Patterns and Disparities in R&D Expenditure: A Study on Select Listed Indian Domestic and Multinational Pharmaceutical Companies

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ABSTRACT

This study investigates the patterns and disparities in Research and Development (R&D) expenditure between selected listed Indian domestic and multinational pharmaceutical companies over a ten-year period from 2013-14 to 2022-23. The analysis distinguishes between capital R&D expenditure, representing long-term infrastructure and asset creation, and revenue (current) R&D expenditure, encompassing recurring operational research costs. Using data from company annual reports and the CMIE Prowess database, the study applies Compound Annual Growth Rate (CAGR), coefficient of variation, index construction (base year 2013-14 = 100), and independent two-sample t-tests with unequal variances to assess both trends and statistical differences between the two groups.

The findings reveal that Indian multinational pharmaceutical companies (MNCs) consistently recorded significantly higher R&D investments than their domestic counterparts across both capital and revenue categories. MNCs exhibited a 7.17% CAGR in capital R&D expenditure, while domestic firms achieved 3.45%. In contrast, domestic companies demonstrated slightly higher growth in revenue R&D expenditure (12.54%) compared to MNCs (10.71%), although the absolute values remained much lower. T-test results confirmed statistically significant differences in most years, with only 2020-21 showing convergence due to pandemic-related disruptions. The overall pattern underscores the persistent R&D intensity gap between MNCs and domestic firms, driven by differences in resource availability, innovation strategies, and global integration. The study concludes that while Indian firms are gradually improving their R&D capabilities, achieving global competitiveness requires balanced growth in both capital and current R&D expenditure, greater collaboration, and enhanced policy support for innovation-led research.

Keywords

Capital R&D expenditure, MNCs, Pharmaceutical, Revenue R&D expenditure

INTRODUCTION

Research and Development (R&D) expenditure is a crucial investment for companies in the pharmaceutical industry. It plays an essential role in long-term sustainability by helping these companies gain a competitive advantage over their rivals. Therefore, it is important for pharmaceutical firms to strategically allocate resources toward R&D activities to promote growth and ensure their long-term survival. There is a strong relationship between the research and development (R&D) expenditure of pharmaceutical firms and their ability to deliver innovative drugs while maintaining a competitive advantage in the market.

Over the decade spanning 2014 to 2023, Indian pharmaceutical companies have exhibited varied trends in R&D spending. Notably, while some firms have increased their R&D investments to develop complex generics and specialty drugs, others have maintained or even reduced their R&D budgets relative to sales (IBEF, 2023).

Indian pharmaceutical companies still lag behind their global counterparts in terms of R&D intensity and innovation outputs. Reports indicate that global firms outperform Indian companies by a factor of three in R&D intensity and produce significantly more patents and publications per billion USD of revenue (*Economic Times, 2024*).

In financial and strategic analysis, research and development (R&D) expenditures are typically categorized into two primary types: revenue expenditures and capital expenditures. (*OECD, 2015; IASB, 2022*).

- ***Revenue R&D expenditure:*** Revenue R&D expenditure, also referred to as current expenditure, comprises recurring costs necessary for the daily functioning of research activities but do not lead to the creation of long-term assets. These include employee salaries, utility costs, consumables, and routine maintenance, and are expensed immediately in the income statement.
- ***Capital R&D expenditure:*** In contrast, capital R&D expenditure includes expenses that lead to the acquisition or significant improvement of assets intended for long-term use in R&D processes, such as buildings, specialized equipment, or software. These expenditures are recorded as assets on the balance sheet and are depreciated over time. Understanding the difference between these two types of expenditures is essential for accurate financial reporting and tax treatment. It also offers insights into an organization's investment strategy whether it focuses on short-term operational capabilities or long-term innovative infrastructure.

