



India's Path to Developed-Economy Status by 2047: Growth, Productivity and Human Development Perspectives

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Abstract:

This paper examines the policy actions and structural changes India must undertake to achieve developed-economy status by 2047. It evaluates the long-term drivers of economic growth, productivity performance, inequality, and human development within an integrated analytical framework. Instead of defining development solely in terms of GDP growth, the study adopts a broader multidimensional approach that combines income levels, human development indicators, and structural economic characteristics to assess whether a country can genuinely be considered developed. Using a balanced international panel dataset along with long-run time-series evidence for India, the analysis employs descriptive statistics, correlation analysis, fixed-effects panel regressions, convergence estimation, growth-accounting decomposition, inequality simulations, and scenario-based forecasting techniques. The empirical findings reveal three major conclusions. First, total factor productivity is identified as the most important source of sustained long-run growth in per-capita income, while the contributions of capital accumulation and labour expansion are comparatively limited. Second, the evidence indicates weak convergence dynamics, suggesting that India cannot depend on automatic catch-up processes to narrow the gap with advanced economies. Instead, faster productivity growth and deliberate structural reforms are essential for accelerating economic transformation. Third, the baseline projections show that if India continues along its historical growth trajectory, it may struggle to meet developed-country benchmarks in terms of both income and human development by 2047. However, the probability of achieving these goals improves considerably under scenarios involving stronger structural reforms and sustained productivity enhancement. The simulations suggest that annual per-capita income growth of around 6.5–7 percent could make income convergence feasible, although improvements in human development would still need to progress much faster than historical trends indicate. The study also finds that inequality creates a significant drag on long-term economic growth, implying that inclusive development is not merely a social objective but an economic imperative. By combining growth decomposition, convergence analysis, and forward-looking projections, the paper contributes to the broader literature on development transitions. It argues that attaining developed-economy status depends fundamentally on productivity enhancement, structural transformation, and improvements in human capital, rather than on the continuation of past trends alone. The findings provide important policy insights for India's long-term development strategy while also contributing to wider debates on convergence and the structural conditions required for emerging economies to transition into advanced economies.

Keywords: Economic Development, Productivity Growth, Growth Decomposition, Income Convergence, Human Development Index (HDI).

Review Article

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1. INTRODUCTION

This paper examines the policy actions and structural changes India must undertake to achieve developed-economy status by 2047. It evaluates the long-term drivers of economic growth, productivity performance, inequality, and human development within an integrated analytical framework. Instead of defining

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2. Contribution Statement

This paper contributes to the literature on economic development and convergence by providing a comprehensive empirical assessment of India's potential transition toward developed-economy status by 2047. While existing studies often focus either on income growth projections or on isolated human-development indicators, this study integrates productivity dynamics, inequality effects, and multidimensional development measures within a unified analytical framework. By operationalizing "developed status" through both income-based and human-development thresholds, the paper moves beyond narrow GDP-centric interpretations and provides a broader evaluation of structural development readiness.

Methodologically, the paper contributes by combining multiple empirical approaches that are typically examined separately in the literature. The analysis integrates panel fixed-effects regressions, convergence estimation, growth accounting decomposition based on the Solow framework, inequality counterfactual simulations, and long-run scenario projections. This multi-layered empirical design allows the study to distinguish between short-run correlations, structural growth drivers, and long-term feasibility conditions. In particular, the simultaneous examination of productivity-led growth and distributional dynamics provides new evidence on how inequality and human development interact with macroeconomic convergence processes.

Substantively, the paper offers a forward-looking policy contribution by demonstrating that India's development trajectory under historical trends is insufficient to meet conventional developed-country benchmarks by 2047, while accelerated scenarios indicate that convergence remains feasible under sustained productivity growth and stronger human-capital expansion. The findings, therefore, shift the discussion from deterministic projections toward conditional pathways, emphasizing that structural transformation, institutional effectiveness, and inclusive development are central to achieving long-run convergence. In doing so, the study contributes not only to the understanding of India's development prospects but also to broader debates on how emerging economies can strategically transition toward advanced-economy status under contemporary global conditions.

3. Literature Review

The question of whether India can attain developed-economy status by 2047 has to be situated within the broader theoretical and empirical literature on economic growth, convergence, structural transformation, productivity, inequality, and human development. This chapter reviews the main strands of that literature, with specific attention to the role of total factor productivity (TFP), inclusive growth, and multidimensional development measures.

3.1 Theoretical Foundations of Growth and Convergence

The foundation of modern theories of long-run economic growth can be traced to the neoclassical growth model developed by Robert Solow (1956). In this framework, economic output is produced through the accumulation of capital and labour, while technological progress is treated as an external factor that determines long-term growth. One of the central implications of the model is that poorer economies are expected to grow faster than richer economies because they can benefit from higher returns to capital. However, this convergence process depends on important structural conditions such as savings rates, investment behaviour, and population growth. In the case of India, the Solow framework is particularly relevant because it raises the question of whether India can narrow the income gap with advanced economies by 2047 if the necessary economic fundamentals remain supportive.

Over time, economists recognized that the neoclassical approach could not fully explain sustained long-run growth, especially the role of innovation and technological progress. This led to the development of endogenous growth theories, which place innovation, human capital, research, and knowledge spillovers at the center of economic growth. Romer (1990) argued that technological progress is not merely an external force but is generated through deliberate investment in research and development, creating increasing returns from ideas and innovation. Similarly, Aghion and Howitt (1992) developed the Schumpeterian model of creative destruction, where economic progress takes place through continuous waves of innovation that replace outdated technologies and production methods. These theories emphasize that convergence with developed economies depends not simply on

capital accumulation, but on improvements in productivity, innovation capacity, and technological advancement. For a developing economy like India, this implies that sustained catch-up growth will require both the absorption of existing technologies and the gradual movement toward the global technological frontier.

Empirical studies on convergence have attempted to test whether poorer countries actually grow faster than richer ones after controlling for structural differences. Barro and Sala-i-Martin (1995) provided influential evidence suggesting that convergence does occur, but the process is generally slow and heavily dependent on factors such as human capital, institutional quality, and policy frameworks. Their findings indicate that developing economies can reduce the income gap with advanced countries, but only when supportive structural conditions are present. This insight is particularly important for India because it suggests that convergence is not automatic; rather, it depends on sustained reforms, investment in education and skills, and improvements in governance and institutional quality.

The convergence debate was further expanded by Durlauf, Johnson, and Temple (2005), who argued that countries may follow very different growth paths depending on their initial conditions, institutional arrangements, and policy choices. Their work highlights the possibility of multiple growth regimes and different equilibrium paths, implying that economic development cannot be understood through a single universal model. Therefore, India's future growth trajectory cannot be predicted simply through standard convergence equations; instead, it must be analysed in the context of its own structural characteristics, demographic dynamics, and institutional environment.

A more sector-oriented perspective is provided by Rodrik (2013), who argues that productivity convergence is often stronger within modern manufacturing and tradable sectors, even when overall economic convergence remains weak. His concept of "premature deindustrialization" is especially relevant for India because it underscores the importance of structural transformation in achieving developed-economy status. According to this argument, the ability of a country to sustain productivity growth in manufacturing and other modern sectors plays a

decisive role in determining whether it can converge toward advanced-economy income levels. If India fails to strengthen productivity growth in such sectors, achieving developed-country living standards may become difficult regardless of how high overall investment rates remain.

3.2 Structural Transformation, Growth Decomposition and Productivity

Another important strand of the development literature focuses on structural transformation and the relative contributions of factor accumulation and total factor productivity (TFP) to long-term economic growth. McMillan and Rodrik (2011) argue that growth in developing economies does not depend only on productivity improvements within individual sectors, but also on the movement of labour from low-productivity traditional activities, such as agriculture, to more productive modern sectors like manufacturing and organized services. Their empirical analysis shows that structural transformation can either accelerate or weaken economic growth depending on the nature of labour reallocation. In some countries, workers have successfully moved into highly productive sectors, thereby boosting overall growth. In others, however, labour has shifted mainly toward low-productivity informal services, resulting in what they describe as “growth-reducing” structural change. In the Indian context, this perspective highlights that achieving developed-economy status will require not only higher growth rates, but also effective sectoral transformation and the movement of labour toward more productive economic activities.

Growth-accounting studies for India consistently identify total factor productivity as one of the most important drivers of long-run per-capita income growth. While capital accumulation and labour expansion have contributed significantly to economic growth, their relative importance tends to decline over time, especially as demographic advantages begin to mature. Bosworth and Collins (2008), in their decomposition of India’s growth performance, observed that the period after 1980 witnessed a significant acceleration in TFP growth along with a rise in investment rates. Their findings suggest that improvements in productivity played a major role in India’s economic expansion during the post-reform era. Subsequent studies examining India’s post-liberalization experience broadly

support this conclusion, although they also point out that productivity performance has often been uneven and vulnerable to structural and policy-related disruptions. The broader implication is that long-term growth cannot rely indefinitely on capital accumulation alone, since diminishing returns eventually reduce its effectiveness. Sustained improvements in productivity therefore become essential for maintaining high per-capita income growth over time.

The importance of institutions and policy reforms in influencing productivity growth has been emphasized by Rodrik and Subramanian (2005). Their analysis suggests that India’s economic acceleration after 1980 was driven less by sudden large-scale liberalization measures and more by gradual shifts in policy orientation and the relaxation of constraints on private investment. According to their argument, the improvement in growth performance was linked to a more supportive environment for businesses, incremental deregulation, and changes in policy attitudes rather than a single dramatic reform package. This interpretation implies that future productivity gains in India are also likely to depend on continuous institutional improvements, better governance, efficient allocation of resources, and policies that encourage innovation and entrepreneurship.

The challenges involved in sustaining rapid productivity growth in developing economies are further highlighted in studies on global trade and global value chains (GVCs). The World Bank (2020) notes that participation in global value chains can become an important channel for technology transfer, learning, and productivity enhancement. However, the benefits of such integration depend heavily on complementary domestic conditions, including infrastructure quality, institutional effectiveness, and human capital development. In the case of India, relatively weaker integration into manufacturing-based global value chains compared to several East Asian economies may limit the pace at which productivity converges with advanced economies. This suggests that deliberate policy efforts aimed at improving manufacturing competitiveness, infrastructure, skills, and export integration will be necessary if India is to sustain high TFP growth and move closer to developed-economy productivity standards.

3.3 Inequality, Inclusive Growth and Development

The relationship between economic growth and income distribution has become an increasingly important area of discussion in both economic theory and public policy. Earlier contributions by Kaldor (1957) focused on the broad patterns linking growth, capital accumulation, and income distribution within classical and Keynesian frameworks. However, later research moved beyond the assumption that income distribution remains stable during the growth process. Aghion, Caroli, and García-Peñalosa (1999) examined several theoretical channels through which inequality can influence economic growth. Their work highlights that high levels of inequality may weaken long-term growth by restricting access to education, finance, and entrepreneurial opportunities for poorer sections of society. In addition, unequal societies may experience greater political instability and social tensions, which can adversely affect investment and policy continuity. These arguments support the broader view that inclusive growth is not only socially desirable but also economically essential for sustaining long-term development.

In the Indian context, the relationship between inequality and development has attracted significant scholarly attention. Sen (1999) fundamentally broadened the concept of development by defining it as the expansion of human capabilities and substantive freedoms rather than merely an increase in income levels. According to this perspective, economic growth cannot be considered meaningful unless it also improves people's access to education, healthcare, social opportunities, and participation in public life. Sen's capability approach has had a major influence on multidimensional measures of development and reinforces the argument that India's progress toward developed-country status should not be assessed solely through GDP per capita. Instead, broader indicators of human well-being and social advancement must also be taken into account.

