios.

Table 7: Ranking of the states according to PCSDP between 1970-71 to 1995-96

State	Rank in the year																									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1944	1995
Andhra Pradesh	16	15	19	14	13	16	17	17	14	14	15	13	12	13	14	14	14	13	13	12	15	14	16	14	15	14
Assam	19	17	15	19	17	18	20	20	21	18	19	16	16	16	16	15	16	16	21	21	20	19	20	19	20	21
Bihar	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Delhi	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2
Goa	3	2	3	3	2	2	2	2	4	3	2	4	2	2	2	4	4	2	2	2	2	2	1	2	1	1
Gujrat	7	8	12	9	11	9	8	8	7	7	7	7	7	7	7	7	7	8	7	7	7	7	7	7	6	6
Haryana	5	5	5	6	6	6	6	6	6	6	6	6	5	6	6	5	5	6	5	6	4	4	6	5	5	5
Himachal Pradesh	9	9	8	7	8	7	9	9	8	11	10	8	10	10	12	11	9	10	11	8	9	11	10	11	11	11
Jammu and Kashmir	10	10	9	10	9	10	10	10	10	9	8	9	8	9	9	9	10	14	14	13	14	15	15	15	17	17
Karnataka	13	13	13	12	10	12	14	12	12	12	11	12	11	11	11	12	11	9	10	11	11	9	9	9	9	10
Kerala	14	12	11	13	12	13	12	15	15	13	12	14	14	19	15	16	15	15	17	15	13	13	13	12	12	12
Maharashtra	4	6	6	5	5	5	5	5	5	5	5	5	6	5	5	6	6	5	6	5	5	6	4	4	3	3
Manipur	20	21	20	17	14	15	15	13	16	15	14	15	15	14	13	13	13	12	15	17	16	12	14	13	14	16
Madhya Pradesh	15	14	14	15	16	14	16	16	18	19	16	17	17	17	19	18	20	17	20	20	17	20	18	16	18	18
Orissa	18	20	17	18	21	19	21	18	17	20	17	18	21	18	20	17	17	20	16	16	21	21	21	20	21	20
Pondicherry	6	3	2	2	3	4	4	4	2	2	3	2	3	3	3	3	2	4	4	4	6	5	5	6	7	7
Punjab	2	4	4	4	4	3	3	3	3	4	4	3	4	4	4	2	3	3	3	3	3	3	3	3	4	4
Rajasthan	11	16	16	16	18	17	13	14	13	17	21	19	20	15	17	20	18	21	12	14	12	16	12	17	13	15
Tamil Nadu	12	11	10	11	15	11	11	11	11	10	13	11	13	12	10	10	12	11	9	9	8	8	8	8	8	8
Tripura	21	18	21	20	20	21	19	21	20	16	18	21	19	21	21	21	21	19	19	18	18	17	17	22	16	13
Uttar Pradesh	17	19	18	21	19	20	18	19	19	21	20	20	18	20	18	19	19	18	18	19	19	18	19	18	19	19
West Bengal	8	7	7	8	7	8	7	7	9	8	9	10	9	8	8	8	8	7	8	10	10	10	11	10	9	9

Table 8: Matrix of Rank Correlation Coefficient of the Ranks of States in Different Pairs of Years