LITERATURE REVIEW

Research and development (R&D) expenditure is widely recognized as a primary engine of long-term competitiveness in the pharmaceutical sector, linking investment to new drug discovery, product pipelines and market leadership (DiMasi, Grabowski, & Hansen, 2016). Empirical studies show that higher R&D intensity is strongly associated with firms' innovative outputs and valuation over time. This connection makes the measurement and classification of R&D spending (capital vs revenue) particularly consequential for both

managers and policymakers. The distinction between capital R&D (long-lived assets like specialized equipment and buildings) and revenue (current) R&D (daily research operations such as lab consumables and salaries) is fundamental for financial reporting and economic analysis; authoritative guidance such as the OECD Frascati Manual and accounting standards emphasize different treatment and implications for performance measurement (OECD, 2015; IASB, 2004). How firms allocate between these categories affects reported profitability, tax treatment and interpretation of innovation strategies. Pal and Nandy (2019) provide empirical evidence from 37 Indian pharmaceutical firms that R&D intensity is positively associated with financial performance measures like ROA and ROE, supporting the view that investment in R&D yields returns for firms. Moreover, in their model they find that capital intensity and operating expenditure also exert positive effects, indicating that both capital (e.g. fixed assets, infrastructure) and recurring expenditures are relevant for value creation. Sectoral analyses highlight that the pharmaceutical industry is capital-intensive by nature, with substantial outlays required to maintain laboratory infrastructure and clinical trial capabilities; nevertheless, recurring operational expenditures (clinical staff, trial costs) typically form a large share of annual R&D budgets (DiMasi et al., 2016). This pattern explains why cross-firm comparisons must control for company scale and the stage of product pipelines when interpreting capital vs revenue R&D shares. Evidence from sectoral innovation studies indicates that R&D spending profiles (capital vs revenue) differ by strategic emphasis: firms pursuing radical innovation invest relatively more in capital assets and platform technologies, whereas firms focused on process or incremental product improvements channel more into current R&D (Pavitt, 1984). This conceptual distinction maps onto observed heterogeneity within Indian pharma between specialty/innovator arms and generic manufacturers. Collaboration between industry, academia and contract research organizations (CROs) has become an important pathway for sharing both capital and recurrent R&D burdens; open innovation approaches allow firms to outsource parts of discovery or trials, reducing the need for heavy capital investment while maintaining pipeline momentum (Chesbrough, 2003). For emerging-market firms, such collaborations can be a pragmatic route to increase revenue R&D activity without parallel heavy capital expenditures. Firm strategy literature underscores that R&D allocation is as much managerial as it is financial: corporate decisions whether to prioritize rapid product launches, pipeline breadth or platform investments shape whether a firm's R&D takes a capital or current orientation (Chesbrough, 2003). Observed heterogeneity among Indian firms therefore reflects diverse strategic choices, not only resource constraints.

OBJECTIVES

The objectives of the paper are:

1. To provide a comprehensive overview of the trends in capital and revenue R&D expenditure among selected Indian domestic and multinational pharmaceutical companies over the period from 2014 to 2023.

2. To examine whether the difference between the capital and revenue expenditure of the Indian domestic and Indian Multinational Pharmaceutical Companies is statistically significant.

RESEARCH METHODOLOGY

For the purpose of the study, top 42 listed Indian Domestic Pharmaceutical companies and top 34 listed Indian Multinational Pharmaceutical companies have been selected based on their market capitalization. The data has been taken for a period of 10 years starting from 2013-14 to 2022-23. The data has been taken from annual report of the select companies and Prowess database by CIME. To provide a comprehensive overview of the trends in capital and revenue R&D expenditure, this analysis employs Compound Annual Growth Rate (CAGR), index construction with 2013-14 as the base year, and the coefficient of variation. For visual representation, both graphs and line charts are utilized. To determine whether a statistically significant difference exists in capital and revenue R&D expenditure between the two groups of sample companies, an independent two-sample t-test with unequal variances is applied.

