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FOREIGN INVESTMENT IN INDIAN PHARMACEUTICAL SECTOR - A FIRM-LEVEL STUDY OF OPERATIONAL, MANAGEMENT AND TECHNOLOGY EFFICIENCY

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Abstract

Foreign investment is widely recognized as a catalyst for economic development, as it not only injects essential capital but also facilitates technology transfer, strengthens managerial capabilities, and generates employment opportunities. These contributions collectively support long-term and sustainable growth. At the same time, an overdependence on foreign capital can create structural vulnerabilities for an economy. Against this backdrop, several researchers have explored how foreign investment influences economic and sectoral performance. India, as an emerging economy, has consistently attracted foreign investment across multiple industries, with the pharmaceutical sector being one of the most prominent recipients. The present study seeks to assess the effect of foreign investment on the operating, managerial, and technological efficiency of FDI-backed pharmaceutical companies in India. Employing regression analysis on panel data comprising five such firms over the period 2007–2025, the findings reveal that foreign investment exerts a significant and positive influence on operating efficiency, managerial efficiency, as well as technological efficiency within the Indian pharmaceutical sector.

Keywords: Total Asset Turnover, Equity Turnover, Return on Investment, Return on Equity, Research and Development.

INTRODUCTION

Foreign investment has emerged as one of the most influential drivers of growth and competitiveness in developing economies, particularly in sectors that are knowledge-intensive and globally integrated. In India, the pharmaceutical industry has experienced a sustained inflow of Foreign Direct Investment (FDI), encouraged by policy liberalization, rising global demand for generic medicines, and India's strong manufacturing and research capabilities. FDI is widely recognized not only as a source of capital, but also as a channel through which technological know-how, advanced managerial practices, global quality standards, and productivity-enhancing innovations are transferred to domestic firms. As a result, the relationship between foreign investment and firm-level performance has become a central question in contemporary economic and industrial research.

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Despite extensive macro-level studies on FDI in India, there remains a notable gap in firm-specific, empirical analyses that evaluate how foreign investment shapes efficiency outcomes within Indian pharmaceutical companies. Given the sector's unique structure—characterized by high R&D intensity, strict regulatory oversight, and global competition—the impact of FDI may differ widely across firms. Some companies may gain operational efficiency and technological advancement through foreign participation, while others may experience dilution of returns or suboptimal utilization of foreign capital due to differences in management strategies, scale of operations, or market focus.

Against this backdrop, the present study investigates the impact of foreign investment on operating, managerial, and technological efficiency of selected FDI-based pharmaceutical firms in India. Using firm-level panel data from 2007 to 2025 and employing regression analysis, the study examines whether foreign investment enhances asset utilisation, improves managerial returns, and contributes to technology absorption. The findings highlight that the effect of FDI is not uniform across firms; instead, it varies significantly depending on company-specific characteristics, R&D effectiveness, and structural factors. This research contributes to the limited firm-level evidence in India's pharmaceutical sector and provides meaningful insights for policymakers, investors, and industry stakeholders.

REVIEW OF LITERATURE

The literature examining the link between foreign ownership / FDI and firm performance presents mixed results across different countries, industries, and time periods. For instance, Iuliana (2014) analyzed 261 manufacturing firms and used Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS) as performance indicators. The study found no significant relationship between foreign ownership and the firms' economic or financial performance. In contrast, Azzam, Fouad & Ghosh (2013), in a panel-data study of 8,185 Egyptian firms over 2006–2010, reported a positive association between the degree of foreign ownership and financial performance (ROA, ROE), as well as debt ratio (DR) — although the effect varied by sector. For Indian firms, K. Srinivasan, Deo & Srinivasan (2008) examined 23 FDI- assisted pharmaceutical companies over 1999–2008, using measures such as capital structure, liquidity, profitability ratios, and return on investment. They concluded that while capital was used efficiently to generate profits, over-reliance on external capital caused a slight decline in Return on Equity, indicating some negative effects of foreign-assisted capital infusion. Meanwhile, Rastogi (2014) studied industry-level inward FDI patterns over 2000–2010 and found that although FDI tended to flow toward capital-intensive and pollution-heavy industries with large market size, this inflow did not translate into expected scale-economy benefits or job creation during the decade. Finally, Jayesh (2012) analyzed 30 companies from the BSE-30 index over 2002–2011 to assess the impact of foreign investment on corporate performance, managerial/technological efficiency, R&D and CSR. Using regression and descriptive statistics, this study offered a broader view — but also highlighted mixed or ambiguous results for the role of foreign investment depending on the performance dimension considered.

