

## **UNDERSTANDING THE REGIONAL ECONOMIC GROWTH AND SECTORAL CONVERGENCE IN INDIA: A BASE YEAR ANALYSIS**

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### **INTRODUCTION:**

Regional inequalities and gaps in growth among countries and regions persistently increase over time. Numerous studies are examining the subject of regional economic growth and convergence in India. Notwithstanding the extensive literature on economic development and convergence, regional economic growth, disparities, and convergence remain contentious among policymakers and researchers. The studies on India have yielded conflicting evidence concerning the convergence and divergence of wealth among Indian states. Therefore, additional research is required to explore the matter further. This study seeks to enhance the current literature on regional economic growth and convergence by analyzing regional economic growth from a novel approach.

India is a democratic, federal republic and a welfare state, with legally delineated roles and financial resources for central and state governments. The principal objective of government policy is to mitigate poverty and inequality by promoting economic growth to achieve this aim. It has implemented fiscal policies encouraging development and efforts to minimize regional disparities through resource allocation. Nevertheless, regional inequities have endured and are a significant concern. To preserve a robust sense of national unity, the constitutional constraints of the federal system allocate greater political and economic authority to the central government. The constitution mandates the establishment of a Finance Commission every five years to assess tax revenues between the federal and state governments. The Indian Constitution allocates most tax-raising authority to the federal government, leading to fiscal disparities among the state's revenue sources.

The economic growth rates of Indian states have varied significantly over time. Andhra Pradesh has shown consistent growth in per capita real income, with its CAGR rising from 1.14% (1970-79) to 6.93% (2011-20), while Assam has experienced lower and fluctuating growth, including both positive and negative rates. Bihar has demonstrated improvement with a CAGR of 8.49% from 2004-13. Gujarat and Haryana have maintained strong growth,

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with CAGRs ranging from 2.02% to 7.58% and 2.47% to 7.33%, respectively, while Karnataka has displayed varying rates from 1.26% to 6.99%. Kerala has sustained steady growth with a CAGR of -0.30% to 7.51%, and Madhya Pradesh has experienced a mix of positive and negative rates, reflecting a stable yet dynamic economy. States such as Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal also exhibit varied growth patterns. Telangana, India's youngest state formed in 2014, has shown steady growth, indicating a promising economic trajectory.

The socio-economic development of the Indian Federation is profoundly affected by regional differences, especially in agriculture. This disparity influences wealth inequality among states and social development. The interconnectedness of economic and social elements complicates the identification of causal links. An equitable development paradigm necessitates a growth trajectory that is both economically and socially just. A multitude of research addresses the subject of growth and convergence in India. These studies have yielded conflicting evidence concerning the convergence and divergence of wealth among Indian states. Therefore, additional research is required to investigate the matter further. This study seeks to enhance the current literature on regional economic growth and convergence by analyzing regional economic growth from a novel approach.

## **REVIEW OF LITERATURE**

The neoclassical model, introduced by Solow (1956), and the endogenous growth model, presented by Romer (1986) and Lucas in 1988, are the primary frameworks for analyzing economic development and convergence. It initially employs the analytical framework of the Solow, (1956) growth model, which is extensively utilized in neoclassical growth theory. The model assumes decreasing returns to inputs, positive and flexible substitution between labour and capital, stable technology and preferences, and the absence of barriers to the flow of inputs across states. Mankiw et al., (1992) enhance the Solow model by including human capital as a distinct production input. Convergence transpires when the growth rates of economically disadvantaged and affluent states gradually align over time. Unconditional convergence occurs when income levels converge independently of any regulating factors. Barro (1991) and Barro & Sala-i-Martin (1991) conducted one of the initial empirical analyses of economic convergence. Barro (1991) found no correlation between per capita growth and initial per capita GDP levels in a study of 98 countries from 1960 to 1985, indicating the absence of unconditional convergence. Rodrik (2013) established that unconditional convergence occurs solely in modern areas of the economy rather than across the entire economy. He identified the widespread occurrence of labour productivity convergence in manufacturing operations, irrespective of geographical location or national factors.

