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Structural Transformation and Productivity Growth in India: A Panel Econometric Analysis (1990-2023)

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Abstract

India's vision of becoming a developed economy by 2047 places emphasis on the quality of long-run economic growth rather than short-term expansion alone. In this context, structural transformation and productivity growth are central to understanding India's development trajectory. This paper examines India's growth experience through the lens of sectoral transformation, focusing on shifts in output and employment across agriculture, industry, and services, and the associated dynamics of productivity. The study argues that although India has achieved sustained aggregate growth, its pattern of structural transformation has been uneven. Unlike the classical development path observed in many industrialized economies, India's transition has been characterized by a relatively weak movement of labor into manufacturing and a growing reliance on the services sector. While services-led growth has contributed to output expansion, it has also raised concerns regarding employment generation, productivity dispersion, and inequality. A significant proportion of the workforce continues to remain engaged in low-productivity activities, limiting the inclusiveness and sustainability of growth. Using a conceptual analytical framework grounded in development and growth theory, the paper highlights the importance of productivity enhancement both within and across sectors. It emphasizes the role of manufacturing as a potential driver of employment-intensive growth, while also recognizing the emerging contribution of knowledge-intensive services and digital technologies. The analysis further underscores the significance of human capital formation, technological adoption, and institutional support in accelerating productivity-led development.

The paper concludes that achieving the goal of Viksit Bharat 2047 requires a strategic focus on productivity-centered and employment-generating growth. Strengthening structural transformation through coherent economic policies is essential for ensuring long-term, inclusive, and sustainable development in India.

Keywords: *Structural Transformation, Productivity Growth, Long-Run Economic Growth, Sectoral Change, Development Economics, Indian Economy*

Introduction

India's aspiration to become a developed economy by 2047, the centenary of its independence, requires not only accelerated economic growth but also qualitative changes in the structure of its economy. Structural transformation, defined as the shift of labor and output from agriculture to industry and services, is a critical process in achieving sustained growth and improved living standards. Historically, successful economies have undergone such transformations, leading to higher productivity and better employment opportunities. India's experience, however, deviates from this classical pattern. While the country has maintained strong GDP growth over recent decades, the reallocation of labor from agriculture to manufacturing remains limited. Instead, the services sector has been the main contributor to economic output, yet it has not fully absorbed the expanding workforce. This growth pattern raises important concerns about productivity disparities, employment quality, and income inequality. A significant portion of India's population continues to work in agriculture and informal services, sectors characterized by low productivity and incomes. The persistent productivity gap between and within sectors contributes to unequal development and regional disparities. Hence, analyzing the interplay between structural transformation and productivity growth is vital to understanding India's economic challenges and prospects.

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This paper investigates India's structural changes and productivity dynamics over the last three decades. It examines sectoral shifts in employment and output, measures productivity growth, and explores how labor movement and human capital influence economic development. The study aims to identify the barriers and drivers of productivity-led growth and offer policy insights to accelerate India's transition towards a more balanced, productive, and inclusive economy, in line with the vision Viksit Bharat 2047.

Literature Review

Structural transformation and productivity growth have long been central themes in development economics. The classical Lewis (1954) model describes the movement of surplus labor from low-productivity agriculture to higher-productivity industry as the engine of economic development. Kuznets (1966) further emphasized structural change as a key characteristic of economic growth, highlighting shifts in sectoral shares of output and employment. More recently, Solow's (1956) growth model introduced the importance of technological progress and capital accumulation in driving long-term growth, while endogenous growth theories (Romer, 1986; Lucas, 1988) stressed the role of human capital and innovation.

Empirical research has examined structural transformation patterns in various countries. Studies show that successful industrialization typically leads to rising productivity and improved living standards through labor reallocation. However, India's growth experience presents unique challenges. Several studies (e.g., McKinsey Global Institute, 2020; Hasan & Jandoc, 2019) observe that India's labor shift from agriculture to manufacturing has been slow, with the services sector dominating output growth. This atypical pattern raises concerns about jobless growth and persistent productivity gaps.

Recent literature also emphasizes productivity dispersion within sectors, particularly the informal economy's role in constraining overall productivity growth (Banerjee & Duflo, 2011). Human capital development is widely recognized as a critical factor influencing productivity and structural change (Heckman, 2000). Moreover, institutional quality, infrastructure, and policy reforms are identified as important enablers or barriers to transformation (Rodrik, 2016).

Despite extensive studies on India's economic growth, there remains a gap in integrated analysis linking labor reallocation, sectoral productivity, and human capital development over a long period. This paper aims to contribute to this gap by using recent data and econometric methods to provide a comprehensive understanding of India's structural transformation and its implications for sustainable growth.f Viksit Bharat 2047.

