WORKING PAPER 153

# CONVERGENCE OF STANDARDS OF LIVING ACROSS INDIAN STATES

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# CONVERGENCE OF STANDARDS OF LIVING ACROSS INDIAN STATES[1]

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## *Abstract*

*Given the limitations using per capita income in evaluating social well being, this study measures standard of living by real per capita consumption and re-examines whether the standards of living across Indian States are converging or not.* b-*convergence is found for rural sectors of the states during the pre-liberalisation era. Similar result is obtained by combining the rural and urban areas of the states. In contrast, reform period shows opposite results. Furthermore,* s-*convergence shows that consumption inequality has increased over time.*

## Introduction

There has been considerable research into the causes and nature of differences in growth rates across countries and regions over time. Even small differences in these growth rates, if cumulated over a long period, may have substantial impact on the standards of living of people. Despite considerable research on the subject, cross-country and cross-regional income disparities are on the rise over time. Understanding the causes behind such inequalities is essential to formulate appropriate policies and bring about required institutional changes in order to spread the benefits of growth processes across different regions.

While measuring the extent of income inequalities in different regions of a country like India, problems arise due to unavailability of strictly comparable and consistent data on State income (Dholakia, 2003). There are well-known limitations in the use of per capita income in evaluating social well-being on account of conceptual and methodological ambiguities (Planning Commission, 2002; p. 32-35). Despite these limitations, in the Indian context several studies of descriptive and analytical nature have tried to focus on the issue of measuring income disparities and poverty across different regions (Datta Roy Choudhury, 1993; Cashin and Sahay, 1996; Marjit and Mitra, 1996; Rao *et al*., 1999; Dagupta *et al*. 2000; Ahluwalia, 2001; Sachs *et al*., 2002 among others) on the basis of data on State Domestic Product (SDP).

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However, SDP reflects the productive capacity and productive efficiency of the resources employed within a state. Conceptually SDP is based on production approach, that is, *income-originating* within the geographical boundary of a state. It does not include the net factor incomes accruing to normal residents of the state from the residents living outside the boundary of the state. Therefore, there is a difference between the income accruing and income originating in a state if there is significant factor (i.e., capital and labour) mobility[2] across the borders of the state. This may result in substantial difference between SDP and personal disposable income[3] in a state. Moreover, transfer payments like pension, foreign remittances and interest on public debt can be very substantial in a state (like Kerala) with historically high level of human capital development (Dholakia, 2003). Thus, the personal disposable income is likely to be much higher than SDP in such a state (Jeromi, 2003). Analyses of different measures of regional growth and inequality in terms of per capita income across the Indian states do not take into account a part of the income accruing to a state outside its boundary. However, there has been no estimate of this income for any state of India (Rao *et al*., 1999). This is because although the *income-accruing approach* relates to the income-accruing to the normal residents of a state, it is very difficult to estimate state income applying this approach, due to lack of data on flows of factor incomes to/from the boundaries of the state. But, the estimates of national income (Net National Product) are based on *income-accruing* approach (EPWRF, 2003).

Since SDP does not include the net factor incomes accruing to a state on the one hand, while on the other hand, there is no estimate of this income; analysing the differential growth patterns of levels of living among states in India may pose a serious data problem. Nevertheless, understanding the intra-regional and inter-regional distribution of standards of living is extremely relevant in India's economic development. There are a few studies (Vaidyanathan, 1974; Chatterjee and Bhattacharya, 1974; Das *et al*., 1993) that have attempted to explain the inter-regional disparities in consumption expenditure in India. Using simple measure of growth and inequality Datta Roy Choudhury (1993) has made an attempt on the similar lines to examine the inter-state and intra-state variations in economic development and standards of living across 15 major states in India from 1967-68 to 1979-80. The study has found that the extent of inter-regional variations in real per capita consumption was less pronounced as compared to variations in real per capita income during the reference period. Singh *et al*., (2003) and Deaton and Dreze (2002) have also shown the divergence pattern

in growth of average per capita expenditure across the states. But, then since per capita consumption is a better measure of social well-being as compared to per capita income, it is interesting to examine the convergence issues at more disaggregated levels (i.e., rural and urban) to understand the regional inequality in India. On these lines, studies examining convergence in per capita consumption within the neoclassical growth paradigm are hardly seen in the Indian context.

The present study makes a preliminary attempt to understand the growth process of real per capita consumption across 14 major states[4] in India using data on household consumer expenditure[5] based on the National Sample Survey (NSS). It tries to examine the absolute and sigma convergence[6] in real per capita consumption across the states in India and to establish the relationship between the two. Neoclassical growth paradigm is employed to analyse the convergence (or divergence) in real per capita consumption.

The following section deals with the analytical framework to address the issue of convergence. The third section deals with the database and concepts of consumption expenditure, while empirical analysis is done in the fourth section. A concluding section appears at the end.

## Analytical Framework

Neoclassical growth paradigm has been extensively used in recent years (Ramsay, 1928; Solow-Swan, 1956; Cass, 1965; and Koopmans, 1965) to understand and explain inter-region and inter-country growth and level differences in standards of living. If the economies are similar with respect to their taste and preferences, and technology, then the per capita growth rate tends to be inversely related to the starting level of output or income per person due to implications of diminishing returns to reproducible capital. Application of this framework has led to a vast and growing literature on growth and convergence across countries and regions (Baumol, 1986; De long, 1988; Lucas, 1988; Barro and Sala-i-Martin, 1995 among others).