Contrary to Rodrik's (2013) findings, Barro (2016) indicated a lack of unconditional convergence. scrutinized Barro and Sala-i-Martin (1992) and Barro (2016) to study unconditional convergence and the middle-income trap. They examined two models: the Solow model (S-convergence), where poorer nations catch up in growth, and the Wilde model (W-convergence), where poorer nations surpass the frontier's growth rate. Their analysis also focused on beta convergence, which tracks the alignment of a nation's output growth over time.

Cashin & Sahay (1996) analysis identified a 1.5% annual convergence rate in income among 20 Indian states from 1961 to 1991, requiring 45 years to eliminate the disparity in each state's baseline per capita net state domestic product level. The study by Marjit and Mitra (1996) contests the Solovian model's presumption that places with low per capita income should see accelerated growth in India, asserting that the neoclassical model's inference of decreasing returns to capital may not apply in the Indian context. Marjit & Mitra (1996) identified a small convergence force between India and China in both absolute and conditional terms due to geographical disparities, sluggish population movements, governmental policies, and a slower economic convergence at lower developmental stages. The study by Rao et al., (1999) in India demonstrated an increasing interstate income disparity, contradicting the presumption of diminishing marginal returns to capital. It contradicts the findings of Cashin and Sahay (1996) about the convergence of incomes between states, which indicated an inverted U relationship between inequality and economic growth. Ahluwalia's research on interstate economic growth across 14 Indian states revealed that private investment ratios positively influence growth, highlighting the necessity for states to enhance private investment while vying for it. Adabar, (2004) and Nayyar (2008) employ dynamic panel analysis to assess regional investment, human capital, and literacy rates. Private investment typically gravitates towards affluent locations, whereas governmental investment preferentially supports wealthier areas due to the augmented tax money produced by prosperous governments. Chikte (2011) identified  $\sigma$ -divergence in production across 15 major Indian states from 1970-71 to 2004-05, notably intensified post-reform, affected by variables such as PCSDP growth rate, population growth, literacy, commercial bank lending, and state government capital investment. Cherodian & Thirlwall (2015) employed cross-sectional equations to investigate regional income differences in India from 1999-2000 to 2010-11, assessing unconditional and conditional beta convergence across 28 states and four union territories. Roy et al., (2019) examined Indian states and territories from 1980 to 2014 to ascertain the presence of conditional or unconditional convergence before and following liberalization, employing the Levin, Lin, and Chu test.

## RESEARCH GAP AND OBJECTIVE:

Despite the extensive research on convergence available in the Indian context, most research focuses on back-year analysis using the splicing method, which ignores the underestimation and overestimation problems for estimating national income. Furthermore, the available literature primarily analyses their work on state domestic product and the three broad sectors of the economy, which ignore the impact of sub-sectors in the economy. To address these issues, the specific objectives of the study are as follow:

To identify the regional disparities among different regions

To identify the base-year-wise unconditional  $\beta$ —convergence or divergence among different sectors and sub-sectors of the Indian federation

## METHODOLOGY

### a. $\beta$ —Convergence

Various theories and models have been proposed to elucidate regional economic growth, convergence, and disparities in the state. The neoclassical model, proposed by Solow-Swan in 1956, and the endogenous growth model, proposed by Romer in 1986 and Lucas in 1988, respectively, are the two main models used to discuss economic growth and convergence. Initially, it employs the analytical framework of the Solow-Swan (1956) growth model, which is extensively utilised in neoclassical growth theory. This model functions as a crucial instrument for examining economic growth and convergence. The model posits a Cobb-Douglas Production Function with exogenous labour augmentation, indicating that the output of Indian state  $i$  at time  $t$ , where  $i = 1, 2, 3, \dots, N$  and  $t = 1, 2, 3, \dots, T$ , is contingent upon the levels of technology  $A$ , capital stock  $K$ , and labour quantity  $L$ . The equation represents the production function:

$$Y_{it} = K_{it}^{\alpha} (A_{it} L_{it})^{1-\alpha} \quad 0 < \alpha < 1 \quad (1)$$

