

The Impact of Foreign Direct Investment on Innovation in India: An Analytical Study

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Abstract

This study explores the intricate relationship between Foreign Direct Investment (FDI) inflows and innovation in India, particularly during the post-liberalization period from 1991 to 2021. It critically examines theoretical perspectives and empirical trends to assess how FDI has influenced domestic innovation capabilities, as measured through indicators such as patent applications and gross expenditure on R&D (GERD). Drawing on a broad spectrum of economic theories—from early work by Kindleberger and Vernon to Dunning’s eclectic paradigm—the paper evaluates the dualistic nature of FDI: as a vehicle for advanced technology transfer and as a potential source of dependency.

India’s FDI inflows dramatically increased following economic reforms and a rise in patent filings, even though R&D intensity relative to GDP stagnated. The findings underscore that while FDI has positively contributed to innovation output, structural limitations such as inadequate absorptive capacity and inconsistent R&D investment hinder the full realization of FDI’s innovation potential. The paper calls for more cohesive policy frameworks to align FDI with sustainable and inclusive innovation-driven growth.

Keywords: *Foreign Direct Investment (FDI); Innovation; India; Technology Transfer; R&D; Patent Applications; Economic Reforms; Absorptive Capacity; Multinational Corporations; Liberalization.*

1. Introduction

In the current global situation, FDI inflows and innovation are the two most important indicators that attract the attention of both scholars and policymakers and contribute significantly to global economic development and competitiveness. Policymakers in LIDC, for instance, would encounter greater difficulties in adapting policies based on the impacts of FDI inflows and innovation.

1.1 Foreign Direct Investment Theory

In previous economic theory literature that addressed the issue of FDI Inflows, the concentration was on where the FDI was originating from rather than what it did to the country receiving it. In this way, the specific features of the destination which led to the foreign investment were also hidden. Given this focus, the initial forays of economists, such as Charles Kindleberger, can be easily understood as one would conceptualize FDI as “an investment which the investor’s purpose is either to establish a lasting interest in an enterprise that is vested in economy outside that of the investor or to engage in the day-to-day management of, or to operate an activity in, an economy of which the investor is not a resident.” This investment is intended to gain a decisive or at least an effective vote/voice in the management of the target firm (Kindleberger, 1969). The meaning emphasizes the source of investment and also suggests the purpose behind such investment in control and managing the firm.

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1.2 Foreign Direct Investment Inflows and Innovation Relations

The rich theoretical and empirical studies of the influence of FDI flows on the innovation systems of the host country can roughly be divided into three approaches. The first one, on the one hand, holds that FDI inflows positively impact innovation systems and different indicators of innovation in the host economy as FDI transfers advanced technology and upgrades the innovation capabilities of domestic firms, sectors, and the economy as a whole (Caves 1975). Additional global competition puts more pressure on domestic firms to innovate over the long term in R&D. In the first place, research and development (R&D) in DCs maintains alliances First generated by foreign direct investment motives (Yildirim & Arun, 2017).

Moreover, by enhancing competition in the local market, FDI inflow compels firms to innovate to live in a new competitive environment (Bertschek, 1995), and hence would indirectly encourage innovation. FDI inflows enhance the capital stock of firms in the host country, which ultimately allows for greater R&D investments, hiring of a more skilled labor force, and better technologies of production (Glass & Saggi, 2002). FDI contributes to growth not only by raising the capital stock, but also by spurring innovation through the supply of human capital and skilled workers to recipient economies (Blomstrom & Kokko, 1998). The potential for technology transfer through FDI flows is a stronger case for the pro-FDI and innovation sides. Foreign affiliates, who are also considered the main channel for innovation transfer, not only operate in conventional equipment transfer mode, but also have helped spur innovation in host country firms, as high-performance foreign firms shared knowledge with domestic firms through FDI (Garcia et al., 2013). There are many other channels through which FDI flows are assumed to stimulate indigenous innovation.

The relationship between FDI inflows and innovation has been a topic of interest in the literature. MacDougall (1960), using the marginal productivity theory, argued that although FDI could lower income in the capital-holding sector of the host economy due to the decreasing marginal productivity of additional capital, it would effectively raise labor's wage, thereby bringing net income to the host economy. In contrast, Solow (1966) emphasized difficulties in technology transfer, suggesting that capital-intensive, advanced technologies found in industrialized countries might be unsuitable for the labor-abundant, infrastructure-deficient conditions of many LDCs. Vernon's (1966) product cycle theory also illuminates the relationship between FDI and innovation by suggesting that firms initially maintain their lead in robotics technologies during the early stages of production but must engage in FDI as these technologies spread abroad and are replicated if they wish to remain competitive in foreign markets.