RESULTS & DISCUSSION

Trend of Capital and Current R&D Expenditure of Select Listed Indian Domestic and Multinational Pharmaceutical Companies

In this section, the trend of capital and revenue R&D expenditure has been depicted for both categories of samples i.e., Indian Multinational and Indian Domestic Pharmaceutical Companies.

Table 1: Trend of Capital R&D Expenditure of Select Listed Indian Domestic and Multinational Pharmaceutical Companies (Rs. in Million)

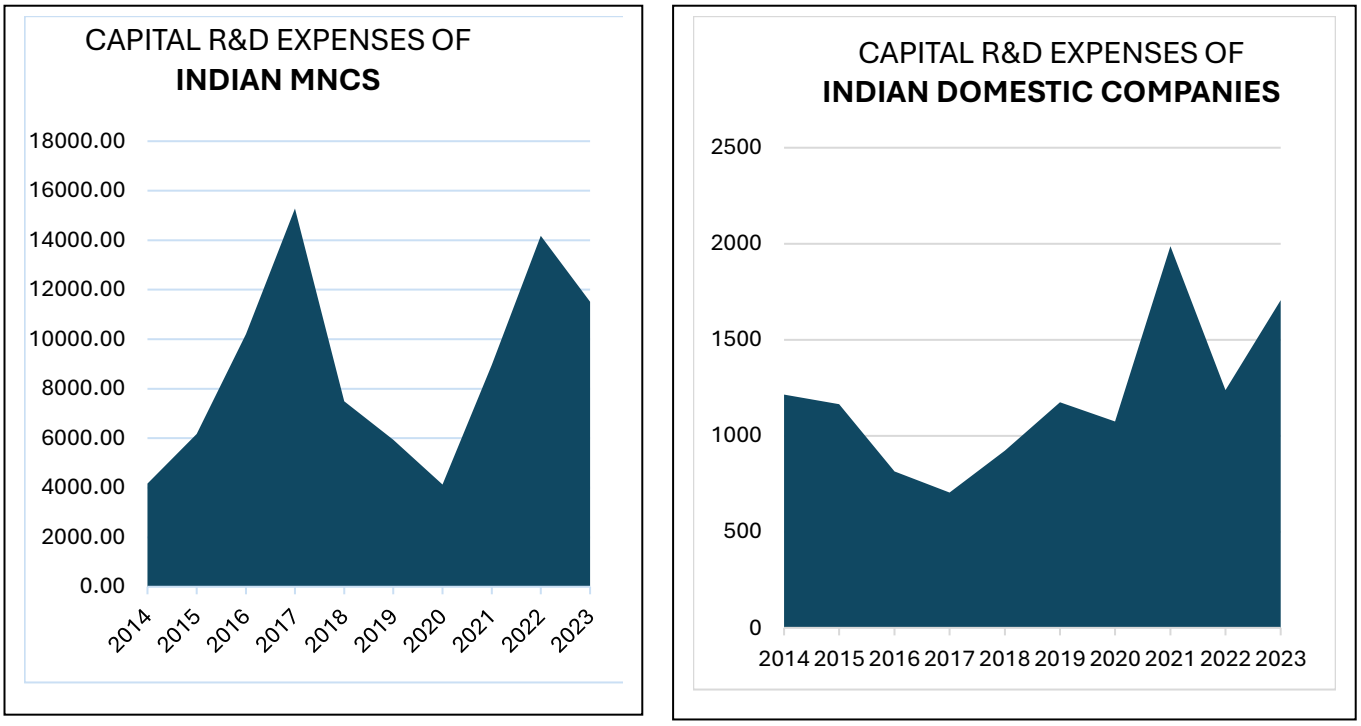
	Capital R&D	
Year	**Indian Domestic Cos.**	**Indian MNCs**
2014	1215.4	50,031.71
2015	1164.3	63,130.56
2016	814.5	76,876.87
2017	704.3	92,889.27
2018	922.6	85,187.07
2019	1174.5	86,630.4
2020	1074	88,713.5
2021	1987.3	95,673.53
2022	1238.4	98,201.45
2023	1705.5	99,954

