



ROLE OF FOREIGN DIRECT INVESTMENT ON TECHNOLOGY TRANSFER AND ECONOMIC GROWTH IN INDIA

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ABSTRACT

Foreign Direct Investment has emerged as a pivotal force in shaping the technological landscape and economic growth of India. This study delves into the intricate relationship between FDI, technology transfer, and economic development in the Indian context. As India positions itself as a global economic player, attracting substantial foreign investments, it becomes imperative to examine how these investments facilitate the transfer of advanced technologies and contribute to overall economic growth. The historical context of FDI in India is explored, tracing the evolution of policies that have influenced the inflow of foreign investments. The study investigates the sectors most impacted by FDI and the mechanisms through which technology transfer occurs. By analyzing empirical evidence, the study aims to quantify the extent of technology diffusion resulting from FDI and its subsequent impact on innovation, productivity, and competitiveness in Indian industries. Furthermore, the study evaluates the role of government policies in fostering an environment conducive to technology transfer and assesses the challenges and opportunities associated with this process. Insights derived from this research can inform policymakers, businesses, and academics about the nuanced dynamics of FDI, technology transfer, and economic growth in India, thereby guiding strategic decisions to optimize the benefits of foreign investments for sustainable development.

Keywords: *foreign, technology, economic*

INTRODUCTION

Foreign Direct Investment (FDI) plays a crucial role in shaping the economic landscape of countries, particularly in the context of emerging economies like India. Over the past few decades, India has emerged as a significant player in the global economy, and FDI has been a key driver of its economic growth. One of the primary channels through which FDI contributes to economic development is technology transfer. Technology transfer refers to the process by which knowledge, skills, and technology are exchanged between foreign and domestic entities. In the case of FDI, multinational corporations (MNCs) bring in not only capital but also advanced technologies and managerial expertise, which can have far-reaching implications for the host country. In the Indian context, understanding the relationship between FDI, technology transfer, and economic growth is essential for policymakers, businesses, and academics. This introduction aims to provide a brief overview of the interplay between FDI, technology transfer, and economic growth in India. It will explore the historical context of FDI in India, the evolution of its policies, and the impact of FDI on various sectors of the economy. Additionally, the introduction will highlight the significance of technology transfer in fostering innovation, enhancing productivity, and contributing to the overall development of India's economic landscape.

As we delve into the intricate dynamics of FDI and its effects on technology transfer and economic growth in India, it becomes evident that this relationship is multi-faceted. The subsequent sections of this exploration will analyze the historical trends, policy frameworks, and empirical evidence to provide a comprehensive understanding of how FDI has influenced technology transfer and, in turn, contributed to the economic progress of India.

Technology Transfer:

Knowledge and Skills Transfer: Foreign investors often bring advanced technologies, managerial expertise, and industry best practices. This transfer of knowledge and skills is crucial for the development of domestic industries.

Research and Development (R&D): FDI can stimulate increased spending on research and development activities, leading to the creation and transfer of cutting-edge technologies.

Sectoral Impact:

Manufacturing and Infrastructure: FDI often targets sectors like manufacturing and infrastructure, bringing in not just capital but also sophisticated technologies. This enhances the quality and efficiency of production processes.

Information Technology (IT) and Services: India has become a hub for IT services, attracting substantial FDI. This has resulted in the transfer of IT skills and knowledge, contributing significantly to the growth of the services sector.

Innovation and Productivity:

Innovation Spillovers: FDI can facilitate innovation spillovers, whereby the adoption of advanced technologies by foreign firms leads to increased innovation within domestic firms in the same industry.

Productivity Gains: The infusion of advanced technologies through FDI can lead to improvements in productivity, helping domestic firms produce more with the same or fewer resources.

Employment Generation:

Skilled Employment: FDI often creates job opportunities, particularly in high-skilled sectors, contributing to the growth of a skilled workforce.

Multiplier Effect: The growth of FDI-supported industries has a multiplier effect on employment, benefiting not only the direct workforce but also those in related industries and services.