Where  $Y_{it}$  denotes output,  $A_{it}$  signifies the technological level,  $K_{it}$  indicates the capital stock,  $L_{it}$  represents the labour quantity of state  $i$  at time  $t$ . At the same time,  $\alpha$  and  $(1 - \alpha)$  correspond to the shares of capital and labour in output, respectively. Assuming technology ( $A$ ) and labour quantity ( $L$ ) grow exogenously at rates ' $n$ ' and ' $g$ ', respectively.

$$L_{it} = L_{i0} e^{n_i t} \quad (2)$$

$$A_{it} = A_{i0} e^{g_i t} \quad (3)$$

In their 1992 work, MRW enhanced the model by incorporating human capital ( $H$ ) as a distinct production input while maintaining the assumption of a Cobb-Douglas aggregate production function characterised by constant returns to scale. From equations 2 and 3, as the capital, output, and consumption per efficiency unit of labour, respectively, the evolution of  $k_{it}$  over time can be expressed as:

$$\hat{k}_{it} = s y_{it} - (n_i + g_i + \delta) k_{it}$$

Assuming that the production function parameter,  $\alpha$ , and the depreciation of capital,  $\alpha$ , are held constant across Indian states, all other factors are subject to variability. The evolution of capital per efficiency unit of labour, denoted as  $k_{it}$ , over time, can be articulated as

$$\hat{k} = s \hat{k}^\alpha - (n + g + \delta) \hat{k} \quad (4)$$

Under these initial conditions, the capital follows a convergence path to a steady state. MRW (1992) demonstrates that the variables  $\hat{k}_t$ ,  $\hat{y}_t$ , and  $\hat{c}_t$  eventually reach a state of equilibrium, referred to as the steady-state values of  $\hat{k}^*$ ,  $\hat{y}^*$ , and  $\hat{c}^*$  respectively, as defined by

$$\hat{k} = \left[ \frac{s}{n + g + \delta} \right]^{\frac{1}{1-\alpha}} \quad (5)$$

$$\hat{y} = \left[ \frac{s}{n + g + \delta} \right]^{\frac{\alpha}{1-\alpha}} \quad (6)$$

$$\text{and } c = \hat{y} - (n + g + \delta) \hat{k} \quad (7)$$

The Solow-Swan growth model predicts that the steady-state ratios of capital-labour and output-labour are directly and inversely influenced by saving and population growth rates. The change in the Indian state  $i$  can be described by approximating the first-order Taylor series expansion of  $\hat{y}_t$  around the equilibrium values  $\hat{y}^*$  mentioned in equation (6).

$$\partial(\ln(\hat{y}_{it}) / \partial_t = \beta [\ln(\hat{y}_i) - \ln(\hat{y}_{it})] \quad (8)$$

The parameter  $\beta$ , calculated as  $(1-\alpha)^*(n+g+\delta)$ , signifies the convergence rate. It measures the per capita absolute income growth rate reduction as it nears its equilibrium value. The growth rates in per capita real income are shaped by the disparity between current levels and those of the steady state throughout the transition period.

#### **b. $\sigma$ - Convergence**

The concept of  $\sigma$ -convergence refers to the cross-sectional dispersion of per capita income (PCI) among regions. It occurs when the variation in PCI decreases over time, indicating a tendency for income levels to converge toward uniformity across economies.

