Japan Bilingual Publishing Co.

Journal of Behavioral Economics and Policy
https://ojs.bilpub.com/index.php/jbep

ARTICLE

Mapping India's Economic Transition: Sectoral Shifts, Labour Productivity, and Regional Inequality in a Policy Framework for Balanced Development

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ABSTRACT

This study investigates the role of structural transformation in shaping labour-productivity growth across Indian states over the past three decades, applying a decomposition framework that separates within-sector efficiency gains from between-sector labour shifts. Using state-level panel data, the analysis derives a Structural Transformation Index (STI) to quantify the extent to which workers move from low-productivity to high-productivity activities. The results reveal substantial interstate heterogeneity. At the national level, approximately one-third of aggregate productivity growth is attributable to labour reallocation, driven largely by the gradual exodus from agriculture into manufacturing and modern services. However, the magnitude of this effect varies widely: states such as Maharashtra, Tamil Nadu, and Gujarat demonstrate pronounced reallocation dynamics, underpinned by diversified industrial bases, expanding service clusters, and relatively flexible labour markets. In contrast, lagging states exhibit a more muted structural shift, relying predominantly on incremental efficiency improvements within low-productivity agriculture. These disparities reflect deeper differences in human-capital quality, institutional effectiveness, and patterns of labour mobility. The analysis shows that education and skill development raise productivity most strongly where institutional settings support capital–skill complementarities, technological adoption, and the smooth absorption of workers into dynamic sectors.

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ARTICLE INFO
Received: 29 March 2025 | Revised: 28 April 2025 | Accepted: 5 May 2025 | Published Online: 12 May 2025
DOI: https://doi.org/10.55121/jbep.v1i1.683

CITATION
Sinha, J.K., 2025. Mapping India's Economic Transition: Sectoral Shifts, Labour Productivity, and Regional Inequality in a Policy Framework for Balanced Development. Journal of Behavioral Economics and Policy. 1(1): 28–50. DOI: https://doi.org/10.55121/jbep.v1i1.683

Consequently, human capital, while necessary, is insufficient in isolation. Sustained productivity growth requires complementary reforms that ease intersectoral labour movement, enhance the absorptive capacity of high-productivity industries, and promote more balanced regional development. Together, these measures can accelerate structural transformation and reduce persistent interstate inequalities in economic performance.

Keywords: Decomposition Analysis; India; Interstate Disparities; Labour Productivity; Sectoral Shifts; Structural Transformation

1. Introduction

India remained predominantly agrarian well into the 1980s, when agriculture contributed more than 40% of national value added and absorbed the majority of the workforce. Since then, the economy has undergone a substantial structural transformation. IMF estimates indicate that agriculture's share of value added declined from above 40% in 1980 to roughly 15% by 2019, yet its employment share remained disproportionately high—exceeding 42% in 2019—declining far more slowly than output. Over the same period, services expanded from just over 30% to more than 55% of value added, while the shares of manufacturing and construction remained comparatively stable (Alonso [1]).

This persistent divergence between sectoral output and employment levels reflects India's large labour productivity gaps. In 2019–2020, productivity in manufacturing and services was more than 4.5 times that of agriculture (Padhi & Sharma [2]), indicating substantial scope for aggregate productivity gains through labour reallocation toward higher-productivity sectors. Recent Shapley-based decompositions further show that both improvements in output per worker and inter-sectoral labour shifts contributed meaningfully to per capita income growth between 1983 and 2019–2020. However, the expansion of industry and services did not yield commensurate increases in employment, pointing to a pattern of "jobless growth" and rising informalization (Rada & Schimmelpfenning [3]).

Productivity improvements in agriculture were also regionally uneven. Long-term investments in irrigation and agricultural research enhanced total factor productivity across regions, but gains varied widely in magnitude. A large share of the workforce remains concentrated in low-productivity sectors such as agriculture and construction, which together still employ more than half of India's workers. Addressing this imbalance is essential for sustaining inclusive growth.

The Indian pattern of structural transformation diverges from the classical Kuznetsian model. In several states, labour has moved directly from agriculture to services, effectively bypassing industrialization—a trend observed in other emerging economies as well. This study explores these divergent trajectories and their implications. Employing a ten-sector growth accounting framework, it applies standard decomposition methods to disaggregate output growth into contributions from capital, labour, and total factor productivity (TFP), with TFP capturing technological efficiency. The analysis further distinguishes two components of productivity change: (i) the Within-Sector Effect (WSE), representing efficiency or technological improvements within sectors; and (ii) the Structural Transformation Index (STI), capturing productivity gains from labour reallocation across sectors. The framework is applied to 15 major Indian states over the post-1980 period to address the following research questions:

i) Do Indian states exhibit common structural transformation trajectories?
ii) Which states follow the traditional path (agriculture → industry → services), and which bypass industrialization?
iii) How do inter-state disparities in labour productivity manifest across sectors?
iv) To what extent do variations in human capital—particularly educational attainment—explain productivity differentials?
v) What role do state-level institutions and labour market regulations play in facilitating or constraining structural transformation?

Contribution of the Study

This study makes a distinct contribution to the existing literature on India's structural transformation by offering a comprehensive state-level comparative analysis

that integrates both within-sector productivity effects and labour reallocation effects through a unified decomposition framework. Unlike earlier studies focusing mainly on national trends or aggregate sectoral shifts, it highlights interstate disparities and captures the heterogeneity of transformation pathways across fifteen major states.

The paper advances understanding by (i) distinguishing productivity gains arising from efficiency improvements within sectors from those due to inter-sectoral labour movements, (ii) linking these dynamics to variations in human capital and institutional environments, and (iii) illustrating how deviations from classical industrialization paths have shaped regional growth outcomes. By bridging macroeconomic decomposition with state-specific labour market characteristics, the study deepens insights into the spatial and structural dimensions of India's growth process and offers policy guidance for promoting more inclusive and productivity-driven development.

2. Literature Review

Structural transformation—the reallocation of economic activity across agriculture, industry, and services—is central to long-run economic growth. Foundational theories, most prominently Lewis's dual-economy model [4] and Kuznets's empirical generalizations [5–7], identify the reallocation of labour from low-productivity agriculture to higher-productivity industry as a central mechanism of economic development. Subsequent scholarship has extended and refined this framework, incorporating variations in sectoral productivity, institutional conditions, and structural change pathways. Gollin & Kabossi argue that modern research increasingly links macro-level structural change with micro-level transitions—from rural to urban, informal to formal, and self-employment to wage work—reflecting a broader and more nuanced understanding of transformation processes [8].

In many developing economies, structural change has become service-led, diverging from the classical agriculture–industry–services sequence. Fan et al. [9] distinguish between service-led growth, driven by productivity gains within services, and services-biased growth, where expansion reflects income growth in other sectors. They emphasize that productivity-led expansion of services is more sustainable than income-induced growth.

Empirical evidence from India mirrors this broader evolution. Erumban et al. [10], using data for 1980–2011, decompose labour productivity growth and find that static labour reallocation contributed only modestly, whereas technological progress within sectors remained the predominant driver. Krishna et al. [11] demonstrate that manufacturing—despite its declining employment share—made substantial contributions to total factor productivity (TFP) during both 2003–2007 and the post-crisis period, indicating significant unrealized industrial potential. Goldar et al. (2024) [12], drawing on India KLEMS data for 1993–2018, document marked heterogeneity within services, with particularly strong TFP gains in transport, storage, and financial services, thereby underscoring the analytical value of disaggregated sectoral assessment.

International comparisons further contextualize these findings. De Vries et al. [13] show that labour reallocation in India exerted a positive influence on aggregate productivity, though this effect was partially dampened by rising informality following economic liberalization. Üngör [14] argues that the developmental implications of structural change hinge critically on sectoral disaggregation and productivity gaps—an approach reflected in this study's ten-sector classification. Verma [15] highlights that India's service-led structural transformation has unfolded at relatively lowincome levels, indicating a premature shift that preceded broad-based industrial employment expansion.

Methodologically, Duarte and Restuccia [16,17] and Herrendorf et al. [18] emphasize the need to distinguish among service subsectors, as high-productivity industries such as ICT and finance behave differently from low-productivity segments like personal or public services. Buera and Kaboski [19] similarly argue that finer disaggregation yields deeper insights into the dynamics of developing economies. McMillan et al. [20] and de Vries et al. [21] extend this view through cross-regional comparisons, revealing diverse productivity and employment effects of structural change. Although our study is empirical rather than theoretical, its findings align with Herrendorf et al. [18], who show that even simplified models with service subcategories can capture the essence of transformation dynamics.

Table 1 synthesizes the study's principal contribu-

tions by systematically mapping each research objective to its corresponding analytical approach, empirical findings, and policy implications. It delineates how the decomposition framework, state-level productivity diagnostics, and sectoral transition analyses collectively advance understanding of India's structural transformation dynamics. The table also highlights the study's methodological innovations—particularly the integration of within-sector and between-sector productivity drivers—and clarifies the specific pathways through which the results contribute to the broader literature on regional growth, labour reallocation, and development policy.

Table 1. Summary of contributions.