In this paper, the Barro and Sala-i-Martin (1995) framework is applied to understand the growth process of Indian states. This framework relates the growth process with two notion of classical convergence to explain the differences in levels and growth rates of income across different economies. b-convergence refers to whether the standards of living of people in poor economies are growing faster than those of rich ones, while S-convergence measures whether the

cross-sectional dispersion of the natural log of the levels of per capita real income declines over time. The first type of convergence β generates the second type of convergence, σ, but the converse is not true. Moreover, the convergence process may be disturbed by new shocks (coming for example through distortion in agricultural prices and oil prices, and climatic conditions etc.) that tend to increase dispersion over time. In the present context, *per capita consumption* expenditure is used as an alternative to per capita income for the cross-sectional analysis of convergence and growth across 14 major states in India from 1983 to 1999–00.

**β-Convergence** (absolute or unconditional convergence) can be estimated using the following standard growth regression model (1). This equation relates the growth rates of real per capita consumption between two periods to the initial level of real per capita consumption:

$$\mathrm{n}\left[ y_{iT} \Big/ y_{i0} \right] = a - \left[ (1 - e^{-\beta T}) \right] \ln(y_{i0}) + u_{i0,T} \qquad (1)^{7}$$

where $a = x + (1 - e^{-\beta T}) \ln(y^*)$ is a constant, y stands for real per capita consumption, y* is the steady-state level of real per capita consumption, *i* refers to a state (province), $T$ is the time interval, $u_{i0,T}$ is the random disturbance term with mean zero (0) and variance $\sigma^2$ and distributed independently of ln ($y_{i0}$). It reflects unexpected changes in production conditions or preferences. It is also assumed to be independent over time and across states. Considering the steady-state growth rate, x, the convergence speed, β, as fixed, the equation (1) states that the growth rate of real per capita consumption depends negatively on the initial level of real per capita consumption [ln ($y_{i0}$)]. The parameters *a* and β are common to all states. The estimates of β can be obtained directly from the nonlinear form of equation (1). In general, if β> 0, then the equation implies convergence, i.e., poor states grow faster than the rich states.

In order to measure consumption inequality across different regions, the notion of **σ-convergence** can be used, which is defined as the cross-state dispersion of real per capita consumption. This is measured by taking the sample variance of the natural log of real per capita consumption (see Eq. (2)).

$$\sigma^2{}_t = (1/n) \sum_{i=1}^{n} \left[ \ln (y_{it}) - \mu_t \right]^2, \qquad (2)$$

where $\mu_t$ is the sample mean of ln ($y_{it}$) at time t. When sample size, n is large, $S_t^2$ is close to population variance and its evolution can be derived over time in accordance with the first-order difference equation,

$$\sigma_t^2 = e^{-2\beta}.\sigma^2_{t-1} + \sigma_u^2 \qquad (3)$$

If the variance of the disturbance term, $S_u^2$ is constant over time for all 't', then the solution of the first-order difference Eq. (3) is given by

$$\sigma^2_t = \frac{\sigma^2_u}{1-e^{-2\beta}} + \left(\sigma^2_0 - \frac{\sigma^2_u}{1-e^{-2\beta}}\right).e^{-2\beta t} \qquad (4)$$

where $S^2_0$ is the variance of ln ($y_{i0}$). We can verify the solution of Eq. (4) that satisfies Eq. (3) and this $S_t^2$ monotonically approaches its steady-state value:

$$\sigma^2 = \frac{\sigma^2_u}{1-e^{-2\beta}} \qquad (5)$$

Therefore, the steady-state value $S^2$ rises with $S_u^2$ but declines with $\beta$. If $\beta > 0$, then over time $S_t^2$ falls (rises) if the initial value $S^2_0$ is greater (less) than the steady-state value of $S^2$. Hence, a positive coefficient $\beta$ does not necessarily result in a fall in $S_t^2$ ($\sigma$-convergence). In other words, $\beta$-convergence is a necessary but not a sufficient condition for $\sigma$-convergence. However, it is to be noted that the steady-state dispersion is positive even if $\beta$ is positive as long as $S_u^2 > 0$.

## Database

The present study is based on secondary data sources. NSS for 38th (1983), 50th (1993-94) and 55th (1999-00) Quinquennial Rounds on rural, urban and combined (total) household consumer expenditure for 14 major states have been used from the National Human Development Report (NHDR) 2001 (Planning Commission, 2002)[8]. Data on rural, urban and total population for each state have also been taken from the same source. Three different concepts of per capita consumption expenditure have been used to examine the convergence issue. These are viz., (1) Per capita consumption expenditure (PCC); (2) Inequality adjusted per capita consumption expenditure (IPCC)[9]; and (3) Inflation and inequality adjusted per capita consumption expenditure (IIPCC)[10]. Monthly per capita consumption expenditure data have been converted to annual figures by multiplying with the

factor 12. Analysis of different growth patterns of consumption are attempted on the basis of this estimated annual per capita consumption expenditure across each of the respective groups (i.e. rural, urban, and total) in different states.

