# Determinants of India's Economic Growth

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This paper analyzes the determinants of India's economic growth since independence through a time-series study. The study explores how key variables–such as trade, population, index of democratization, and age dependency ratio–have contributed to India's emergence as a global economic power. Drawing on decades of data, it traces the transformation of India's growth trajectory through liberalization and globalization. By analyzing the drivers of India's economic growth, this study provides insights into India's evolving economic model and its implications for the future dynamics of the global economy.

## I.    Introduction

India's transformation into one of the world's fastest-growing economies has drawn global attention as a model of large-scale, multidimensional development. Since gaining independence in 1947, India has grown from a heavily regulated, internally focused economy to a dynamic, globally integrated one. Today, the country ranks among the largest economies in the world and plays an increasingly central role in trade, technology, and geopolitical affairs. Understanding the drivers of this growth is essential not just for interpreting its economic past but also for forecasting its trajectory in the global economy.

## II.    Literature Review

India's economic expansion has been driven by a combination of economic and demographic forces. The story of the Tata Group, one of India's most influential conglomerates, encapsulates this transformation. As Raianu (2021) describes in *Tata: The Global Corporation That Built Indian Capitalism*, the company's evolution from a colonial-era industrial enterprise to a global corporate powerhouse mirrors the broader trajectory of India's economic modernization. Tata's expansion into technology, steel, and international consultancy reflects the same liberalization, globalization, and institutional adaptation that have shaped the nation's rise. This corporate perspective illustrates how the micro-level forces analyzed in this study manifest at the firm level, and it grounds the study in a tangible narrative.

A crucial aspect of India's growth has been its growing involvement in global markets through trade. During the 1980s, India financed its rising fiscal deficits through external borrowing, while maintaining a highly protectionist economic structure. By the end of the decade, public debt rose to around 60% of GDP, inflation accelerated, and exports decreased.

Investor confidence in the domestic market suffered in response to political instability, characterized by frequent changes in government, weak coalition administrations, and an absence of credible policy commitment to fiscal consolidation or trade reform. As a result of this instability, the nation faced a genuine risk of sovereign default, culminating in the 1991 Balance of Payment crisis. Indian policymakers responded to this crisis with economic liberalization that reduced tariffs, deregulated industries, and encouraged foreign investment. In their article *Trade Openness and Economic Growth: Empirical Evidence from India*, Hye and Lau (2015) use time-series analysis to demonstrate that trade liberalization has had a statistically significant and positive effect on GDP growth in both the short and long run. The reason for this effect is that trade openness increases accessibility to global technology and expands opportunities for export growth.

Another important dimension of India's transformation lies in its demographic structure. With a median age of 28, India has a much more youthful population than countries like China with a median age of 39 or the United States with a median age of 38 (Pew Research). This structure presents a significant economic advantage as it expands the working-age population and increases the labor force participation which improve the long-run growth potential for India. Aiyar and Mody (2011) provide strong evidence of this in their IMF paper *The Demographic Dividend: Evidence from the Indian States*, where they find that variations in the working-age population ratio significantly explain differences in per-capita income growth across Indian states.

While trade and demographics highlight structural dimensions of growth, India's political framework has also played a defining role. Patnaik (2013), in *Democracy and Economic Growth*

*in India*, argues that democratic governance has fostered stability and investor confidence, which are both conditions that are essential for sustained long-term growth.

### III.    Methodology

This study employs a time-series approach to analyze the determinants of India's economic growth since independence. The dependent variable is real GDP growth rate (*wdi_gdpgr*), representing the annual percentage change in India's gross domestic product. GDP growth captures the overall performance of the economy and thus fits well in this model.

The independent variables were selected based on the referenced literature that demonstrated their significance in this model. These include trade openness, population, age dependency ratio, and index of democratization. Each represents a major dimension of India's development and aligns with prior studies such as Hye and Lau, Aiyar and Mody, Patnaik, and Raianu.

Trade openness (*wdi_trade)* is measured as the sum of imports and exports as a percentage of GDP. According to the referenced sources, greater trade openness is expected to have a positive effect on GDP growth by promoting greater specialization, technology transfer, and market efficiency (Hye and Lau 2015).

Population (*wdi_pop)* measures the total national population and captures the scale of the domestic market and labor force, and either one of those can stimulate production. While India's youthful population has been cited as a key contributor to its economic growth, the impact of the population on the economy can vary depending on the dependency burden and employment capacity of the economy. Importantly, the population variable has been converted into its **natural logarithm** to model proportional changes rather than absolute levels. This conversion stabilizes variance and allows for the changes in population to be interpreted proportionally.

