

Navigating India's Tech-Driven Economic Evolution

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India is experiencing a profound transformation in its economic structure, spurred by the integration of advanced engineering technologies. From artificial intelligence and automation to innovations in smart manufacturing and digital infrastructure, these developments are quietly but steadily redefining how industries operate and grow. As the country pursues its ambition to become a global economic powerhouse, these technologies are becoming central not only to industrial performance but also to broader economic planning and policy.

Recent trends suggest that technological innovation is contributing meaningfully to national economic output. As various sectors adopt more efficient and sophisticated production techniques, there has been a noticeable improvement in productivity and value addition. Industries such as electronics, precision manufacturing, and renewable energy are gaining momentum, playing a growing role in shaping economic indicators and sectoral performance. These shifts are becoming increasingly visible in trade patterns and national accounts.

At the same time, these advancements are reshaping the nature of employment. While new industries and services are emerging—bringing with them a demand for skilled labor—there is also a clear impact on traditional job roles, particularly those reliant on routine tasks. This dual effect highlights the importance of a responsive workforce strategy, one that supports both innovation and inclusion, ensuring that technological progress benefits a broad spectrum of society.

India's integration into global value chains has also evolved alongside these changes. Enhanced industrial capabilities have allowed Indian firms to compete more effectively in international markets, reflected in export growth across several high-value sectors. As the country strengthens its position as a manufacturing and innovation hub, this shift has implications for trade balances, investment flows, and long-term economic competitiveness.

These dynamics also carry important fiscal implications. As industries grow and incomes rise, the state benefits through increased revenue collections, which can be reinvested into development priorities such as infrastructure, education, and technology. The relationship between innovation, public investment, and revenue generation creates a feedback loop that can significantly influence national growth trajectories if managed strategically.

This research paper aims to examine these key dimensions in greater detail, focusing on the economic implications of new engineering technologies in the Indian context. Specifically, it explores four interrelated areas:

- Contribution to GDP growth.
- Job creation vs Job displacement.
- Impact on trade balances and industrial competitiveness.

- Influence on government tax revenues and investment cycles.

By analyzing these elements together, this study seeks to provide a nuanced understanding of how technology is shaping India's economic landscape and what it means for the future of inclusive and sustainable development.

1. Contribution to GDP growth.

India's economic landscape has been significantly influenced by the integration of advanced engineering technologies. In the fiscal year 2023–24, the country's real GDP growth accelerated to 8.2%, up from 7.0% in the previous year. This surge was primarily driven by substantial investments in public infrastructure and a rebound in the manufacturing sector, which benefited from buoyant construction activities and lower input costs .

The manufacturing sector, a key beneficiary of engineering advancements, experienced notable growth. The adoption of automation, smart manufacturing, and digital technologies enhanced productivity and efficiency, contributing to the sector's expansion. This growth not only bolstered domestic economic activity but also improved India's competitiveness in global markets.¹

Furthermore, the services sector, particularly in areas like information technology and digital services, saw increased demand and output. The integration of engineering technologies facilitated the development of new service offerings and improved delivery mechanisms, thereby contributing to overall GDP growth.

On the fiscal front, the growth in GDP was accompanied by a significant increase in net indirect taxes, which rose by 19.1% year-on-year. This uptick in tax revenue provided the government with additional resources to invest in infrastructure and technology development, creating a positive feedback loop that supports sustained economic growth.²

Key Metrics Related to Engineering Technologies and GDP Growth³

Metric	FY22/23	FY23/24	Change
Real GDP Growth Rate (%)	7.0	8.2	+1.2
Manufacturing Sector Growth Contribution	Significant	Increased	Positive
Net Indirect Tax Growth (%)	10.6	19.1	+8.5
Public Infrastructure Investment Growth (%)	Not specified	Increased	Positive

2. Job Creation vs. Job Displacement

The rapid advancement of engineering technologies, particularly artificial intelligence (AI) and automation, is reshaping India's employment landscape. While these technologies offer opportunities for job creation, they also pose challenges related to job displacement, especially in sectors susceptible to automation.⁴

Job Displacement Trends

India's Economic Survey 2024–25 highlights that AI and automation could lead to significant job displacement, particularly affecting workers in the middle and lower wage brackets. Sectors such as IT services, customer support, and routine data processing are at higher risk, as businesses increasingly adopt AI-driven solutions to enhance efficiency and reduce costs .