Policy Framework:

Liberalization Policies: India's liberalization policies have played a crucial role in attracting FDI. Continuous efforts to streamline regulatory processes and reduce bureaucratic hurdles can further enhance the inflow of foreign investments.

Incentives for Technology Transfer: Governments may offer incentives and concessions to encourage FDI that includes technology transfer components, fostering a more technology-driven economy.

Challenges:

Absorptive Capacity: Ensuring that the domestic industry has the absorptive capacity to effectively utilize and adapt the transferred technologies is a challenge that needs to be addressed.

Equity Concerns: Balancing the benefits of FDI with concerns related to equity, environmental sustainability, and social impacts is essential for inclusive and sustainable development.

REFORMS IN THE INDIAN ECONOMY

Prior to 1991, the government exercised a great degree of control over industrial activity by regulating and promoting much of the economic activity. Foreign investment and imports were discouraged, and native resources were allocated through manufacturing licences under the plan for development. Import prohibitions and hefty taxes, as well as licencing and reservations, resulted in a domestic industry that was fiercely protected. Licencing restrictions were the backbone of industrial policy, helping to keep the playing field as level as possible. A new production unit or significant expansion of operations required government clearance under the Industries Development and Regulation Act (1951).

Alterations to the production line necessitated additional approval from higher-ups at the factory. Furthermore, approval was often conditional on factors such as product kind, production volume, and geographic region. The decision to award a licence involved numerous phases and became a very bureaucratic procedure, with certain aspects of state capture by incumbent domestic enterprises. The economy became highly bureaucratized as a result of this and other initiatives. Additionally, numerous industries, like textiles, were set aside for the small-scale sector, making it impossible for domestic enterprises within these sectors to enjoy economies of scale and making these industries unattractive to MNCs. The government also managed a company's ability to go public. Without the permission of the government, factories could not shut down or lay off employees. The goal was to reduce joblessness, but the result was to make the industrial economy less productive. Indian trade strategy before the 1990s concentrated on import substitution. In a variety of ways, import restrictions were put in place. In accordance with the purpose of obtaining self-reliance, import licencing was implemented to exercise control over the importers. In addition, a single agency, typically a government-owned business, was given exclusive rights to import particular goods.

FOREIGN DIRECT INVESTMENT

There was a dramatic increase in foreign net inflows as limitations on foreign investments were loosened or eliminated. Under the new regulatory framework, there was a notable increase in the number of approvals for international technological collaborations. The value of FDI approvals also risen dramatically in the post-reform period. In 1997, FDI approvals were US\$15.8 billion, compared to US\$0.3 billion in 1991. A rise in net FDI inflows is shown in Figure 5.1. This rise occurs after 1991. From a low of US\$ 0.074 bn in 1991, FDI inflows increased to US\$ 3.6 bn by 1997, before declining to US\$ 2.6 bn in 1998. The growth rate of FDI accelerated sharply after 1991, from 23% yearly between 1981 and 1990 to 44% annually between 1991 and 2001. In 1991, foreign investment was only US\$0.1 billion, but by 2001, that number had grown to US\$4.28 billion (World Bank Development Indicators). While FDI has increased, it only accounts for a small fraction of India's total

investment. By 1998, this ratio had dropped to 2.5%, well below that of nearly every other Asian nation. Foreign direct investment (FDI) has been seen to expand significantly after large-scale public sector privatization in many other post-reform nations. However, this has not happened in India; Indian companies, such as BALCO and VSNL, have shown they are capable of absorbing major state-owned industries that are being privatized. But the share of FDI, as a percentage of gross domestic investment (GDI) and GDP, has been expanding. The percentage of FDI in GDI rose from 0.2% in 1990 to 3.98 % in 2001, while the percentage of FDI in GDP rose from 0.5% in 1990 to 0.90 % in 2001. Foreign investment inflows have picked significantly, although they still pale in contrast to those in other nations. To compare India with China, for instance (UNCTAD 2003), see here. In 1991, India's proportion of FDI in the developing countries was just 0.4%. A small improvement was evident by 2001, when the share had climbed to 1.7 per cent.