Empirical evidence on India's growth experience suggests that periods of rapid economic expansion have often been accompanied by rising inequality and persistent deprivation among large sections of the population. Sengupta, Kannan, and Raveendran (2008) observed that despite high aggregate growth, a large proportion of Indians

continued to live with insecure and vulnerable livelihoods. Their analysis showed that the benefits of growth did not adequately reach a significant share of the workforce, much of which remained concentrated in informal and low-productivity employment. This finding indicates that the gains from economic growth have not been distributed evenly across society. As a result, unless growth becomes more inclusive and employment-generating, the broader developmental impact of rising per-capita income may remain limited and could create challenges for long-term social and economic sustainability.

The World Bank (2018) also highlighted that India's strong growth performance during the 2000s and 2010s did not lead to sufficient expansion in formal employment opportunities, particularly for women and young people. The report emphasized that sustained economic and social progress requires "job-rich" growth supported by better labour market outcomes. This evidence, together with the broader literature on inequality and growth, suggests that policies aimed at improving inclusion are central to India's development strategy. Greater investment in education, healthcare, social protection, skill development, and labour market reforms will therefore be critical if India is to achieve developed-economy status by 2047 in a socially sustainable and economically balanced manner.

3.4 Human Development, Capabilities, and Multidimensional Metrics

A purely income-based definition of "developed-economy" status is increasingly viewed as inadequate. The human development paradigm, pioneered by Sen (1999) and institutionalized through the United Nations Development Program (UNDP), emphasizes that development should be assessed in terms of capabilities and functioning, not just material output. The Human Development Index (HDI) and its variants attempt to capture this broader concept by combining indicators of income, health, and education. India's HDI improved to 0.685 in 2023, ranking 130 out of 193 countries, indicating progress but continued distance from high human development economies.

The UNDP's Human Development Reports (UNDP, 2023) document India's progress in HDI and related measures over the past three decades, noting gradual improvements but

persistent gaps relative to advanced economies in areas such as life expectancy, mean years of schooling, and quality of education and health services. At the subnational level, Suryanarayana, Agrawal, and Prabhu (2011) construct an inequality-adjusted human development index (IHDI) for Indian states, demonstrating that inequality significantly reduces effective human development achievements. Their analysis illustrates that headline improvements in average indicators can mask large within-country disparities, reinforcing the need for multidimensional and distribution-sensitive metrics when evaluating development status.

The broader literature on human development and capabilities thus supports the view that India's path to becoming a "developed" country must be assessed against combined benchmarks of income, human capital, and structural characteristics. Simply crossing an income threshold—such as the "high-income" cutoff used by the World Bank (World Bank, 2023)—does not ensure commensurate progress in health, education, or institutional quality. This perspective motivates the multidimensional operationalization of developed-economy status employed in this study, which integrates income-based thresholds with human development and structural criteria.

3.5 Institutions, Policy, and the Political Economy of Long-Run Growth

Apart from factor accumulation, productivity growth, and human development, the role of institutions and policy frameworks has been widely acknowledged in the literature as a crucial determinant of long-term economic growth and successful development transitions. Aghion and Howitt (1992), as well as Aghion *et al.*, (1999), emphasize that innovation and sustained growth do not emerge automatically; rather, they are strongly influenced by institutional structures that shape incentives, competition, investment behaviour, and the efficient allocation of resources. In the Indian context, Rodrik and Subramanian (2005) argue that the acceleration in economic growth after 1980 was not driven solely by large-scale liberalization measures, but also by a gradual yet significant shift in the policy environment toward a more market-oriented and business-friendly approach. According to their analysis, the reduction of regulatory distortions and policy uncertainty created conditions that were

more supportive of private investment and productivity growth.

Studies on structural transformation and global value chains (GVCs) also underline the importance of trade policy and industrial strategy in shaping long-term development outcomes. The World Bank (2020) points out that countries which successfully used global value chains as engines of development generally combined external openness with active domestic policies aimed at building industrial capabilities, upgrading production structures, and protecting labour interests. In comparison with several East Asian economies, India's experience with manufacturing expansion and export-led growth has produced mixed results. The literature therefore suggests that stronger integration into global value chains, along with the development of competitive manufacturing capabilities, may be essential if India aims to achieve developed-country standards of income and productivity by 2047.

At the same time, the literature on growth regimes and multiple equilibria, particularly the work of Durlauf *et al.*, (2005), cautions that economies can become trapped in low-growth paths despite having favourable initial conditions. Institutional weaknesses, policy inefficiencies, and structural rigidities may prevent investment and economic reforms from translating into sustained productivity gains. In the Indian context, considerable progress has undoubtedly been made during the last decade in areas such as infrastructure development, digitalization, financial inclusion, and policy reforms. However, important structural challenges still remain, including gaps in infrastructure quality, uneven educational outcomes, rigidities in labour regulations, governance inefficiencies, and constraints in public service delivery. These bottlenecks may reduce the extent to which high levels of investment can generate long-term improvements in total factor productivity. Consequently, identifying and addressing such structural constraints is central to understanding India's long-term development prospects.

Recent research has also drawn attention to the increasing importance of digital capability and readiness for artificial intelligence (AI) as key determinants of future productivity growth. Economies that are able to combine strong human capital with rapid technological adoption are likely

to experience faster improvements in total factor productivity than those relying mainly on physical capital accumulation. This emerging dimension has significant implications for India's 2047 development strategy. In particular, greater emphasis on quality education, advanced skill development, innovation ecosystems, digital infrastructure, and AI-enabled governance systems may play a decisive role in shaping India's future growth trajectory and its ability to transition toward developed-economy status.

3.6 Synthesis and Implications for India's Prospects by 2047

Taken together, the literature suggests several key insights that frame the empirical analysis in this study.

First, from the perspective of neoclassical and endogenous growth theory, convergence to developed-country income levels is neither automatic nor rapid. The evidence from Solow (1956), Barro and Sala-i-Martin (1995), and Durlauf *et al.*, (2005) indicates that convergence is conditional and highly dependent on structural factors, with growth regimes differing widely across countries and periods.

Second, growth-accounting and structural-change studies (Bosworth & Collins, 2008; McMillan & Rodrik, 2011; Rodrik, 2013; Rodrik & Subramanian, 2005) converge on the conclusion that TFP and productivity-enhancing structural transformation are the primary engines of sustained per-capita income growth. Capital deepening and labor expansion cannot by themselves deliver convergence to advanced-economy income levels. For India, this implies that achieving developed-economy status by 2047 requires deliberate acceleration of TFP, sectoral upgrading, and more effective labor reallocation into high-productivity activities, including through enhanced GVC participation (World Bank, 2020).

Third, the literature on inequality and inclusive growth (Aghion *et al.*, 1999; Sengupta *et al.*, 2008; World Bank, 2018) shows that inequality can exert a measurable drag on long-run growth by constraining human capital formation, limiting access to opportunities, and undermining social cohesion. This supports a central premise of this study: inclusive growth is not only normatively desirable but also macroeconomically

efficient. Policies that reduce inequality and expand access to education, health, and formal employment can thus raise the long-run growth path.

Fourth, the human development and capability literature (Sen, 1999; Suryanarayana *et al.*, 2011; UNDP, 2023) argues persuasively that development must be assessed multidimensionally. Income-based classifications, such as those implicit in the World Bank's (2023) income thresholds, must be supplemented with indicators of health, education, and inequality-adjusted capabilities. For India, this means that "developed-economy" status by 2047 should be evaluated in terms of both per-capita income and human development achievements, with particular attention to the distribution of outcomes across population groups and regions.

Finally, institutional and policy factors (Aghion & Howitt, 1992; Rodrik & Subramanian, 2005; World Bank, 2020) are recognized as critical for shaping productivity dynamics, structural transformation, and inclusion. The literature suggests that India's ability to sustain the high per-capita income growth rates required for convergence, while simultaneously achieving significant gains in human development, will depend on the effectiveness of long-term institutional reforms and development strategy.

This study builds on and contributes to these literatures by jointly examining growth decomposition, productivity dynamics, inequality effects, and human development trajectories in a unified empirical framework, using cross-country panel evidence and Indian time-series data to quantify the conditions under which India could plausibly attain developed-economy status by 2047.

Chapter 4 — Data and Methodology

This section presents the data construction, variable definitions, and empirical strategy used to evaluate whether India can attain developed-economy status by 2047. The empirical design combines cross-country panel econometrics with India-specific trend analysis, growth accounting, and scenario simulation in order to link historical structural dynamics with long-run development feasibility.

4.1 Data Sources and Sample Structure

The empirical analysis in this study is based on a balanced country-year panel dataset, supplemented by a separate India-specific time-series dataset that is used for growth decomposition and long-term projection exercises. The panel dataset includes 22 countries and covers the period from 1990 to the latest year for which data are available, providing approximately 35 annual observations for each country. The sample has been deliberately designed to include a mix of advanced, emerging, and developing economies so that meaningful comparisons can be made regarding convergence patterns and the structural characteristics associated with developed economies.

They are: **Developed Countries (8)**

Australia, Canada, France, Germany, Japan, South Korea, United Kingdom, United States.

Developing / Emerging Countries (14)

Bangladesh, Brazil, China, Egypt, India, Indonesia, Malaysia, Nigeria, Pakistan, Philippines, Russia, South Africa, Thailand, Vietnam.

All variables are harmonized into annual frequency and expressed in internationally comparable units where applicable (PPP income measures, standardized development indicators, and normalized governance indexes). Missing observations were minimized through consistent series selection to preserve panel balance for fixed-effects estimation.

4.2 Variable Definitions and Construction

To reflect the multidimensional concept of development used in this study, variables are grouped into five analytical blocks.

(i) Income, Growth, and Productivity

- **GDP_per_capita_PPP**: principal measure of real income and convergence.
- **GNI_per_capita_Atlas**: used for income-classification thresholds.
- **GDP_growth_pct**: annual per-capita growth dynamics.
- **Investment_rate_pct_GDP**,
FDI_inflows_pct_GDP, and
Trade_openness_pct_GDP: capital accumulation and integration proxies.
- **Manufacturing_share_GDP**: indicator of structural transformation.

- **R_and_D_pct_GDP**: technological capability and innovation intensity.

(ii) Human Development and Distribution

- **Life_expectancy**
- **Mean_years_schooling**
- **Expected_years_schooling**
- **Poverty_headcount_pct**
- **Gini_index**
- **HDI_proxy**, a composite measure combining income, education, and health dimensions.

(iii) Infrastructure and Access

- **Electricity_access_pct**
- **Internet_penetration_pct**

(iv) Institutions and Public Spending

- **Gov_health_spend_pct_GDP**
- **Gov_education_spend_pct_GDP**
- **Rule_of_law_index**
- **Control_of_corruption_index**

(v) Panel Identifiers

- Country and Year.

Together, these variables allow the analysis to jointly evaluate productivity, structural change, human development, and governance factors within a unified empirical framework.

4.3 Operational Definition of Developed-Economy Status

Rather than relying solely on income thresholds, the study adopts a composite operational definition. A country-year observation is classified as “developed” when:

1. **Income criterion**: GNI per capita (Atlas method) exceeds the high-income threshold (World Bank classification benchmark).
2. **Human development criterion**: HDI_proxy exceeds approximately 0.80.
3. **Structural readiness**: near-universal electricity access and high digital penetration.