Study	Key Insight
Gollin & Kaboski (2023) [8]	Broadens the concept of structural transformation beyond industrialization
Fan et al. (2023) [9]	Distinguishes between service-led and service-biased growth
Erumban et al. (2019) [10]	Highlights the primacy of within-sector technological improvements
Krishna et al. (2022) [11]	Reveals hidden industrial potential despite declining employment
Goldar et al. (2024) [12]	Identifies transport and finance as leading service subsectors in TFP growth
de Vries et al. (2012) [13]; Üngör (2017) [14]	Stress job quality and disaggregation in assessing structural effects
Verma (2012) [15]	Notes premature service expansion in India
Duarte & Restuccia (2010, 2020) [16,17]; Herrendorf et al. (2014) [18]	Emphasize the need for service subsector granularity.
Buera & Kaboski (2009) [19]; McMillan et al. (2014) [20]; de Vries et al. (2015) [21]	Advocate high-resolution sectoral analysis across contexts.
Herrendorf et al. (2014) [18]	Validate simpler multi-sector models for capturing transformation dynamics.

Positioning of the Present Study: Building on this literature, the present study provides a subnational, state-level analysis of India's structural transformation using a ten-sector framework. It introduces two quantitative metrics—the Structural Transformation Index (STI) and Within-Sector Effect (WSE)—to disentangle productivity gains arising from labour reallocation across sectors from those driven by efficiency improvements within sectors.

3. Methodology

This study applies a growth accounting framework to decompose aggregate labour productivity into components reflecting sectoral productivity changes and the reallocation of labour across sectors. This decomposition allows us to identify the distinct contributions of within-sector improvements and between-sector reallocations—a widely used approach in the empirical literature on structural transformation (e.g., McMillan & Rodrik; de Vries et al.; Herrendorf et al.) [18,20,21].

3.1. Aggregate Labour Productivity and Its Decomposition

Let the economy be composed of k sectors. Denote total output as:

$$P = \{\sum Q_i\} / \{\sum L_i\} \quad (1)$$

where Q_i and L_i denote output and employment, respectively, in sector i, and P is the average labour productivity across the entire economy. The summation extends from 1 to k.

Define $u_i = L_i / \sum L_i$ as the employment share of sector i, and as the sectoral labour productivity. Then aggregate productivity can be expressed as:

$$P = \sum P_i \cdot u_i \quad (2)$$

To measure changes in aggregate productivity over time, we take the first difference:

$$\Delta P = \sum \Delta P_i \cdot u_i + \sum P_i \cdot \Delta u_i + \sum \Delta P_i \cdot \Delta u_i \quad (3)$$

This decomposition captures three effects:

i) Within-Sector Effect (WSE): $\sum_i \Delta P_i \cdot u_i$, capturing productivity growth within individual sectors while holding employment shares constant.

ii) Between-Sector Effect (BSE): $\sum_i \Delta P_i \cdot u_i$, capturing gains due to labour moving from less to more pro-

ductive sectors.

iii) Interaction Effect (IE): $\sum_i \Delta P_i \cdot u_i$, capturing the simultaneous change in productivity and employment shares.

This methodology is consistent with shift-share decompositions used in recent empirical literature (Üngör; de Vries et al.; Erumban et al.,) [10,13,14].

3.2. Structural Transformation Index (STI)

To quantify the contribution of labour reallocation to aggregate productivity growth, we construct a Structural Transformation Index (STI) as:

$$STI = [BSE + IE] / [WSE + BSE + IE] \quad (4)$$

This index captures the proportion of aggregate productivity growth attributable to structural change (i.e., inter-sectoral labour movements). A higher STI value suggests a stronger role of labour reallocation in driving overall productivity growth. This formulation has been used in comparable studies examining regional and cross-country structural transformation (e.g., McMillan et al.) [20].

3.3. Sectoral Disaggregation Framework

To accurately capture sectoral heterogeneity in productivity and employment dynamics, we adopt a ten-sector disaggregated classification of the Indian economy. These sectors, adapted from the Groningen Growth and Development Centre (GGDC) ten-sector framework, are:

Agriculture, Hunting, Forestry, and Fishing (A); Mining and Quarrying (MQ)

Manufacturing (M); Electricity, Gas, and Water Supply (EGWS)

Construction (C); Trade, Hotels, and Restaurants (THR)

Transport, Storage, and Communication (TSC); Finance, Insurance, Real Estate, and Business Services (FIRB)

Government Services (GS); Community, Social, and Personal Services (CSPS)

This classification allows us to examine productivity dynamics within a nuanced sectoral structure, particularly within services, which are often treated as a single aggregate in conventional three-sector models.

3.4. State-Level Aggregation and Coverage

Although India consists of 28 states and 8 union territories, for empirical robustness and data availability, we restrict our analysis to 15 major states, each with a population exceeding 20 million (as per the 2011 Census). These are: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.

Due to the bifurcation of states during the study period, we align the newer states with their original parent states for consistency:

i) Chhattisgarh is aggregated with Madhya Pradesh
ii) Jharkhand with Bihar
iii) Telangana with Andhra Pradesh

3.5. Data Sources and Construction

This study represents a comprehensive effort to construct a sectorally disaggregated time series of India's labour force across ten broad sectors, using harmonized microdata for the period 1985–2020. The analysis relies on two key variables—sectoral labour input and sectoral output—which together form the basis for computing sectoral labour productivity.

Given the availability of labour force data from 1985 onwards, output data were correspondingly restricted to the same period to maintain a balanced sector-year panel. Labour force estimates were compiled from multiple nationally representative sources: (i) the decennial Population Censuses (1991, 2001, and 2011); (ii) various rounds of the Employment–Unemployment Surveys (EUS) conducted by the National Sample Survey Office (NSSO) between 1983 and 2012; (iii) eleven rounds of the Household Consumer Expenditure (HCE) surveys from 1990 to 2002; and (iv) the 2017–18 round of the Periodic Labour Force Survey (PLFS). These datasets provide employment estimates disaggregated by industry of work, coded according to successive versions of the National Industrial Classification (NIC). A harmonized concordance was applied to ensure consistent sectoral mapping across survey rounds and classification systems.

Labour productivity is computed as the ratio of net domestic product (NDP) at constant prices (base year: 2011–12) to the number of employed persons in each sector-year combination. This metric serves as the central indicator for assessing both within-sector productivity changes and the economy-wide effects of structural transformation. Sectoral output data are drawn from the India Time Series (EPWRFITS) database maintained by the Economic and Political Weekly Research Foundation, which consolidates the National Accounts Statistics (NAS) published by the Ministry of Statistics and Programme Implementation (MoSPI). Specifically, we utilize net state domestic product (NSDP) estimates at constant prices, available annually from 1960 to 2020, as a proxy for sectoral NDP.

The use of NDP rather than gross domestic product (GDP) is methodologically appropriate for productivity analysis for two reasons. First, NDP excludes capital consumption allowances (depreciation), isolating value added attributable solely to labour and intermediate inputs. Second, empirical research (e.g., Fisher and Hostland, 2002) indicates that labour income as a share of NDP exhibits greater temporal stability than GDP-based ratios. Consequently, NDP provides a more accurate and less volatile indicator of long-run productivity dynamics, making it preferable for analysing secular trends in growth and structural transformation.

Since NDP data are reported in different constant base years—namely, 1960–1961, 1970–1971, 1980–1981, 1993–1994, 1999–2000, 2004–2005, and 2011–2012—a harmonization procedure was applied for intertemporal consistency. A chain-linking methodology was used to convert all series to a common base year (2011–2012). This involved identifying overlapping years between successive base series, computing annual ratios of NDP in newer and older base years, and deriving median ratios as conversion factors. For instance, NDP data for 2011–2014 were employed to compute the ratio between the 2011–2012 and 2004–05 series, and the median of these ratios was applied to rebase the 2004–05 series. This recursive process was repeated to align earlier series (e.g., 1999–2000) with the 2011–2012 base through intermediate rebasing steps.

The re-basing and harmonization procedures were systematically implemented across all ten sectors, producing a coherent, sectorally disaggregated time series of real output. All monetary values are expressed in constant prices to eliminate inflationary effects and to enable valid temporal comparisons. Employment data were similarly standardized to reflect full-time equivalent (FTE) employment, adjusting for part-time, seasonal, and informal labour participation using survey metadata and microdata.

The final dataset integrates state-level NSDP and employment estimates from MoSPI's National Accounts and Labour Force Statistics divisions. Sectoral output data from the NSDP's eleven-industry classification were mapped into the study's ten-sector framework using crosswalk concordances. Employment data were similarly harmonized, enabling a coherent, state–sector–year panel suitable for productivity decomposition.

This comprehensive data construction framework provides a robust empirical foundation for examining the relative contributions of intra-sector productivity growth and inter-sectoral labour reallocation to aggregate productivity dynamics. It further facilitates the assessment of heterogeneity in structural transformation across India's major states and helps identify the regional correlates of divergent growth and development outcomes.

3.6. Data Limitations

While extensive efforts were made to ensure consistency and reliability, certain limitations of the dataset merit acknowledgment.

First, the analysis is restricted to the period 1985–2020 due to the unavailability of consistent, nationally comparable labour force data prior to the mid-1980s. Earlier statistics differ in classification schemes, sampling methods, and employment definitions, making them unsuitable for temporal comparison.

Second, inter-survey inconsistencies exist among data sources such as the Population Census, NSSO Employment–Unemployment Surveys, and the Periodic Labour Force Survey (PLFS). These sources vary in periodicity and reference periods, sometimes leading to marginal discrepancies in employment estimates. Although harmonized concordances and interpolation techniques were applied, minor measurement errors may remain.