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1970	1.00																									
1971	0.96	1.00																								
1972	0.93	0.96	1.00																							
1973	0.94	0.97	0.95	1.00																						
1974	0.90	0.94	0.92	0.96	1.00																					
1975	0.95	0.96	0.96	0.99	0.97	1.00																				
1976	0.96	0.96	0.93	0.97	0.94	0.97	1.00																			
1977	0.97	0.94	0.92	0.97	0.95	0.98	0.98	1.00																		
1978	0.96	0.94	0.91	0.98	0.93	0.96	0.97	0.98	1.00																	
1979	0.91	0.95	0.90	0.96	0.95	0.95	0.96	0.95	0.96	1.00																
1980	0.89	0.94	0.91	0.96	0.96	0.96	0.93	0.95	0.94	0.97	1.00															
1981	0.92	0.94	0.92	0.98	0.96	0.97	0.93	0.95	0.96	0.97	0.97	1.00														
1982	0.90	0.95	0.90	0.95	0.97	0.96	0.93	0.93	0.93	0.97	0.97	0.98	1.00													
1983	0.93	0.92	0.89	0.95	0.94	0.95	0.93	0.97	0.96	0.95	0.94	0.97	0.96	1.00												
1984	0.91	0.93	0.90	0.95	0.95	0.95	0.95	0.96	0.95	0.97	0.95	0.97	0.98	0.98	1.00											
1985	0.97	0.91	0.90	0.94	0.94	0.95	0.92	0.95	0.94	0.96	0.96	0.98	0.97	0.97	0.98	1.00										
1986	0.92	0.92	0.90	0.96	0.95	0.96	0.93	0.96	0.96	0.96	0.96	0.98	0.97	0.97	0.98	0.99	1.00									
1987	0.86	0.91	0.87	0.93	0.95	0.95	0.91	0.93	0.91	0.94	0.95	0.95	0.96	0.94	0.96	0.96	0.96	1.00								
1988	0.93	0.89	0.85	0.93	0.88	0.91	0.93	0.95	0.97	0.93	0.89	0.91	0.89	0.94	0.94	0.91	0.94	0.91	1.00							
1989	0.94	0.92	0.87	0.95	0.90	0.93	0.93	0.95	0.98	0.95	0.92	0.94	0.91	0.94	0.93	0.92	0.94	0.91	0.98	1.00						
1990	0.95	0.94	0.89	0.94	0.91	0.94	0.96	0.95	0.95	0.94	0.90	0.92	0.91	0.92	0.93	0.89	0.91	0.91	0.96	0.96	1.00					
1991	0.87	0.89	0.84	0.91	0.90	0.92	0.93	0.93	0.92	0.95	0.91	0.92	0.92	0.91	0.95	0.92	0.93	0.95	0.95	0.95	0.97	1.00				
1992	0.91	0.90	0.85	0.92	0.89	0.92	0.95	0.94	0.94	0.93	0.89	0.90	0.89	0.90	0.92	0.88	0.90	0.91	0.95	0.95	0.99	0.98	1.00			
1993	0.91	0.90	0.87	0.93	0.92	0.95	0.93	0.94	0.93	0.92	0.92	0.93	0.92	0.91	0.95	0.93	0.93	0.96	0.93	0.93	0.96	0.97	0.96	1.00		
1994	0.90	0.89	0.82	0.90	0.87	0.90	0.93	0.92	0.91	0.92	0.87	0.87	0.87	0.88	0.91	0.86	0.88	0.91	0.94	0.94	0.98	0.97	0.99	0.96	1.00	
1995	0.88	0.89	0.81	0.89	0.85	0.88	0.91	0.89	0.90	0.92	0.88	0.86	0.87	0.86	0.88	0.85	0.86	0.90	0.93	0.94	0.96	0.96	0.97	0.93	0.99	1.00

Figure 6: Inter-temporal Movement of RC_t and RCa_t

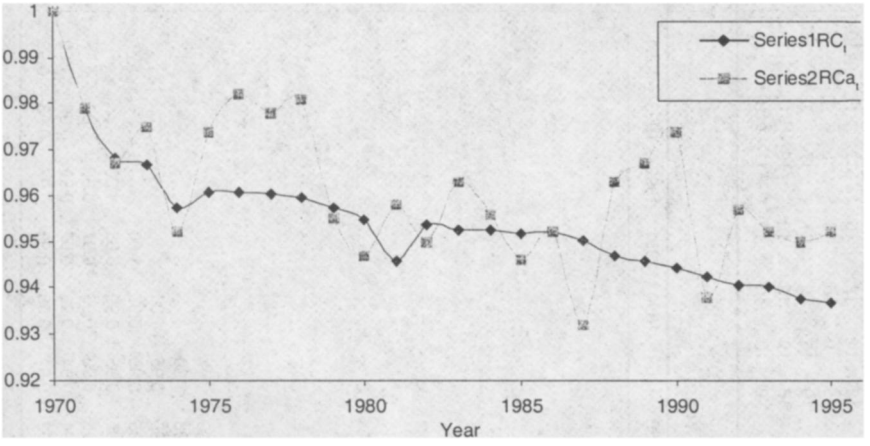
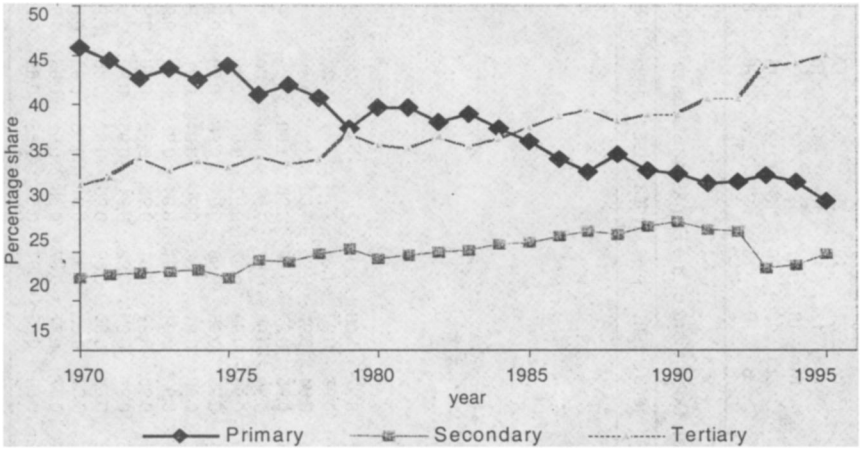