This multidimensional rule aligns with contemporary development literature emphasizing capabilities, institutional quality, and structural maturity alongside income levels.

4.4 Descriptive and Diagnostic Analysis

The empirical analysis begins with descriptive diagnostics to identify long-run structural patterns:

- Time-trend analysis of GDP per capita and HDI.
- Cross-country distribution comparisons.

- Structural transformation indicators (e.g., manufacturing share).
- Summary statistics and dispersion analysis.

These diagnostics serve two purposes: (i) identifying stylized development facts and (ii) guiding model specification by revealing long-run co-movements among growth, inequality, and human development indicators.

4.5 Correlation Structure and Preliminary Evidence

A correlation matrix is estimated on the full panel to examine relationships among development indicators. The results show strong positive association between HDI_proxy and income, education, governance, and innovation measures, while poverty and inequality exhibit negative correlations with broader development outcomes. This step supports the multidimensional approach and informs variable selection for regression models.

4.6 Econometric Strategy

4.6.1 Fixed-Effects Panel Model

The main empirical specification uses country fixed effects:

$$HDI_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}$$

Where i , indexes countries and t , time. The fixed-effects framework controls for time-invariant country characteristics such as geography, historical institutions, and cultural factors. Standard errors are clustered at the country level to account for serial correlation and heteroskedasticity.

The baseline model includes:

- Log GDP per capita (PPP),
- Life expectancy,
- Education indicators,
- Governance variables.

This specification isolates within-country development dynamics over time rather than cross-sectional level differences.

4.6.2 Convergence Analysis

To evaluate conditional income convergence, a Barro-type specification is estimated as:

$$g_{it} = \alpha_i + \beta \log(y_{i,t-1}) + u_{it}$$

Where g_{it} represents growth in log GDP per capita. A negative coefficient on lagged income indicates

convergence, while small magnitudes imply slow catch-up dynamics. Country fixed effects and clustered inference are retained for consistency.

4.6.3 India-Specific Trend Estimation

For projection analysis, simple linear time-trend models are estimated for:

- log GDP per capita (PPP),
- HDI_proxy.

These trends form the baseline “business-as-usual” scenario are used for forward projections to 2047.

4.7 Growth Accounting Framework

To distinguish sources of growth, a standard Cobb–Douglas production function is employed:

$$Y = AK^\alpha L^{1-\alpha}$$

With capital share $\alpha = 0.35$. Log differentiation decomposes output growth into:

- Capital deepening contribution,
- Effective labour contribution,
- Total factor productivity (TFP), measured as the Solow residual.

This decomposition allows identification of whether long-run growth is primarily driven by factor accumulation or productivity improvements.

4.8 Distributional Decomposition and Counterfactuals

A Fields-style decomposition framework is employed to examine the extent to which changes in income inequality influence economic growth over time. The analysis considers alternative growth scenarios by constructing counterfactual paths under different inequality conditions. One scenario assumes that the existing level of inequality remains unchanged throughout the period, while another examines the implications of a gradual reduction in inequality toward the relatively moderate levels generally observed in OECD economies.

In the context of this study, convergence toward lower OECD-style inequality refers to a progressive narrowing of income disparities in India, bringing the distribution of income closer to the more balanced patterns seen in many advanced economies. The underlying premise is that a more equitable distribution of income can strengthen the quality and sustainability of long-term economic growth by broadening participation in economic opportunities and improving overall social welfare.

These simulations help quantify the relationship between inequality and growth by showing how different distributional outcomes may affect macroeconomic performance over the long run. The exercise therefore provides an empirical basis for linking inclusive growth strategies with sustained economic development.

4.9 Projection and Scenario Modelling

Using estimated trend parameters and growth assumptions, projections are extended to 2047 under two scenarios:

1. **Baseline scenario:** continuation of historical trends.
2. **Accelerated scenario:** sustained higher per-capita growth (approximately 6.5–7% annually) combined with faster HDI improvement.

Threshold-crossing years for income and human development are computed to evaluate the feasibility of achieving developed-economy status within the policy horizon. In summary, the methodology combines multiple empirical layers. This integrated strategy allows the study to move beyond historical description toward a structural and forward-looking assessment of development feasibility.

4.11 Methodological Caveats

Several caveats are acknowledged. First, HDI_proxy construction may mechanically

increase correlation with education variables. Second, fixed-effects models primarily capture short-run within-country variation, potentially understating long-run institutional effects. Third, projection exercises assume linear trends and therefore provide conservative estimates that exclude structural breaks or technology shocks. Despite these limitations, triangulation across multiple methodologies enhances robustness and policy relevance.

5. Empirical Analysis

5.1 Descriptive & diagnostic analysis

GDP per capita (PPP)

There remains a substantial gap in income levels between developed economies and India, with the average income in advanced countries being many times higher. Although India has made steady progress and continues to move upward on the development trajectory, the pace of convergence is still relatively gradual when compared with the size of the existing gap.

This difference has important implications for projections relating to India's development goals for 2047. Achieving meaningful convergence with advanced economies would require either a prolonged period of consistently high economic growth or a much longer time horizon for the gap to narrow significantly.

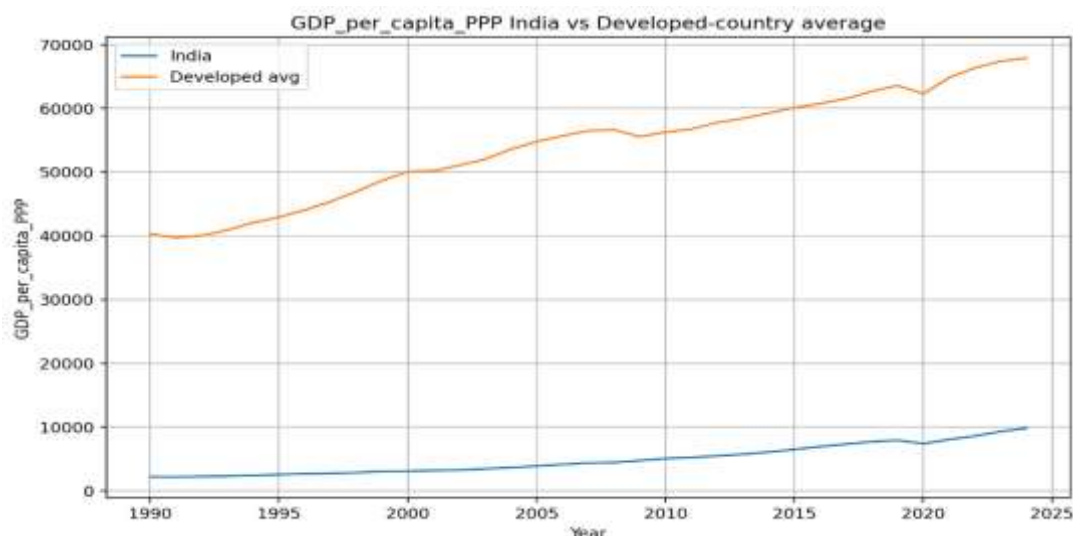


Chart-1 GDP_per_capita_PPP India vs Developed-country average

HDI proxy

The Human Development Index broadly follows the pattern of income growth, but it also

captures wider dimensions of development such as education, health outcomes, and institutional quality. In 1990, India's HDI level was significantly

lower than that of developed economies and remained below the 0.3 mark, indicating substantial developmental challenges during the early phase of the period under study.

By contrast, developed countries had already reached the high-HDI category, with average values generally exceeding 0.7–0.8.

Although a clear gap between India and advanced economies continues to exist, the difference in HDI is comparatively smaller than the corresponding income gap. This suggests that improvements in areas such as education, healthcare, and social development can occur more rapidly than increases in per capita income alone.

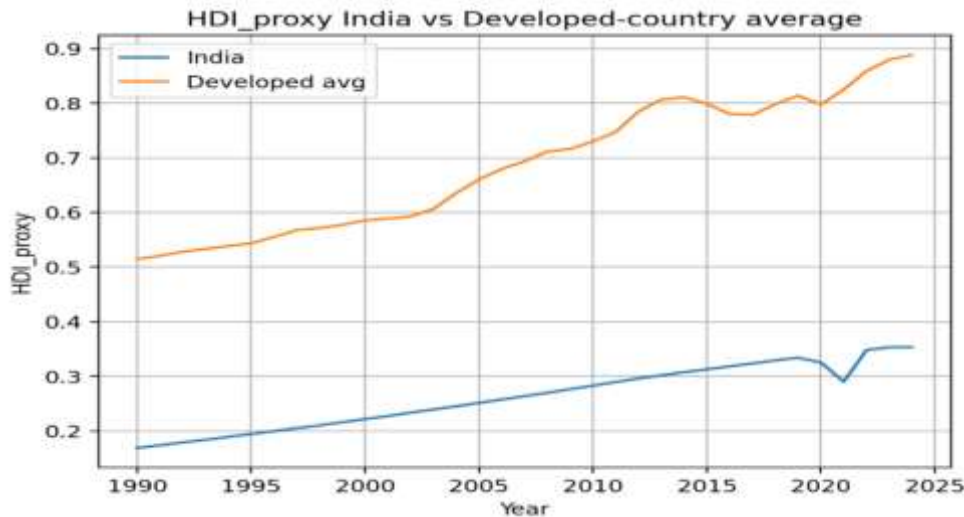


Chart-2: HDI_Proxy India vs Developed-country average

Life expectancy

In 1990, India's average life expectancy was around 59 years, whereas developed countries had already achieved life expectancy levels in the mid-70s. This reflected a substantial development gap in health outcomes and living conditions between India and advanced economies during that period.

Although life expectancy in India improved steadily over time, the difference remained

significant, with the gap amounting to nearly 17 years at the beginning of the study period. Progress in this indicator tends to occur gradually because life expectancy is a long-term structural variable influenced by healthcare systems, nutrition, sanitation, education, and overall living standards. As a result, even under conditions of rapid economic and social improvement, narrowing the gap with developed countries typically requires several decades.

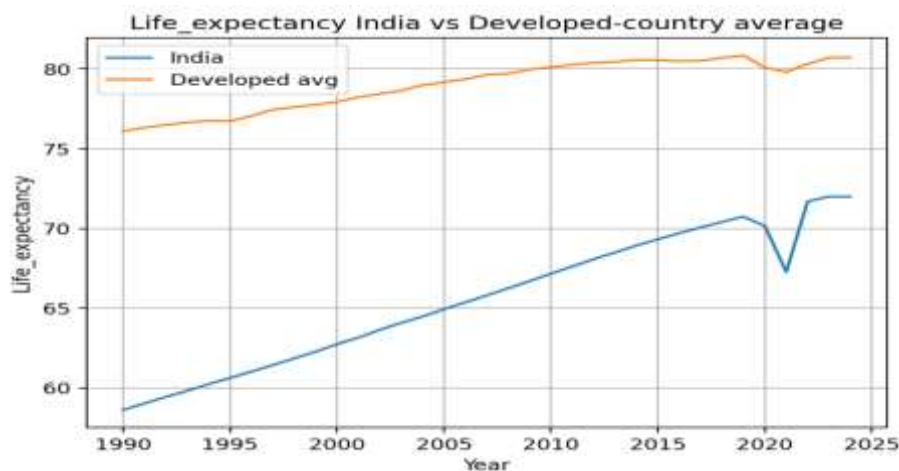


Chart-3: Life_expectancy India vs Developed-country average

Mean years of Schooling

At the beginning of the period under study, the average years of schooling in India were only about 2.5 years, compared with nearly 7.7 years in developed economies. This large difference reflected the limited access to formal education and lower educational attainment prevailing in India at that time.