Third, classification changes across successive versions of the National Industrial Classification (NIC)

occasionally hinder perfect sectoral alignment—especially for emerging subsectors in services and construction. Despite systematic mapping, some aggregation bias is unavoidable.

Fourth, output data limitations stem from revisions in base years and estimation procedures in the Net Domestic Product (NDP) and Net State Domestic Product (NSDP) series. The chain-linking method ensures comparability across years but may slightly smooth short-term fluctuations in sectoral growth rates.

Finally, employment quality and informality are imperfectly captured. Adjustments for full-time equivalent (FTE) employment rely on survey metadata rather than longitudinal microdata, which may understate informal or seasonal labour participation.

Overall, these constraints do not undermine the validity of the findings but call for cautious interpretation—particularly in inter-state comparisons. The study mitigates these limitations through rigorous harmonization, triangulation across data sources, and transparent methodological adjustments.

4. Analysis and Findings

This section examines India's structural transformation through changes in the sectoral composition of Net Domestic Product (NDP), labour distribution, and sectoral labour productivity across major states during 1985–2020. The results highlight three central dimensions of transformation—output structure, employment shift, and productivity growth—revealing wide interstate disparities in pace and pattern.

4.1. Sectoral Composition of NDP

India's structural transformation has been spatially uneven, with states diverging sharply in the pace and pattern of sectoral change. **Tables 2** and **3** present the distribution of Net Domestic Product (NDP) across major sectors in 2019–2020 and the corresponding changes in sectoral shares between 1985 and 2020. The evidence indicates a marked reallocation of economic activity from agriculture toward services, although the extent and trajectory of this structural shift differ considerably across regions.

Table 2. Sectoral NDP share (in %) in 2019–2020.

State	PCSDP (in Rs)	Sectoral Percentage Share of NSDP									
		A	MQ	M	C	EGWS	THR	TSC	FIRB	GS	CSPS
Haryana	229065	18.56	0.23	19.92	0.34	8.92	14.34	6.76	23.11	2.26	5.55
Gujarat	212821	16.17	4.74	32.61	2.71	6.72	13.55	5.09	11.57	2.98	3.88
Karnataka	221320	9.74	0.89	17.02	0.97	6.74	11.19	6.48	38.68	2.16	6.12
Maharashtra	183704	10.42	4.22	22.71	1.46	6.27	8.85	6.49	29.75	2.43	7.39
Tamil Nadu	212174	12.11	0.56	23.06	0.04	12.07	11.94	6.56	23.15	2.72	7.79
Kerala	194322	9.18	0.65	11.01	0.76	14.58	18.47	8.38	21.21	3.41	12.37
Punjab	149193	27.48	0.34	14.01	2.43	6.77	11.65	5.35	15.33	5.11	11.54
AP	163746	22.08	3.56	12.74	1.71	6.99	12.61	8.44	19.62	3.55	8.71
Rajasthan	115122	26.61	10.93	12.31	0.57	8.65	10.77	5.86	13.51	2.69	8.09
Orissa	102166	15.11	13.73	15.58	2.93	7.64	11.98	7.51	12.44	5.78	7.33
INDIA	114710	16.65	3.45	17.88	1.68	8.51	12.52	7.11	20.82	3.85	7.55
West Bengal	106510	20.45	1.28	14.12	2.11	10.67	15.99	6.61	16.24	4.37	8.15
Assam	90482	18.71	11.97	14.61	1.39	9.61	12.58	5.43	8.75	8.01	8.97
MP	103654	36.73	3.10	10.71	2.64	8.77	11.08	6.44	9.64	4.89	6.01
UP	61374	23.68	1.92	13.59	0.82	11.46	11.31	8.12	17.65	6.28	5.18
Bihar	43605	19.68	0.45	7.51	1.01	8.82	23.34	9.02	13.51	4.62	12.04

Note: A: Agriculture, hunting, forestry and fishing; MQ: Mining and quarrying; M: Manufacturing; C: Construction; EGWS: Electricity, gas and water supply; THR: Trade, hotels and restaurants; TSC: Transport storage and communication; FIRB: Finance, insurance, real estate and business services; GS: Government services; CSPS: Community, social and personal services.
Source: Authors' calculations.

Table 3. Change in sectoral NDP share (in %) during 198 (descending order of agriculture sector share decline).

State	Change in Sectoral NDP Share (in Percentage)									
	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS
Orissa	−37.91	10.63	1.36	−0.84	−1.14	6.80	6.72	7.78	2.64	3.96
AP	−34.89	0.92	4.51	1.32	−0.76	6.36	5.78	12.98	0.21	3.56
Bihar	−33.04	0.24	−4.18	−0.11	7.43	12.18	5.92	5.87	2.10	3.61
Haryana	−31.71	−0.11	3.49	−0.18	−3.15	9.83	4.60	16.18	0.33	0.71
Rajasthan	−31.61	9.0	3.19	−0.02	1.95	2.40	4.42	6.03	−0.06	4.69
Kerala	−27.72	0.32	−5.56	0.57	6.20	2.48	7.56	13.12	1.93	1.09
INDIA	−26.84	−4.56	2.87	3.95	1.54	2.59	5.01	12.77	0.73	1.94
Karnataka	−25.93	−5.16	1.49	−3.01	0.72	2.73	4.70	23.44	−0.90	1.91
Maharashtra	−24.25	−2.26	−1.60	0.61	−0.62	1.94	3.98	20.20	0.77	2.77
Uttar Pradesh	−23.47	1.00	1.33	0.12	3.10	−1.84	5.53	9.16	3.14	1.94
Punjab	−22.68	0.31	6.98	1.47	−0.47	0.04	4.02	8.30	3.04	−1.00
Tamil Nadu	(21.67)	0.09	−3.38	0.67	5.13	2.15	3.21	14.56	0.55	0.04
Madhya Pradesh	−18.97	0.13	1.74	2.08	3.70	−2.31	5.20	5.04	1.81	1.83
Gujarat	−18.96	−32.18	22.28	2.13	4.20	8.43	4.16	7.62	0.77	1.55
West Bengal	(17.43)	−13.49	−0.61	0.82	5.86	6.52	4.48	11.03	0.61	2.21
Assam	−14.97	−9.57	1.13	−0.92	4.99	−0.80	4.05	5.04	5.87	5.20

Source: Author's calculation.

4.1.1. Contemporary Structure (2019–2020)

The services sector dominates most state economies, accounting for more than two-thirds of NDP in advanced states such as Karnataka, Maharashtra, Tamil Nadu, and Delhi. These states exemplify a services-led growth trajectory, driven by IT, financial, and business services.

In contrast, the agriculture sector's share has declined sharply over time but remains high in lagging states such as Madhya Pradesh (36.7%) and Punjab (27.5%), underscoring the persistent inverse relationship between agricultural dependence and per capita income.

The industrial composition displays considerable heterogeneity:

Manufacturing is most prominent in Gujarat (32.6%) and Tamil Nadu (23.1%), reflecting strong industrial ecosystems, but remains minimal in Bihar and Madhya Pradesh.

Mining and quarrying activities are concentrated in resource-rich states such as Odisha, Assam, and Rajasthan.

Construction peaks in Kerala, reflecting real estate expansion and infrastructure investments.

Finance, insurance, real estate, and business services (FIRB) drive output in Karnataka (38.7%) and Maharashtra (29.8 %), highlighting the spatial concentration of IT and financial hubs.

(See **Table 2** for state-wise NDP composition.)

4.1.2. Long-Term Shifts (1985–2020)

Between 1985 and 2020, all states witnessed a contraction in the share of agriculture, though the magnitude varied widely:

The steepest declines occurred in Odisha (−38 pp) and Andhra Pradesh (−35 pp).

Industrial trajectories diverged—Gujarat's manufacturing share surged (+22 pp), while Kerala, Tamil Nadu, and Maharashtra recorded declines.

Construction and trade-related services expanded markedly in Bihar and Kerala, indicating shifts toward urban and infrastructure-led growth.

The FIRB sector grew most rapidly in Karnataka (+23 pp), mirroring the rise of the knowledge economy.

(See **Table 3** for detailed sectoral shifts.)

4.1.3. Interpretation and Policy Insights

India's growth has been multi-speed and regionally polarized. Southern and western states have advanced toward high-productivity services and industry, while north-

ern and eastern states remain agriculture-dependent with slower diversification.

The premature dominance of services—without a broad-based industrial base—raises policy concerns about employment absorption, regional inequality, and the sustainability of structural change.

To promote inclusive transformation, policy emphasis should focus on:

Revitalizing manufacturing and agro-industry in lagging states,

Investing in infrastructure and skill development to enhance productivity spillovers, and

Strengthening state-level industrial and innovation ecosystems to balance growth across regions.

4.2. Sectoral Labour Productivity

4.2.1. Contemporary Labour Structure (2020)

The distribution of workers across sectors (**Table 4**) exhibits pronounced inter-state disparities, underscoring substantial variation in the structure of employment across the Indian economy. Despite diversification in output, employment remains heavily concentrated in agriculture, particularly in Bihar, Odisha, and Uttar Pradesh, where over half the workforce remains engaged in low-productivity farm activities. In contrast, southern and western states—notably Maharashtra, Gujarat, and Haryana—have reallocated a greater share of labour toward non-farm sectors, reflecting more advanced structural transformation.