This analysis was later developed by Dunning (1971,1993), who also stressed the importance of absorptive capacity (that is, infrastructure, qualified workers, and institutional capabilities) as an essential key to the successful reception and assimilation of technology. Pavitt (1971) contended that LDCs are mainly in need of simple technologies used in agriculture, public utilities, and health care, which are usually not monopolized by MNCs and can be had through cooperation with other governments. However, Joshi (1972) accused MNCs of being profit-oriented and often at the expense of the host country, while they inserted conditionalities in technology transfer contracts so as to create technological dependency. Patil (1977) suggested, the MNCs often confine the technological know-how to the operations through the exclusive staffing and tight control, which prevents the spread to broader dissemination and the build-up of local capabilities.

Developing the theoretical framework, Dunning (1980) developed the eclectic paradigm, indicating that FDI is triggered by the matching of ownership-specific advantages, internalization advantages, and the profitability of moving the firm by combining the local resources from home and host countries. According to Hanumanth Rao (1985), the technology transferred by MNCS is not usually compatible with host country factor endowments and is therefore not efficacious. In a similar vein, Bagchi (1990) also worries about the fact that MNCs invest for the exploitation of natural resources without long-range productivity, capital formation, and real innovation in host countries, while retaining control, while promising some form of delayed 'development'.

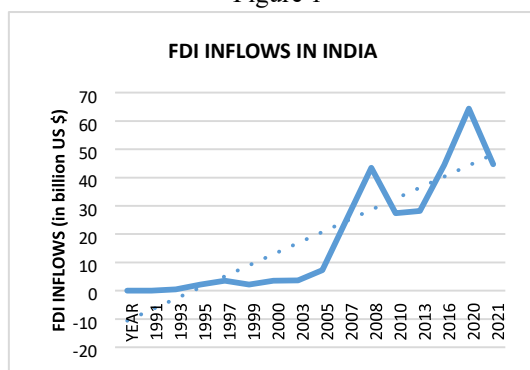
FDI Inflows affect the economy and Innovation on economic growth. However, there is a gap to be addressed in the economic literature regarding the effects of FDI Inflows on Innovation in the host economy.

Accordingly, the aim of the present study is:

1. To look at and investigate the trends of FDI inflows overall and the Innovation in India

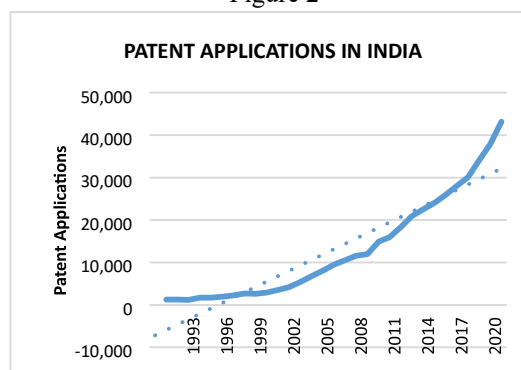
Trends Of FDI Inflows and Innovation in India

Figure 1



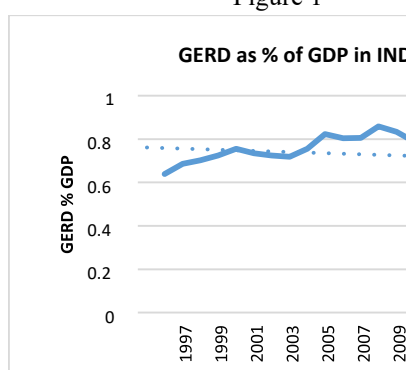
Source- UNCTAD Database

Figure 2



Source- WIPO Database

Figure 1



Source- UNESCO UIS Database

Table 4.13: CAGR (India)