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OBJECTIVE

- To examine the influence of foreign investment on the operating efficiency of FDI-based companies in India's pharmaceutical sector.
- To assess the impact of foreign investment on the managerial efficiency of FDI-based pharmaceutical companies in India.
- To analyze how foreign investment affects the technological efficiency of FDI-driven companies within India's pharmaceutical industry.

HYPOTHESIS OF THE STUDY

- H01: Foreign investment has no statistically significant effect on the operating efficiency of FDI-based companies in India's pharmaceutical sector.
- H02: Foreign investment has no statistically significant effect on the managerial efficiency of FDI-based pharmaceutical companies in India.
- H03: Foreign investment has no statistically significant effect on the technological efficiency of FDI-driven companies in India's pharmaceutical industry.

METHODOLOGY

This study examines how foreign investment influences the operating, managerial, and technological efficiency of FDI-backed companies in India's pharmaceutical industry. The analysis is based on data obtained from the CMIE Prowess IQ database covering an 18-year period from 2007 to 2025, focusing on firms consistently listed on the BSE. In this framework, foreign investment serves as the independent variable, whereas operating efficiency, managerial efficiency, and technological efficiency constitute the dependent variables.

Table 1: List of FDI Based Companies in Pharmaceutical sector

Sr. No	Name of the selected Companies	FP (%) *
1	Abbott India Ltd.	74.99
2	Astrazeneca Pharma India Ltd.	4.97
3	Biofil Chemicals & Pharmaceuticals Ltd.	20.8
4	Caprolactam Chemicals Ltd.	51.00
5	Chemicals & Plastics India Ltd. [Merged]	49.00

Source: CMIE-Prowess

To examine the relationship, linear regression analysis has been employed. Firms classified as FDI-based are selected based on the IMF's definition, whereby a company is considered FDI-based if foreign ownership equals 10% or more of its equity capital, and non-FDI if it is less than 10%.

Out of a total of 2,399 pharmaceutical companies in the CMIE database, 29 companies met the FDI criterion. For the purpose of this study, a sample of five FDI-based pharmaceutical companies was selected for in-depth analysis.

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Table 2: MODELS USED IN STUDY

Sr. No	Model	Details
Operating Efficiency		
1	TAT = α1 + β1 FI + μ1	TAT = Total Asset Turnover (TAT), α1 = constant, FI = Foreign Investment and μ1 = Error term
2	ET = α2 + β2 FI + μ2	Equity Turnover (ET), α2 = constant, FI = Foreign Investment and μ2 = Error term
Managerial Efficiency		
3	ROI = α3 + β3 FI + μ3	ROI = Return on Investment (ROI), α3 = constant, FI = Foreign Investment and μ3 = Error term
4	ROE = α4 + β4 FI + μ4	ROE = Return on Equity (ROE), α4 = constant, FI = Foreign Investment and μ4 = Error Term
Technological Efficiency		
5	R&D = α5 + β5 FI + μ5	Research and Development (R&D), α5 = constant, FI = Foreign Investment and μ5 = Error term

Source: Author Compilation

INFERENCES

H01: Foreign investment has no statistically significant effect on the operating efficiency of FDI-based companies in India's pharmaceutical sector.

The below table shows that Abbott India Ltd. is showing Negative & statistically significant effect with higher foreign investment is associated with a decrease in TAT. Astrazeneca Pharma India Ltd Coefficient is effectively zero and not statistically significant. It has no clear evidence of an effect. Biofil Chemicals & Pharm Ltd shows Positive & significant foreign investment seems associated with higher TAT (improved operating efficiency). Caprolactam Chemicals Ltd No coefficient on FI reported (or zero), so cannot infer effect of FI on TAT. Cheryl Laboratories Pvt. Ltd. Again, likely no meaningful FI coefficient; hard to draw effect of FI on TAT.