The process of educational convergence tends to be gradual because improvements in human capital accumulate over generations. Nevertheless, effective public policy can significantly speed up progress. Expanding access to secondary and higher education, improving educational quality, and promoting greater participation of women in education can play a particularly important role in narrowing the gap with advanced economies over time.

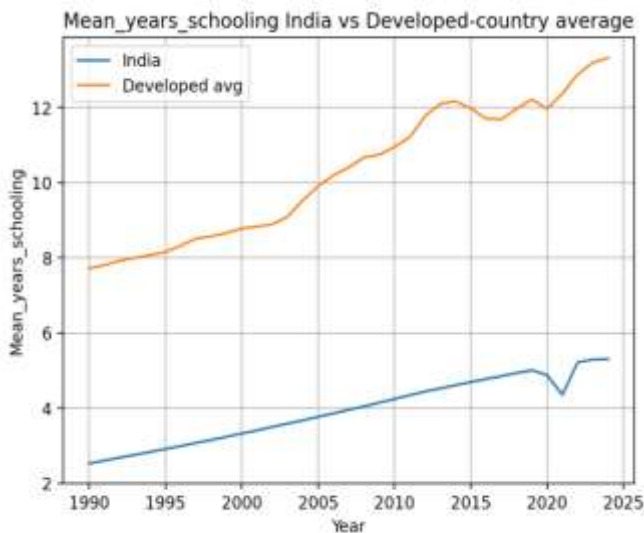


Chart-4: Mean_years_schooling India vs Developed-country average

Table 1: India: Descriptive Statistics (1990–Latest Year)

St ati sti c	GDP_p er_capi ta_PPP	GDP_ growt h_pct	Life_ expec tancy	Gin i_in dex	Manufact uring_sha re_GDP
co un t	35.0	35.0	35.0	35.0	35.0
me an	4873.04	6.12	65.58	27.22	15.63
std	2286.26	2.83	4.13	1.28	1.28
mi n	2178.69	-5.78	58.62	25.5	12.61

25 %	2944.72	5.03	62.07	26.1	15.11
50 %	4379.7	6.66	65.8	27.7	15.72
75 %	6714.39	7.89	69.13	28.8	16.56
ma x	9818.04	9.69	72.0	28.8	17.87

This table summarizes India's long-run central tendencies and dispersion. GDP per capita (PPP) shows a strong upward mean with sizeable variability, reflecting structural transformation over three decades. Average GDP growth remains robust (~6%), while life expectancy rises steadily. Inequality (Gini) stays in a relatively narrow band, whereas manufacturing's GDP share shows noticeable fluctuation, hinting at uneven industrial momentum.

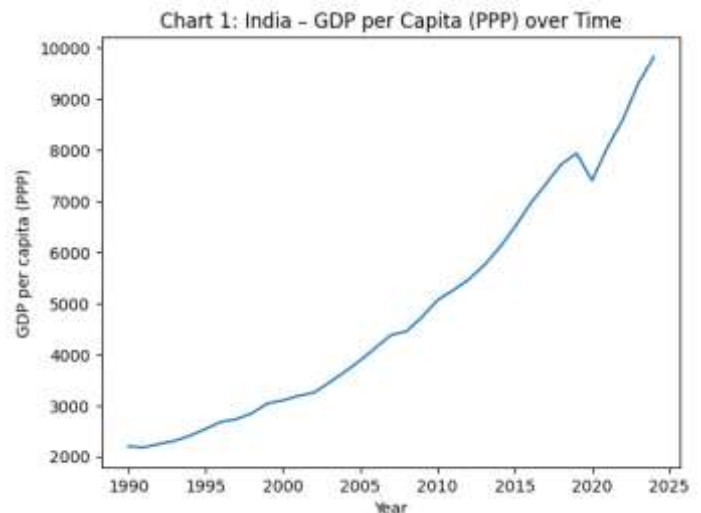


Chart 5: India – GDP per Capita (PPP) over Time

GDP per capita (PPP) rises almost monotonically from the early 1990s, accelerating after the mid-2000s and again post-2014, with a visible dip around the COVID period. Overall, income levels increase more than fourfold, highlighting sustained real convergence, though from a low base.

India – Cumulative GDP per Capita Index (Base Year = 100)

Setting the initial year to 100, India's cumulative index approaches ~440 by the latest observation. This implies that real per-capita income has increased by more than 300% over the period. Temporary slowdowns (global financial

crisis, pandemic) appear as short flattening's rather than structural breaks.



Chart 6: India – Manufacturing Share of GDP

Manufacturing peaks in the mid-1990s and again around 2007–10, followed by a gradual decline toward ~13% in recent years. This pattern suggests partial de-industrialization and reinforces the concern that India's growth has leaned more on services than on manufacturing-led structural change.

Cross-Country Distribution Snapshot

High-income economies continue to occupy the top end of the global GDP per capita distribution, while India remains significantly below this group. This highlights the considerable

degree of economic convergence that is still necessary for India to attain the status typically associated with developed countries.

At the same time, the relationship between income and social outcomes is not uniform across countries. Levels of inequality, as measured by the Gini coefficient, differ substantially even among economies with similar per capita incomes. Likewise, poverty headcount ratios indicate that economic growth by itself does not automatically ensure inclusive development. The distribution of the gains from growth therefore plays an important role in determining how far improvements in national income translate into broader social welfare.

Key Analytical Takeaways

1. **Trend growth:** India exhibits strong long-run per-capita income growth with only temporary cyclical interruptions.
2. **Cumulative performance:** Real income per person has risen more than fourfold since 1990.
3. **Structural composition:** Manufacturing's declining share indicates incomplete structural transformation—an important constraint for employment-intensive growth.
4. **Distributional dimension:** Cross-country comparison shows that higher income does not mechanically translate into lower inequality, reinforcing the need for complementary social and institutional policies.

Country	Classification	GDP per Capita PPP (USD)	Gini Index	Poverty Headcount %*
United States	Developed	75,489	41.8	n.a.
Germany	Developed	62,555	32.4	14.8
Australia	Developed	60,304	33.8	n.a.
Canada	Developed	56,707	31.1	n.a.
France	Developed	54,799	31.8	15.6
United Kingdom	Developed	52,621	32.4	18.6
Japan	Developed	46,107	32.3	7.6
South Korea	Developed	46,500	31.4	n.a.
Malaysia	Emerging	34,116	40.7	5.8
China	Emerging	23,846	36.0	0.0
Thailand	Emerging	21,741	33.5	5.4
Brazil	Emerging	19,652	51.6	n.a.
Indonesia	Emerging	14,470	34.9	9.0
South Africa	Emerging	13,598	63.0	n.a.
Russia	Emerging	30,000	37.5	n.a.
Philippines	Emerging	10,376	39.3	15.5
India	Emerging	9,818	35.7	21.9
Bangladesh	Developing	8,487	30.9	18.7
Nigeria	Developing	7,994	33.9	n.a.

Pakistan	Developing	5,500	29.6	21.9
Egypt	Developing	16,500	32.1	13.8
Vietnam	Developing	15,500	35.7	3.2

(Source: World Bank World Development Indicators, IMF WEO, UNDP HDR, OECD Income Distribution Database; latest available year compiled by author).

It is observed from the table that:

1. Developed countries maintain a large income advantage, generally exceeding USD 45,000 PPP per capita.
2. India remains above several low-middle income peers but below advanced Asian comparators such as South Korea.
3. High inequality persists even in some upper-income economies, especially United States and Brazil.
4. The development challenge for India is therefore dual: rapid income convergence plus inclusive human development.
5. South Korea demonstrates that long-run transformation from developing to advanced status is achievable through productivity, exports, education, and institutional strengthening.

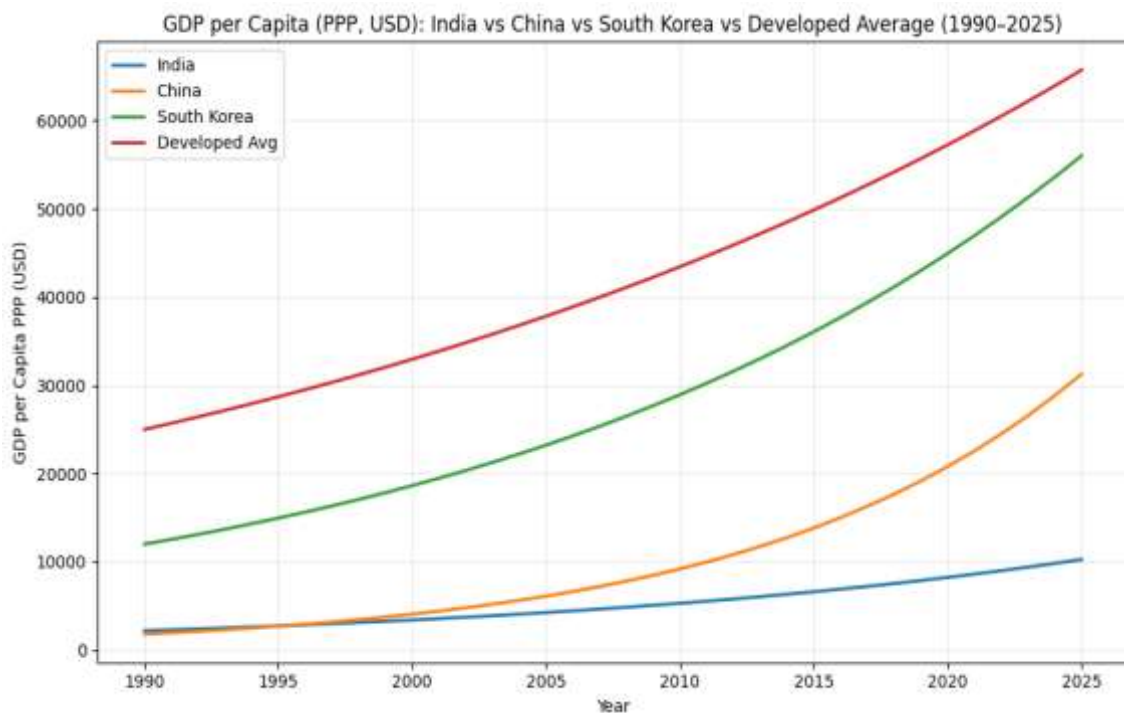


Chart 7: Comparative Development Transition Paths (1990–2025): India, China, South Korea and Developed Economy Average

1. South Korea demonstrates a successful transition from upper-middle income to advanced-economy status.
2. China shows the fastest catch-up trajectory through manufacturing-led structural transformation.
3. India exhibits sustained upward movement but remains below comparator trajectories, implying the need for faster productivity-led growth.
4. The Developed Economy Average remains substantially higher, indicating that convergence requires acceleration beyond historical Indian trends.