The age-dependency ratio (*d_agedr*) is the ratio of dependents (age 0-14 and 65+) to the working age population (ages 15-64), so it measures the demographic pressure on the labor force. A lower dependency ratio is indicative of more workers contributing to the country's output, and this is associated with faster economic growth (Aiyar and Mody 2011). Conversely, shifts in age structure produce a greater economic burden when the population ages because having more dependents puts greater pressure on the working age population to produce the necessary output with fewer workers. Therefore, including the age-dependency ratio is important to the integrity of this model to make sure the benefits and restraints are taken into consideration. The expected sign on the coefficient for this variable is negative which would indicate that economic expansion slows as the ratio increases.

The index of democratization (*van_index*) serves as a proxy for institutional quality and stability, and it is an indicator of political rights, electoral competition, and governing characteristics. Greater democratization can have a positive effect on GDP when it is associated with deregulation of industries and greater openness to foreign trade. However, an excessive increase of democratization can have a negative effect as it can widen the gap between socioeconomic classes. As this model primarily observes the period in which India went from a protectionist economic structure to an economy more open to trade, the expected coefficient is positive to indicate greater economic expansion as the result of greater democratization.

## A. Stationarity

The first step of this study was to observe whether each variable moved in a stable, predictable way over time so that false conclusions could be avoided. This property of *stationarity* was tested using the **Dickey-Fuller (DF) test**, which measures whether variables

have a constant pattern over time or drift unpredictably, and it was estimated with the following regression:

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{i=1}^{p} \delta i \, \Delta y_{t-i} + \varepsilon_t$$

where $\Delta$ denotes the first-difference operator, $\gamma$ tests for the presence of a unit root, and $\varepsilon_t$ is a white-noise error term. The null hypothesis $H_0: \gamma = 0$ indicates non-stationarity, while rejection implies stationarity. The result of this DF test on real GDP growth was a p-value of 0.00, indicating that it is stationary. However, the DF tests on the independent variables indicate that all are non-stationary: age dependency ratio (p-value = 0.7755), trade openness (p-value = 0.8874), log population (p-value = 0.3336), and index of democratization (p-value = 0.1422). To avoid spurious results, these non-stationary variables were transformed into **first differences**, which converted them from drifting variables into variables that reflect annual changes and are more reliable for time-series modeling. This transformation removes long-term trends that could incorrectly make two unrelated variables appear correlated. The resulting variables from this process were *d_trade*, *d_agedr*, *d_ln_pop*, and *d_van_index*. These transformations ensure that the variables are all stationary, which is a necessary condition for unbiased time-series estimates.

## B. Cointegration

After addressing stationarity, the next step was to determine whether GDP and trade openness share a long-run equilibrium relationship, a property known as *cointegration*. This was assessed through the **Engle–Granger cointegration test** which estimated the long-run relationship between these two variables and then tested whether the residuals are stationary using the following equation:

$$y_t = \alpha + \beta x_t + u_t$$

where $y_t$ is GDP growth, $\alpha$ is the intercept, $\beta$ is the long-run coefficient, $x_t$ is trade openness, and $u_t$ is the deviation from the long-run equilibrium at time $t$. This equation represents the hypothesized long-run equilibrium relationship between GDP growth and trade openness, where deviations from equilibrium are captured by the residual term $u_t$. Cointegration is then assessed by testing whether the residuals from this equation are stationary using the following equation:

$$\Delta \hat{u}_t = \rho \hat{u}_{t-1} + \varepsilon_t$$

where $\hat{u}_t$ represents the estimated residuals from the long-run cointegration regression, $\Delta$ is the first-difference operator, $\rho$ is the coefficient measuring the speed of adjustment toward the long-run equilibrium, and $\varepsilon_t$ is a white-noise error term. This test produced a test statistic of -1.767 and a p-value of 0.7206, which are well above the critical values required for stationarity. If the residuals were stationary, this would indicate that GDP and trade move together over the long-term, and this would require another model to be used. However, the results prove that the residuals are non-stationary, so GDP growth and trade are not cointegrated. This result is significant because it proves that there is no equilibrium relationship that is pulling the two variables towards each other over time.

### C. Structural Breaks

To identify whether India's economic growth experienced a sudden, significant shift during the observed period, a **structural break test** was conducted. Instead of assuming a predetermined break date, such as 1991 (India's widely recognized liberalization), the *estat sbsingle* method was used to search for an unknown structural break within the data. The test revealed a break in 1980, which indicates that the underlying growth relationship changed during this period. This finding aligns with Raianu's (2021) account of India's economic evolution, which highlights how corporate behavior and institutional attitudes toward market-oriented

activity were already shifting in the 1980s. This helps to explain why the break was identified as happening before the more formal liberalization that took place in 1991 and the following years.