A study by the International Monetary Fund (IMF) indicates that approximately 40% of global employment is exposed to AI, with advanced economies facing greater risks. In India, while the immediate impact may be less severe, the potential for job displacement remains significant, necessitating proactive measures to mitigate adverse effects .

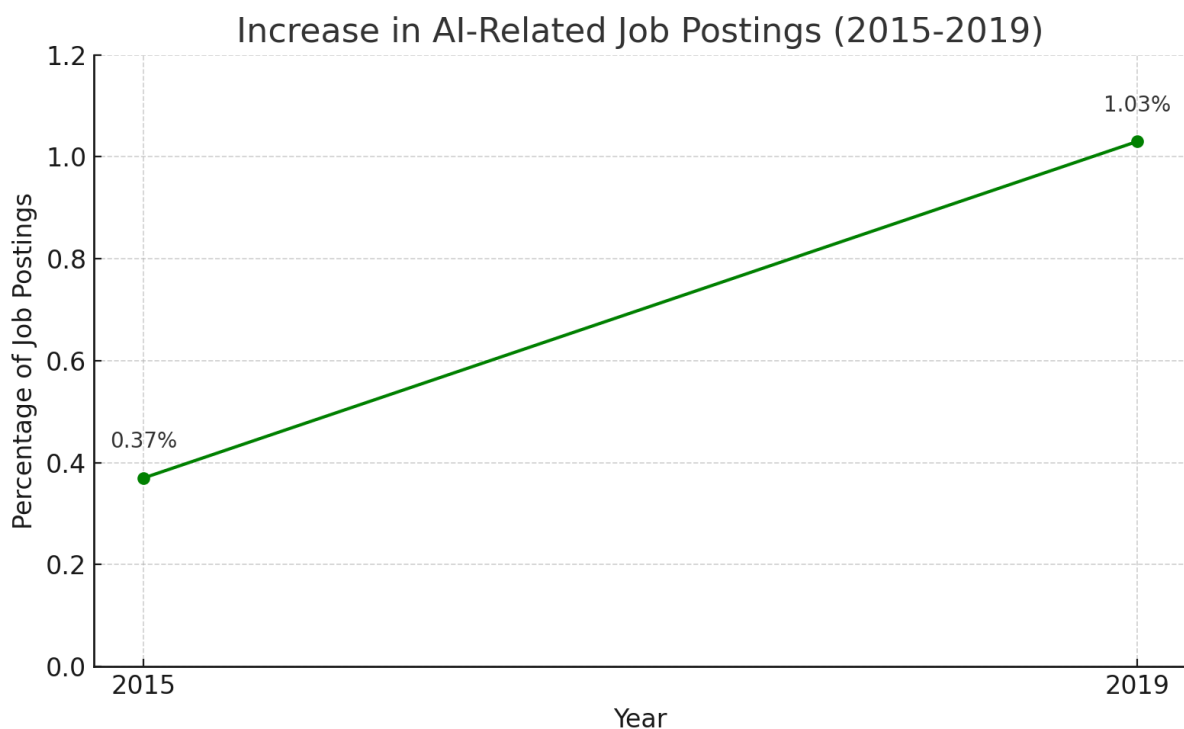
Job Creation Opportunities

Conversely, the integration of AI and automation is also creating new employment opportunities. The demand for AI-related skills in India's services sector has grown almost exponentially since 2016, with job postings requiring such skills increasing from 0.37% in 2015 to 1.03% in 2019 . This surge reflects the emergence of roles in AI development, data analysis, and machine learning engineering.⁵

Furthermore, the adoption of AI is fostering the development of new industries and services, such as AI-driven healthcare solutions, fintech innovations, and smart manufacturing, contributing to job creation in these emerging sectors.