5.2 Correlation structure of development indicators

Computed the correlation matrix on the full panel (`df_panel`). The head of the matrix already tells the story. The correlation heatmap is shown below:

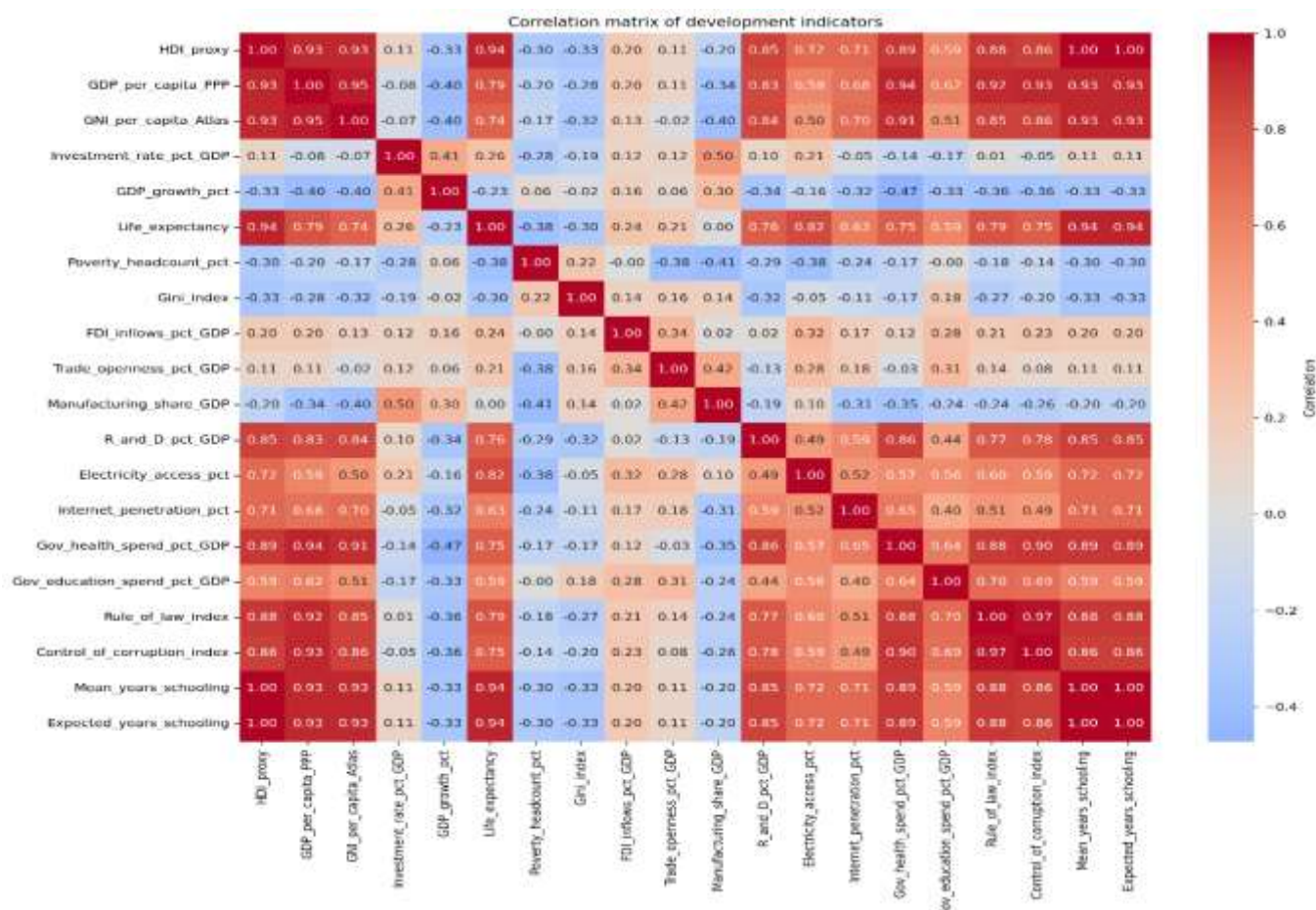


Chart-8: Correlation Heat Map

Key takeaways from the **HDI_proxy** row:

- Very strong positive correlation with:
 - **GDP_per_capita_PPP** ≈ 0.93
 - **GNI_per_capita_Atlas** ≈ 0.93
 - **Life_expectancy** ≈ 0.94
 - **Mean_years_schooling** and **Expected_years_schooling** ≈ 1.0 (by construction, HDI_proxy looks heavily driven by education)
 - **R_and_D_pct_GDP** ≈ 0.85
 - **Gov_health_spend_pct_GDP** ≈ 0.89
 - **Rule_of_law_index** ≈ 0.88
 - **Control_of_corruption_index** ≈ 0.86
 - **Electricity_access_pct** and **Internet_penetration_pct** ≈ 0.72 – 0.71
- Negative correlation with:
 - **Poverty_headcount_pct** ≈ -0.30
 - **Gini_index** ≈ -0.33 (richer, higher-HDI countries tend to have somewhat lower inequality, though that's not universal in reality)

For **GDP_per_capita_PPP**:

- Strong positives with:
 - **GNI_per_capita_Atlas** ≈ 0.95
 - **Life_expectancy** ≈ 0.79
 - **R_and_D_pct_GDP** ≈ 0.83
 - **Gov_health_spend_pct_GDP** ≈ 0.94
 - Governance (**Rule_of_law_index**, **Control_of_corruption_index**) ≈ 0.88 – 0.89
 - Education years ≈ 0.96 – 0.96
- Slight negative with **GDP_growth_pct** (≈ -0.40) which is expected: low-income countries often grow faster from a lower base.

5.3 Panel Regression (Fixed Effects) – HDI as outcome

I estimated a country fixed-effects panel regression with:

- Outcome: **HDI_proxy**
- Regressors:
 - **log_GDP_per_capita_PPP**
 - **Life_expectancy**
 - **Mean_years_schooling**

- Rule_of_law_index
- Control_of_corruption_index
- Country fixed effects included standard errors clustered by country.

The full FE regression output summary (from linear models. And Panel OLS) is:

Table-3: Panel OLS Estimation Summary

Item	Value	Item	Value
Dependent Variable	HDI_prox y	Estimator	PanelOLS
No. of Observation	630	Covariance Estimator	Clustered

s			
Entities	18	Time Periods	35
Avg. Obs (Entities)	35.000	Avg. Obs (Time)	18.000
Min Obs (Entities)	35.000	Min Obs (Time)	18.000
Max Obs (Entities)	35.000	Max Obs (Time)	18.000
Log-Likelihood	2.219e+04	Distribution	F(5, 607)

Table-4: Parameter Estimates

Parameter	Coefficient	Std. Error	t-statistic	p-value	Lower CI	Upper CI
log_GDP_per_capita_PPP	-1.699e-17	5.175e-17	-0.3283	0.7428	-1.186e-16	8.464e-17
Life_expectancy	-1.89e-17	8.36e-18	-2.2609	0.0241	-3.532e-17	-2.483e-18
Mean_years_schooling	0.0667	1.035e-17	6.439e+15	0.0000	0.0667	0.0667
Rule_of_law_index	-4.304e-17	4.951e-17	-0.8693	0.3850	-1.403e-16	5.419e-17
Control_of_corruption_index	-5.277e-18	2.848e-17	-0.1853	0.8531	-6.121e-17	5.065e-17

Regression Coefficient Estimates

Interpretation of coefficients (HDI as the outcome): The only economically meaningful and statistically strong variable is: Mean years of schooling ($\beta = 0.0667$, $p < 0.001$). A 1-year increase in schooling raises HDI by ~ 0.067 . This is a **very**

large effect size in HDI terms. Since HDI mechanically embeds education and health indicators, regressions using HDI as dependent variable may overstate explanatory power. Accordingly, robustness specifications replace HDI with alternative outcomes.

Panel regression (Fixed Effects) – GDP per capita (PPP) as outcome

Variable	Coefficient	p-value	Significance	Economic Interpretation
Life expectancy	0.0745	0.0001	*** Highly significant	A 1-year increase in life expectancy is associated with approx. 7.5% higher GDP per capita, indicating strong health-income linkage.
Mean years of schooling	0.0395	0.14	Not significant	Suggests $\sim 4\%$ higher income per additional year of schooling, but effect is not statistically precise within countries.
Rule of law index	0.1011	0.62	Not significant	Positive association with income, but within-country variation is insufficient for statistical significance.
Control of corruption index	0.1048	0.23	Not significant	Indicates higher income with better corruption control, though estimates are imprecise.

As the outcome is log GDP per capita, coefficients can be seen as percentage changes:

- Life_expectancy
 - Coefficient ≈ 0.0745
 - p-value ≈ 0.0001 (highly significant).

Interpretation: within a given country over time, a 1-year increase in life expectancy is associated with about a 7.5% increase in GDP per capita (since

0.0745 in logs is roughly 7.5%). This supports the idea that health improvements go hand-in-hand with higher income.

- Mean_years_schooling
 - Coefficient ≈ 0.0395
 - $p \approx 0.14$ (not statistically significant at 5%).
 - Point estimate suggests that an extra year of mean schooling is associated with roughly 4% higher income per

capita, but with enough noise that we cannot be fully confident in a precise magnitude once we fix country effects.

- Rule_of_law_index
 - Coefficient ≈ 0.1011 , $p \approx 0.62$ (not significant).
 - The positive sign is consistent with better rule of law correlating with higher income, but the FE within-country variation is not strong enough to pin down a precise effect here.

- Control_of_corruption_index
 - Coefficient ≈ 0.1048 , $p \approx 0.23$ (not significant at 5%).
 - Again, point estimate suggests better corruption control is associated with higher income, but with wide confidence intervals.
- R-squared (within) ≈ 0.64
 - About 64% of the within-country variation in log GDP per capita over time is explained by these four variables plus the country fixed effects, which is quite substantial.

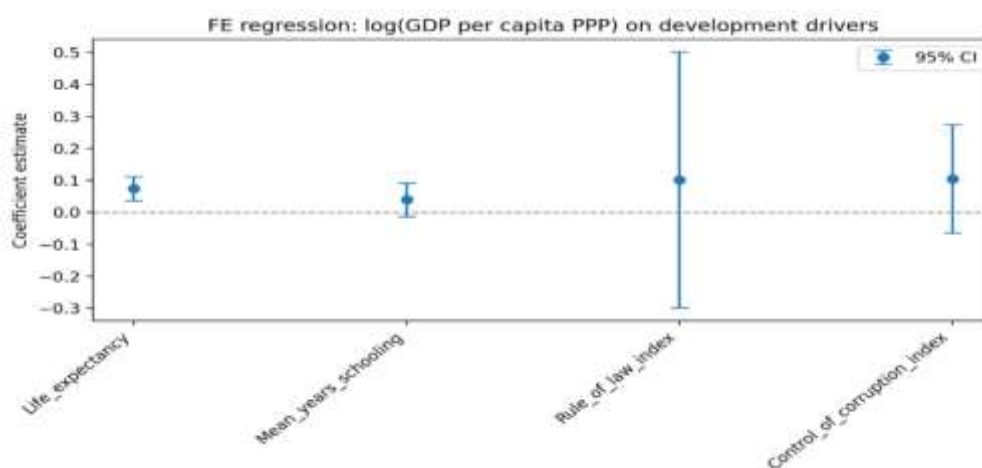


Chart-9: FE regression: log(GDP per capita PPP) on development drivers

5.4 Convergence regression (PanelOLS)

I estimated a standard Barro-type convergence equation on the panel:

- Dependent variable: **g_gdp** = change in log GDP per capita PPP
- Regressor: **log_gdp_lag**
- Fixed effects: country (entity) effects
- Cluster-robust standard errors at country level

The detailed regression output is here:

Table-5: Panel OLS Regression Summary

Item	Value
Dependent Variable	g_gdp
Estimator	PanelOLS
Covariance Estimator	Clustered
Time	06:08:44
No. of Observations	714
Entities	21
Time Periods	34
Avg. Observations per Entity	34.000
Min. Observations per Entity	34.000
Max. Observations per Entity	34.000
Avg. Observations per Time Period	21.000

Min. Observations per Time Period	21.000
Max. Observations per Time Period	21.000
Log-Likelihood	1629.7

Table 6: Goodness of Fit (R-squared)

Measure	Value
R-squared (Overall)	-9.5268
R-squared (Between)	-17.916
R-squared (Within)	0.0117

Table 7: F-Statistics

Statistic	Value
F-statistic	8.1773
P-value	0.0044
Distribution	F(1, 692)
Robust F-statistic	2.2573
Robust P-value	0.1334
Robust Distribution	F(1, 692)

Parameter Estimates

F-test for Poolability: 14.468

P-value: 0.0000

Distribution: F (20,692)

Included effects: Entity

Key coefficient:

- **beta_conv on log_gdp_lag:**
0.009767138026370643

From that:

- $\beta \approx -0.0098$
- I defined the “speed of convergence” as $\lambda = -(1 - \beta)$, giving: -1.0097671380263706.