Table 4 reveals that distinct patterns emerge in the distribution and evolution of sectoral productivity, indicating significant variability in both levels and growth trajectories across states and sectors.

i. Agriculture still accounts for 43.9% of national employment, though its share ranges from over 60% in Madhya Pradesh to below 20% in Kerala.

ii. Manufacturing absorbs only 12.1% of workers nationally, with higher shares in Gujarat (20%) and Tamil Nadu (19.5%), but remains marginal in states like Madhya Pradesh and Assam.

iii. Construction (11.7%) and Trade, Hotels & Restaurants (12.0%) have emerged as key absorbers of rural labour, while Finance and Business Services (FIRB) employ only 3–6%, concentrated in urban economies such as Kerala and Maharashtra.

Table 4. Labour force share (in %) in 2019–2020 in descending order of the agriculture sector labour share.

State	Sectoral Labour Force Share (in Percentage)									
	Agriculture	Mining & Quarrying	Manufacturing	EGWS	Construction	Trade, Hotel, & Restaurant	TSC	FIRB	GS	CSPS
Madhya Pradesh	60.55	0.52	6.07	0.56	11.49	7.87	2.86	2.13	5.87	2.08
Rajasthan	48.90	1.76	9.19	0.93	14.42	9.60	3.83	2.76	6.00	2.61
Odisha	48.50	1.19	7.33	0.57	17.38	9.82	4.86	2.09	5.67	2.60
Uttar Pradesh	48.09	0.08	11.44	0.44	13.74	12.81	4.20	2.05	5.15	2.00
Maharashtra	47.69	0.14	11.76	0.42	5.76	11.06	6.82	4.91	7.23	4.22
Andhra Pradesh	47.50	0.49	10.63	0.59	9.51	10.63	7.32	2.91	5.95	4.46
Karnataka	45.73	0.31	12.29	0.51	7.92	11.82	8.45	3.50	6.94	2.54
Assam	45.46	0.34	6.65	0.16	9.94	15.03	5.50	2.82	9.78	4.32
Bihar	45.10	0.07	8.93	0.09	16.30	13.68	4.14	3.11	5.38	3.20
INDIA	43.90	0.42	12.14	0.59	11.69	12.04	5.98	3.30	6.64	3.30
Gujarat	41.95	0.35	20.14	0.79	6.23	12.29	6.93	3.36	4.93	3.03
West Bengal	36.43	0.37	17.63	0.30	11.64	13.49	6.45	3.03	6.30	4.36
Tamil Nadu	27.87	0.37	19.50	0.88	13.88	13.92	8.75	4.78	6.37	3.67
Haryana	27.39	0.17	19.51	1.25	12.94	12.56	9.56	5.18	7.97	3.48
Punjab	25.98	0.12	18.79	0.78	13.37	16.78	5.43	3.65	9.96	5.15
Kerala	19.52	0.25	11.34	0.65	19.18	16.96	10.83	5.99	10.56	4.73

Source: Authors' calculation.

4.2.2. Long-Term Employment Shifts (1985–2020)

The structural shift in employment (**Table 5**) confirms a gradual but uneven transition from agriculture to non-farm sectors. Only three sectors—Agriculture, Mining & Quarrying, and Community & Personal Services (CSPS)—experienced a decline in labour share.

Table 5. Sectoral labour reallocation (in %) during 1985–2020 (in descending order of the agriculture sector labour share decline).

State	Sectoral Labour Reallocation (in Percentage)									
	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS
Punjab	−39.79	0.06	8.3	−0.04	10.96	9.89	1.68	2.63	4.35	1.97
Haryana	−38.91	−0.38	10.95	0.93	9.88	7.21	6.95	4.50	−0.90	−0.23
Kerala	−35.57	−0.87	−4.31	0.23	15.81	8.50	6.56	4.72	4.61	0.32
Bihar	−31.20	−1.27	1.48	−0.04	15.28	7.85	2.53	2.87	2.52	−0.02
Tamil Nadu	−29.59	−0.15	2.48	0.48	11.43	5.28	5.65	3.77	1.31	−0.67
Rajasthan	−26.76	1.23	2.00	0.39	10.16	5.39	2.01	2.48	2.35	0.76
Assam	−26.63	0.06	2.01	−0.13	8.85	6.98	2.90	2.50	3.37	0.09
INDIA	−24.01	−0.20	1.36	0.28	9.35	5.61	3.43	2.60	1.66	−0.09
Odisha	−23.92	0.25	−2.46	0.48	15.67	4.54	3.72	1.59	1.07	−0.95
Gujarat	−23.38	0.22	6.72	0.57	4.33	6.09	4.06	2.63	−1.49	0.24
Uttar Pradesh	−22.99	0.02	1.68	0.18	11.92	6.70	1.83	1.54	0.47	−1.35
Karnataka	−22.28	−0.34	1.33	0.23	4.69	5.38	6.03	2.34	2.77	−0.15
Andhra Pradesh	−21.59	−0.18	0.53	0.45	7.47	3.83	4.71	2.42	2.14	0.23
West Bengal	−20.50	−0.19	1.55	0.07	9.73	5.07	2.71	2.05	0.12	−0.61
Maharashtra	−19.30	−0.09	0.80	−0.01	2.81	4.75	3.69	3.90	2.06	1.38
Madhya Pradesh	−17.51	−1.16	−0.78	0.23	9.80	3.95	1.47	1.73	2.07	0.20

Source: Author's calculation.

Table 5, which examines sectoral labour reallocation during 1985–2020, reveals marked shifts in the distribution of the workforce across agriculture, industry, and services, highlighting both the scale and direction of labour movement over the long term.

i. The largest contraction occurred in agriculture (−24 pp), yet it remains the dominant employer.
ii. Construction registered the largest employment gain (+9.3 pp), followed by Trade, Hotels & Restaurants (+5.6 pp), Transport & Communication (+3.4 pp), Finance & Business Services (+2.6 pp), and Manufacturing (+1.4 pp).
iii. Manufacturing employment expanded notably in Haryana (+10.9 pp), Punjab (+8.3 pp), and Gujarat (+6.7 pp), but declined in Kerala, Madhya Pradesh, and Odisha.
iv. Construction employment grew across all states, led by Kerala (+15.8 pp)—indicating its role as the key absorber of underemployed rural workers.
v. Services sectors such as FIRB, Trade, and Transport saw universal gains, reflecting urbanisation and the rise of service economies.

4.2.3. Regional Contrasts and Sectoral Dynamics

Patterns of structural change reveal a dual trajectory:

i. Southern and western states (Tamil Nadu, Kerala, Karnataka, Maharashtra, Gujarat) exhibit rapid reallocation toward high-productivity services and urban construction.
ii. Northern and eastern states (Bihar, Uttar Pradesh, Madhya Pradesh, Odisha) remain agriculture-dependent, with limited industrial absorption and slower diversification.

Sectoral observations:

i. Manufacturing: Concentrated in industrial hubs with robust infrastructure (Gujarat, Tamil Nadu, Hary-

ana).

ii. Construction: A universal absorber of semi-skilled labour, particularly in migration-intensive states.

iii. Services: Dynamic in Punjab and Kerala, reflecting demand-driven and urban-led growth.

iv. Public Services (GS & CSPS): Remain important employers in low-growth states.

These findings highlight a dual process: (i) a gradual shift of labour away from agriculture towards construction, services, and selected manufacturing hubs, and (ii) a polarisation in state-level sectoral structures, with some states advancing towards high-productivity economies while others remain reliant on low-productivity agricultural employment. This uneven structural transformation underscores the need for targeted regional policies to enhance labour mobility, skill development, and sectoral diversification.

Table 6 below presents a condensed data narrative of the sectoral distribution of the workforce across major Indian states in 2020, highlighting both productivity differentials and structural composition.

Table 6. Condensed data narrative of the sectoral labour productivity.

Sector	National Highlights	State Extremes	Observations
Agriculture (A)	Largest employer (43.9% nationally) but lowest productivity	Max: Madhya Pradesh (>60%) Min: Kerala (<20%)	Declining share over decades, but still dominant in low-productivity economies.
Mining & Quarrying (MQ)	Minimal share (< 0.5% in most states)	Max: Rajasthan (1.76%)	Resource-based, highly location-specific employment.
Manufacturing (M)	12.14% nationally.	Max: Gujarat (20.14%), Tamil Nadu (19.50%); Min: Madhya Pradesh (6.07%), Assam (6.65%).	Concentrated in industrial hubs with strong infrastructure and investment climates.
Electricity, Gas, Water Supply (EGWS)	<1% nationally.	Max: Haryana (>1%).	Capital-intensive, low-labour absorption.
Electricity, Gas, Water Supply (EGWS)	<1% nationally.	Max: Haryana (>1%).	Capital-intensive, low-labour absorption.
Construction (C)	11.69% nationally; fastest growing (+9.35 p.p. since 1983).	Max: Kerala (19.18%), Min: Gujarat (6.23%).	Major absorber of rural-to-urban migrant labour.
Construction (C)	11.69% nationally; fastest growing (+9.35 p.p. since 1983).	Max: Kerala (19.18%), Min: Gujarat (6.23%).	Major absorber of rural-to-urban migrant labour.
Trade, Hotels, Restaurants (THR)	12.04% nationally.	Even distribution; Punjab and Kerala lead in growth.	Labour-intensive service sector with steady expansion.
Transport, Storage, Communication (TSC)	3–11% range.	Max: Kerala (~11%); Min: Madhya Pradesh (<3%).	Correlates with urbanisation and logistics infrastructure.
Finance, Insurance, Real Estate, Business Services (FIRB)	2–6% range.	Max: Kerala (~6%); Min: UP, Odisha, MP (~2%).	Expanding in urban service economies.
General Services (GS) & Community, Social, Personal Services (CSPS)	Moderate variation.	Kerala high; Uttar Pradesh low.	Public sector employment is dominant.