Workforce Adaptation and Skill Development

To navigate the dual challenges of job displacement and creation, workforce adaptation through skill development is crucial. A survey conducted by the Indian Institute of Management Ahmedabad reveals that 68% of employees expect AI to partially or fully automate their jobs in the next five years, while 63% anticipate the creation of new job roles due to AI. This underscores the need for reskilling and upskilling initiatives to equip the workforce with competencies relevant to the evolving job market.⁶



3. Impact on Trade Balances and Industrial Competitiveness

The integration of advanced engineering technologies, particularly artificial intelligence (AI) and automation, is reshaping India's trade dynamics and industrial competitiveness. These technologies are enhancing operational efficiencies, reducing costs, and enabling Indian industries to better compete on the global stage.

Enhancement of Export Efficiency

Automation has significantly improved export processes by streamlining operations, reducing errors, and accelerating order fulfillment. For instance, Indian textile exporters implementing automated systems for quality control and inventory management have reported a 30% increase in efficiency and a notable reduction in operational expenses.⁷

In April 2025, India's merchandise exports rose by 9.03% year-on-year, reaching \$38.49 billion, driven by robust performances in electronics and engineering goods. However, the trade deficit widened to \$26.42 billion, indicating that while exports are growing, imports are increasing at a faster pace.⁸

Strengthening Industrial Competitiveness

AI and automation are bolstering India's industrial competitiveness by enhancing productivity, quality, and innovation. The electronics sector, for example, has seen substantial growth, with mobile phone exports increasing from \$1.6 billion in FY19 to \$11.1 billion in FY23. This surge is attributed to advancements in manufacturing capabilities and supportive government initiatives.⁹

Furthermore, the 'Make in India' initiative aims to increase the manufacturing sector's contribution to GDP to 25% by 2025, promoting domestic production and reducing reliance on imports.¹⁰

Challenges and Opportunities

Despite these advancements, challenges persist. India's electronics sector still contributes only 1.7% to GDP, compared to higher percentages in countries like Taiwan and South Korea. Additionally, the majority of electronics production caters to domestic demand, with limited penetration into global markets.

However, opportunities abound. The adoption of AI in logistics is optimizing supply chains, reducing delivery times, and lowering operational costs, thereby enhancing India's appeal as a manufacturing and export hub.¹¹

4. Impact on Government Tax Revenues and Investment Cycle

The integration of advanced engineering technologies, particularly artificial intelligence (AI) and automation, is reshaping India's fiscal landscape. These technologies influence both the revenue streams through taxation and the dynamics of public and private investments.

Enhancement of Tax Revenues

India's tax-to-GDP ratio has shown an upward trend, reaching 6.6% in FY 2023–24, up from 6.1% in the previous fiscal year. This improvement is attributed to increased compliance and the broadening of the tax base, facilitated by digitalization and AI-driven analytics in tax administration.¹²

However, certain areas, such as stamp duty collections, have underperformed. In Nagpur, for instance, collections fell 7% short of the target in FY 2024–25, primarily due to lower-than-expected real estate transactions.¹³