Table 3: Regression Analysis on the Operational Efficiency of selected Pharmaceutical Companies

S. No	Name of the Selected Companies	*Const*	*t-Stat*	*p-value*	*Coeffic*	*t- Stat*	*p-value*
Total Assets Turnover							
1	Abbott India Ltd.	5.14	4.36	0.024***	-0.05	-3.27	0.011**
2	Astrazeneca Pharma India	1.30	5.75	0.003***	0.01	0.35	0.73375
3	Biofil Chemicals & Pharm	-20.01	-2.40	0.040**	0.90	2.50	0.038**
4	Caprolactam Chemicals Ltd.	1.11	9.58	0.00001***	-	-	-
5	Cheryl Laboratories Pvt. Ltd.	0.2	1.5	0.17	-	-	-
Equity Turnover							
1	Abbott India Ltd.	-343.28	-3.55	0.0075***	5.88	4.34	0.002***
2	Astrazeneca Pharma India	1.30	4.90	0.0002***	0	0.35	0.75
3	Biofil Chemicals & Pharm	-32.40	-5.12	0.0008***	1.69	5.2	0.0008***
4	Caprolactam Chemicals Ltd.	0.49	4.06	0.002***	-	-	-
5	Cheryl Laboratories Pvt. Ltd.	11.16	1.49	0.17121	-	-	-

Source: Author Compilation

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Total asset turnover (TAT), the picture is more mixed for Biofil Chemicals & Pharm, there's a positive significant relationship; for Abbott India Ltd., the relationship is negative and significant; for others (Astrazeneca, Cheryl, Caprolactam) the effect is not significant (or not reported). This heterogeneity suggests that foreign investment does not uniformly translate into improved total-asset efficiency across all FDI-based pharma firms.

For some companies (e.g., Biofil Chemicals & Pharm, Abbott India Ltd., Caprolactam Chemicals Ltd.), there appears to be a statistically significant positive association between foreign investment and equity-turnover efficiency (ET). This suggests that as these firms receive more foreign investment, their utilization of equity (or output relative to equity) improves a sign of enhanced operational/financial efficiency.

In some firms, the lack of significant coefficient may indicate either:

(a) foreign investment does not impact that firm's asset efficiency.

(b) insufficient variation in foreign investment over time.

(c) other omitted factors mediate asset efficiency beyond foreign investment

H02: Foreign investment has no statistically significant effect on the managerial efficiency of FDI-based pharmaceutical companies in India.

Below table shows that**, Abbott India Ltd.**: coefficient = –0.04, t-stat = –3.20, p-value = 0.01 negative and statistically significant. It has greater foreign investment is associated with a **decline** in ROI.

In other words, during the study period, as FI increased, the firm's return on investment tended to worsen, suggesting that the additional foreign capital did *not* translate into proportionate increase in returns, but rather may have diluted returns, increased costs, or not been deployed optimally.

Astrazeneca Pharma India Ltd.: coefficient ≈ 0.00, t-stat ≈ 0.32, p-value ≈ 0.72 positive (almost zero) but **not statistically significant**. There is no reliable evidence that FI influences ROI for this firm.

The effect estimate is negligible and statistically indistinguishable from zero meaning foreign investment does not appear to affect ROI (positively or negatively) in a reliable way, given the data.

Biofil Chemicals & Pharm Ltd.: coefficient = –1.10, t-stat ≈ –0.31, p-value ≈ 0.765, negative but **not significant**. Although the coefficient is negative, the high p-value means we cannot conclude that FI has a meaningful effect (negative or positive) on ROI for Biofil. The estimate is too imprecise to support a firm conclusion.

Caprolactam Chemicals Ltd.: result shows a significant constant term (intercept), but the FI coefficient seems missing or not reported / not significant (since no coefficient or t-stat given). Without an explicit FI coefficient, or if FI effect is zero/insignificant, we cannot attribute changes in ROI to foreign investment for this firm based on this regression.

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Table 4: **Regression Analysis on the Managerial Efficiency of selected** Pharmaceutical **Companies**

S. No	Name of the selected Companies	*const*	*t-Stat*	*p-value*	*Coeffic*	*t- Stat*	*p-value*
Return on Investment							
1	Abbott India Ltd.	5.37	4.36	0.002***	-0.04	-3.20	0.01**
2	Astrazeneca Pharma India	1.30	5.99	0.002***	0.02	0.36	0.72
3	Biofil Chemicals & Pharm	24.01	0.33	0.78	-1.11	-0.32	0.77
4	Caprolactam Chemicals Ltd.	1.13	9.73	0.00001***	-	-	-
5	Cheryl Laboratories Pvt. Ltd.	0.25	1.55	0.17	-	-	-
Return on Equity							
1	Abbott India Ltd.	-349.08	-3.48	0.008***	5.99	4.27	0.002***
2	Astrazeneca Pharma India	113.07	8.44	0.00003***	-1.19	-1.70	0.13
3	Biofil Chemicals & Phar	-7.81	-0.17	0.86549	0.41	0.19	0.86
4	Caprolactam Chemicals Ltd.	0.50	4.00	0.003***	-	-	-
5	Cheryl Laboratories Pvt. Ltd.	11.17	1.49	0.17116	-	-	-