Figure 7: Share of Primary, Secondary and Tertiary Sectors in GPD for All-India: 1970-71 to 1995-96



the sum of squares of deviations of the n sum of ranks allotted to the states in each year from their respective means. In our case m = 26, n = 22 and S_w = 567685.1 and hence W = 0.9484, which is significant at 1 per cent level.

In this context, it is useful to compute the average or mean rank of each state/union territory to get an idea of a state's average ranking relative to other states for the entire period. The standard deviation around this average shows the extent of deviation from this average position. It is seen that the fluctuation has been the largest in case of Rajasthan, Tamil Nadu, Tripura, Assam, Jammu and Kashmir, Kerala and Manipur. Of course, the standard deviation does not show whether the state has tended to be primarily above or below its average rank. The latter is shown by the number of worse (better) years, i e, by the number of times a state has exceeded (fallen short of) its average rank. Bihar is seen to be the worst off with respect to its mean achievement, even though the standard deviation is smaller than that of states such as Rajasthan and Tamil Nadu. The low standard deviation of the ranks for Bihar confirms that Bihar has been consistently bad. Table 9 portrays the entire picture.

As a next exercise in this direction, we compute the weighted average of per capita SDPs of different states in a year t to get the national average per capita SDP for that year ($\overline{y}_t$), viz, $\overline{y} = \Sigma_i n_{it} y_{it} / \Sigma_i n_{it}$, where y_{it} is the per capita SDP and n_{it} is the population in year t. A state's performance can be judged by considering its divergence from the national average over the whole period.

We compute this average divergence in two different ways. First, we look at the measure $\Sigma_t \mid y_{it} - \overline{y}_t \mid$ / (total number of years). The magnitude of this measure shows how far a state has diverged from the national average. The results are given in the second column of Table 10. Delhi, Goa, Pondicherry and Punjab are seen to have high values for this measure, whereas Karnataka is characterised by a low measure.

The above measure, however, does not reveal whether a state is predominantly above or below the national average. To find this, we construct a second measure, $\Sigma_t (y_{it} / \overline{y}_t)$ /(number of years). Table 10 also shows these results. When the measure is larger than unity, the state in question has performed on the average better than the national average per capita SDP. It is interesting to note that the states with a high value of the absolute difference are also characterised by a value of this ratio that is larger than unity. The exception seems to be West Bengal, which has a low value for the first measure thereby indicating a stable per capita SDP near the national average, but a value of the income ratio greater than unity. Hence, West Bengal has stayed near, though above, the national average for most of the years.

Index of Rank Concordance

Boyle and McCarthy (1997) proposed a simple measure for assessing the inter-temporal mobility of states (or countries) in terms of the ranking of the states by income levels. The measure seeks to capture the change in the rankings as reflected by Kendall's index of rank concordance.

Actually, they proposed a multi-annual version (RC_t) and a binary version (RCa_t) of the measure. The first is defined as

$$RC_t = \frac{\text{Variance } \sum_{t=0}^{T} AR(Y)_{it}}{\text{Variance } \{(T+1)^* \text{ AR } (Y)_{i0}\}}$$

where $AR(Y)_{it}$ = the actual rank of country i's per capita income level in year t; $AR(Y)_{io}$ = the actual rank of country i's per capita income level in the initial year 0; (T+1) = number of years for which data are used in computing the index.