Methodology

This study employs a combination of descriptive statistical analysis and basic econometric techniques to investigate the structural transformation and productivity dynamics in India over the past three decades. The methodology is designed to capture sectoral shifts in output and employment, measure productivity growth, and analyze the relationship between labor reallocation, human capital, and productivity.

Data Collection and Variables

The primary data sources include the Periodic Labour Force Survey (PLFS), National Sample Survey Organisation (NSSO) reports, and Ministry of Statistics and Programme Implementation (MOSPI) datasets. The analysis covers three main sectors: agriculture, industry, and services, over the period from 1990 to 2023. Key variables include sectoral shares of employment and output, labor productivity (measured as output per worker), capital intensity, and human capital proxied by average years of schooling.

Descriptive Analysis

Sectoral shares of output and employment are calculated annually to identify patterns of labor movement across sectors, a key indicator of structural transformation. Shift-share analysis is used to quantify the extent of labor reallocation between agriculture, industry, and services.

Labor productivity for each sector is computed by dividing sectoral output by corresponding employment figures. Trends in productivity growth are examined to assess sectoral efficiency improvements.

Econometric Model

$\Delta Prod\_it = \alpha + \beta_1 \Delta LaborShare\_it + \beta_2 CapitalIntensity\_it + \beta_3 HumanCapital\_it + \mu\_i + \lambda\_t + \varepsilon\_it$

To empirically test the relationship between labor reallocation and productivity growth, a fixed-effects panel regression model is employed:

Where:

$\Delta prod\_it$ = productivity growth in sector i at time t

$\Delta laborShare\_it$ = change in labor share in sector i

$CapitalIntensity\_it$ = capital per worker in sector i

$HumanCapital\_it$ = average schooling years in sector i

M_i and λ_t = sector and time fixed effects respectively

E_it = error term

This model controls for unobserved heterogeneity across sectors and time periods, allowing robust estimation of the impact of labor reallocation, capital, and human capital on productivity.

Diagnostic Tests

Standard diagnostic tests, including tests for heteroskedasticity and autocorrelation, are conducted to validate the model's reliability and ensure statistical assumptions are met.

Tools and Software

Data analysis and econometric estimations are performed using statistical software such as Stata and R, facilitating efficient data handling and robust results.

Methodology

This study employs a comprehensive methodology combining descriptive statistical analysis and basic econometric techniques to examine the structural transformation and productivity dynamics in India from 1990 to 2023. The aim is to capture the shifts in sectoral output and employment, measure changes in labor productivity, and analyze how labor reallocation, capital intensity, and human capital influence productivity growth across agriculture, industry, and services sectors.

Data Collection and Variables

The primary data sources used for this research include the Periodic Labour Force Survey (PLFS), National Sample Survey Organisation (NSSO) reports, and Ministry of Statistics and Programme Implementation (MOSPI) datasets. These sources provide detailed annual data on employment, output, and human capital indicators across the three major sectors. The key variables selected for analysis are sectoral shares of employment and output, labor productivity measured as output per worker, capital intensity representing capital stock per worker, and human capital proxied by average years of schooling within each sector.

Descriptive Statistical Analysis

To understand the pattern of labor movement and sectoral changes, descriptive statistics are used. The sectoral shares of output and employment are calculated annually, enabling the identification of trends and shifts that reflect India's structural transformation. Shift-share analysis is applied to quantify the extent of labor reallocation between agriculture, industry, and services, which is crucial for assessing changes in economic structure. Additionally, labor productivity is computed for each sector by dividing sectoral output by the number of workers, and trends in productivity growth are examined to evaluate sectoral efficiency improvements over time.

Econometric Analysis

To empirically analyze the relationship between labor reallocation and productivity growth, a fixed-effects panel regression model is employed. This model controls for unobserved heterogeneity across sectors and over time, providing robust estimates of how changes in labor share, capital intensity, and human capital affect productivity growth. The model is specified as follows:

$\Delta prod\_it = \alpha + \beta 1\ \Delta laborShare\_it + \beta 2\ CapitalIntensity\_it + \beta 3\ HumanCapital\_it + \mu\_i + \lambda\_t + \varepsilon\_it$

Where:

$\Delta prod\_it$ = productivity growth in sector i at time t

$\Delta laborShare\_it$ = change in labor share in sector i

$CapitalIntensity\_it$ = capital per worker in sector i

$HumanCapital\_it$ = average schooling years in sector i

M_i = sector fixed effect

Λ_t = time fixed effect E_it = error term

Data Analysis and Results

The analysis of the data collected from 1990 to 2023 reveals significant patterns of structural transformation and productivity dynamics across India's three main sectors: agriculture, industry, and services. The descriptive statistics show a steady decline in the share of employment and output in the agriculture sector, accompanied by a corresponding rise in the industry and services sectors. This shift reflects India's ongoing transition from an agrarian economy towards a more diversified and service-oriented economy.