## Findings

### b-Convergence

In order to test for b-convergence in different concepts of per capita consumption expenditure across Indian States we have divided the total time period 1983 to 1999-00 into three sub-periods viz., 1983 to 1993-94, 1993-94 to 1999-00, and 1983 to 1999-00 for three different groups i.e. rural, urban, and total (combined). Growth rate of PCC (IPCC, IIPCC; each in one time) is taken as the dependent variable, which is estimated from the LHS of the Eq. (1) and *ln* of PCC (IPCC, IIPCC) at the beginning of each sub-period is the independent variable. The equation (1) is estimated by using Non-linear Least Squares (NLLS) method[11] to examine the speed of convergence, b.

The empirical estimates of b-convergence in PCC, IPCC, and IIPCC are given in column 3 of each of the Tables 1, 2, and 3 respectively. Column 3 of Table 1 shows that the rates of divergence in rural PCC, and urban PCC are 1.56 and 2.23 per cent respectively per year during the period 1983 to 1999-00. The speeds of divergence in the case of *total per capita consumption expenditure* across the states are found to be 1.36, 2.27, and 1.78 per cent during the three periods respectively. The rates of divergence in rural PCC, urban PCC, and total PCC indicate that the rich states were growing faster than the poor states in the period 1983 to 1999-00.

When we consider IPCC across 14 major states, the rate of divergence declines from 1.56 to 1.43 per cent in rural IPCC and 1.78 to 1.5 % in total IPCC per year during the period 1983 to 1999-00. None of the coefficients of urban IPCC is statistically significant in any of these periods (see, Table 2). The R-square values are also very low. However, there was marginal increase in speed of divergence in total IPCC (2.51 %) over total PCC (2.27 %) during 1993-94 to 1999-00.

**Table 1: b-Convergence in Per Capita Consumption Expenditure (PCC)**

| **Dependent variable: Growth rate of PCC, df=12** | | | | | | |
|---|---|---|---|---|---|---|
| Col.1 | Col.2 | Col.3 | Col.4 | Col.5 | Col.6 | Col.7 |
| **Rural** | Time Interval | b | t-Value | Error Variance | Steady state dispersion | R-square |
| 1983 to 1993-94 | 10 | -0.0126 | -1.7 | 0.00275 | -0.10776 | 0.175 |
| 1993-94 to 1999-00 | 6 | -0.0177 | -1.41 | 0.003683 | -0.10222 | 0.131 |
| 1983 to 1999-00 | 16 | **-0.0156** | -2.74** | 0.005308 | -0.1675 | 0.328 |
| **Urban** | | | | | | |
| 1983 to 1993-94 | 10 | -0.0068 | -0.61 | 0.001767 | -0.12902 | 0.029 |
| 1993-94 to 1999-00 | 6 | -0.0314 | -0.61 | 0.008942 | -0.13796 | 0.062 |
| 1983 to 1999-00 | 16 | **-0.0223** | -2.1*** | 0.00755 | -0.16554 | 0.206 |
| **Total** | | | | | | |
| 1983 to 1993-94 | 10 | **-0.0136** | -1.92*** | 0.002167 | -0.07858 | 0.211 |
| 1993-94 to 1999-00 | 6 | **-0.0227** | -1.92*** | 0.003667 | -0.07894 | 0.181 |
| 1983 to 1999-00 | 16 | **-0.0178** | -2.96** | 0.005375 | -0.14831 | 0.356 |

*Note :* The basic equation (1) is estimated by employing the NLLS method. The steady state dispersion is estimated from equation (5). * 0.01 level, ** 0.05 level and *** 0.10 level.

**Table 2 : b-Convergence in Inequality Adjusted Per Capita Consumption Expenditure (IPCC)**

| **Dependent variable: Growth rate of IPCC, df=12** | | | | | | |
|---|---|---|---|---|---|---|
| Col.1 | Col.2 | Col.3 | Col.4 | Col.5 | Col.6 | Col.7 |
| **Rural** | Time Interval | b | t-Value | Error Variance | Steady state dispersion | R-square |
| 1983 to 1993-94 | 10 | -0.0066 | -0.64 | 0.004492 | -0.33804 | 0.031 |
| 1993-94 to 1999-00 | 6 | -0.022 | -1.58 | 0.00425 | -0.09448 | 0.155 |
| 1983 to 1999-00 | 16 | **-0.0143** | -2.02*** | 0.007325 | -0.25247 | 0.214 |
| **Urban** | | | | | | |
| 1983 to 1993-94 | 10 | 0.0016 | 0.105 | 0.003425 | 1.072026 | 0.0009 |
| 1993-94 to 1999-00 | 6 | -0.0257 | 0.105 | 0.006875 | -0.13035 | 0.056 |
| 1983 to 1999-00 | 16 | -0.0132 | -1.03 | 0.009 | -0.33643 | 0.067 |
| **Total** | | | | | | |
| 1983 to 1993-94 | 10 | -0.0087 | -0.97 | 0.002942 | -0.16759 | 0.067 |
| 1993-94 to 1999-00 | 6 | -0.0251 | -1.92*** | 0.003308 | -0.06426 | 0.209 |
| 1983 to 1999-00 | 16 | -0.0150 | -2.25** | 0.00625 | -0.20522 | 0.248 |

*Note :* The basic equation (1) is estimated by employing the NLLS method. The steady state dispersion is estimated from equation (5). * 0.01 level, ** 0.05 level and *** 0.10 level.