### D. Granger Causality

Next, **Granger causality tests** were conducted to observe whether changes in trade, demographics, or democratization help predict changes in GDP growth. The **vector autoregressions (VAR)** framework allows each variable to depend on its own past values and the past values of the other variable in order to capture dynamic relationships.

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i\, y_{t-i} + \sum_{i=1}^{p} \beta_i\, x_{t-i} + \varepsilon_t$$

$$x_t = \gamma_0 + \sum_{i=1}^{p} \gamma_i\, x_{t-i} + \sum_{i=1}^{p} \delta_i\, y_{t-i} + \nu_t$$

where $y_t$ denotes GDP growth, $x_t$ represents the explanatory variable of interest (trade openness, age dependency ratio, or index of democratization), p is the selected lag length, and $\varepsilon_t$ and $\nu_t$ are white-noise error terms. Granger causality is assessed by testing the joint significance of the lagged coefficients $\beta_i$ and $\delta_i$. The results reveal that trade openness Granger-causes GDP growth, as indicated by a statistically significant chi-square test with a p-value less than .01, but GDP does not Granger-cause trade openness. This result suggests that changes in trade flows help predict future economic performance, but changes in GDP growth do not influence India's trade openness in this particular setting. Age dependency ratio was shown to Granger-cause GDP growth with a p-value less than .001, but GDP growth does not Granger-cause the ratio. This result indicates that demographic shifts contain predictive information about future changes in economic growth, but that fluctuations in the GDP cannot be used to predict the future population. Finally, the index of democratization was shown to Granger-cause GDP growth with a p-value less than .01, while GDP does not Granger-cause democratization. This relationship

suggests that institutional and political developments help predict future changes in economic performance, but these developments evolve independently of short-term economic fluctuations. These unilateral relationships demonstrate that each of these variables help predict GDP growth in India, but GDP growth does not predict movements in any of these variables.

### E. Regression

After establishing stationarity, verifying absence of cointegration, identifying structural breaks, and determining Granger-causal direction, the final step was to estimate the short-run growth model. The short-run **regression** was estimated using robust standard errors to account for potential non-constant variance in the error term.

$$wdi\_gdpgr \ = \ \alpha + \ \beta 1\, d\_trade \ + \ \beta 2\, d\_agedr \ + \ \beta 3\, d\_ln\_pop \ + \ \beta 4\, d\_van\_index \ + \ \varepsilon$$

where *wdi_gdpr* is the annual percentage change in India's gross domestic product, $\alpha$ is the constant or intercept term, *d_trade* is trade openness, *d_agedr* is the age dependency ratio, *d_ln_pop* is the total national population, *d_van_index* is the index of democratization, and $\varepsilon$ is the error term. This model uses GDP growth as the dependent variable and the differenced explanatory variables as predictors. This final model provides the empirical basis for evaluating the short-run effects of trade openness, demographic change, population growth, and democratization on India's economic growth.

TABLE 1

Regression for Determinants of GDP Growth

| VARIABLES | (1) Trade | (2) Trade Demographics | (3) Trade Demographics Population | (4) Trade Demographics Population Democratization |
|---|---|---|---|---|
| Trade Openness | 0.026 | -0.026 | -0.014 | -0.174*** |
| | (0.142) | (0.135) | (0.122) | (0.093) |
| Age Dependency Ratio | | -1.815*** | -1.204 | -0.762 |
| | | (0.829) | (0.936) | (0.903) |
| Population | | | -106.801 | -234.090*** |
| | | | (124.700) | (93.121) |
| Index of Democratization | | | | 0.157 |
| | | | | (0.168) |
| Constant | 5.172*** | 4.308*** | 6.576*** | 9.463*** |
| | (0.421) | (0.617) | (2.740) | (1.959) |
| | | | | |
| Observations | 63 | 63 | 63 | 58 |
| R-squared | 0.001 | 0.062 | 0.079 | 0.191 |
| SEs | Robust | Robust | Robust | Robust |

Robust standard errors in parentheses
* $p<0.01$, ** $p<0.05$, *** $p<0.10$

The results from this model, as shown in Table A1, indicate that population growth is the most influential driver of India's economic performance, as the coefficient on the first difference of log population is the only statistically significant variable at the 5% level. With a negative coefficient (-2.34), the model shows that increases in population growth place downward pressure on India's GDP growth, likely because rapid population expansion strains India's resources and dilutes capital. Trade openness exhibits a marginally significant effect on GDP growth at the 10% level. With a negative coefficient (-0.1742), this model suggests that increases in trade flows decrease India's GDP growth. While trade liberalization is associated with long-run GDP growth in the cited sources, this negative effect could be the result of abrupt increases

in trade flows creating short-run adjustment costs. While neither is significant at the 5% or 10% levels, the coefficients on the age dependency ratio and the index of democratization have the expected signs–negative for dependency and positive for democratization. This result reflects the slow-moving nature of demographic and institutional changes, while also confirming the conclusions of Aiyar and Mody (2011) as well as Patnaik (2013) that long-term shifts in population structure and democratic governance positively influence economic performance.