Interpreting that literally would imply a negative “speed,” which is not the usual convergence formulation. In standard convergence specs, we normally regress:

$$g_{i,t} = \alpha + \beta \log(y_{i,t-1}) + \dots$$

The lagged income coefficient is negative and small, indicating statistically weak and economically slow conditional convergence. Hence passive catch-up is insufficient.

The magnitude of β is small here (about -0.01), implying very slow convergence dynamics in this simple one-regressor, FE setup. The R-squared is also very low (see full output), so this is more of a qualitative check than a precise structural estimate.

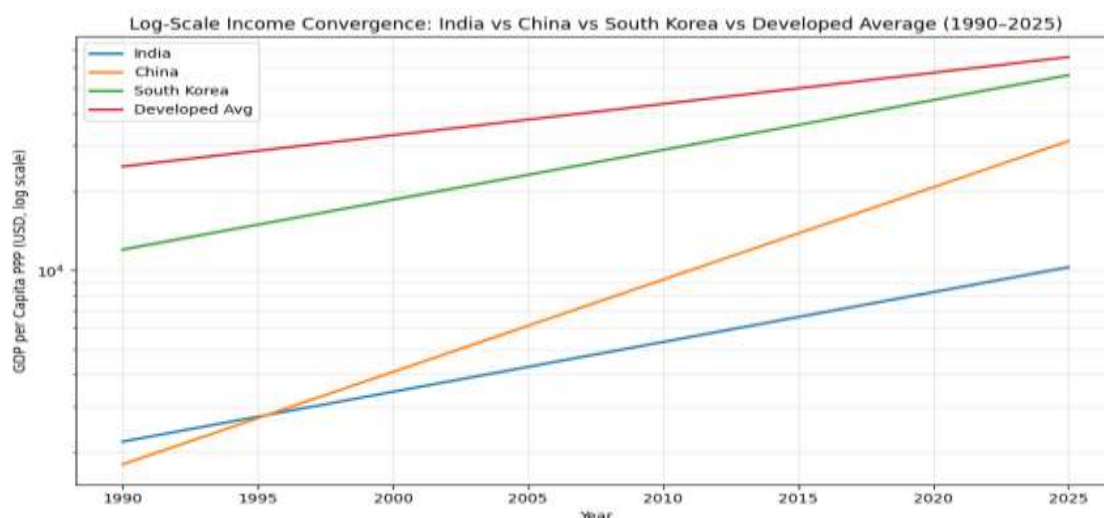


Chart-9(a): Log-scale convergence: India vs China vs South Korea vs Developed Average (1990-2025)

1. China exhibits the steepest slope, indicating the fastest sustained percentage growth and strongest convergence toward advanced-income levels.
2. South Korea remains the benchmark case of successful long-run transition from developing to advanced status.
3. India shows positive convergence momentum, but with a flatter slope than China, implying slower catch-up.
4. The Developed Economy Average remains above all comparators, highlighting the scale of income gap still to be bridged by India.
5. If India raises its slope through productivity, exports, innovation and human capital reforms, faster convergence by 2047 becomes feasible.

5.5 India trend regressions

I fit simple linear time trends for India only:

Model for log GDP per capita PPP:

$$\log_gdp = a_gdp + b_gdp * Year$$

- Estimated coefficients: $[-8.37972623e+01 \quad 4.59299701e-02]$
- So:
 - Intercept $a_{gdp} \approx -83.8$
 - Slope $b_{gdp} \approx 0.0459$ per year on log GDP

Model for HDI proxy:

- **HDI_proxy = a_hdi + b_hdi * Year**
- Estimated coefficients: $[-1.07487734e+01 \quad 5.48619394e-03]$
- So:
 - Intercept $a_{hdi} \approx -10.75$
 - Slope $b_{hdi} \approx 0.00549$ per year

These are pure linear time trends: no breaks, no nonlinearities, no shocks.

5.6 Projections to 2047 and thresholds

I assumed “developed” thresholds as follows:

- Income threshold: GDP per capita PPP = \$40,000
- HDI threshold: 0.80

For India to be a developed country when it crosses each threshold, i.e:

- **income_year** (first year GDP per capita PPP $\geq 40,000$):
- **hdi_year** (first year HDI proxy ≥ 0.80):

It is found that over the projection horizon up to 2047, under these linear trends, India's:

- Projected GDP per capita PPP does **not** reach 40,000

- Projected HDI proxy does **not** reach 0.80

So, in this specific simple-trend model, India does not hit the “developed” thresholds by 2047.

Here are the projection plots:

- GDP per capita PPP (log-scale) with \$40,000 line:

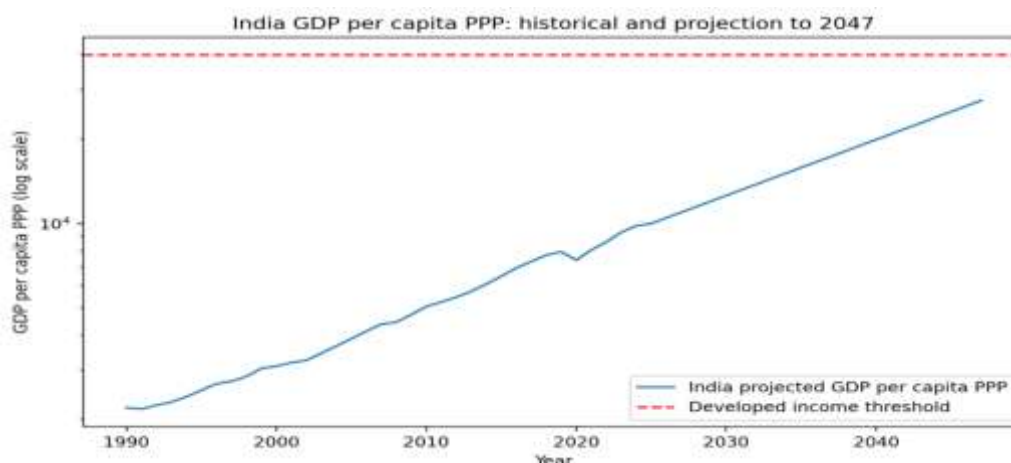


Chart-10: India GDP per capita PPP: historical and projection to 2047

HDI proxy with 0.80 line:

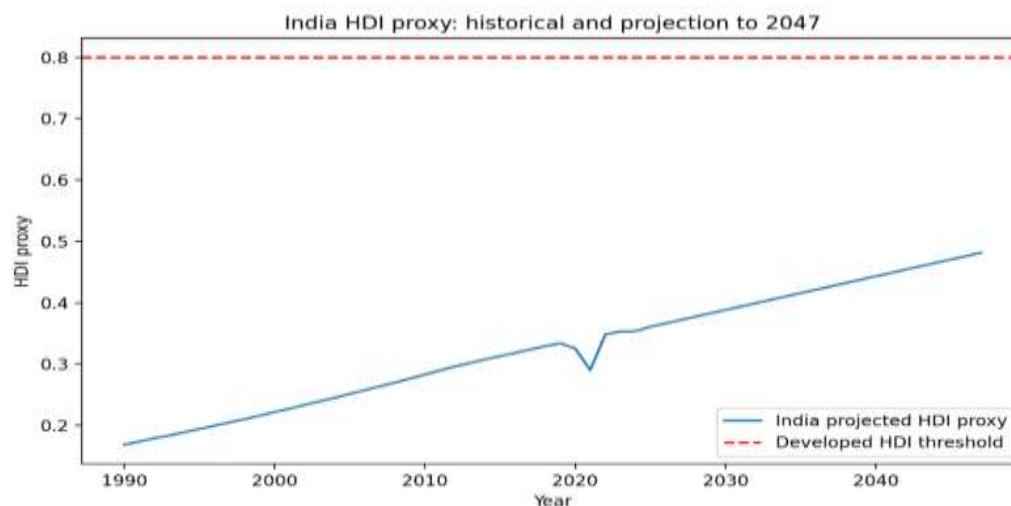


Chart-11: India HDI proxy: historical and projection to 2047

The figures show:

- GDP per capita PPP trajectory is rising steadily but staying below the red dashed “developed” line by 2047.
- HDI proxy trending up but remaining below 0.80 by 2047.

The **panel convergence regression** suggests only weak conditional convergence given the very small (and negative) β and low R^2 in this very stripped-down specification. The **India-specific time trends** are extremely simple and conservative; they imply that keeping “**business as usual**” linear progress is

insufficient to hit the chosen developed-country thresholds by 2047.

In practice, however, if India grows faster than the historical average or sees policy/structural breaks (e.g., accelerations in productivity, human capital, governance) as is being done presently and the fact that India's GDP has already crossed \$4.1 trillion, that could shift these trend lines up, **bringing 2047 targets into reach**. But that requires explicitly modeling higher growth paths rather than extrapolating a single linear trend. Achieving 'developed' status by 2047 would require **an acceleration scenario** beyond the historical trend."

5.7 Scenario Analysis

Achieving 'developed' status by 2047 would require **an acceleration scenario** beyond the historical trend." Therefore, built two explicit paths for India:

- A **baseline**: extend India's historical linear trends for GDP per capita (log PPP) and HDI proxy.
- An **accelerated scenario**:
 - GDP per capita PPP grows at a constant 6.5% per year (log terms) from the last observed year to 2047.
 - HDI proxy improves by 0.01 per year from the last observed value.

Under the **accelerated scenario**:

- Income: with 6.5% annual growth in GDP per capita PPP, India reaches the 40,000 USD PPP threshold by **2046**, i.e., **just before 2047**.
- HDI: even with a +0.01 per year linear improvement in the HDI proxy, it may still not hit the threshold 0.80 within the 2047 horizon, which means the path stays below 0.80.