We, however, see a somewhat different patterns in the period 1993-94 to 1999-00, if adjustments in rural IPCC, urban IPCC, and total IPCC were made for inflation to arrive at inflation and inequality adjusted per capita consumption expenditure (IIPCC). Then the speed of divergence in total IIPCC across 14 major states was observed to increase from 2.51 to 3.37 per cent per year during this period (Col. 3, Table 3).

Furthermore, it is important to note that the rate of convergence in rural IIPCC and total IIPCC (real welfare) were found to be 4.71 and 3 per cent per year respectively during 1983 to 1993-94. The R-square values for these periods are also found to be 0.37 and 0.27, which are reasonable. On an average, Figure 1 also shows the inverse relationship between growth rate of rural IIPCC and its initial levels of IIPCC indicating the evidence of convergence. The average growth rate of rural IIPCC in two rich states viz., Haryana and Punjab decreased at the rate of 0.62 and 0.16 per cent respectively during 1983 to 1993-94. Similarly, Figure 2 shows the negative relation between growth rate of total IIPCC and its initial levels. The average growth rate of total IIPCC for Haryana was still negative (–0.15 %). It seems that b convergence in total IIPCC (real welfare) across the states was found due to convergence in rural IIPCC since the relation between the initial level of urban IIPCC and its growth rate was not significant during that period. Moreover, the other two coefficients of urban IIPCC in the periods 1983 to 1993-94 and 1983 to 1999-00 were not statistically different from zero. Further, in most of the cases not only are the coefficients insignificant but the R-square values are also low. This indicates the poor inverse relationship between the initial levels of per capita consumption expenditure and its growth rate during the respective periods.

Therefore, it may be argued that before liberalisation, evidence was found to be in favour of b-convergence in total IIPCC at 3 per cent per annum during 1983 to 1993-94. This indicates that the total IIPCC in poor states was growing faster than the rich states during 1983 to 1993-94. However, the situation changed in the period 1993-94 to 1999-00 where the rate of divergence in total IIPCC was around 3.37 % per year (see Figure 3). Interestingly, during 1983 to 1999-00 there was no evidence of b-convergence (or divergence) in total IIPCC as the net effects of diverging growth patterns of total IIPCC across the states in pre-liberalisation and post-liberalisation was just offset (Figure 4). Therefore, there was no evidence of b-convergence in IIPCC between the time points 1983 to 1999-00.

**Table 3 : b-Convergence in Inflation and Inequality Adjusted Per Capita Consumption Expenditure (IIPCC)**

| **Dependent Variable: Growth rate of IIPCC, df=12** | | | | | | |
|---|---|---|---|---|---|---|
| Col.1 | Col.2 | Col.3 | Col.4 | Col.5 | Col.6 | Col.7 |
| **Rural** | Time Interval | b | t-Value | Error Variance dispersion | Steady state | R-square |
| 1983 to 1993-94 | 10 | **0.0471** | 2.09*** | 0.0071 | 0.0794 | 0.374 |
| 1993-94 to 1999-00 | 6 | -0.0327 | 1.47 | 0.0060 | -0.0883 | 0.13 |
| 1983 to 1999-00 | 16 | 0.0071 | 0.61 | 0.0100 | 0.7063 | 0.034 |
| **Urban** | | | | | | |
| 1983 to 1993-94 | 10 | 0.0243 | 0.95 | 0.0062 | 0.1309 | 0.088 |
| 1993-94 to 1999-00 | 6 | -0.0054 | 0.95 | 0.0048 | -0.4413 | 0.002 |
| 1983 to 1999-00 | 16 | -0.0011 | -0.08 | 0.0066 | -3.0081 | 0.0006 |
| **Total** | | | | | | |
| 1983 to 1993-94 | 10 | **0.03** | 1.8*** | 0.0047 | 0.0807 | 0.27 |
| 1993-94 to 1999-00 | 6 | **-0.0337** | -1.95*** | 0.0036 | -0.0513 | 0.206 |
| 1983 to 1999-00 | 16 | 0.0009 | 0.09 | 0.0067 | 3.7163 | 0.0007 |

*Note* : The basic equation (1) is estimated by employing the NLLS method. Steady state dispersion is estimated from equation (5). * 0.01 level, ** 0.05 level and *** 0.10 level.

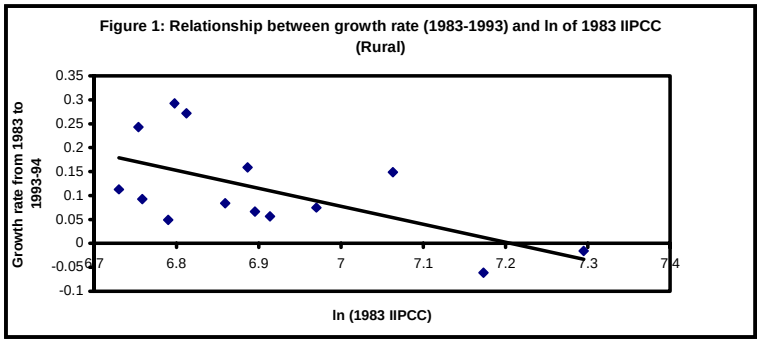


Figure 1: Relationship between growth rate (1983-1993) and ln of 1983 IIPCC (Rural)
Growth rate from 1983 to 1993-94
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
6.7
6.8
6.9
7
7.1
7.2
7.3
7.4
ln (1983 IIPCC)