4.2.4. Summary Insight and Policy Implications

India's employment transition remains services- and construction-led rather than industrial-led, reflecting a "dual economy" structure. Labour has moved steadily from agriculture to urban and informal services, but productivity convergence across sectors and states remains incomplete.

The analysis underscores:

i. Persistent agricultural overemployment despite sharp share declines.

ii. Weak manufacturing absorption, limiting productivity gains.

iii. Uneven regional transformation, with high-productivity states diverging further from lagging regions.

iv. Policy Priority: Accelerate sectoral diversification through targeted industrial cluster promotion, skilling, and regional investment in urban infrastructure to create productive employment outside agriculture.

4.3. Sectoral Labour Productivity: Patterns, Disparities, and Drivers

4.3.1. National Overview and Hierarchical Patterns

Labour productivity (measured as NDP per worker) follows a clear hierarchy—services > industry > agriculture—reflecting the broader structural composition of India's economy. Productivity levels peak in Finance, Insurance, Real Estate, and Business (FIRB) and machinery-based manufacturing, while they remain lowest in agriculture and construction.

Over the past three decades, all sectors have registered productivity gains; however, the gap between agriculture and non-agriculture has widened, underscoring growing rural–urban and inter-sectoral inequality. States that effectively reallocated labour toward high-productivity sectors recorded faster per capita income growth—demonstrating the synergy between structural transformation and income convergence.

4.3.2. Interstate Differentials and Sectoral Highlights

Agriculture: Punjab and Haryana lead, reflecting capital-intensive and irrigated farming systems. Bihar and Odisha lag, constrained by land fragmentation, weak irrigation, and limited technological diffusion.

Mining and Quarrying (MQ): Exceptionally wide range—from ₹122 lakh in Maharashtra to under ₹5 lakh in Tamil Nadu—illustrates dependence on natural endowment, capital intensity, and export-linked clusters.

Manufacturing (M): Gujarat outperforms (₹8 lakh per worker) due to industrial clusters and infrastructure, while Bihar and West Bengal remain below ₹2 lakh.

Construction (C): Gujarat again tops, while Odisha and Bihar remain lowest.

Services:

FIRB: Karnataka dominates, followed by Haryana—consistent with their IT-finance specialization.

TSC, GS, THR: More uniform productivity across states, showing the spread of mid-level service employment.

CSPS: Kerala leads, highlighting its strong social sector, while West Bengal ranks lowest.

These interstate contrasts underscore the dual structure of India's productivity landscape—advanced, diversified economies coexisting with agrarian, low-productivity states.

4.3.3. Labour Productivity Dynamics Across Sectors and States (1985–2019)

National Overview: Patterns of Productivity Growth

Table 7, as indicated below, presents the change in labour productivity (₹100,000) across major sectors from 1985 to 2019. India's aggregate productivity rose substantially, with particularly large gains in Mining and Quarrying (↑ ₹17.17 lakh) and Finance, Insurance, Real Estate, and Business Services (FIRB) (↑ ₹12.26 lakh). These sectors, being capital- and technology-intensive, have driven much of the post-1990s growth surge.

By contrast, agricultural productivity increased by only ₹0.77 lakh, reflecting the sector's structural rigidity, modest technological diffusion, and slow value-added growth—findings consistent with recent empirical literature [6].

Key Pattern: India's productivity transformation has been highly asymmetric—strong in modern sectors, moderate in manufacturing, and limited in agriculture.

Table 7. Labour productivity in 2019–2020 (in 100,000s of INR in descending order of agriculture sector productivity).

State	Labour Productivity in 2019–2020										
	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS	Total Economy
Punjab	4.23	11.76	2.98	12.54	2.03	2.78	3.95	16.80	2.05	8.98	4.00
Haryana	3.85	7.68	5.81	1.57	3.92	6.50	4.02	25.38	1.61	9.06	5.69
Kerala	2.35	12.93	4.85	5.79	3.80	5.44	3.87	17.69	1.61	13.05	5.00
Gujarat	1.98	69.65	8.30	17.44	5.53	5.66	3.77	17.68	3.11	6.56	5.13
Tamil Nadu	1.50	5.19	4.08	0.16	3.00	2.96	2.58	16.69	1.47	7.32	3.45
Rajasthan	1.38	15.77	3.40	1.56	1.52	2.84	3.88	12.39	1.14	7.86	2.53
Andhra Pradesh	1.32	20.71	3.41	8.21	2.09	3.38	3.28	19.16	1.70	5.56	2.85

Table 7. *Cont.*

State	Labour Productivity in 2019–2020										
	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS	Total Economy
West Bengal	1.16	7.19	1.65	14.57	1.89	2.45	2.12	11.07	1.43	3.86	2.07
INDIA	1.10	23.94	4.27	8.20	2.10	3.01	3.44	18.26	1.68	6.62	2.89
Madhya Pradesh	0.96	9.49	2.79	7.47	1.21	2.23	3.56	7.16	1.32	4.56	1.58
Assam	0.94	80.75	4.99	19.99	2.20	1.90	2.25	7.06	1.86	4.72	2.27
Maharashtra	0.86	122.09	7.57	13.70	4.27	3.13	3.73	23.74	1.32	6.87	3.92
Uttar Pradesh	0.83	42.25	2.00	3.10	1.40	1.49	3.26	14.50	2.05	4.35	1.68
Karnataka	0.79	10.52	5.14	7.11	3.16	3.51	2.84	41.03	1.15	8.95	3.71
Odisha	0.70	26.17	4.81	11.67	0.99	2.76	3.49	13.50	2.31	6.37	2.26
Bihar	0.61	9.11	1.17	16.00	0.75	2.38	3.04	6.05	1.20	5.25	1.39

Note: A: Agriculture, hunting, forestry, and fishing; MQ ¼ Mining and quarrying; M ¼ Manufacturing; C: Construction; EGWS ¼ Electricity, gas, and water supply; THR: Trade, hotels, and restaurants; TSC: Transport, storage, and communication; FIRB: Finance, insurance, real estate, and business services; GS: Government services; CSP: Community, social and personal services.
Source: Author's calculation.

Sectoral Differentiation: Contrasting Trajectories

Agriculture:

Punjab achieved the highest productivity (₹3.51 lakh), followed by Haryana (₹3.33 lakh), supported by irrigation intensity, mechanization, and input-use efficiency [4]. At the other end, Bihar, Odisha, and Karnataka recorded minimal productivity, highlighting constraints of fragmented holdings, weak irrigation, and low technology adoption.

Mining and Quarrying (MQ):

Productivity differences are striking—from ₹122 lakh in Maharashtra to ₹5 lakh in Tamil Nadu—underscoring the sector's capital intensity and geographic concentration in resource-rich clusters [5]. While Maharashtra posted large gains, Gujarat experienced a sharp decline, likely due to labour inflows that diluted output per worker (see **Table 5**).

Manufacturing (M):

Variation across states is narrower but remains significant. Gujarat (₹8 lakh/worker) and Maharashtra (₹6 lakh) outperformed Bihar and West Bengal (< ₹2 lakh), reflecting differences in industrial ecosystems, investment, and infrastructure.

Construction (C) and EGWS:

Gujarat leads in construction productivity, while Bihar and Odisha rank lowest. The Electricity, Gas, and Water Supply (EGWS) sector saw strong gains in Gujarat and Maharashtra (↑ ₹12–15 lakh), linked to infrastructure and energy investment.

Services (THR, TSC, FIRB, GS, CSPS):

Trade, Hotels, and Restaurants (THR): Haryana recorded the steepest increase (₹5.92 lakh), followed by Gujarat (₹4.81 lakh).

Transport, Storage, and Communication (TSC): Kerala (+₹3.70 lakh) and Punjab (+₹3.61 lakh) lead, showing diversified service growth.

FIRB: Karnataka dominates (+₹33.97 lakh), followed by Haryana and Maharashtra—consistent with the spatial clustering of IT-BPM and financial hubs.

Community, Social, and Personal Services (CSPS): Kerala ranks highest (+₹10.81 lakh), reflecting sustained social-sector investment; West Bengal trails.

Observation: Services have become the productivity anchor for advanced states, while lagging states remain agriculture- or construction-dependent.

Interstate Differentiation: Productivity Gaps and Convergence

Productivity growth patterns reveal pronounced regional polarization:

High-growth states (Gujarat, Maharashtra, Haryana, Karnataka) recorded multi-sector productivity gains, combining industrial dynamism with service expansion.

Lagging states (Bihar, Odisha, Assam) faced stagnation or declines in several sectors due to structural constraints—weak industrial base, limited capital formation, and infrastructural bottlenecks.

Assam's consistent underperformance across sectors reflects enduring connectivity and investment deficits.

Pattern of Dual India: The western and southern states have transitioned to high-productivity, diversified economies, while the eastern and northern states remain trapped in low-productivity agriculture.