FDI Inflows	23.17%
Patent Applications	12.05%
GERD as % GDP	-0.04%

There has been a significant rise in annual Foreign Direct Investment inflows to India from 1991 to 2021. It is crucial to interpret the figures presented in I.&B.M./4.2 and I.&B.M.-related issues and reports (Please note, “Foreign Direct Investment Inflows to India – Appendix I,” which supplements the I.&B.M. for all years from 1991 to 2013). The total annual FDI value for the years 1991 to 2020 is reported at \$4.1 billion U.S. The relatively low peak value of \$63 billion U.S. for 2020 is staggering compared to the figures presented in this article for 1991-2021. In countries such as India, this era coincided with the introduction of LPG (Liberalisation, Privatisation, and Globalisation) policies. The years in the Indian economy following the 1991 economic reforms are referred to as the post-reform period, during which the country has generally experienced substantial economic growth. FDI inflows increased rapidly from 1991 until around 2008, after which they began to decline dramatically due to the Global Financial Crisis. Since then, Foreign Direct Investment inflows have been recovering and surpassing the 2008 levels, experiencing a downturn only in the last year, that is, 2021, mainly due to the economic slowdown during the pandemic cycle (Chattopadhyay et al., 2022).

However, the inward stock of FDI in India increased from 0.07 billion US\$ in 1991 to 3.58 billion US\$ in 2000, then rose to 43.40 billion US\$ in 2008, before declining to 27.39 billion US\$ in 2010. Last year, FDI inflows into India recovered and exceeded their 2008 levels only in 2015 (44 billion US\$). It peaked at 64.36 billion US\$ in 2020 before dropping to 44.72 billion US\$ due to pandemic lockdowns. The CAGR in FDI inflows for 1991-2021 stands at a robust 18.53%. Excluding 2021 for the previously stated reasons, the CAGR for 1991-2021 increases to 23.17%. CFDI inflows to India were increasing at a high CAGR during the first decade of the reform period (1991-2000), at 31.59%. This rate was even eclipsed in the period 2001-08, when the CAGR of annual FDI inflows into India was 35.71%. It was the depression that interrupted this growth rate. The LPG policies can be claimed to have accomplished their intended goals concerning FDI inflows.

Growth in Patents Trends in Patent Applications The rise in patents lodged each year has been phenomenal between 1991 and 2021 in India, indicating a growth in innovation activity. Patents per annum were 1,267 in 1991, 2,866 in the year 2000, 14,888 in 2010, and 43,163 in 2021. The CAGR for the entire duration from 1991 to 2021 was 12.05 percent. During the first decade, 1991-2000, it registered a CAGR of 9.67%; the second decade, 2001-2010, recorded 15.62%; and from 2010 to 2021, it was 9.49%.

The trends shown in patents are indicative of the swift economic growth that has characterized the Indian economy during the post-1991 economic reforms, whose antecedents stretch back to the mid-1980s. R&D has made steady progress in absolute terms of the funds spent on it, but not in terms of the relative share of such expenditure in the GDP of the Indian economy, as the above figures indicate. Now, both the public and private sectors need to converge on this quickly if the Indian economy is to become the next economic superpower. Relying entirely on the innovation capabilities of wealthy nations means remaining enthralled by new adversaries that India is striving to challenge in the competitive world.

Indicator	1991	2000	2010	2021	CAGR (%)	Remarks
FDI Inflows (US\$ Billion)	0.07	3.58	27.39	44.72	23.17%	Peaked at \$64.36B in 2020; dropped in 2021 due to the pandemic
Patent Applications	1,267	2,866	14,888	43,163	12.05%	Significant rise, driven by reforms and increased foreign collaboration
GERD as % of GDP	—	—	—	—	-0.04%	Stagnant, despite increased R&D in absolute terms, the relative share fell.
Major Policy Phase	LPG Reforms	WTO Accession	Post-GFC Recovery	Pandemic Era	—	Liberalization policies stimulated FDI and innovation.

The above table presents Key Trends on FDI, innovation, and R&D trends in India (1991–2021):

1. FDI Inflows (US\$ Billion):

- **Massive Growth:** FDI inflows increased from a meagre \$0.07 billion in 1991 to \$44.72 billion in 2021, showing a **compound annual growth rate (CAGR) of 23.17%**.
- **Policy Impact:** This growth aligns with the **Liberalization, Privatization, and Globalization (LPG)** policies introduced in 1991, which opened up the Indian economy to foreign investors.
- **Volatility & Recovery:** After reaching a high of \$64.36 billion in 2020, inflows dropped in 2021 due to the **COVID-19 pandemic-induced economic slowdown**, highlighting the vulnerability of FDI to global shocks.