Distribution of FDI

Sector-by-sector analysis presented here is based solely on approval data because actual FDI inflows into different sectors are not known. From the early 1990s to 2002, the infrastructure and energy sectors received the lion's share of approvals. The number of approvals in industries other than manufacturing increased. Half-yearly data from the SIA Database shows that the metallurgy, power, and fuel sectors are taking larger and larger shares of the total number of approvals. Transportation, manufacturing machinery, and the food industry all experienced significant declines. During the early years of 1992–1994, the services sector, which includes telecommunication, increased its share. In later years, the climate at home stifled its expansion. From 1991 to 2002, the United States approved Rs. 570 billion in cumulative investments in India, making it the country's largest investor. The next in line is Malaysia, then Australia, France, Germany, the Netherlands, South Korea, Japan, and finally France. After 1997, the United States' share of FDI into India began to decline. Since 1993, Mauritius's cumulative investments have placed it just behind the United States. By 1997, the inflows from this country accounted for almost 20 per cent of FDI inflows, probably because of its status as a tax haven. The areas of power, fuel, telecommunications, and transportation saw the greatest number of approvals.

FORMS OF FOREIGN DIRECT INVESTMENT

Purchasing a permanent stake in a firm through investment is known as foreign direct investment. Long-term participation of one nation in another is also referred to as foreign direct investment. Typically, it entails management, joint ventures, technology transfer, and participation in know-how. Foreign direct investment is made through joint ventures, combination and acquisition, brownfield, and greenfield investments.

Greenfield Investment

Investing in a building, office, or other physical structure or collection of buildings associated with the business, or in a location where no previous facilities have been developed. The term "greenfield investment" is frequently used in relation to foreign direct investment. Green field investments take place when global corporations work with developing nations to construct their new stores and facilities. The main goal of the host nation is greenfield development, which expands manufacturing capacity and employment opportunities while transferring technology and know-how that can help build links with the global market. Prospective companies are frequently offered tax advantages, subsidies, and other incentives by developing nations to invest in green space.

Brownfield Investment

Although technically a brownfield development, firms replace the complete plant and buildings, workforce, and product line. This is completely at odds with what Greenfield spent. This policy also pertains to foreign direct investment. The primary benefit of brownfield sites is their ability to develop and execute tasks that are frequently impacted by internal constraints and a higher likelihood of cost overruns.

Merger & Acquisition

Another kind of M&A is foreign direct investment. Combining two businesses usually results in the creation of a new company, whereas acquisitions entail the purchase of one business by another without the creation of a new firm. International businesses buy or merge with an existing business in their host nation through this technique. Due to its tendency to facilitate speedy market access and cost effectiveness when losses are incurred, M&A has become more popular than greenfield investment.

Joint Venture

Joint ventures are yet another well-liked type of external direct investment. A worldwide joint venture is one of the greatest strategies to break into new markets. A joint venture may be formed with a host country corporation, a government agency, or any enterprise with an international standing. When two or more parties join forces to share resources in order to accomplish a certain goal, each member is accountable for the profits, losses, and expenses.

OBJECTIVE

1. In order to evaluate the factors that determine foreign direct investment (FDI) inflows.
2. To determine the effect that foreign direct investment has had on the Indian economy.