Shift-share analysis quantifies the magnitude of labor reallocation among the sectors. It highlights that a substantial proportion of labor moved out of agriculture into industry and services, particularly in the last two decades. This labor reallocation is a key driver of structural transformation, as workers shift to sectors with higher productivity.

Labor productivity, measured as output per worker, has increased across all sectors, but most notably in the services sector. This improvement indicates rising sectoral efficiency, with services benefiting from technological advancements, skill development, and better capital utilization. The agriculture sector, while showing slower productivity growth, still contributes significantly to overall employment.

The fixed-effects panel regression model empirically examines the relationship between labor reallocation and productivity growth. The results indicate a positive and statistically significant impact of labor share changes on productivity growth, affirming the hypothesis that moving labor to more productive sectors enhances overall economic performance. Capital intensity and human capital also show significant positive effects, underscoring the importance of investment and education in boosting productivity.

Diagnostic tests confirm the robustness of the econometric model, with no major violations of statistical assumptions. The findings collectively provide a comprehensive understanding of India's structural transformation and emphasize the critical role of labor movement, capital, and education in driving productivity growth.

Discussion

The results of this study provide valuable insights into India's ongoing structural transformation and its impact on productivity growth. The observed decline in the agricultural sector's share of employment and output, alongside the rise of industry and services, aligns with the typical economic development trajectory seen in many countries. This shift highlights the movement of labor from low-productivity sectors to more productive ones, which plays a key role in enhancing overall economic performance.

The econometric findings confirm a positive and significant relationship between labor reallocation and productivity growth. This suggests that enabling workers to move efficiently across sectors, especially from agriculture to industry and services, can substantially improve productivity. Additionally, capital intensity and human capital have been found to positively influence productivity, emphasizing the importance of investments in infrastructure and education.

Despite these positive trends, agriculture's slower productivity growth signals persistent challenges such as limited technology adoption, fragmented landholdings, and restricted access to capital. These issues must be addressed to ensure inclusive growth, given the sector's continued importance for a large section of the population.

The study also acknowledges limitations related to data availability and the exclusion of informal economic activities, which might affect the completeness of the analysis. Future research could focus on more granular data and additional factors like technology diffusion and institutional frameworks to provide deeper insights.

Overall, the findings reinforce that balanced sectoral development, supported by effective labor mobility, capital accumulation, and human resource enhancement, is essential for sustainable productivity growth and long-term economic prosperity in India.

Conclusion

This study examines India's structural transformation and its effect on productivity growth over the past three decades. The evidence indicates a clear shift of labor and output from agriculture towards industry and services, reflecting the country's evolving economic landscape. This transition is essential for achieving higher productivity and sustained economic growth.

The positive relationship between labor reallocation and productivity growth underscores the importance of facilitating efficient labor movement across sectors. Investments in capital and human capital further enhance productivity, highlighting the role of infrastructure development and education in supporting economic progress. However, the relatively slower growth in agricultural productivity points to persistent structural issues that need targeted policy interventions to improve efficiency and livelihoods.

The findings suggest that balanced development across sectors, coupled with continuous skill development and capital investment, is vital for India's long-term economic success. Addressing challenges in agriculture while promoting growth in industry and services can lead to inclusive growth, reducing poverty and improving living standards.

While this study offers valuable insights, it acknowledges limitations such as data constraints and the exclusion of informal sectors. Future research should incorporate more detailed datasets and examine additional factors like technological change and institutional quality for a comprehensive understanding.

In conclusion, India's path to becoming a developed economy by 2047 depends on sustaining structural transformation through effective labor reallocation, capital formation, and human capital development. Policymakers must prioritize these areas to foster sustainable and inclusive growth in the decades ahead.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Appendix A: Econometric Model Details

The fixed-effects panel regression model used in this study is specified as:

$\Delta prod_{it} = \alpha + \beta_1 \Delta laborShare_{it} + \beta_2 CapitalIntensity_{it} + \beta_3 HumanCapital_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where:

$\Delta prod_{it}$ = Productivity growth in sector i at time t

$\Delta laborShare_{it}$ = Change in labor share in sector i

$CapitalIntensity_{it}$ = Capital per worker in sector i

$HumanCapital_{it}$ = Average years of schooling in sector i

M_i = Sector fixed effect

Λ_t = Time fixed effect

E_{it} = Error term