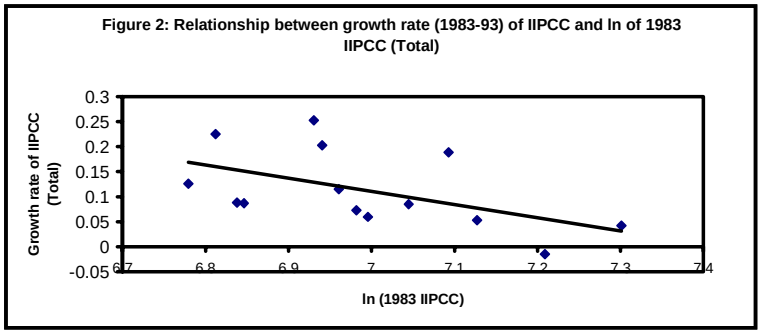


Figure 2: Relationship between growth rate (1983-93) of IIPCC and ln of 1983 IIPCC (Total)
Growth rate of IIPCC (Total)
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
6.7
6.8
6.9
7
7.1
7.2
7.3
7.4
ln (1983 IIPCC)

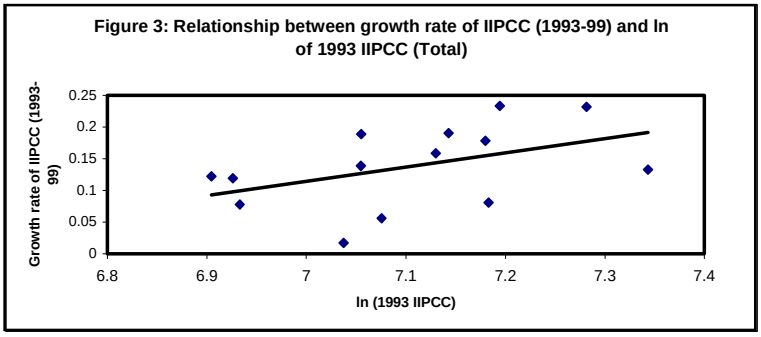
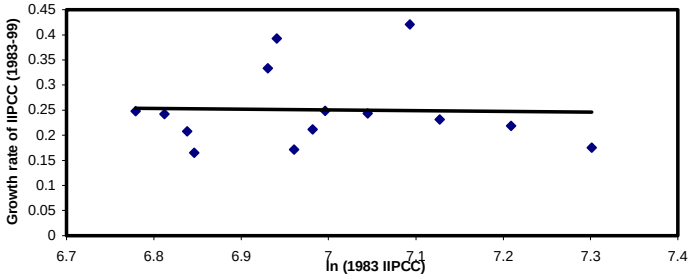


Figure 3: Relationship between growth rate of IIPCC (1993-99) and ln of 1993 IIPCC (Total)
Growth rate of IIPCC (1993-99)
0.25
0.2
0.15
0.1
0.05
0
6.8
6.9
7
7.1
7.2
7.3
7.4
ln (1993 IIPCC)

**Figure 4: Relationship bewteen growth rate of IIPCC (1983-99) and ln of 1983 IIPCC (Total)**




*Note:* IIPCC = Inflation and inequality adjusted per capita consumption expenditure.

**Table 4 :** b**-Convergence in real Per Capita Income (PCI) across 14 major States at 1980-81 prices**

| **Dependent variable: Growth rate of PCI , df=12** | | | | | | |
|---|---|---|---|---|---|---|
| Col.1 | Col.2 | Col.3 | Col.4 | Col.5 | Col.6 | Col.7 |
| | Time Interval | b | t-Value | Error Variance dispersion | Steady state | R-square |
| 1983 to 1993-94 | 10 | **-0.0226** | -2.52** | 0.014775 | -0.31955 | 0.298 |
| 1993-94 to 1999-00 | 6 | **-0.0321** | -3.03** | 0.011917 | -0.17972 | 0.388 |
| 1983 to 1999-00 | 16 | **-0.0249** | -3.11* | 0.042542 | -0.83316 | 0.354 |

*Note :* The basic equation (1) is estimated by employing the NLLS method. Steady state dispersion is estimated from equation (5). * 0.01 level, ** 0.05 level and *** 0.10 level.

In order to compare the nature and extent of convergence (divergence) in terms of real per capita income[12] and real per capita consumption expenditure (i.e., IIPCC) across 14 major states, we have computed the rate of convergence in real per capita income for different periods reported in column 3 of Table 4 above. We can see that there was significant evidence of absolute divergence in real per capita income across the states in each period. However, the rate of divergence in PCI was 3.21 per cent in 1993-94 to 1999-00, higher than in the other two periods.

While b-convergence was found in total IIPCC at the rate of 3 per cent per year on an average, to close the gap between the current levels of per capita consumption and its steady state, divergence was observed in PCI at the rate of 2.26 per cent per annum in the period 1983 to 1993-94. Therefore, there has been a significant difference between the levels of living across the states in terms of real per capita income and real per capita consumption expenditure during the pre-liberalisation era. On the contrary, divergence patterns in both IIPCC and PCI were found in the post-liberalization period 1993-94 to 1999-00 but the extent of rate of divergence in total IIPCC was higher than the rate of divergence in real PCI by 0.16 per cent per year. Thus, we observe here that the real per capita consumption expenditure, which may take into account the net factor incomes outside the boundary of the state and hence, is a better indicator of standard of living than that of real per capita income, is diverging faster than the real per capita income across the states.