#### **c. Data Sources, Variables and Time Frame**

Data are predominantly gathered from secondary sources. The Net State Domestic Product is primarily sourced from the EPWRF and the CMIE State of India. We have sourced the population data from the EPWRF and the Census of India. The present study examined regional disparities among central states by ranking them according to their initial per capita income levels. The study aimed to ascertain whether the Indian region exhibits

absolute convergence or absolute divergence by analysing data from the period 1970 to 2020, which was divided into six distinct intervals: 1970-71, 1980-81, 1993-94, 1999-00, 2004-05, and 2011-12. The data has been categorised into two segments: base-to-base and base-to-availability. This classification follows the chronological order of 1970 to 1986, 1980 to 1997, 1993 to 2004, 1999 to 2008, 2004 to 2013, and 2011 to 2021. In 1970-71 and 1980-81, we have selected 15 prominent states for analysis. In the base years of 1993-94 and 1999-00, the study chose 18 major states due to the significant territorial reconfigurations in 2000. It includes the formation of Chhattisgarh from Madhya Pradesh, the establishment of Jharkhand from the southern portion of Bihar, and the creation of Uttarakhand from northern Uttar Pradesh. Similarly, for the base years 2004-05 and 2011-12, we have selected 19 major states, as Telangana was delineated from the northeastern region of Andhra Pradesh in 2014.

## **RESULTS**

### **a. Regional Disparities and $\sigma$ -Convergence among Major States**

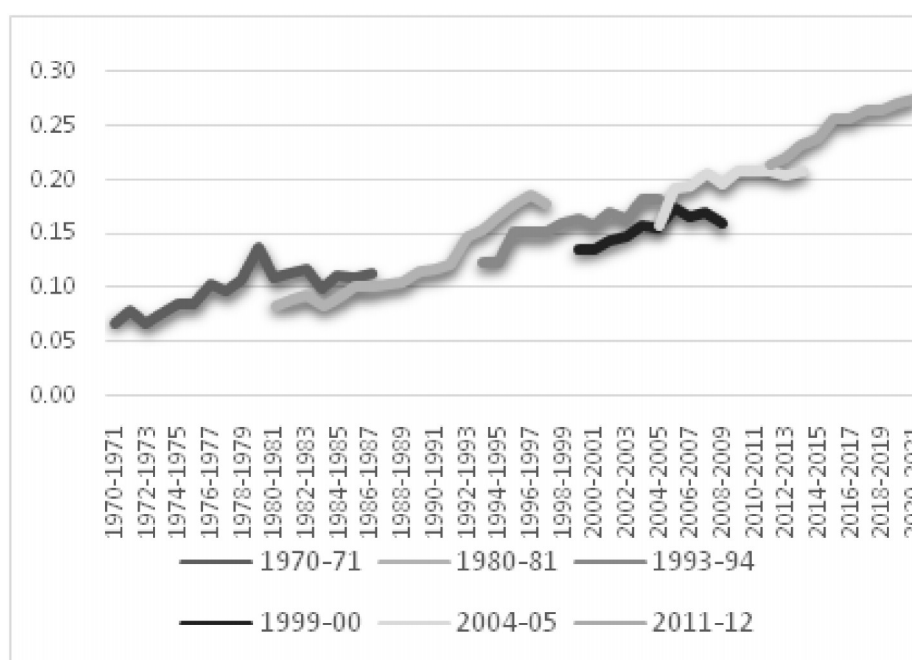
Indian states have historically exhibited significant economic disparities, with some regions prospering while others lag. In 1970, Punjab ranked first in per capita real income, driven by its robust agricultural and industrial sectors. Haryana followed in second place, benefiting from its proximity to Delhi and strong agriculture and manufacturing industries. Gujarat ranked third, reflecting its industrialization and entrepreneurial spirit. Over time, rankings shifted as economic performance and progress varied, with some states maintaining their positions and others experiencing significant changes. For instance, Haryana consistently ranked high, holding the second position in 1980, 1993, and 2004 due to sustained economic growth. In contrast, Bihar and Odisha struggled with poor infrastructure, limited industrialization, and widespread poverty, frequently ranking among the lowest. Rajasthan, however, improved significantly, rising from 14th in 1980 to 10th in 1999, aided by developments in tourism, agriculture, and infrastructure. Karnataka outperformed Tamil Nadu in later years, despite both showing steady economic performance, while manufacturing and IT-focused states attracted investments and created jobs. Maharashtra, home to financial capital Mumbai, rose from 4th in 1970 to 2nd in 1980, fueled by a strong industrial base and expanding service sector. Uttarakhand, a newer state, progressed from 11th in 1999 to 2nd in 2011 due to tourism and hydropower. West Bengal, which dropped from 5th in 1970 to 10th in 1999, has seen recent improvements in economic performance.