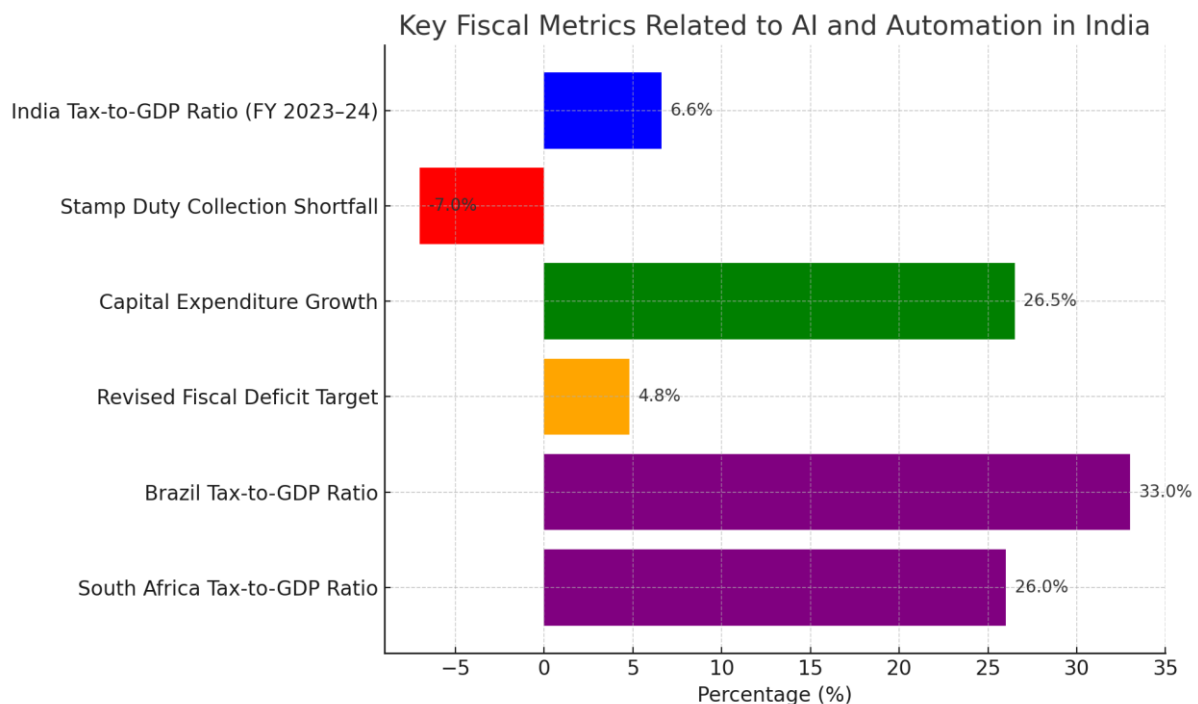
Influence on Investment Cycle

The government's capital expenditure has seen a significant increase, with a 26.5% rise during April–January FY24 compared to the same period in FY23. This surge is largely directed towards infrastructure development, aiming to stimulate economic growth and attract private investments.¹⁴

Concurrently, the fiscal deficit has been a focal point, with the government revising its target to 4.8% of GDP for FY 2024–25, striving to bring it below 4.5% by FY 2025–26. This fiscal consolidation is crucial for maintaining investor confidence and ensuring sustainable economic growth.¹⁵

Comparative Perspective

When compared to other emerging economies, India's tax-to-GDP ratio remains relatively low. For instance, Brazil and South Africa have ratios exceeding 25%, indicating potential room for India to enhance its revenue mobilization.¹⁶



Conclusion:

The rise of advanced engineering technologies is quietly reshaping India's economic landscape, creating both opportunities and challenges. While fears of job displacement persist, the data reveals a parallel surge in high-skilled roles, particularly in AI and automation-driven sectors. This shift underscores the need for agile workforce strategies that prioritize reskilling and adaptability.

On a macroeconomic level, these technologies are contributing to GDP growth, enhancing industrial competitiveness, and improving tax revenues—yet their full potential remains untapped. The widening trade deficit and lingering fiscal constraints highlight the importance of balanced, forward-looking policies that encourage innovation while ensuring inclusive progress.



Concluding Insight:^[1]_[SEP]

India stands at a crossroads where technology can either deepen inequalities or become a great economic equalizer. The path it chooses will depend on policies that harmonize efficiency with equity, ensuring that progress benefits not just industries, but people.

Strategic investments in education, infrastructure, and R&D will be critical in shaping a future where technology amplifies India's growth without leaving its workforce behind.

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