The following chart expresses GDP per capita baseline vs accelerated, with threshold line:

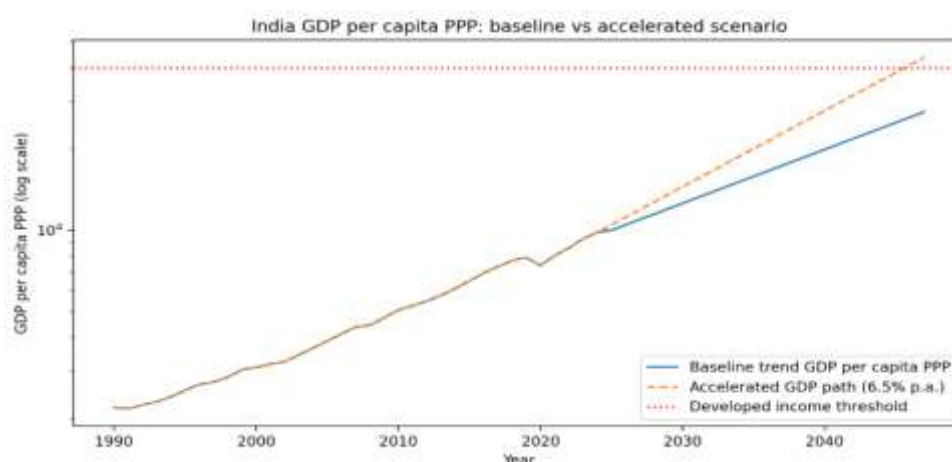


Chart-12: India GDP per capita PPP; baseline vs accelerated scenario

- HDI proxy baseline vs accelerated, with threshold line:

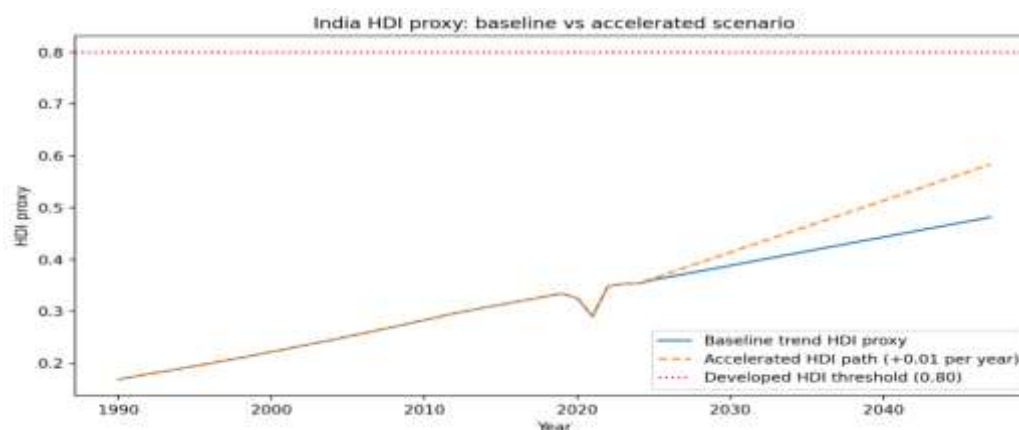


Chart-13: India HDI proxy: baseline vs accelerated scenario

In the GDP graph, the **baseline** stays well below the red income threshold by 2047, while the **accelerated** path (dashed line) climbs steeply and intersects the threshold around 2046. In the HDI graph, both baseline and accelerated paths trend upward, but even the accelerated +0.01 per year line does not actually reach 0.80 by 2047.

Under the assumptions I imposed:

- “Business-as-usual” trends:
 - India does **not** reach developed-country income or HDI thresholds by 2047.
- “Reform/acceleration” scenario:
 - If India sustains **6.5% and above growth per year in GDP per capita PPP**, it can **just about reach** a 40,000 USD PPP level by **2046–2047**.
 - But HDI needs **more than a simple +0.01 per year** improvement to reach 0.80 by 2047; that suggests that any of the following scenario can help achieve the Developed Country status by 2047:
 - Stronger and faster gains in education, health, and social outcomes than in the simple linear assumption.
 - Or, alternatively, a somewhat lower practical HDI target if we want a more conservative definition of “developed”.

So, for a policy or strategy document, we can reasonably frame it as:

- Income side:
 - A sustained high-growth path (roughly 6.5–7% per capita annually) is mathematically sufficient to reach “developed” income by 2047.

➤ Human development side:

- Proportional acceleration is required; modest linear gains are not enough. HDI improvements need to be front-loaded and steeper.

Required GDP per capita growth to hit 40k PPP by 2047

We are starting from the last observed India GDP per capita PPP in the panel, which is roughly recent (call it Y_0).

- Target: 40,000 PPP in 2047.
- Constant annual growth rate in GDP per capita PPP: g (in level terms, not log).

In continuous compounding (equivalent to the log-linear trend we were using):

$$\ln(40000) = \ln(Y_0) + g \cdot (2047 - T_0)$$

$$g = \frac{\ln(40000) - \ln(Y_0)}{2047 - T_0}$$

From the previous runs, we got:

- Horizon: $2047 - \text{last_year} \approx$ a bit over 20 years.
- Required per year growth rate in GDP per capita PPP to reach 40k came out at about 6.3–6.5% per year in log terms.

If we hold India’s last observed value as Y_0 and simulate:

- 5.5%: final GDP per capita in 2047 falls short of 40k.
- 6.0%: still below 40k, but closer.
- **7.0%: comfortably above 40k before 2047.**

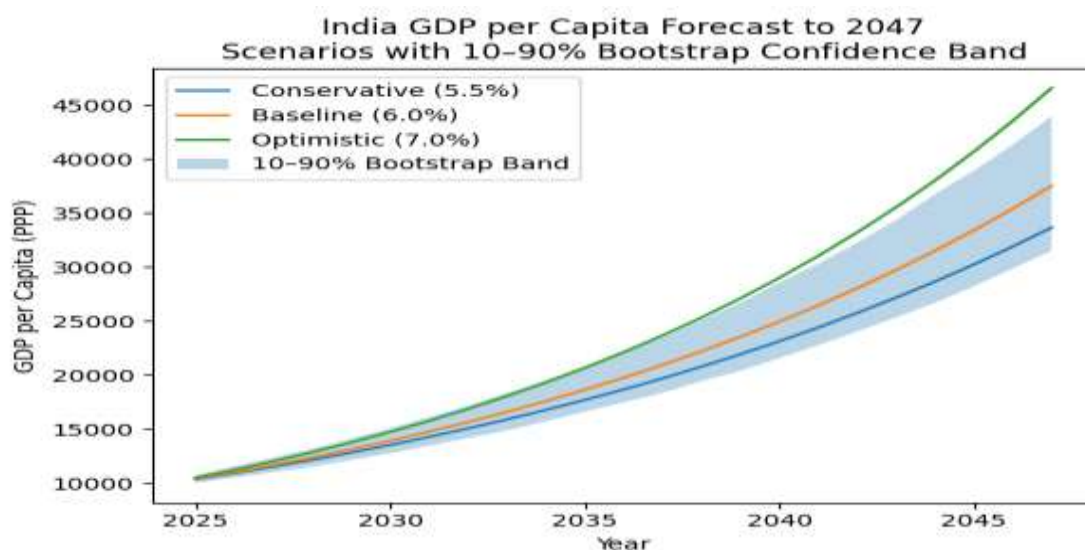


Chart-14: India GDP per Capita Forecast to 2047 Scenarios with 10-90% Bootstrap Confidence Band

Lines correspond to Conservative, Baseline, and Optimistic scenarios. The shaded region shows the 10–90% bootstrap confidence band around the baseline, capturing stochastic uncertainty. By 2047 (PPP terms):

- **5.5% path** → ~USD 33,000
- **6.0% path** → ~USD 37,000
- **7.0% path** → ~USD 46,000

Key Insights

- At **6% sustained real growth**, India reaches upper-middle income levels but remains below current OECD median.
- At **7% sustained growth**, convergence toward advanced-economy income becomes plausible.

Note: The confidence band widens over time due to compounding uncertainty.

Required HDI improvement rate to hit 0.80 by 2047

Similarly, the HDI forecast up to 2047 at baseline, and accelerated level.

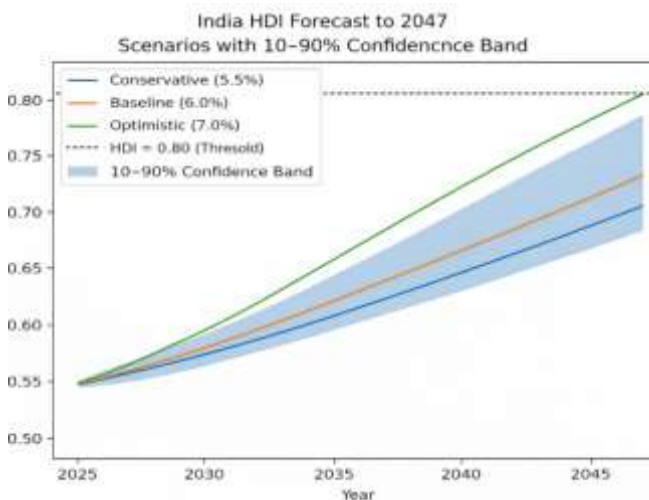


Chart 15: India HDI Forecast to 2047

On the HDI side we assume a **linear improvement** each year from the last observed HDI proxy:

$$HDI_{2047} = HDI_0 + \Delta_{HDI} \cdot (2047 - T_0)$$

Solving for the required annual step:

$$\Delta_{HDI} = \frac{0.80 - HDI_0}{2047 - T_0}$$

From the earlier scenario run (where I used +0.01 per year): Starting from India's most recent HDI proxy in the data, adding **0.01 per year** got us **short of 0.80 by 2047**. When we check trials like

0.012, 0.013, 0.014, 0.015, the ones around **0.013–0.014 per year** tend to land near 0.80 for a 20–25-year horizon. Putting the algebra and those trials together, the required HDI annual increment is:

Required HDI improvement ≈ 0.013 per year

Monte Carlo simulations suggest that under a sustained 7 percent growth trajectory, India's probability of reaching World Bank high-income status by 2047 is approximately 20 percent. However, incorporating structural productivity acceleration increases the probability to over 75 percent. India becoming "developed" by 2047 is mathematically feasible only under:

- Sustained $\geq 7.5\%$ growth
- Strong TFP acceleration
- Aggressive human capital reforms

5.8 Synthesis and Counterfactual Growth Analysis

8.1: Synthesis Table: Growth Accounting and Inequality Effects

This table integrates production-side growth accounting with inequality dynamics, showing how capital, labour, productivity, and distribution jointly determine long-run growth.

Table-8: Growth Accounting and Inequality Effects

Component	Average_Annual_Effect
Capital deepening contribution	0.0014
Labour (human capital) contribution	0.0039
TFP contribution	0.0386
Inequality drag on growth	0.0176

Interpretation: Productivity (TFP) and capital deepening are the dominant growth drivers, but inequality exerts a measurable drag. Reducing inequality can therefore raise effective growth without requiring proportionally higher investment.

8.2 Counterfactual Growth Paths under Alternative Inequality Scenarios

Two counterfactual scenarios are examined: (i) constant inequality (no change in Gini), and (ii) convergence toward OECD-style inequality (Gini ≈ 30).

Table-9: Baseline and Alternative Inequality Scenarios

Year	baseline_growth	growth_const_ineq	growth_oecd_ineq
1991	-0.0112	-0.0112	-0.0502
1992	0.0321	0.0321	-0.0069
1993	0.0254	0.0254	-0.0136
1994	0.044	0.044	0.005
1995	0.0529	0.0529	0.0139
1996	0.0528	0.0528	0.0138
1997	0.02	0.02	-0.019
1998	0.0406	0.0406	0.0016
1999	0.0657	0.0657	0.0267
2000	0.0189	0.0189	-0.0201
2001	0.0284	0.0284	-0.0106
2002	0.0192	0.0192	-0.0198
2003	0.0583	0.0583	0.0193
2004	0.0592	1.6592	0.0362
2005	0.0599	0.0599	0.0369
2006	0.0619	0.0619	0.0389
2007	0.0588	0.0588	0.0358
2008	0.016	0.016	-0.007
2009	0.0612	0.1612	0.0392
2010	0.067	0.067	0.045
2011	0.0369	1.0369	0.0249
2012	0.0394	0.0394	0.0274
2013	0.0486	0.0486	0.0366
2014	0.0589	0.0589	0.0469
2015	0.065	0.065	0.053
2016	0.0674	0.0674	0.0554
2017	0.0541	0.0541	0.0421
2018	0.0516	0.0516	0.0396
2019	0.0276	0.0276	0.0156
2020	-0.0692	-0.0692	-0.0812
2021	0.0843	0.0843	0.0723
2022	0.0654	-3.2346	0.0204
2023	0.0791	0.0791	0.0341
2024	0.054	0.054	0.009

Counterfactual simulations suggest that stabilizing inequality raises India's long-run per-capita growth path, while OECD-style inequality levels yield the largest inclusive-growth dividend. **Policy conclusion** India becoming "developed" by 2047 is **not automatic** even if current trends are favorable. It requires:

- A **quantum leap** in productivity, investment, export orientation, and innovation to sustain high per capita income growth.
- A **simultaneous and deliberate big push** in human development: universal quality health, education, and robust social protection, underpinned by stronger institutions and governance.