The binary measure, on the other hand, can be obtained by considering the ranks in years t and 0 and is given by

$$RCa_t = \frac{\text{Variance } \{AR(Y)_{it} + \text{AR } (Y)_{io}\}}{\text{Variance } \{2^* \text{ AR}(Y)_{io}\}}$$

Clearly, the multi-annual measure, extending over the whole period, contains all possible pairs of years for which the binary measure could be computed.

The intuitive interpretation of this measure is not far to seek. First of all, let

us note that the multiperiod measure can be calculated for every value of T, i e, T= 0,1, 2,... Secondly, the denominator gives the variance of the sum of the rankings if the relative position of the states remained unchanged in every period from 0 to T. This is obtained by multiplying the base period ranking by (T+1) and then calculating the variance of the product across states. The numerator, on the other hand, measures the inter-state variation of the sum of the actual rankings of the states over the period from 0 to T.

Now, it can be shown that the variance of the sum of rankings (i e, denominator of RC_t) is maximum if the states did not have any change in the ranking over time. The variance in the numerator, however, could be zero since the rankings may change in such a manner that the sum becomes the same for all the states. Hence, the value of the rank concordance measure will lie between zero and unity. The closer the value of the measure to zero the greater is the extent of mobility within the distribution.

We have calculated both the multi-annual and binary measure for the inter-temporal mobility of the states in terms of PCSDP. These results are presented in Table 11 and are shown in Figure 6. There is a downward trend in both RC_t (series 1) and RCa_t (series 2) though the binary measure fluctuates more. However, the most important point to note is that the values come down from unity very steadily to about 0.94 over the 25 years under study. This observation therefore corroborates our earlier findings that the mobility of the states within the overall distribution has been virtually nil implying thereby that the states have, by and large, maintained the same relative position over the period.

Structural Variations

The final step in our analysis of interstate disparities consists of looking at structural variations amongst the states. The PCSDP data is divided up into three major sectors, i e, those originating in primary, secondary and tertiary sectors. To keep matters simple, we define primary to include agriculture, forestry and logging and fishing. The secondary sector is identified with manufacturing and tertiary consists of the rest. We denote the share of the k-th sector product in the total SDP of state i in period t by s_{ikt}.

It was observed that the share of the manufacturing sector has remained mostly stable or increased (marginally) in almost all states, except Assam and Manipur. Second, the share of the primary sector has fallen sharply for all the states and that for the tertiary sector has risen (except for Delhi and Goa). Third, the share of the tertiary sector has overtaken that of the primary sector in most states, though the time point at which this has happened differs from state to state. The overtaking has occurred primarily in the late 1970s and early 1980s. There are cases, however, like Haryana and Punjab, where the overtaking is yet to come about. Finally, a striking feature of all the states is that the changes in the primary and the tertiary sectors are roughly equal in magnitude and opposite in sign for all the states, thereby confirming the stable trend in manufacturing already noted above.

The findings are confirmed by regressing the sectoral shares on time for each state. The coefficients of time were highly significant in almost all the regressions, suggesting the presence of significant trends in shares of the primary, manufacturing and tertiary sectors for each state.

The size of the coefficients indicated that the rate of change per unit of time had been the highest for the primary sector, followed by the tertiary sector and then by the manufacturing sector. The rise in the tertiary sector in most states has been much faster than the risein the share of the manufacturing sector. The average change (i e, the average value of the time coefficients) across all states are found to be as follows:

Primary: decline by 8 per cent points;
Secondary: increase by 2 per cent points;
Tertiary: increase by 6 per cent points.

Figure 7 presents the picture for India as a whole.

