

**India's Ambition Towards Indigenous Innovation:
An Acceleration or Impediment?**

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Abstract: Political actions, such as domestic industrial policies and international trade agreements, have played a critical role in shaping the progress of a country's indigenous technological innovation. This essay examines how political measures have influenced India's efforts and results on investing in developing indigenous technologies, whether they have served to either facilitate or hinder progress. This analysis will focus on three aspects: government-led initiatives that have acted as catalysts for technological development, access of critical technologies restricted through geopolitical risks and imbalanced trade relations, and social barriers, such as the caste-based discrimination that further constrained the implementation of innovation policies. Through an investigation of cases and examples, these findings highlight the political measures that have played a double-edged role in shaping India's development of indigenous technological innovations.

Political Measures and Indigenous Innovation in India

To understand such dynamics with greater clarity, it is important to examine India's political strategies in detail. With the GDP growth projected to be 6.5% for the 2025 fiscal year (Malhotra), India is surging ahead, outpacing other major economies. This rapid growth is stimulated by robust domestic demand and bold policy reforms. With an ambitious vision known as "Viksit Bharat 2047," India aims to position itself as a developed country by its independence centenary in 2047 ("Vision India @ 2047"). Achieving the goal requires a sustainable annual growth of 8%-10% over the next 22 years, so that India has been making critical shifts, transitioning from an importer to a globally competitive and self-reliant economy, with particular focus on domestic technological advancements. Political measures are put in place to support technological leadership in indigenous areas like Artificial Intelligence, quantum technology, and digital manufacturing. In recent years, progress has been made through

programs like the PLI (Production-Linked Incentive Scheme) and the FAME program (Faster Adoption and Manufacturing of Electric Vehicles in India), which have encouraged indigenous manufacturing and innovation.

Although a focused, technological roadmap has been set on stage, challenges come along with transformations given infrastructure deficits and demographic divides. For example, fundamental technological innovations such as semiconductors and advanced electronics remain relatively insufficient, and despite government support, challenges such as infrastructural deficiencies, limited R&D investment, and persistent socio-political inequalities continue to slow progress. Therefore, this essay will explore how political decisions influence indigenous technological innovation in India.

Incentive-Based Policies as Catalysts for Indigenous Innovation

Policies through incentive-based schemes have served as powerful catalysts for indigenous technological innovation. By performance-driven incentives, these political measures subsidize selected sectors of companies on incremental sales to achieve production targets (Government of India). Creating The creation of protected spaces for local firms to innovate and scale top-down measurements, helps create safer environments to build resilient and indigenous supply chains that foster self-sufficiency in key technological and industrial areas. The introduction of the PLI (Production Linked Incentive schemes), which is aimed at the production of the ACC (Advanced Chemistry Cell) Battery and auto component sectors, is a key example of this initiative. This scheme in particular focuses on promoting the production of Advanced Automotive Technology products, including Zero Emission Vehicles.

According to the Indian Ministry of Heavy Industries, the ₹18,100 crore budget scheme is intended to empower India's industrial renaissance with an emphasis on domestic production and technology. Government projections highlight employment opportunities for more than 60 lakh people in India and also acknowledges the increase in contribution of the manufacturing sector to the country's total capital formation, which in previous years has been between 17-20% (Kapoor et al.). By these measurements, the PLI policy would usefully incentivize both production and innovation in the EV sector in India.

Geopolitical Vulnerabilities and Trade Imbalances

While targeted policies such as incentive schemes have stimulated short-term industrial growth, their effectiveness in fostering long-term, self-reliant technology innovation remains questionable given high dependency on imports. A prime example is “screwdriver assembly,” where products are locally assembled, but with critical components, such as semiconductors or display panels, still being imported. In the electronics manufacturing field, India continues to rely heavily on imported semiconductors and display panels, both of which are essential components in everything from smartphones to electric vehicles (Rao). Although domestic productions have been expanded, it does little to reduce import dependency and stimulate long-term innovation (Keller and Pauly). Thus, this leads to concerns about the sustainability and depth of India's targeted agenda. If access to these foreign technologies is suspended due to global supply chain disruptions, India's innovative progress could quickly slow down.