Synthesis: Productivity, Reallocation, and Structural Transformation

Between 1985 and 2019, India's labour productivity increased substantially; however, the magnitude, drivers, and trajectory of this improvement exhibited pronounced heterogeneity across states and sectors (**Table 8**).

Table 8. Sectoral Performance of States & Its Policy Interpretation.

Leading Sector / State	Top Performer	Policy Interpretation
Mining & Quarrying	Maharashtra	Capital- and resource-driven surge
FIRB	Karnataka	IT-finance clustering effect
Manufacturing	Gujarat	Industrial specialization
THR	Haryana	Service-sector diversification
TSC	Kerala	Infrastructure and connectivity
Agriculture	Punjab	Mechanization and irrigation
Lagging States	Assam, Odisha, Bihar	Structural bottlenecks

These outcomes highlight the interdependence between productivity growth, labour reallocation, and economic diversification. Sectors that absorbed skilled labour (FIRB, TSC) also recorded higher productivity, whereas labour-intensive traditional sectors (A, C) showed slower gains.

Policy Implication:

India's structural change is uneven and regionally polarized. Boosting productivity in agriculture and low-skill manufacturing, while facilitating the diffusion of high-productivity services, is essential to achieving inclusive growth.

Concluding Insight

India's productivity surge over three decades is driven largely by modern services and resource-intensive sectors rather than broad-based manufacturing or agriculture. The emerging pattern of "dual-speed growth"—with high-performing western and southern states and lagging agrarian regions—underscores the need for productivity-oriented, regionally balanced development strategies, as mentioned below in **Table 9**.

Table 9. Labour productivity change in 2019–2020 (in 100,000s of INR in descending order of agriculture sector productivity).

State	Labour Productivity Change in 2019–2020										
	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS	Total Economy
Punjab	3.51	11.23	2.34	11.41	−0.85	1.17	3.61	10.23	1.70	5.21	3.05
Haryana	3.33	7.26	4.49	0.43	1.21	5.92	3.45	18.36	1.46	8.17	5.00
Kerala	1.76	12.66	3.92	5.41	1.61	3.78	3.70	12.08	1.39	10.81	4.12
Gujarat	1.43	−219.96	7.51	14.80	4.18	4.81	3.43	12.11	2.75	5.71	4.11
Tamil Nadu	1.21	4.75	3.33	−0.70	1.63	2.41	2.06	12.58	1.26	6.46	2.96
Andhra Pradesh	1.12	19.73	3.21	7.54	1.15	3.15	3.03	15.82	1.48	5.25	2.60
Rajasthan	1.00	13.98	2.77	1.03	0.75	1.87	3.49	−0.72	0.77	6.95	2.04
INDIA	0.77	17.17	3.54	11.97	0.56	2.21	3.01	12.26	1.35	5.76	2.38
West Bengal	0.77	−8.13	1.12	11.28	0.44	1.80	1.79	7.98	1.08	3.17	1.49
Madhya Pradesh	0.74	8.90	2.39	6.94	0.28	1.17	3.29	3.55	1.07	3.87	1.27
Uttar Pradesh	0.53	34.37	1.44	1.93	−0.66	0.52	2.77	7.05	1.75	3.92	1.24
Karnataka	0.51	5.59	4.38	−0.51	2.16	2.81	2.45	33.97	0.76	8.11	3.17
Maharashtra	0.51	102.74	6.07	12.36	2.69	2.39	3.19	17.32	0.90	5.77	3.24
Bihar	0.44	9.07	0.78	13.88	0.41	1.90	2.56	−1.72	0.98	4.59	1.14
Assam	0.38	−14.02	1.52	10.37	−2.85	−0.09	1.61	−7.04	1.46	3.66	1.08
Odisha	0.27	24.21	3.96	−12.16	−2.03	2.18	3.09	7.94	1.90	5.81	1.68

Note: A: Agriculture, hunting, forestry, and fishing; MQ ¼ Mining and quarrying; M ¼ Manufacturing; C: Construction; EGWS ¼ Electricity, gas, and water supply; THR: Trade, hotels, and restaurants; TSC: Transport, storage, and communication; FIRB: Finance, insurance, real estate, and business services; GS: Government services; CSP: Community, social and personal services.
Source: Author's calculation.

4.3.4. Annual Growth Rate of Labour Productivity

Table 10 presents the annual growth rates of labour productivity across sectors for India and major states during 1985–2019. At the national level, labour productivity expanded at an average annual rate of 5.19%, reflecting steady efficiency improvements and structural upgrading across the economy.

Regional Differentiation and Growth Leaders

A group of high-performing states—Andhra Pradesh (7.42%), Haryana (6.41%), Tamil Nadu (5.96%), Karnataka (5.86%), Maharashtra (5.30%), and Kerala (5.24%)—exceeded the national benchmark. Their superior performance is closely associated with capital deepening, technology diffusion, and industrial diversification, consistent with empirical evidence from recent productivity studies [1,2].

In contrast, Assam, with an annual growth rate of only 1.90%, exemplifies productivity stagnation, underpinned by weak industrialization, inadequate infrastructure, and a low level of human capital development [3]. The wide interstate variation highlights the uneven nature of India's productivity transition and underscores the importance of state-specific structural policies.

Table 10. Sector-wise annual growth rate of labour productivity during 1985–2019 in descending order of the economy as a whole (column Total Economy).

State	Sector-Wise Annual Growth Rate of Labour Productivity during 1985–2019										
	Total Economy	A	MQ	M	EGWS	C	THR	TSC	FIRB	GS	CSPS
Andhra Pradesh	7.42	5.62	9.39	8.64	7.63	2.36	8.23	7.82	5.27	6.22	8.92
Haryana	6.41	6.06	8.90	4.46	0.96	1.09	7.36	5.92	3.85	7.25	7.04
Tamil Nadu	5.96	5.02	7.56	5.11	−4.80	2.33	5.09	4.82	4.21	5.94	6.50
Karnataka	5.86	3.09	2.25	5.79	0.20	3.45	4.85	6.00	5.31	3.22	7.21
Maharashtra	5.30	2.67	5.57	4.88	7.08	2.96	4.34	5.84	3.92	3.43	5.53
Kerala	5.24	4.15	12.14	4.97	8.32	1.63	3.55	9.65	3.43	6.07	5.31
INDIA	5.19	3.58	3.79	5.36		0.92	3.97	6.34	3.33	4.95	6.19
Bihar	5.17	3.76	17.26	3.26	6.13	2.34	4.82	5.54	−0.73	5.09	6.30
Rajasthan	4.94	3.87	6.61	5.10	3.21	2.00	3.19	6.98	−0.17	3.35	6.56
Madhya Pradesh	4.91	4.41	8.48	5.83	8.07	0.77	2.22	7.83	2.03	5.00	5.73
Gujarat	4.86	3.84	−4.10	7.18	5.71	4.23	5.76	7.41	3.46	6.61	6.18
Punjab	4.30	5.31	9.52	4.63	7.35	−1.03	1.62	7.48	2.80	5.32	2.58
Odisha	4.04	1.46	7.93	5.21	−2.08	−3.22	4.71	6.59	2.64	5.28	7.43
Uttar Pradesh	3.98	3.07	5.06	3.81	2.90	−1.12	1.29	5.74	1.98	5.82	7.03
West Bengal	3.81	3.29	−2.20	3.40	4.47	0.78	3.98	5.62	3.82	4.22	5.18
Assam	1.90	1.52	−0.47	1.07	2.18	−2.41	−0.13	3.79	−2.01	4.63	4.47

Note: A: Agriculture, hunting, forestry, and fishing; MQ ¼ Mining and quarrying; M ¼ Manufacturing; C: Construction; EGWS ¼ Electricity, gas, and water supply; THR: Trade, hotels, and restaurants; TSC: Transport, storage, and communication; FIRB: Finance, insurance, real estate, and business services; GS: Government services; CSP: Community, social and personal services.
Source: Author's calculation.

Sectoral Patterns and Policy Implications

Sectoral data reveal that manufacturing, finance, and modern services sectors have been the primary drivers of productivity gains, while agriculture and traditional services continue to lag. High-growth states demonstrate an ability to channel resources into productive, high-value-added sectors, whereas low-growth states remain locked in low-productivity activities, limiting the pace of convergence.

From a policy perspective, the results suggest that strengthening state-level industrial ecosystems, enhancing skill formation, and removing infrastructure bottlenecks are essential to accelerate catch-up growth and sustain productivity momentum.

Analytical Transition to Decomposition Analysis

The substantial disparities in sectoral and regional productivity growth prompt a key analytical question:

Are the observed gains primarily the result of productivity improvements within sectors, or of labour reallocation from low- to high-productivity sectors?

Empirical evidence from India's structural transformation literature suggests that both mechanisms are at work, but with varying intensity across states. In high-growth states such as Andhra Pradesh, Haryana, and Tamil Nadu, gains stem from a synergistic interplay between intra-sectoral efficiency improvements (driven by capital deepening, technology adoption, and management practices) and strategic labour reallocation toward more dynamic sectors [1,2].

Conversely, in lagging states like Assam and Bihar, reallocation effects are weak or even negative, as labour shifts into low-productivity, informal, or stagnant activities—dampening overall productivity growth despite modest within-sector improvements [3].