METHODOLOGY

All of the information used in this study comes from secondary sources, namely the Handbook of Statistics on the Indian Economy, which is compiled and distributed on a yearly basis by the Reserve Bank of India. Between the years 2000-01 and 2012-13, information on foreign direct investment (FDI) and gross domestic product (GDP) was gathered. The Gross Domestic Product (GDP) is a measure of economic expansion. GDP is going to be considered the dependent variable (the cause), while foreign direct investment is going to be considered the independent variable (the impact). In order to evaluate the causal link that exists between foreign direct investment (FDI) and economic development, regression models with variable time delays are utilized. It is generally accepted that foreign direct investment (FDI) during the period 't' results in a rise in GDP through the multiplier effect in the subsequent period 't+1'. Consequently, the regression model is evaluated using a range of different time delays, and the results are presented in the form of an equation.

$$\text{GDP}_t = b_0 + b_1 \text{FDI}_{t-k} + u$$

In equation 1, the letter 't' represents the time period that does not include any time lag, while the term 't-k' refers to the time period that takes into account the time lag. The letter 'k' represents the values '0, 1, 2, and so on' during the process of running a regression model with different time delays. In this way, GDP_t indicates the Gross Domestic Product of the time period 't', while FDI_{t-k} indicates the amount of foreign direct investment

that has occurred over the course of the previous years. In this equation, 'b0' represents the regression intercept, 'b1' represents the regression coefficient (slope), and 'u' represents the random dispersion factor.

Equation 1 indicates that GDP is regressed on FDI and GDP of period, and as a result, a linear regression model is implied in the equation 't' depends on FDI of period 't-k'. If k=0, GDP_t is regressed on FDI_t that is for the same year. When, k=1, then impact of 't-1' (for example: 2000-01) year's FDI on GDP of year 't' (for example: 2001-02) is studied through the model. Similarly, if k is taken to be 2, then the model (1) shows the influence of FDI of 't-2' year (for example: 2000-01) on GDP of year 't' (for example: 2002-03). It is relevant to each time lag when the same thing occurs. The estimate procedure known as Ordinary Least Square (OLS) is utilized in this instance for the purpose of estimating the unknown parameters (b0 and b1).

ANALYSES AND RESULTS

A trend analysis of the link between foreign direct investment and gross domestic product is the first step in completing the investigation that corresponds to the current objectives. For the same, the information regarding GDP and FDI can be seen in table 1.

Table1 FDI And GDP In India During 2000-01 To 2012-13

Sr. No.	Years	GDP		FDI	
		In Rupees Billion	% Increase	In Rupees Billion	% Change
1	2000-01	21774.13	---	184.04	---
2	2001-02	23558.45	8.19% (↑)	292.45	58.90% (↑)
3	2002-03	25363.27	7.66% (↑)	243.97	-16.58% (↓)
4	2003-04	28415.03	12.03% (↑)	198.30	-18.72% (↓)
5	2004-05	32422.09	14.10% (↑)	269.47	35.89% (↑)
6	2005-06	36933.69	13.92% (↑)	394.57	46.42% (↑)
7	2006-07	42947.06	16.28% (↑)	1026.52	160.16% (↑)
8	2007-08	49870.90	16.12% (↑)	1394.21	35.81% (↑)
9	2008-09	56300.63	12.89% (↑)	1907.00	36.78% (↑)
10	2009-10	64778.27	15.06% (↑)	1578.00	-17.25% (↓)
11	2010-11	77953.13	20.34% (↑)	1324.00	-16.10% (↓)
12	2011-12	89749.47	15.13% (↑)	1548.16	16.93% (↑)

13	2012-13	100206.20	11.65% (↑)	1465.82	-5.32% (↓)
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As seen in Table 1, the Gross Domestic Product (GDP) has been steadily growing throughout the course of the years; however, the pace of growth has varied from year to year. FDI, on the other hand, has a tendency to fluctuate between different levels. Initially, foreign direct investment (FDI) saw a rapid increase in the period of 2001-2002 (% \uparrow = 58.90), but it subsequently began to decrease over the subsequent two years. During the year 2006-2007, there was a remarkable increase in foreign direct investment (FDI) that was more than two and a half times higher than the previous year (% \uparrow = 160.16). Also, the Gross Domestic Product (GDP) rose by a greater amount than it had previously (% \uparrow = 16.28). It is possible that this is related to a significant increase in foreign direct investment. One more time, foreign direct investment (FDI) blossomed in 2008-2009 (% \uparrow = 36.78), but then it began to drop till 2010-2011, and then it began to recover in 2011-2012 (% \uparrow = 16.93). Indeed, the increases in GDP have continued, most likely as a result of the impact of foreign direct investment (FDI) in both the current and previous years. In spite of this, both GDP and FDI have grown in 2012-2013 in compared to the year 2000-2001; nevertheless, the direction of their augmentation has been different.