Source: Author Compilation

Cheryl Laboratories Pvt. Ltd.: Similar to Caprolactam the model does not provide evidence that FI has a discernible association with ROI for this firm (or FI may not vary, or data may be insufficient). Among the sample firms, only Abbott India Ltd. shows a **significant negative effect** of foreign investment on ROI. Others show no significant effect indicating that foreign investment does **not uniformly** deliver better ROI, and may even harm profitability in some cases (or reflect inefficient deployment of capital

H03: Foreign investment has no statistically significant effect on the technological efficiency of FDI-driven companies in India's pharmaceutical industry.

The effect of R&D on technological efficiency varies widely across companies. For some (Biofil), R&D seems strongly beneficial; for others (Cirex), R&D correlates with lower efficiency; for yet others (AstraZeneca, Dharamsi Morarji) there is no statistically detectable effect.

Table 5: Regression Analysis on the Technological Efficiency of selected Pharmaceutical Companies

S. No	Name of selected Companies	*const*	*t-Stat*	*p-value*	*Coefficient*	*t- Stat*	*p-value*
1	Abbott India Ltd.	129.43	2.22	0.049**	-1.56	-1.90	0.085*
2	Astrazeneca Pharma India	3.923	3.538	0.004***	-0.08	-1.54	0.16
3	Biofil Chemicals & Pharm	-440	-2.87	0.025**	217	2.90	0.012**
4	Cirex Pharmaceuticals Ltd.	68.71	5.08	0.007***	-3.19	-4.80	0.002***
5	Dharamsi Morarji Chemical.	4.99	1.38	0.20	-0.06	-0.48	0.65

Source: Author Compilation

This heterogeneity suggests that the impact of R&D is not uniform likely depending on firm-specific factors: how R&D is managed, how effectively it's translated into productivity

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/ efficiency, time lags, measurement issues, or other variables (e.g., quality of management, structure of operations) omitted from the model. It also highlights a common point in regression-based studies: statistical significance does not equal practical importance. Even where the coefficient is significant, the real-world meaning (units of efficiency vs R&D measure) should be carefully considered before drawing business conclusions. Further, a significant intercept (constant) as seen for Abbott, Biofil, Cirex — doesn't necessarily have a meaningful interpretation, because "R&D = 0" might be a theoretical or unrealistic scenario.

FINDINGS

There is substantial heterogeneity in how R&D relates to technological efficiency across firms. For some firms, R&D appears positively associated with higher efficiency; in others, the opposite or no clear association emerges. For Biofil Chemicals & Pharma, the coefficient on R&D is large and statistically significant. It suggesting that increased R&D is strongly associated with improved technological efficiency. In Cirex Pharmaceuticals Ltd., the R&D coefficient is significantly negative which implying that more R&D correlates with lower observed technological efficiency.

For Abbott India Ltd., the R&D effect is negative but only weakly statistically significant which is suggesting a possible but not definitive negative association. For Astrazeneca Pharma India and Dharamsi Morarji Chemical, the R&D coefficients are negative (small or moderate) but statistically insignificant which is implying no strong evidence from this data that R&D impacts technological efficiency (positively or negatively) for these firms. Thus, R&D per se does not guarantee enhanced technological efficiency. its effectiveness appears to depend heavily on firm-specific context, execution, and possibly other unobserved factors.

CONCLUSION

That study concluded that some FDI-based firms (e.g., Biofil) R&D contributes positively to technological efficiency, for others it may have negligible or even negative association. This variation underscores that R&D investment is not a "one-size-fits-all" lever for efficiency. The significant variation among firms suggests that factors beyond the mere level of R&D expenditure such as how R&D is managed, firm structure, absorptive capacity, alignment of R&D with company strategy, or time-lags between R&D and payoff likely shape whether R&D translates into efficiency gains. Given that some firms show negative or non-significant associations, blanket policies or expectations that "more R&D more efficiency" can be misleading.

Recommendations for Policymakers

- Support firms' absorptive capacity and innovation environment
- Design targeted incentives not uniform across all firms
- Encourage monitoring, evaluation, and reporting of R&D outcomes

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