However, for a quick view, a summary for evidence of convergence or divergence in per capita consumption expenditure (income) in different time periods is given in Table 5.

**Table 5: Evidence of Convergence/ Divergence between time points**

| **Rural** | 1983 to 1993-94 | 1993-94 to 1999-00 | 1983 to 1999-00 |
|---|---|---|---|
| PCC | - | - | Divergence (1.56 |
| IPCC | - | - | Divergence (1.43) |
| IIPCC | Convergence (4.71) | - | - |
| **Urban** | | | |
| PCC | - | - | Divergence (2.23) |
| IPCC | - | - | - |
| IIPCC | - | - | - |
| **Total** | | | |
| PCC | Divergence (1.36) | Divergence (2.27) | Divergence (1.78) |
| IPCC | - | Divergence (2.51) | Divergence (1.5) |
| IIPCC | Convergence (3) | Divergence (3.37) | - |
| **PCI** | Divergence (2.26) | Divergence (3.21) | Divergence (2.49) |

*Note :* (-) refers to existence of neither convergence nor divergence. Figures in parentheses are percentages

## Sigma Convergence

We next move on to the concept of sigma convergence. Table 6 shows consumption inequality in rural, urban, and total PCC (IPCC, IIPCC) for the years 1983, 1993-94, and 1999-00 estimated from the Eq. (2). The same equation (2) is weighted with population shares in respective groups and inequality measures are shown in column 2 of Table 6.

**Table 6: Consumption Inequality across 14 major States**

| **Cross-State Dispersion of PCC** | | | | | | |
|---|---|---|---|---|---|---|
| | **Unweighted** | | | **Weighted by population share** | | |
| | **Rural** | **Urban** | **Total** | **Rural** | **Urban** | **Total** |
| **1983** | 0.028 | 0.038 | 0.050 | 0.021 | 0.028 | 0.036 |
| **1993-94** | 0.009 | 0.012 | 0.025 | 0.010 | 0.013 | 0.024 |
| **1999-00** | 0.023 | 0.033 | 0.046 | 0.020 | 0.028 | 0.040 |
| **Cross-State Dispersion of IPCC** | | | | | | |
| **1983** | 0.026 | 0.034 | 0.047 | 0.018 | 0.024 | 0.033 |
| **1993-94** | 0.010 | 0.013 | 0.023 | 0.011 | 0.012 | 0.020 |
| **1999-00** | 0.022 | 0.028 | 0.041 | 0.018 | 0.022 | 0.034 |
| **Cross-State Dispersion of IIPCC** | | | | | | |
| **1983** | 0.026 | 0.016 | 0.029 | 0.018 | 0.017 | 0.026 |
| **1993-94** | 0.010 | 0.011 | 0.016 | 0.011 | 0.010 | 0.013 |
| **1999-00** | 0.022 | 0.016 | 0.027 | 0.018 | 0.017 | 0.025 |

*Note :* Equation ( 2) is estimated with and without weights.

It can be seen from Table 6 that as expected the weighted cross-state dispersion values of different measures of per capita consumption expenditure in rural, urban, and total were less than that of the unweighted one in each year (except a very marginal increase in rural IIPCC from 0.01 to 0.011 during 1993-94). In both the cases these measures of dispersions in rural, urban and total PCC (IPCC, IIPCC) declined from 1983 to 1993-94 and then increased slightly in 1999-00. The decline in dispersion in 1993-94 was compatible with the b-convergence in rural and total IIPCC (real welfare) across the States during the period 1983 to 1993-94.

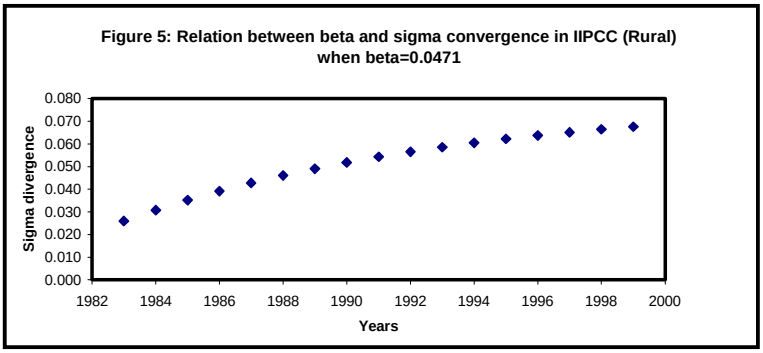
**Table 7 : Relation between â and S-convergence (divergence) in IIPCC**