2. Patent Applications (Innovation Indicator):

- **Innovation on the Rise:** Patent filings rose sharply from 1,267 in 1991 to 43,163 in 2021, with a **CAGR of 12.05%**. This reflects a growing emphasis on **technological innovation and knowledge generation**.
- **Three Decade Progression:** The 2001–2010 period saw the highest patent growth rate (15.62%), suggesting a **post-reform innovation push**, likely spurred by increased foreign presence and competition.
- **FDI-Innovation Link:** The upward trend in patents suggests that FDI may have played a role in **stimulating domestic innovation**, directly via technology transfer and indirectly via competitive pressure.

3. GERD as % of GDP (R&D Intensity):

- **Stagnation in R&D Investment:** Despite absolute growth in R&D spending, GERD as a share of GDP remained largely flat, even **declining slightly at -0.04% CAGR**.

- **Missed Opportunity:** This indicates that **India has not proportionately increased R&D spending** to match its economic or innovation growth, possibly limiting the long-term benefits of FDI-induced technology spillovers.

4. Overall Insight:

- The data suggests a **positive association between FDI inflows and innovation output**, but also underscores the **limited absorptive capacity** of the Indian economy.
- **Policy Implication:** While India has been successful in attracting FDI and increasing patent activity, the **underinvestment in R&D as a share of GDP** could constrain sustainable innovation-led growth.
- There is a need for **stronger public-private R&D collaboration**, targeted incentives, and reforms in intellectual property and education to enhance the innovation ecosystem.

Leader, it must strengthen the infrastructure and policies that convert FDI inflows into sustainable innovation outcomes.

2. Policy Recommendations

1. Strengthen R&D Investment:

- Increase public spending on R&D and incentivize private sector participation through tax credits, grants, and PPP models.
- Establish national innovation funds and competitive research grants to support high-impact innovation.

2. Enhance Absorptive Capacity:

- Invest in human capital through STEM education, vocational training, and research-based higher education reforms.
- Develop regional innovation hubs and technology parks that connect academia, industry, and foreign investors.

3. Link FDI to Innovation Goals:

- Align FDI policy with national innovation priorities by encouraging foreign firms to set up R&D centres in India.
- Mandate or encourage technology-sharing agreements and joint ventures with Indian firms.

4. Improve Intellectual Property Rights (IPR) Infrastructure:

- Streamline the patent application and approval process.
- Strengthen enforcement of IPR laws to ensure confidence among foreign investors and domestic innovators.

5. Facilitate Sector-Specific Innovation:

- Target FDI in sectors with high innovation potential, such as renewable energy, pharmaceuticals, and digital technologies.
- Support indigenous innovation in agriculture, healthcare, and public services to meet national development goals.

6. Monitor and Evaluate Impact:

- Establish robust metrics and evaluation mechanisms to measure the innovation outcomes of FDI inflows.
- Promote data transparency through collaboration with international bodies like WIPO and OECD.

3. Conclusion

There is a mixed but mostly optimistic picture of the FDI-innovation nexus in India between 1991 and 2021. The influx of FDI into the country took a new turn due to the liberalization of the economy since the early 1990s. The inflow is important not only for the generation of innovation and patent applications but also clearly for technology-based industries. Transfer of Technology and Management Skills FDI can transfer technology and management skills as well as best practices from the world, which infuses a sense of vibrancy and competition into the business.

However, the analysis also highlights less obvious structural weaknesses in India's innovation ecosystem. The rise in innovation outputs is disproportionate to the increase in R&D intensity (measured as GERD as a share of GDP). This disjunction suggests that FDI could be a catalyst rather than a replacement for robust and sustained domestic R&D investment. Second, India's limited absorptive capacity—reflected in the ability of Indian firms and institutions to absorb and take ownership of foreign technology effectively—serves as an impediment to diffusing innovations more widely.

Weak institutions, a fragmented policy process, and inadequate infrastructure also limit FDI's potential. To truly transform into the innovation center of the world, India must become more than just a destination that attracts foreign capital; it must also evolve into a hub of knowledge creation! This would involve strengthening public and private research and development, establishing cohesive higher education and skill systems, promoting collaboration between the academic and industrial sectors, and ensuring coordinated innovation governance.

Indeed, while FDI has significantly contributed to innovation in post-reform India, leveraging FDI investment as a vehicle for Indian innovation will not be possible without strategic policy measures to build indigenous innovation capacities. India will achieve a sustainable, inclusive, and globally competitive growth path only through conscientious cooperation with both foreign and domestic investment.

4. Conflict of Interest

The authors declare that they have no conflict of interest.

5. Funding Declaration

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