While the analysis indicates the behaviour of the individual sectors over time, it does not provide any clue about the way the shares in each state have behaved vis-a-vis the shares in the other states as well as the shares at the national level. To study the latter, we define y_{jk} to be the share of the k-th sector in the all-India GDP (as found in the National Income Statistics, CSO). Next, we define a metric measuring the distance between the

Table 10: Performance of States Compared to National Average during 1970-71 to 1995-96

State	$\frac{\Sigma_t \lvert y_{it} - \bar{y}_t \rvert}{T}$	$\frac{\Sigma_t (y_{it} - \bar{y}_t)}{T}$
Andhra Pradesh	215.36	0.88
Assam	377.13	0.79
Bihar	760.32	0.57
Delhi	2720.86	2.56
Goa	1764.06	1.96
Gujarat	481.07	1.26
Haryana	911.46	1.51
Himachal Pradesh	182.74	1.11
Jammu and Kashmir	204.58	1.00
Karnataka	63.65	1.01
Kerala	161.10	0.92
Maharashtra	1052.94	1.58
Manipur	227.31	0.87
Madhya Pradesh	316.42	0.83
Orissa	406.82	0.77
Pondicherry	1003.06	1.60
Punjab	1287.45	1.73
Rajasthan	254.46	0.86
Tamil Nadu	117.09	1.04
Tripura	373.73	0.78
Uttar Pradesh	381.59	0.78
West Bengal	234.70	1.14

Note: T is the total number of years over the period.

Table 9: Overall Performance of States during 1970-71 to 1995-96

State	Rank		No of Worse Years	No of Better Years
	Average over Period	Standard Deviation		
Andhra Pradesh	14.46	1.63	10	16
Assam	18.27	2.03	12	14
Bihar	21.96	0.20	25	1
Delhi	1.12	0.33	3	23
Goa	2.35	0.89	16	10
Gujarat	7.58	1.36	8	18
Haryana	4.46	0.65	14	12
Himachal Pradesh	9.50	1.39	13	13
Jammu and Kashmir	11.27	2.85	9	17
Karnataka	11.15	1.38	11	15
Kerala	13.73	1.85	12	14
Maharashtra	5.00	0.85	7	19
Manipur	15.08	2.37	8	18
Madhya Pradesh	17.12	1.88	11	15
Orissa	18.96	1.75	14	12
Pondicherry	3.81	1.57	13	13
Punjab	3.35	0.63	11	15
Rajasthan	15.88	2.92	11	15
Tamil Nadu	10.43	1.84	14	12
Tripura	19.15	2.13	14	12
Uttar Pradesh	18.92	0.98	17	9
West Bengal	8.46	1.17	11	15

Table 11: Inter-temporal Movement of RC_t and RC_{at}

Year	RC_t	RC_{at}
1970	1.000	1.000
1971	0.979	0.979
1972	0.968	0.967
1973	0.967	0.975
1974	0.957	0.952
1975	0.961	0.974
1976	0.961	0.982
1977	0.961	0.978
1978	0.960	0.981
1979	0.957	0.955
1980	0.955	0.947
1981	0.955	0.958
1982	0.954	0.950
1983	0.953	0.963
1984	0.953	0.956
1985	0.952	0.946
1986	0.952	0.952
1987	0.950	0.932
1988	0.947	0.963
1989	0.946	0.967
1990	0.944	0.974
1991	0.943	0.938
1992	0.941	0.957
1993	0.940	0.952
1994	0.938	0.950
1995	0.936	0.952

three shares for each state in each year and those for the national economy. This is given by

$$D_{it} = \Sigma_k (S_{ikt} - y_{kt})^2 \ \forall \ i,t.$$

For the 22 states, we have 22 such sums of squared deviations for each year. We next go on to look at the behaviour of these distances over time. This is done in two steps. First, for each state, the D_{it} is regressed on time to discover the way the three shares for the state have behaved vis-a-vis the national shares. In this context, though most states seem to be converging to the all-India structure, there are some which appear to be diverging.

The following is a summary picture.

Converging states: Andhra Pradesh, Assam, Bihar, Delhi, Goa, Karnataka, Maharashtra, Orissa, Tripura.

Diverging states: Gujarat, Manipur, Pondicherry, Punjab.

Not converging/diverging states: Haryana, Jammu and Kashmir, Himachal Pradesh, Kerala, Rajasthan, West Bengal (+), Madhya Pradesh, Tamil Nadu (–).

(The direction of change for some of the states is shown in brackets.)

As a second step, we calculate the mean value of the D_{it} across i for each value of t to form an idea about the average distance of the structural parameters characterising the states from those of the national economy. A linear time trend is then fitted to this scatter. It is found that the coefficient of time is negative and highly significant. This suggests that despite individual differences, the states as a whole are coming closer over time to the all-India structure.