For example, India's high dependency on imports such as Crude oil from Russia and critical industrial goods from China has intensified geopolitical tensions (Srivastava; Bahree). India has imported over 87% of crude oil in the fiscal year of 2024, and this heavy purchase gave

an official reason for President Trump to place a total of 50% tariffs on New Delhi, the highest on the South Asian nations (Srivastava; Bahree). However, the United States has been the top export market for India, making up to 18% of exports and 2.2% of GDP, such a tariff “punishment” would potentially cut GDP by 0.2–0.4%, stopping India from carrying out its “Viksit Bharat 2047” plans (Inamdar). Similar to a trade embargo, the proposed programs such as government subsidies and financing support may not be enough to tackle the impact of a doubling tariffs, potentially resulting in “huge job losses” and supply chain breakdown (The Hindu Bureau).

Given the escalating tensions and its compounding effects, India has not yet prepared the necessary greenhouse for indigenous innovation. Additionally, the trade imbalance between India and China increased from \$71 billion in the 2015-16 fiscal year to \$128 billion in the 2024-25 fiscal year, making India vulnerable from this sharp rise (Taneja and Upreti). Imports have been concentrated in critical components for its technology advancements from electronic integrated circuits, automatic data processing machines to pharmaceuticals and base metals (Taneja and Upreti). Thus, without cutting-edge developments such as made-in-India productions, domestic firms face bottlenecks in research and production. Although India's industrial strategies have achieved some success in specific areas, they have not truly established the foundation for promoting continuous development in indigenous technologies due to external reliance.

Social Barriers: Caste Discrimination and Restricted Human Capital

In addition to these geopolitical and economic barriers, India greatly struggled with deep seeded social struggles. Systemic social issues that have been long-lasting overlooked on the

political agenda may also hinder the access to talents and resources for indigenous technology advancements, such as the caste system. Students from marginalized caste groups, particularly Dalit and Sudra, have always been subjected to unequal access to education and opportunities (Kumar and Admankar, 325-369). According to the experience of Dalit scientist Raosaheb Kale, India's reservation policy through affirmative action, designed to reserve 15% of positions in educational and research institutions for Dalits, is a political measure intended to foster inclusion (Paliwal). Yet its weak enforcement and the persistence of caste-based discrimination in elite institutes like Indian Institutes of Technology and Indian Institute of Science have created a barrier. Specifically, Dalits face problems including struggling to have equal opportunities and enduring social stigma.

Furthermore, Kale was initially denied supervision for his Ph.D. solely due to his Dalit identity, while researcher Rajendra Sonkawade faced professional retaliation for his advocacy of equitable treatment (Paliwal). Due to the ineffectiveness of the implementation of the policies, India's technological innovation has been restricted. These institutions neglected the talents, thus wasting a large amount of the country's human resources. Therefore, policy obstacles rooted in hidden discrimination has prevented India from fully leveraging all its human capital to promote technological progress (Harriss-White and Prakash). This can delay technological innovation in India but also reduce the opportunities to fully take advantage of its population edge, limiting India's ability to develop indigenous technologies.

The Double-Edged Role of Political Measures

Taken together, these political, economic, and social obstacles reveal the complex and sometimes contradictory impacts of India's government. All in all, these political measures have

played a double-edged role in shaping India's development toward indigenous technological innovation. On the one hand, incentive-based strategies have stimulated domestic manufacture and created a potential path for local innovation. On the other hand, as many initiatives are limited to the surface level rather than deep development, the sustainability of self-reliant technological innovation remains uncertain. At the same time, social issues, such as the caste-based exclusion, and geopolitical pressure, continue to constrain access to talent, capital, and collaboration. Altogether, despite the effect of political interventions to accelerate innovation, India will not achieve true technological independence unless it builds stronger research foundations, develops a highly trained workforce, and ensures broader social inclusion.

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