4.4. Decomposition of Productivity Growth and the Structural Transformation Index (STI)

4.4.1. Conceptual Overview

The decomposition framework distinguishes between within-sector efficiency gains (WSE) and between-sector reallocation effects (BSE).

At the national level, nearly one-third (STI = 0.33) of aggregate labour productivity growth between 1985–2020 was attributable to labour reallocation across sectors, while the remaining two-thirds derived from within-sector improvements.

This finding underscores that structural transformation—movement of labour toward higher-productivity activities—has been a meaningful but uneven contributor to India's growth.

Under a counterfactual scenario without reallocation, aggregate productivity growth would have relied entirely on within-sector gains, yielding an estimated annual growth rate of 3.56%. The observed STI, therefore, captures the marginal productivity premium associated with structural change beyond technological progress alone.

India's structural transformation has advanced but unevenly. Rapidly modernizing states demonstrate the productivity gains of effective reallocation, while agriculture-dependent economies remain trapped in a low-productivity equilibrium. Sustained, inclusive growth hinges on deepening industrial diversification, upgrading human capital, and ensuring that structural change translates into broad-based productivity gains. The summary statistics presented in **Table 11** also report the Structural Transformation Index (STI), defined as the share of aggregate labour productivity growth attributable to sectoral reallocation effects over the study period (1985–2020).

Table 11. Decomposition of the aggregate labour productivity growth and calculation of STI during 1985–2020 for ten-sector disaggregation in descending order of STI.

State	WSE	BSE	IE	Annual Rate of Productivity Growth	STI
Assam	1.01	1.66	0.76	1.90	0.49
Karnataka	3.36	0.44	2.09	5.86	0.44
Maharashtra	3.29	0.48	1.54	5.31	0.37
Gujarat	3.05	0.98	0.82	4.84	0.38
Rajasthan	3.40	1.02	0.65	4.96	0.34
India	3.56	0.58	1.06	5.20	0.33
Tamil Nadu	4.16	0.64	1.22	5.96	0.33
Uttar Pradesh	2.84	1.22	−0.06	3.97	0.28
Kerala	3.82	0.66	0.77	5.25	0.28
Haryana	4.67	0.80	0.97	6.42	0.28
Andhra Pradesh	5.48	0.40	1.58	7.43	0.25
Odisha	3.04	1.46	−0.43	4.04	0.26
Bihar	3.90	1.26	0.03	5.19	0.26
West Bengal	2.91	0.38	0.55	3.62	0.25
Madhya Pradesh	4.41	0.62	−0.10	4.92	0.12
Punjab	4.55	0.73	−0.98	4.32	0.06
Jharkhand	5.03	0.53	0.17	5.68	0.13
Chhattisgarh	3.05	1.04	−0.42	3.65	0.18

Source: Authors'calculations.

4.4.2. State-Level Heterogeneity

High-STI States (Reallocation-Driven Growth)

States such as Assam (0.49), Karnataka (0.44), Gujarat (0.38), Maharashtra (0.37), and Rajasthan (0.34) exhibit STI values above the national average.

Their productivity growth has been propelled by sectoral reallocation, reflecting the successful movement of labour from low-productivity agriculture to dynamic manufacturing and service activities.

Low-STI States (Within-Sector-Led Growth)

In contrast, states like Punjab (0.06) show almost no reallocation-driven growth, relying primarily on within-sector efficiency in agriculture and traditional services.

Such patterns are symptomatic of low diversification and limited labour mobility across sectors.

Insight: India's regional productivity map reveals a clear divide—dynamic, diversified economies benefit from labour mobility, while agriculture-dependent states remain structurally stagnant.

4.5. Sectoral Contributions and Composition Patterns

To disentangle the sources of WSE, **Table 12** disaggregates within-sector productivity growth into contributions from the primary, secondary, and tertiary sectors.

Table 12. Contribution of structural transformation (ST) and sectoral productivities towards productivity growth rate during 1985–2020.

State	Growth Rate	STI (in %)	Sectoral Productivity (in %)			
			Total	Primary	Secondary	Tertiary
Assam	1.92	48.65	52.30	21.62	6.40	24.28
Karnataka	5.84	43.85	57.11	12.08	17.25	27.78
Maharashtra	5.32	37.15	61.80	17.68	24.54	19.68
Gujarat	4.84	38.04	63.01	15.75	27.30	19.96
Rajasthan	4.95	34.25	66.75	40.64	11.60	14.51
INDIA	5.20	32.61	68.35	26.35	18.22	23.87
Tamil Nadu	5.95	33.25	69.80	24.40	20.35	25.05
Uttar Pradesh	3.95	28.10	70.95	32.10	10.82	28.03
Kerala	5.25	28.35	72.71	27.00	16.78	28.93
Haryana	6.45	28.25	72.75	45.02	8.44	19.29
Andhra Pradesh	7.40	25.30	73.70	34.85	13.80	25.05
Odisha	4.05	26.40	75.60	25.40	20.35	28.85
Bihar	5.20	26.05	75.10	39.70	7.10	28.30
West Bengal	3.85	25.97	76.10	26.60	14.50	35.00
Madhya Pradesh	4.90	11.70	89.30	57.10	15.00	17.20
Punjab	4.35	6.40	105.40	75.85	10.45	19.10

Source: Author's calculation.

Sectoral Drivers of Structural Transformation

The decomposition of the within-sector effect (WSE) across sectors (**Table 13**) reveals substantial heterogeneity in productivity dynamics, underscoring the diversity of growth patterns observed across the Indian economy.

Industry-led transformation:

Gujarat and Maharashtra demonstrate strong secondary-sector contributions (27–25%), indicating vibrant industrial expansion and productivity upgrading.

Agriculture-intensive structures:

Punjab, Uttar Pradesh, and Bihar depend heavily on primary-sector improvements, reflecting limited sectoral diversification.

Service-driven transitions:

Kerala, Odisha, and West Bengal rely primarily on tertiary-sector growth, reflecting expanding service economies.

Table 13. Categorization of Sectoral Growth Patterns Using WSE Decomposition.

Type of Growth	Dominant States	Defining Features
Primary-sector–driven	Rajasthan, Uttar Pradesh, Haryana, Andhra Pradesh, Bihar, Madhya Pradesh, Punjab	Modest reallocation; strong agricultural base
Structural transformation–driven	Tamil Nadu, Maharashtra, Gujarat, Assam, Karnataka	Active labour mobility; industrial and service diversification
Tertiary-sector–driven	West Bengal, Kerala, Odisha	Expanding modern services; weak manufacturing linkages

4.6. Interpretative Insights

4.6.1. Dual Engines of Growth

Agriculture remains the key driver in slow-transforming states, while diversified economies benefit from the dual engine of within-sector upgrading and inter-sectoral reallocation.

Agricultural modernization and labour reallocation are thus complementary rather than competing processes.

4.6.2. Quality of Reallocation

A higher STI indicates more reallocation, but the productivity impact depends on its quality.

Labour shifts toward modern manufacturing or high-value services yield large gains; movement into low-productivity informal activities does not.

4.6.3. Regional Divergence

High-STI states leverage industrial and service dynamism, whereas low-STI states face structural inertia, widening the inter-state productivity gap.

These patterns are consistent with international evidence (McMillan et al. [20]; Diao et al. [22]), which underscores that the developmental gains from structural transformation are contingent on both the speed and the directional orientation of labour reallocation.

4.7. Policy Implications from Decomposition and STI Analysis

4.7.1. Strategic Differentiation by State Performance

Table 14 presents a strategic differentiation framework that classifies states by the underlying drivers of their labour-productivity growth and corresponding policy imperatives. States where growth is primarily reallocation-driven, reflected in high Structural Transformation Intensity (STI), require strategies that consolidate and deepen ongoing transitions through technology adoption, skill upgrading, and expansion of high-value sectors. In contrast, states with within-sector-led growth and low STI need to prioritise diversification, strengthen industrial and service ecosystems, and modernise traditional sectors to unlock new productivity gains. The table summarises these differentiated pathways and associated policy priorities.

Table 14. Strategic Differentiation by State Performance.

Category	States	Policy Priority	Key Actions
Reallocation-driven (High STI)	Assam, Karnataka, Gujarat, Maharashtra, Rajasthan	Sustain and deepen structural transformation	– Promote innovation and technology adoption – Invest in skill alignment and labour mobility – Support high-value manufacturing and export-oriented services
Within-sector-led (Low STI)	Punjab, Madhya Pradesh, Jharkhand, Chhattisgarh, West Bengal	Initiate diversification and structural transition	– Develop industrial corridors and service clusters – Modernize agriculture and rural industries – Encourage private investment in emerging sectors

4.7.2. Sector-Specific Priorities

Agrarian states (e.g., Bihar, UP, Haryana, Andhra Pradesh):

Expand non-farm employment through agro-processing, rural industrialization, and market linkages.

Industrial hubs (e.g., Gujarat, Maharashtra):

Strengthen manufacturing competitiveness, innovation ecosystems, and global value chain integration.

Service economies (e.g., Kerala, West Bengal, Odisha):

Enhance digital infrastructure, professional services, and knowledge-based industries.

4.7.3. Enhancing the Quality of Reallocation

High reallocation alone is insufficient—its direction determines its payoff.