IV Conclusions

We have noted in the introduction that the spirit of this paper is analytically descriptive. Although the ultimate purpose of our work lies in explanation, it was found that establishing the divergence or convergence among the Indian states is itself an interesting and challenging exercise as well as one worth reporting. We have found a clear tendency for the Indian states to have diverged during the period in question as far as per capita SDP goes. In terms of the shares of different sectors in the SDP, however, there seems to be a tendency for overall convergence towards the national average. In other words, the structural parameters show – convergence, though per capita SDP does not.

As far as explanation goes, we feel that a detailed analysis of the effects of education, human capital formation, health care, nutrition, etc, may need to be studied carefully. Keeping in mind the positive trends displayed by agriculture and manufacture in the analysis of – convergence studied above, it is necessary to analyse sectoral allocations also. In particular, the developmental allocations to the states in the successive plans is expected to play an important explanatory role in our future studies.[3]

The present study is, needless to say, limited in scope, especially since the primary focus is on SDP data. However, following Lucas (1988), we took the position that while this was "too narrow a definition ...thinking about income patterns will necessarily involve us in thinking about many other aspects of societies too." We look forward to reporting the results of our subsequent analysis at some future date. EPW

Notes

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1 Note that this residual includes forestry and logging, fishing, mining and quarrying, construction, trade, hotels and restaurants, real estate ownership and public administration and other services.

2 As far as the growth rate is concerned, one can also consider the average of the year-to-year growth rates for the entire period and regress this on the different indices of initial per capita SDP. Similarly, as initial per capita income one may take $\ln Y_{70}$. These modifications, however, led to the same pattern of results as above in connection with β – convergence. Hence, these are not separately reported here.

3 Sarker (1994) noted this also. The approach suggested by him needs further exploration.

References

Boyle, E G and T G McCarthy (1997): 'Simple Measure of Convergence', *Oxford Bulletin of Economics and Statistics*, Vol 59, No 2, pp 257-64.

Barro, R and X Sala-i-Martin (1995): *Economic Growth*, McGraw-Hill, New York.

Cashin, P and R Sahay (1996): 'Internal Migration, Centre-State Grants, and Economic Growth in the States of India', *IMF Staff Papers*, Vol 43, No 1, pp 123-71.

Dholakia, R (1994): 'Spatial Dimension of Acceleration of Economic Growth in India', *Economic and Political Weekly*, August 21, Vol XXIX, No 35, pp 2303-09.

Ghosh, B, S Marjit and C Neogi (1998): 'Economic Growth and Regional Divergence in India, 1960 to 1995', *Economic and Political Weekly*, June 27 - July 3, Vol XXXIII, No 26, pp 1623-30.

Lucas, Robert E (1988): 'On the Mechanics of Economic Development', *Journal of Monetary Economics*, Vol 22, No 1, pp 3-42.

Marjit, S and S Mitra (1996): 'Convergence in Regional Growth Rates: Indian Research Agenda', *Economic and Political Weekly*, August 17, Vol XXXI, No 33, pp 2239-42.

Nagaraj, R, A Varoudakis and M A Veganzones (1997): 'Long-Run Growth Trends and Convergence across Indian States', mimeograph, IGIDR, Mumbai.

Quah, D (1993): 'Empirical Cross-Section Dynamics in Economic Growth', *European Economic Review*, Vol 37, pp 426-34.

Raman, J (1996): 'Convergence or Uneven Development: A Note on Regional Development in India', Valparaiso University, US, mimeographed.

Rao, M Govinda, R T Shand and K P Kalirajan (1999): 'Convergence of Income across Indian States: A Divergent View', *Economic and Political Weekly*, March 27-April 2, Vol XXXIV, No 13, pp 769-78.

Romer, P (1990): 'Endogenous Technical Change', *Journal of Political Economy*, Vol 98, No 5, pp S71-S02.

Subrahmanyam, S (1999): 'Convergence of Income across States', *Economic and Political Weekly*, November 20, Vol XXXIV, Nos 46 and 47, pp 3327-28.

Sarker, P C (1994): 'Regional Imbalances in Indian Economy over Plan Periods', *Economic and Political Weekly*, March 12, Vol XXIX, No 2, pp 621-33.

Solow, R M (1956): 'A Contribution to the Theory of Economic Growth', *Quarterly Journal of Economics*, Vol 70, pp 65-94.