A mixed tendency of foreign direct investment (FDI) and a growing trend of gross domestic product (GDP) are noted here. It is evident that the Gross Domestic Product (GDP) achieves its maximum point in 2012-2013, whilst Foreign Direct Investment (FDI) reaches its highest level in 2008-2009. The growth path of GDP appears to be smoother in contrast to that of FDI. Despite seeing some significant increases, foreign direct investment (FDI) has been on a downward trend for a number of years. Both the years 2006-2007 and 2009-2010 saw significant increases and decreases in foreign direct investment (FDI). Even though foreign direct investment (FDI) decreased in the 2010-2011 fiscal year, there was a significant increase in gross domestic product (GDP). This might be due to the delayed impact of FDI on GDP, the influence of other economic variables, or both. The current research, on the other hand, considers foreign direct investment (FDI) to be a factor that affects gross domestic product (GDP) and makes an effort to evaluate the real impact of FDI by determining the amount of time that must pass before FDI may contribute to GDP within the context of a partial equilibrium framework.

TABLE 2 RESULTS OF LAGGED REGRESSION MODELS

Time Lag (k)	b0	b1	SEb1	t b1	R	R2	Adj. R2	F-value	DW (d)
0	20345.34	32.62*	7.06	4.62	0.81	0.66	0.63	21.39*	0.50 PA
1	23524.42	33.42*	6.54	5.11	0.85	0.72	0.70	26.11*	0.68 PA
2	27583.61	34.22*	6.20	5.52	0.88	0.77	0.75	30.42*	0.85 IN
3	31818.67	34.91*	4.61	7.57	0.94	0.88	0.86	57.33*	1.22#
4	38218.39	35.06*	5.18	6.77	0.93	0.87	0.85	45.78*	0.50 PA

5	42907.57	43.83*	9.80	4.47	0.88	0.77	0.73	19.99*	0.64 IN
6	48515.31	54.50**	20.80	2.62	0.76	0.58	0.49	6.87**	0.78 IN
7	28953.37	167.51ns	97.95	1.71	0.65	0.42	0.28	2.93ns	0.86 IN
8	58660.40	80.53ns	219.16	0.37	0.21	0.04	-0.28	0.14ns	0.45

Table 2 investigates the outcomes of several lagged regression models, which is focused on this particular direction. The OLS approach was utilized in order to appropriately fit the estimators of the parameters of the lag models. There is a presentation of the estimated values of the regression coefficient (b1) together with its standard error (SEb1), the coefficients of correlation (R), the coefficients of determination (R2 and modified R2), as well as the statistics of t, F, and Durbin-Watson (DW or d).

The regression coefficient, denoted by the letter b1, is a metric that gauges the extent to which the independent variable (FDI) is able to accurately predict the dependent variable (GDP). The value of the regression coefficient (b1) goes up from 32.62 to 167.51 as k grows from 0 to 7, but it goes down to 80.53 when k is equal to 8. This is evident from the data presented in table 2. The t-statistic value reaches its maximum level (t=7.57) when k is equal to three, and then it begins to decrease until it reaches its lowest level (0.37) when k is equal to eight. The estimated regression coefficient from models with a time lag of 0 to 5 years is statistically significant at a level of significance that is less than 1 percent. On the other hand, the regression coefficient in the case of k=6 is statistically significant at a level of significance that is 5 percent. Therefore, foreign direct investment is a significant variable that has an effect on GDP, every time lag except for k=7 and k=8. However, only when k equals three does foreign direct investment have the biggest impact on GDP. On the other hand, when considering the Standard error of regression coefficient, which provides an indicator of the degree to which the predicted value of b1 is likely to differ from the corresponding population parameter, the model that has the lowest standard error is considered to be the most accurate. Table 2 shows that SEb1 is dropping until k equals three, and then it begins to increase after that. When k equals three, the standard error is found to be the lowest (4.61), which indicates that the model with a lag of three is the most accurate.