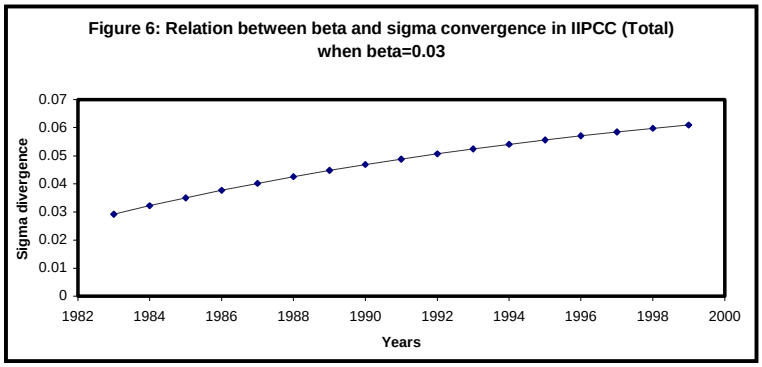
| | b=0.0471 | b=–0.0337 | b=0.03 | b=–0.0337 |
|---|---|---|---|---|
| Year | Rural (1983-93) | Total (1993-99) | Total (1983-93) | Total (1993-99) |
| | $S_t^2$ | $S_t^2$ | $S_t^2$ | $S_t^2$ |
| 1983 | 0.026 | | 0.029 | 0.029 |
| 1984 | 0.031 | | 0.032 | 0.035 |
| 1985 | 0.035 | | 0.035 | 0.041 |
| 1986 | 0.039 | | 0.038 | 0.047 |
| 1987 | 0.043 | | 0.040 | 0.054 |
| 1988 | 0.046 | | 0.043 | 0.061 |
| 1989 | 0.049 | | 0.045 | 0.069 |
| 1990 | 0.052 | | 0.047 | 0.078 |
| 1991 | 0.054 | | 0.049 | 0.087 |
| 1992 | 0.057 | | 0.051 | 0.096 |
| 1993-94 | 0.059 | 0.016 | 0.052 | 0.107 |
| 1994 | 0.060 | 0.020 | 0.054 | 0.118 |
| 1995 | 0.062 | 0.025 | 0.056 | 0.129 |
| 1996 | 0.064 | 0.031 | 0.057 | 0.142 |
| 1997 | 0.065 | 0.037 | 0.058 | 0.155 |
| 1998 | 0.066 | 0.043 | 0.060 | 0.170 |
| 1999-00 | 0.068 | 0.049 | 0.061 | 0.185 |

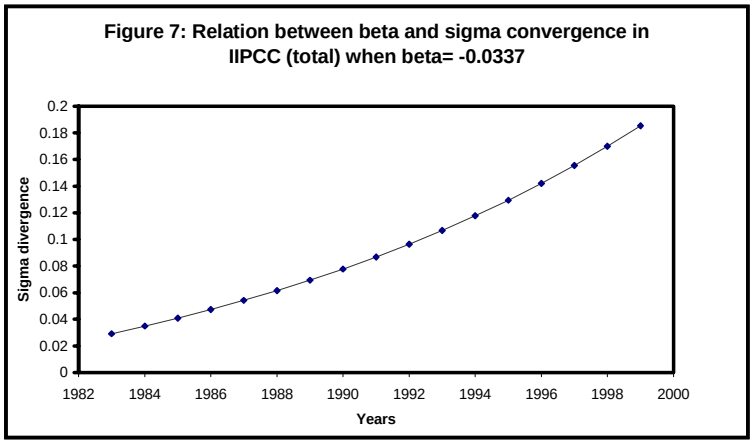
*Note :* Equation (4) is estimated to generate a time series for $S_t^2$ by putting in the values of $\sigma^2_0$ and steady state value of dispersion given in Column 6 of Table 3 depending upon the significant b**.**

Despite this b convergence during the pre-liberalisation period, the sequence of variance of *natural log* of rural and total IIPCC ($S_t^2$) to a common steady state value of dispersion was found to be no more a monotonic one[13]. The dynamics of $S_t^2$ for rural and total IIPCC across 14 major States from 1983 to 1999-00 could be generated for different values of b by using Eq. (4). This is given in Table 7. Unlike static measures of regional disparities (i.e., Coefficient of Variation, Gini Ratios etc.), this ($S_t^2$ ) dynamic measure of inequality combines both absolute and relative concepts together through the absolute convergence coefficient, b, over time.

Table 7 shows that the dispersion of natural log of IIPCC (rural and total) is increasing over time from 1983 to 1993-94 even though there is evidence of convergence as depicted in Table 3 during this period. The rising trends in dispersion of natural log of IIPCC can be observed from Figures 5, 6, and 7 for different values of $b$. However, the shape of the trend lines depends on the parametric values of $b$ in different time intervals. If the value of $b$ is positive (i.e., convergence) then the shape of the curve for $S_t^2$ is concave indicating that the rate of $S_t^2$ tends to increase at a decreasing rate (see Figures 5 and 6). But if $b$ is negative (i.e., divergence) the shape of the curve for $S_t^2$ is convex indicating the increasing tendency of $S_t^2$ at an increasing rate (Figure 7). Therefore, $S_t^2$ may fall, rise or constant depending on the values of $S^2_0$ and $b$ over time to move towards its steady state value of $S^2$. Therefore, a positive coefficient $b$ does not necessarily result in a falling $S_t^2$ (S-convergence). This is in fact empirically shown that $b$-convergence is a necessary but not a sufficient condition for S-convergence.