These rankings highlight areas needing targeted policies to enhance growth and living standards. Policymakers can draw lessons from high-ranking regions and assess the impact of national reforms, such as the 1990s liberalization policies, which benefited industrial and service-oriented states like Maharashtra and Tamil Nadu but left industrially

underdeveloped Bihar struggling. Monitoring rankings allows for identifying successful initiatives, attracting investments, and designing interventions to ensure balanced regional development and improved quality of life across the country.

Figure 1 shows that the sigma convergence of PCNSDP provides valuable insights into economic dynamics among states. Dispersion diminishes with time, indicating  $\sigma$ -convergence, whereas growing over time indicates  $\sigma$ -divergence. The figure demonstrates that income inequality across states is rising. The economic situation in the early 1970s was marked by a PCNSDP variance of 0.07. As the 1980s progressed, the figure for 1980-81 declined to 0.11 from 0.14 in 1979-80, and again there was an increasing tendency. It shows state economic performance differed during this period. From the 1980s until the mid-1990s, income levels diverged significantly. The values steadily climbed from 1980-81 to 1993-94, indicating state-wide income inequality. A temporary convergence occurred in the late 1990s and early 2000s as Per Capita Net State Domestic Product (PCNSDP) variance decreased from 1993-94 to 1999-00.

**Figure 1: Base Year Wise Variance of Per Capita NSDP (authors' calculation based on EPWRF Data)**



However, divergence resumed from 1999-00 to 2004-05, reflecting rising state income disparity. This trend continued into the 2010s, with PCNSDP variance increasing through 2020-21, indicating a persistent income gap. Data beyond 2011-12 confirms growing variance and  $\sigma$ -divergence. While income levels fluctuated between convergence and divergence

from 1970-71 to 2011-12, the overall trend shows rising income disparity among states.

**b. Absolute  $\beta$ -Convergence or Divergence**

The results contradict Cashin & Sahay and Marjit and Mitra (1996). It shows a significant absolute divergence for 1970-79, 1970-86, 1988-92, 1980-97, and 2011-20 as a coefficient value of 3.02, 1.60, 1.75, 2.53, and 1.37 respectively. It shows that with a one per cent change in an initial level of per capita income, there is an increase of respective percentage change in CAGR, which leads to an increase in the gap between the rich and poor economy, as shown in Table 1.

**Table 1: Relationship between In Per Capita Real Income and CAGR (Authors' Calculation Based on EPWRF Data)**

	Economy		Primary		Secondary		Tertiary	
period	Coff	R Sq	Coff	R Sq	Coff	R Sq	Coff	R Sq
1970-79	3.02**	0.51	0.8	0.02	0.9	0.04	0.95	0.07
1970-86	1.6**	0.34	2.5**	0.41	0.17	0	0	0
1980-92	1.75**	0.28	0.33	0.01	0.53	0.03	0.01	0
1980-97	2.53	0.37	0.04	0	1.56*	0.24	1.25	0.12
1993-98	2.03	0.12	-1.7	0.04	2.4*	0.19	2.63*	0.21
1993-04	1.28	0.13	0.04	0	-0.1	0	2.73**	0.31
1999-03	1.5	0.07	-1.4	0.01	-0.15	0	2.63**	0.22
1999-08	0.75	0.03	-0.82	0.02	-1.69	0.11	1.76	0.15
2004-10	1.57	0.11	-0.74	0.02	-1.75	0.06	1.28	0.09
2004-13	0.53	0.02	-1.71	0.07	-1.09	0.03	0.53	0.03
2011-20	1.37**	0.21	2.07	0.1	-0.27	0.01	1.58**	0.36