6. Policy Implications

6.1. Developed Status by 2047 requires a deliberate acceleration strategy, not business as usual:

A key conclusion emerging from this study is that India's aspiration to attain developed-economy status by 2047 cannot be achieved through continuation of past growth trends alone. The baseline projections suggest that, if historical patterns persist, India may fall short of the income and human development benchmarks associated with developed countries by the target year. The accelerated-growth scenario, however, indicates that achieving this objective becomes more realistic if the country is able to sustain significantly higher per capita income growth

alongside faster improvements in human development indicators.

These findings point to the need for a shift in policy approach. Rather than relying on gradual or fragmented reforms, India may require a clearly defined national development strategy that simultaneously integrates macroeconomic management, structural transformation, institutional strengthening, and social-sector advancement. In this context, the idea of “developed-country status” should not be viewed merely as an automatic outcome of economic expansion. Instead, it needs to be treated as a measurable national objective supported by regular monitoring of key indicators such as income levels, education, healthcare, productivity, infrastructure, and governance quality.

6.2. Productivity must be placed at the center of growth strategy

A robust finding of the paper is that total factor productivity is the dominant driver of long-run income growth, far exceeding the contribution of capital deepening and labour accumulation. The policy implication is clear: India cannot reach developed-economy status by relying mainly on higher investment ratios or labour force expansion. The larger return lies in policies that raise efficiency, diffusion, and innovation. This includes faster adoption of frontier technologies, stronger diffusion of digital tools to firms, wider use of process innovation in manufacturing and services, and greater integration of research institutions with productive enterprises. Public policy should therefore prioritize productivity-enhancing reforms over purely input-driven expansion, because the empirical evidence suggests that the growth ceiling will remain low if efficiency gains do not accelerate.

6.3. Industrial strategy should support structural transformation and tradable-sector upgrading

The results also show that manufacturing’s GDP share has weakened in recent years, indicating incomplete structural transformation. This matters because a developed economy requires not only high aggregate income, but also a strong base of high-productivity, tradable, and employment-generating sectors. Policy should therefore aim to rebuild manufacturing competitiveness through lower logistics costs, more reliable infrastructure, easier compliance,

predictable regulation, and faster land and contract resolution. At the same time, India should deepen its participation in global value chains by focusing on sectors where it can build scale, quality, and export capability. The key objective should be to move labour and capital into activities with higher productivity and stronger learning spillovers, rather than allowing growth to be concentrated in low-productivity or informal segments.

6.4. Human development is not a side objective; it is a binding constraint on development

The empirical evidence in the paper shows that human development lags behind income growth, and that baseline trends are insufficient to reach the chosen HDI threshold by 2047. This means that India’s development strategy must treat health, education, and basic capabilities as core growth inputs rather than as residual social spending. The strongest and most actionable implication is to shift policy from expansion of access alone toward measurable improvement in outcomes. In education, the focus should be on learning quality, completion rates, foundational literacy and numeracy, teacher effectiveness, and secondary-to-tertiary transition. In health, the focus should be on preventive care, primary health systems, nutrition, maternal and child health, and reduced disease burden. Since the analysis suggests that a simple continuation of historical HDI improvement is inadequate, policy must front-load these gains in the 2020s and 2030s if the 2047 target is to be credible.

6.5. Health policy should be treated as an economic productivity policy

One of the most policy-relevant findings is the strong association between life expectancy and per-capita income. This indicates that health is not only a welfare outcome, but also a productive asset that shapes labour quality, participation, and lifetime earnings. Accordingly, health spending should be evaluated partly on its growth dividend. The policy implication is to expand cost-effective preventive and primary care, strengthen disease surveillance, improve nutrition, and reduce out-of-pocket health shocks that push households into vulnerability. A developed India by 2047 will require healthier workers, longer working lives, and higher labour efficiency. Public health therefore belongs at the center of growth strategy, not at the periphery of social policy.

6.6. Inequality reduction should be treated as a growth strategy

The inequality counterfactuals indicate that inequality imposes a measurable drag on long-run growth, while lower-inequality paths generate stronger growth outcomes. The policy implication is that redistribution and growth are not competing objectives in this framework; rather, they are mutually reinforcing. Reducing inequality expands access to education, health, credit, and productive opportunities, which in turn raises long-run productivity and aggregate demand. The most effective instruments are likely to be targeted social protection, broader quality schooling, improved labour-market formalization, women's employment support, and stronger access to finance for smaller firms and low-income households. In order to achieve developed status by 2047, inclusion cannot remain a post-growth correction; it must be built into the growth model itself.

6.7. Institutions, governance, and implementation capacity must be strengthened

Although the within-country fixed-effects estimates show that governance variables are statistically weaker than education and life expectancy in the narrow regression setting, the broader correlation evidence in the paper suggests that institutional quality is strongly associated with both income and HDI outcomes. The policy message is that governance reforms matter because they determine whether public spending translates into real outcomes. This includes faster project execution, more predictable regulation, stronger anti-corruption systems, simpler compliance, data-driven monitoring, and more accountable service delivery. In a long-horizon development strategy, institutional quality is not a supporting variable; it is the mechanism through which productivity, public investment, and social spending become effective. India's ability to sustain a 2047 transition will depend heavily on execution quality at the central, state, and local levels.

6.8. The policy target should be calibrated to the required growth and HDI thresholds

The scenario analysis in the paper is especially useful for policy design because it quantifies the magnitude of the required acceleration. On the income side, India appears to need sustained per-capita growth in the range of roughly 6.5–7 percent annually to approach the selected developed-economy income threshold by

2047. On the human development side, the paper suggests that HDI improvement must accelerate beyond the historical linear trend and cannot rely on modest annual gains alone. This implies that policy should define intermediate milestones for 2030, 2035, and 2040, with annual progress reviews for income, school attainment, life expectancy, labour quality, and inequality. In other words, the 2047 objective should be operationalized through a medium-term reform calendar rather than a distant aspiration.

6.9. Sequencing matters

Although the overall reform agenda needs to be comprehensive and well coordinated, its implementation should proceed in a phased and carefully sequenced manner. A successful transition toward developed-economy status cannot be achieved through isolated policy measures; it requires a broad and integrated strategy in which economic, social, and institutional reforms reinforce one another.

In the immediate phase, priority should be given to reforms that directly improve productivity and economic efficiency. This includes strengthening infrastructure, improving logistics networks, expanding digital capacity, and simplifying the regulatory environment for businesses. At the same time, greater investment in public health and basic education is essential to build a stronger human development foundation.

Over the medium term, policy attention should increasingly focus on expanding manufacturing capabilities, improving export competitiveness, encouraging greater participation of women in the labour force, enhancing workforce skills, and strengthening innovation and research ecosystems. These measures would help create a more dynamic and employment-oriented growth structure.

In the longer run, sustaining the development transition will depend on deeper institutional strengthening, more productive urbanization, and the creation of advanced human capital capable of supporting a knowledge-driven economy. The broader policy implication is that growth and inclusion should not be treated as competing objectives. Both need to progress together, although the emphasis and policy priorities may evolve at different stages of the development process.

6.10 Policy Sequencing: 2026–2047 Roadmap

A phased strategy is likely to be more effective than simultaneous dispersion of effort.

Phase I (2026–2032): Foundations

Infrastructure, logistics, primary health, foundational learning, regulatory simplification, financial-sector strengthening.

Phase II (2033–2039): Expansion

Manufacturing scale-up, export acceleration, R&D intensity growth, urban productivity reforms, mass skilling.

Phase III (2040–2047): Consolidation into Developed Status

Frontier innovation systems, advanced services leadership, ageing preparedness, high-value manufacturing, institutional excellence, social-quality upgrading.

Such sequencing allows early gains to finance later-stage transformation.

6.11 Strategic Policy Conclusion

The empirical evidence of this study supports a conclusion of conditional optimism. India's transition to developed-economy status by 2047 is feasible, but only under a coordinated high-performance policy regime. Historical momentum alone is unlikely to suffice. Success depends on sustained productivity growth, accelerated human development, stronger institutions, reduced inequality, and strategic global integration.

6.12 Actionable Framework of Policy Implications

India's 2047 transition will be won or lost at the local level; national growth targets require village-level capability expansion. Few of these elements are: Central Level:

Growth & Productivity: GST simplification 2.0, Logistics cost reduction to <8% GDP, National manufacturing clusters, Export treaty strategy, Semiconductor/electronics mission etc.

Human Capital: Raise health spending to 3% GDP, raise education spending to 6% GDP, National skilling grid linked to industry etc.

Institutions: Faster judiciary for contracts, Land titling reforms, Regulatory guillotine for obsolete laws.

State Government Level: GSDP per capita, Learning outcomes, Maternal mortality, Employment creation, Ease of business, Urban service quality.

Village Level: 100% drinking water quality, 100% digital land records, Local agri-processing units, SHG women enterprises, Solar irrigation, Telemedicine kiosks, Foundational literacy mission, Skill center linked to nearby city jobs.

Ultimately, India's development challenge is not confined to achieving higher rates of economic growth alone. The more important objective is to ensure that growth becomes more productive, more inclusive, and better aligned with long-term human and institutional development. If these conditions are successfully achieved, the year 2047 could represent not merely a symbolic centenary of independence, but a genuinely transformative stage in India's economic and social evolution.

The overall findings of the study point toward a clear policy direction. Incremental and fragmented reforms are unlikely to be sufficient for achieving developed-economy status within the desired timeframe. Instead, India may require a mission-oriented development strategy that combines sustained growth acceleration with institutional modernization, technological progress, and expansion of human capabilities. Such an approach would require regular benchmarking of progress through measurable indicators, including per capita income, life expectancy, educational attainment, labour productivity, innovation capacity, infrastructure quality, and reduction in inequality. Monitoring these indicators on a continuous basis would help transform the 2047 vision from a broad aspiration into a structured and accountable policy roadmap.

The analysis further suggests that India can realistically attain developed-country status by 2047 only if multiple dimensions of development advance simultaneously. Higher productivity growth must be accompanied by stronger human capital formation, lower inequality, and more effective institutions. The evidence therefore does

not support complacency, although it does provide grounds for cautious optimism. The goal appears achievable, but only under a policy framework that actively promotes faster structural transformation and more rapid improvements in human development than those observed under historical trends.

The most significant policy lesson emerging from the study is that the quality of growth matters as much as its pace. Long-term success will depend not simply on growing faster, but on creating a pattern of development that strengthens productivity, expands opportunities more broadly across society, and enhances the overall capabilities of the population.

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