## Conclusion

In this paper we have examined the issue of absolute and sigma convergence taking three indicators of per capita consumption expenditure for rural and urban sectors (and total) across 14 major states from 1983 to 1999-00. One advantage in using per capita consumption expenditure over per capita income is that data for the former are available at rural and urban levels. Moreover, per capita household consumption expenditure can also be expected to take into account the net factor incomes outside the boundary of the state.

The results obtained in inflation and inequality adjusted per capita expenditure (IIPCC) showed differences in the estimates of b-convergence (divergence) not only in other indicators of per capita consumption expenditure, but also deviated from the real per capita income at 1980-81 prices. There was evidence of b-convergence in rural, and total IIPCC across the states at the rate of 4.71 per cent and 3 per cent per year respectively during the pre-liberalisation era (i.e., 1983 to 1993-94). However, the rate of divergence in total IIPCC (3.37 %) was strongly observed in the period 1993-94 to 1999-00. Therefore, during the reform era, even the real per capita consumption expenditure (i.e., IIPCC) showed 0.16 % more diverging trend as compared to real per capita income (3.21 per cent) per year across the states. The economic reforms pursued at different levels across the states seem to have generated an effect on factors leading to agglomeration economics (Bhanumurthy and Mitra, 2003) in the relatively

better off states causing divergence not only in the growth of real per capita income but also in the growth of real per capita consumption expenditure during the reform period. However, there was neither any tendency of convergence nor divergence in total IIPCC among the states during the total period 1983 to 1999-00 due to offsetting tendency of real per capita consumption expenditure in pre-liberalisation and post-liberalisation period.

Similarly the evidence in favour of S-convergence in IIPCC (rural and total) is compatible with b convergence during 1983 to 1993-94. But it gives the opposite results for both the concepts of convergence during 1993-94 to 1999-00. Moreover, the dynamics (or series) of cross-state dispersion generated was found to be rising from 1983 to 1999-00 (Table 7) depending on the parametric values of b and its initial variance. Therefore, even if b-and S-convergence (divergence) show similar results, it seems that b-convergence is a necessary but not a sufficient condition for S- convergence, which may be caused due to changes in the ranks of the states' consumption patterns.

Therefore, policies to accelerate convergence processes in consumption/income in rural and urban sectors across the states may need a thorough understanding of factors mobility and factor-price equalization across the border of the states giving due attention to the differences in structural characteristics of the states in India.

## Notes

[1] The earlier draft of this paper was presented at the Third Development Convention on *Social Security, Human Development and Growth: Linkages and Disparities,* sponsored by the ICSSR Research Institutes located in South India, and organized by the Centre for Development Studies in Trivandrum, Kerala, during January 29-30, 2004.

[2] Factors mobility is one of the reasons for convergence and it leads to factor-price equalization across regions (see, Barro and Sala-i-Martin, 1995; Cashin and Sahay, 1996; Marjit and Mitra, 1996).

[3] Personal Disposable Income is the income of the individuals after tax and non-tax payment, which can be either consumed or saved.

[4] 14 major States are Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharastra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. These 14 major states account for 93 per cent of population and 91.5 per cent of Net Domestic Product (NDP) in the country and may, therefore, be taken as representative for this analytical purpose (Rao *et al.*, 1999).

[5] Definition of household consumer expenditure according to NSS estimate is referred from Sarvekshana Analytical Report Number 2, 1998, p. 2

[6] Neoclassical growth (Solow-Swan, 1956) model predicts conditional convergence. But this concept of conditional convergence is not as interesting as the concept of absolute and sigma convergence while dealing with whether the standard of living of the poor tends to improve faster than that of the rich over time (See, Sala-i-Martin, 2002).

[7] Semi-log model is suitable to find out least squares growth rate since it takes into account all the information over the period. However, if the base and terminal years are normal, then (average) growth rate obtained from these two end points does not vary much from least squares growth rate. Therefore, it can be used for cross-sectional analysis of growth and convergence.

[8] 55$^{th}$ round on per capita consumption expenditure may not strictly be comparable with the earlier rounds because of possible intermingling of responses due to adoption of dual recall periods (7 and 30 days) (for details see Deaton and Dreze, 2002).

[9] Monthly per capita consumption expenditure has been adjusted for inequality using estimated Gini Raios. This is the measure of welfare at current prices Welfare is the difference between the per capita consumption expenditure and per capita consumption expenditure multiplied by Gini Ratios (see, Sen, 1974).

[10] Monthly per capita consumption expenditure has been adjusted for inequality using Gini Ratios and average per capita monthly expenditure for 1993-94 and 1999-2000 has been adjusted for inflation to bring them to 1983 prices, using deflators derived from state specific poverty lines. In this case welfare is measured at constant prices.

[11] See, Sala-i-Martin, (1996); pp. 1334.

[12] Per capita income (NSDP) data for 1983 and 1993-94 is used from NHDR 2001 (Planning Commission, 2002); but the 1999-00 figure is taken from EPW RF (2003) and adjusted to 1980-81 prices.

[13] It is assumed the cross-section is so large that the sample variance of ln ($y_{it}$) corresponds to population variance, $S_t^2$. But, due to small sample size i.e. 14 observations in this case it may not be true. Another point is that the convergence process may be disturbed by new shocks (distortion in agricultural prices and oil prices, and weather conditions etc.) that tend to increase dispersion over time since ln ($y_{i0}$) may be correlated with random disturbance terms in Eq. (1).

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