In a similar manner, the correlation coefficient (R) is utilized in order to evaluate the degree of linearity that exists between foreign direct investment and gross domestic product. In light of the fact that there is just one dependent variable (GDP) and one independent variable (FDI), the correlation between the two is a straightforward bivariate correlation among them. The value of the correlation coefficient (R) in table 2 grows as k increases from 0 to 3, and it reaches its greatest value (R=0.94) when k equals 3. When the time lag is more than three, the value of R continues to decrease, and it reaches its lowest point (R=0.21) when k equals eight. At a time lag of three years, the strength of the link between gross domestic product and foreign direct investment is at its peak.

In addition, in order to determine the considerable time lag on the basis of the goodness of fit of the models, R2 and modified R2 are utilized. These metrics show the number of fluctuations in GDP that can be attributed to foreign direct investment (FDI). Both R2 and adjusted R2 continue to increase until k equals 3, at which point they reach their greatest values of 0.88 and 0.86, respectively on the scale. If this is the case, then foreign direct

investment is able to account for 86% of the changes in GDP. Therefore, it is possible to assert that the model with a time lag of three years is the one that fits the data the best, and consequently, the greatest influence of foreign direct investment (FDI) on GDP occurs after three years. The F-statistic is also used to evaluate the overall importance of the models in addition to this feature. The value of the F-statistic rises at the beginning of the process and reaches its greatest level ($F=57.33$) when $k=3$ is equal to 3. On the other hand, it begins to decrease after $k=3$, and it reaches its lowest point ($F=0.14$) by $k=8$. The results of this investigation demonstrate that regression models are significant for time delays ranging from 0 to 6 years, but that after that point, they achieve no statistical significance. Regardless of the values of the F-statistics, the level of significance is at its maximum when k equals three.

Last but not least, the Durbin-Watson statistic is computed in order to determine whether or not the error terms are autocorrelated. This is done since the best prediction using regression coefficients will be feasible if the model is free from autocorrelation. The requirements that must be met in order to successfully validate autocorrelation and non-autocorrelation in any regression model. Durbin and Watson have previously specified these conditions. The DW (d) statistic is always found to fall within the range of 0 to 4, as seen in the image. Additionally, higher (dU) and lower (dL) boundaries are defined for important DW values. These limitations are established also. When a model is autocorrelated, it can adopt two positions: positive autocorrelation and negative autocorrelation. Both of these possible positions are described here. In cases when the value of d statistics is within the range of 0 to the lower bound dL , the error terms exhibit a positive autocorrelation. Conversely, when the value of d sits between $4-dL$ and 4, ($4-dL < d < 4$), the error terms exhibit a negative autocorrelation. If the value of d that was determined falls anywhere between dL and dU or between $4-dU$ and $4-dL$, then the test is considered to be inconclusive. In addition, if the value of dU is less than or equal to four times the value of dL , this indicates that the error terms do not exhibit autocorrelation, or, to put it another way, the model is devoid of autocorrelation.

CONCLUSION

To sum up, foreign direct investment (FDI) has been crucial in influencing India's technical environment and promoting economic expansion. However, to fully use FDI, a complete strategy that tackles obstacles and takes advantage of possibilities is needed to guarantee equitable and sustainable growth. In the age of globalization, every economy must increase exports while decreasing imports in order to maintain a positive balance of payments. Nonetheless, there is a huge need for foreign money to support advanced management, international competency, enhanced technical collaboration, and economic development. In developing economies like India, individuals generally spend their salaries on necessities and save little of their savings. More capital contributions from other nations are needed to close the economic imbalance between investment and saving. However, foreign capital is beginning to enter the Indian economy in the form of direct and portfolio investments.

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