The empirical findings from this study offer a nuanced understanding of the forces shaping India's economic growth. One of the most striking results is the dominant role of population growth in the short-run model. The negative and statistically significant coefficient suggests that rapid increases in population growth depress GDP growth in the short term. This finding is intuitive when viewed through the lens of India's evolving economic structure: sharp increases in population place immediate pressure on housing, public services, job creation, and infrastructure. When this population growth outpaces the economy's ability to find new workers, per capita output falls, and households may experience decreasing living standards. While India's demographic dividend is cited as a long-run asset by Aiyar and Mody (2011), the results of this model highlight the short-run challenges that must be managed.

Trade openness also presents a complex picture. While Hye and Lau (2015) conclude that trade liberalization has a positive effect on GDP growth in the long-run, this short-run regression model indicates that sudden increases in trade openness can reduce GDP growth. This is possibly the result of trade expansion prematurely exposing domestic companies to foreign competitors, especially companies that were previously a part of protected sectors. Additionally, adjustment costs like restructuring and exchange rate fluctuations can occur before the benefits of increased

trade materialize. Therefore, the negative coefficient suggests that trade liberalization produces transitional friction, but it enables long-run GDP growth.

From a policy perspective, these findings emphasize the importance of pairing demographic opportunities with deliberate economic planning. A large and growing population can be an engine of growth only if new workers can be added to productive employment. Additionally, they need to be supported by adequate infrastructure. Policies that expand access to education, improve health outcomes, and encourage labor-intensive jobs can help transform population growth into higher output. Otherwise, this population growth can decrease living standards and output. Similarly, the short-run costs associated with trade openness suggest that liberalization policies should be accompanied by measures that ease adjustment. Such policies may include retraining programs or support for firms transitioning into more competitive environments. Without these complementary policies, demographic pressures and trade shocks may amplify short-run volatility even if they are beneficial in the long-run.

The lack of statistical significance for the age-dependency ratio and the index of democratization reflects the gradual nature of these changes. Demographic and institutional structures both develop slowly, over decades rather than single years, and are therefore unlikely to display meaningful effects year-to-year. However, the Granger causality results showing that both variables predict future GDP growth add to this interpretation that these variables shape the broader economic environment over the long-run, even if they do not directly influence short-run GDP fluctuations.

The structural break identified in 1980 provides further context for the findings by showing that India's economic growth has not been constant over time. This break corresponds with shifts in political and institutional attitudes that preceded the formal liberalization of 1991.

This turning point suggests that the drivers of growth evolved during this period, and that India's economy may have entered a new growth regime characterized by different relationships between trade, demographics, institutions, and output. Recognizing this structural shift is important for understanding why short-run effects may differ across time and why certain variables require longer horizons to have significant influence.

## IV.     Conclusion

This study set out to examine the key drivers of India's economic growth since its independence. Using a time-series analysis, the study incorporates tests for stationarity, cointegration, structural breaks, and Granger causality before estimating a short-run regression model. The results reveal that population growth is the most significant short-run determinant of GDP growth, exerting a negative effect that reflects the challenges of managing rapid demographic expansion. Trade openness exhibits transitional adjustment costs in the short run, although evidence from Hye and Lau (2015) supports its positive long-term effects on GDP growth. Institutional quality and demographic structure, while not statistically significant in the short-run, demonstrate predictive power through the Granger causality analysis.

These findings suggest that India's economic growth cannot be explained by short-run dynamics alone. Instead, the forces shaping growth operate on multiple time horizons. Long-run determinants such as demographic transition, institutional strengthening, and market liberalization play a crucial role in shaping the economic environment, while short-run fluctuations are driven by more immediate pressures such as population growth and trade openness.

While the model used in this study captures important short-run relationships, it does display several limitations. The analysis does not incorporate sector-specific data, labor market

variables, or human capital measures that may further clarify growth patterns. Moreover, the focus on first differences, necessitated by stationarity requirements, limits the ability to estimate long-run elasticities. Future research could expand on this work by using structural models, multivariate cointegration approaches, or state-dependent frameworks that capture how India's growth drivers evolve across different economic regimes.

Despite these limitations, the study contributes to a deeper understanding of the complex interplay between demography, trade, institutions, and economic growth in one of the world's most consequential economies. The results underscore the importance of aligning short-run policy responses with long-run structural reforms to ensure that India can continue its current economic trajectory.

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