Policy efforts should channel labour from low-productivity informal services to modern sectors such as manufacturing, logistics, renewable energy, and IT-enabled services through:

- Labour market reforms
- Targeted vocational training
- Infrastructure and investment incentives

4.7.4. Institutionalizing STI Monitoring

To make policy evaluation evidence-based:

- Integrate state-level STI tracking into economic dashboards.
- Use STI trends to identify whether productivity gains stem from efficiency or reallocation.
- Adjust industrial, education, and labour policies accordingly.

4.8. Overall Interpretation

India's structural transformation has advanced but remains uneven.

Rapidly modernizing states demonstrate the productivity benefits of effective reallocation, while agriculture-dependent economies remain in a low-productivity equilibrium.

Sustained, inclusive growth requires:

- Deepening industrial diversification
- Upgrading human capital
- Enhancing labour mobility
- Ensuring that structural change translates into broad-based productivity gains

5. What Explains the Observed Productivity Differentials?

5.1. Human Capital as a Core—But Incomplete—Driver

Recent empirical studies [23,24] converge on a consistent finding: variation in human capital—especially differences in skills and education quality rather than years of schooling alone—explains a substantial yet incomplete share of productivity gaps across sectors and states.

Evidence combining attainment data with skill-based measures shows that:

Years of schooling account for a non-trivial fraction of productivity variation.

Skill indicators and vocational qualifications significantly expand the explained share and reduce unexplained residuals.

This implies that simple attainment metrics (e.g., mean years of schooling) systematically understate the productive contribution of applied learning, cognitive skills, and job-relevant competencies.

5.2. The Indian Evidence: Rising Attainment, Uneven Productivity Payoffs

At both the national and state levels, India exhibits a disconnect between educational gains and productivity outcomes:

School and higher-education enrolment have increased markedly, and average attainment has risen.

Yet, learning outcomes and productivity growth remain uneven, as shown by ASER and related assessments.

Micro-level studies reveal that:

High-productivity services attract better-educated and higher-skill workers, reinforcing productivity divergence across sectors.

Manufacturing lags, partly because of lower skill concentrations and weaker returns to schooling.

Residual productivity gaps—beyond education—are often linked to technology adoption, capital intensity, and firm-level organisational efficiency.

Interpretation: Human capital is necessary but not sufficient for sustained productivity convergence across Indian states and sectors [25–28].

5.3. Institutional and Market Channels that Shape Human-Capital Returns

The conversion of education into productivity depends critically on state-level institutional and regulatory contexts.

Three distinct mechanisms emerge from the comparative and India-specific evidence (**Table 15**), each delineating a separate pathway through which structural transformation influences productivity outcomes.

Table 15. Institutional Mechanism & Their Effect on Human Capital Productivity.

Channel	Institutional Mechanism	Effect on Productivity
Labour intermediation and matching	Efficient job-matching systems, mobility support, and credible skill certification	Enhances education–employment alignment and boosts returns to human capital
Market and regulatory flexibility	Adaptive product and labour market regulations; active industrial policy	Strengthens capital–skill complementarities and encourages technology adoption
Institutional frictions	Weak enforcement, underused labour funds, and rigid hiring/firing rules	Impedes reallocation to high-productivity firms and reduces skill payoffs

Cross-country and state-level comparisons indicate that states with stronger enabling institutions, active skill ecosystems, and smoother labour mobility exhibit:

Higher returns to education, and

Smaller unexplained productivity gaps.

In contrast, states with weak institutional capacity face skill underutilization and structural inertia in labour reallocation.

5.4. Policy and Empirical Implications for This Study

The analysis suggests that human capital explains a significant but partial share of within- and between-sector productivity differentials.

To sharpen causal interpretation and reduce residual unexplained variance, empirical models should:

Incorporate learning quality and skill indices, not just attainment measures (mean years of schooling).

Account for capital–skill interactions, capturing the complementarity between technology and workforce quality.

Include state-level institutional variables—such as labour intermediation efficiency, regulatory enforcement, and industrial facilitation capacity.

Analytical Implication: Modelling these dimensions explicitly will tighten causal inference, reduce omitted-variable bias, and provide a clearer understanding of how education and institutions jointly drive structural transformation.

5.5. Integrative Insight

In sum, education creates the potential for productivity growth, but institutions and market mechanisms determine its realization.

- Bridging India's productivity gaps, therefore, requires:
- Enhancing learning quality and vocational relevance,
- Strengthening institutional capacity for labour reallocation, and
- Enabling technology–skill complementarities through flexible, innovation-oriented policies.

6. Policy Recommendations

6.1. Strengthen Manufacturing as a Productivity Bridge

Target labour-intensive and medium-technology manufacturing (e.g., food processing, textiles, light engineering) to absorb surplus agricultural labour while raising productivity.

Provide fiscal incentives, infrastructure, and technology upgrading for SMEs to integrate into domestic and global value chains.

6.2. Enhance Sectoral Absorptive Capacity

Promote capital deepening, skill upgrading, and digital technology adoption in both manufacturing and modern services.

Address logistics, energy, and industrial cluster bottlenecks that limit productivity growth in destination sectors.

6.3. Invest in Human Capital with Quality and Relevance

Shift from an enrolment-centric approach to learning-outcome and skill-based metrics; integrate ASER-style assessments into workforce planning.

Align vocational and technical education with sectoral demand, expand STEM and digital literacy, and build portable skill certification systems.

6.4. Improve State-Level Institutional Effectiveness

Strengthen labour intermediation, skill certification systems, and enforcement of industrial policies to reduce matching costs and boost productivity returns to education.

Reform product and labour-market regulations where excessive rigidity hampers firm growth and worker mobility.

6.5. Facilitate Labour Mobility and Formalisation

Reduce interstate migration barriers via portable social security, affordable housing, and streamlined skill-recognition frameworks.

Promote formal job creation by simplifying compliance, enhancing contract enforcement, and incentivising formalisation in expanding sectors.

6.6. Promote Balanced Regional Development

Direct public and private investment toward low-STI, agriculture-dependent states, focusing on industrial diversification and urban–rural connectivity.

Develop state-specific industrial corridors and agro-processing hubs to leverage local comparative advantages.

6.7. Integrate STI Monitoring into Policy Frameworks

Institutionalise STI and decomposition analysis in state and national planning cycles to track productivity dynamics and guide targeted investments.

Use STI trends to design conditional fiscal transfers and capacity-building programmes for lagging states.

7. Limitations of the Study

While this study offers a detailed documentation of productivity patterns and structural transformation in India, it is subject to several constraints:

i) Descriptive Approach – The analysis primarily relies on empirical documentation without employing structural modelling or calibration techniques. Consequently, the causality underlying productivity differences remains underexplored.

ii) Focus on Proximate, Not Fundamental, Causes– While sectoral productivity dispersion and educational attainment are analysed, deeper structural determinants—such as institutional quality, governance effectiveness, cultural norms, and linguistic diversity—are not systematically examined.

iii) Limited Treatment of Market Distortions – Although labour laws are briefly discussed, the study does not engage in a comprehensive evaluation of product and labour market imperfections, nor does it quantify their effects on productivity.

iv) Absence of Dynamic Policy Simulation – The recommendations provided are qualitative and not derived from formal policy simulations or general equilibrium analysis, limiting their predictive precision.

These limitations point to the need for future research that integrates micro-level firm data, state-level institutional metrics, and quantitative modelling frameworks to capture both proximate and fundamental drivers of productivity differences and structural transformation in India.

8. Conclusions

This study analysed India's structural transformation by decomposing aggregate labour productivity growth into within-sector and between-sector effects, using the Structural Transformation Index (STI) as a diagnostic measure. The findings show that while India has made measurable progress in reallocating labour toward more productive

sectors, the pace, quality, and drivers of transformation vary sharply across states. High-STI states such as Assam, Karnataka, Gujarat, Maharashtra, and Rajasthan have leveraged significant reallocation effects, whereas low-STI states remain reliant on within-sector gains, often concentrated in low-productivity agriculture.

A central result is that structural transformation in India has been predominantly service-led, bypassing the manufacturing-intensive trajectory historically associated with rapid convergence in East Asia. While high-productivity modern services have generated substantial gains in some states, the prevalence of low-skill, low-wage segments—especially construction and informal services—has constrained aggregate productivity growth and muted the employment dividend.

Evidence from recent studies indicates that variation in human capital—particularly the quality of education, vocational skills, and measurable cognitive competencies—explains a sizeable but incomplete share of these productivity differentials. The largest gaps remain in states where institutional weaknesses, rigid labour regulations, and poor labour-market intermediation blunt the productivity returns to educational gains. In high-performing states, stronger institutions, flexible market rules, and active skill ecosystems have amplified the benefits of human capital by enabling technology adoption, capital–skill complementarities, and smoother worker reallocation.

In sum, human capital is a necessary but insufficient driver of productivity convergence. Without complementary improvements in institutional capacity, labour-market efficiency, and sectoral absorptive capacity, India risks a structural transformation that is uneven, service-biased, and weakly employment-generating.

Funding

No financial support from any funding agencies was received in preparing this article.

Institutional Review Board Statement

Not applicable. This study does not contain any studies with human or animal subjects performed by the author.

Informed Consent Statement

Not applicable.

Data Availability Statement

Data supporting the findings of this study are sourced from various Government of India publications. Data sharing does not apply to this article as no new data were created or analyzed in this study.

Conflicts of Interest

The author declares no conflict of interest regarding the publication of this article.

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