Note: \*at 10% significance level

\*\* at 5% Significance level

The economy is further divided into three broad sectors: primary, secondary, and tertiary. The primary sector has absolute  $\beta$ -divergence for the period 1970-86, with a significant speed of 2.5, but the sub-sector of this sector shows mixed results. Agriculture and allied activities have absolute  $\beta$ -divergence for 1970-86 and absolute  $\beta$ -convergence for 2004-13 with a coefficient of 2.31 and -2.50, respectively. The mining and quarrying sectors have only absolute  $\beta$ -convergence for 1970-86, 1999-03, and 2011-20 with a coefficient of -1.72, -6.43, and -2.04, respectively. Absolute  $\beta$ -convergence shows that with a one per cent increase in initial income level, there is a percentage decrease in the economy's CAGR of per capita income, which minimizes the gap between rich and poor economies.

Like the primary sector, the secondary sector also shows absolute  $\beta$ -divergence in the sector for the period 1980-97 and 1993-98 with a coefficient value of 1.56 and 2.40, respectively, but the sub-sectors of the sector provide the opposite results of the sector except the manufacturing sector that shows absolute  $\beta$ -divergence for the period 1993-98 with a coefficient value of 4.18. Construction sectors provide absolute  $\beta$ -convergence for



1979-79, 2004-10, and 2004-13 with a coefficient value of -1.77, -5.17 and -4 respectively. The electricity, gas and water supply sectors provide exciting results. There is significant absolute  $\beta$ -convergence for the initial phase as the period 1970-79, 1970-86, and 1980-92 with a speed of -2.13, -2.65, and -5.48, respectively. The tertiary sector findings are similar to the economy and the above two sectors, i.e., primary and secondary sectors. It provides absolute  $\beta$ -divergence for 1993-98, 1993-04, 1999-03, and 2011-20 with a speed of 2.63, 2.73, 2.63, and 1.58, respectively, showing the increase in the gap between rich and poor due to the sector. The sub-sectors of this sector provide some interesting mixed results for absolute  $\beta$ -convergence and divergence. For absolute  $\beta$ -convergence, the banking and insurance sector provides a significant speed of -3.99 for the period 1993-94, public administration for the period 1999-03 with a substantial speed of -6.13, and other services for the period 1980-92 with a significant speed of -2.72. Banking and insurance have absolute  $\beta$ -divergence for 1999-08 with a substantial coefficient of 0.89. the sector real estate, ownership of dwelling, business services and legal services have absolute  $\beta$ -divergence for 1999-03, 1999-08, and 2011-20 with a significant speed of 4.97, 4.52, and 2.67, respectively. Trade, hotels, and restaurants give an absolute  $\beta$ -divergence for 1993-94 with a considerable speed of 3.05. Transport, storage and communication also have absolute  $\beta$ -divergence for 1993-98 with a significant speed of 6.12 and for 1999-03 with a substantial value of 4.64.

## CONCLUSION

It is important to note that economic growth and development are complex processes influenced by various factors beyond the initial level of Per Capita Real NSDP. Other factors such as government policies, infrastructure, human capital, technological advancements, and external influences play significant roles. Therefore, to understand the dynamics at play, it is crucial to consider these factors alongside the relationship between the initial level of Per Capita Real NSDP and the CAGR. Further analysis, validation with additional data, and examination of other factors are necessary to draw definitive conclusions and understand the complete nature of economic growth and convergence/divergence phenomena.

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