CAGR	3.45%	7.17%
Average	1200.08	83,728.84
Co-efficient of variation	32.46%	19.26%

Source: Compiled by authors

The above table shows in last 10 years, 42 Indian Domestic Pharmaceutical Companies have spent on an average Rs. 1200.08 million on Capital R&D, whereas 34 Indian Pharmaceutical MNCs spent Rs. 83,728.84 million on capital R&D, the same is approximately 70 times of what domestic pharmaceutical companies average spent. Indian Domestic Pharmaceutical Companies reported 3.45% compounded annual growth rate in capital R&D spending whereas Indian Pharmaceutical MNCs have reported 7.17% growth in Capital R&D spending over the last 10 years of study. Co-efficient of variation indicates comparatively higher variability in case of domestic pharmaceuticals.

Figure 1: Trend of Capital R&D Expenditure of Indian Multinational and Indian Domestic Pharmaceutical Companies over last 10 years from 2014 to 2023



Source: Compiled by authors

The data collected for the last 10 years (2014-2023) shows the capital R&D expenditures of 34 Indian Multinational Pharmaceutical Companies and 42 Domestic Pharmaceutical Companies. The highest capital R&D expenditure was observed in 2017, followed by a declining trend from 2018 to 2020. However, from 2021 onwards, there has been a rising trend in capital R&D expenditure. On the other hand, the Domestic Pharmaceutical Companies experienced a declining trend in capital R&D expenditure from 2014 to 2017, with

the lowest expenditure seen in 2017. However, from 2018 to 2021, there has been an increasing trend, with the highest capital R&D expenditure observed in 2021 i.e., during the covid pandemic year.

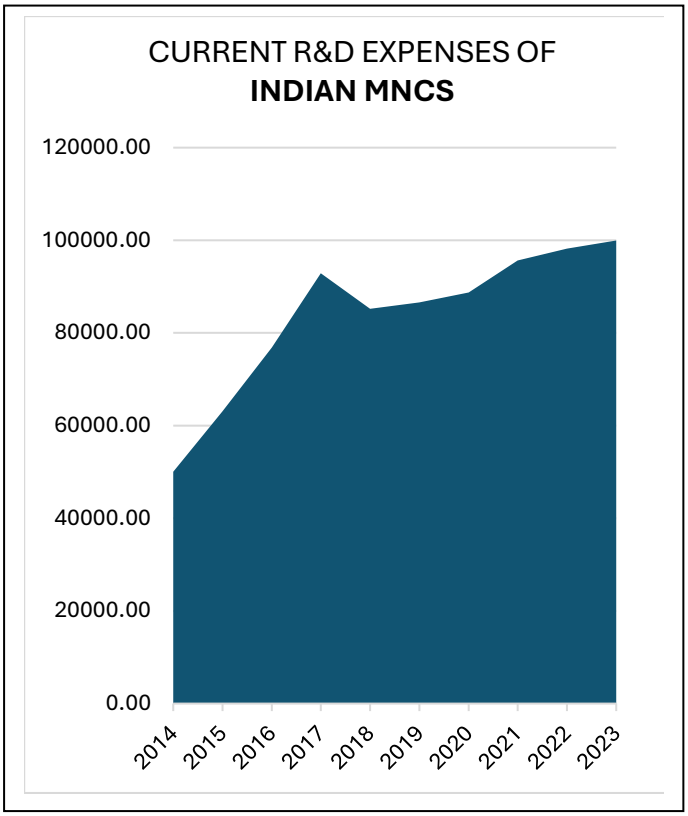
Table 2: Trend of Revenue R&D Expenditure of Select Listed Indian Domestic and Multinational Pharmaceutical Companies (Rs. in Million)

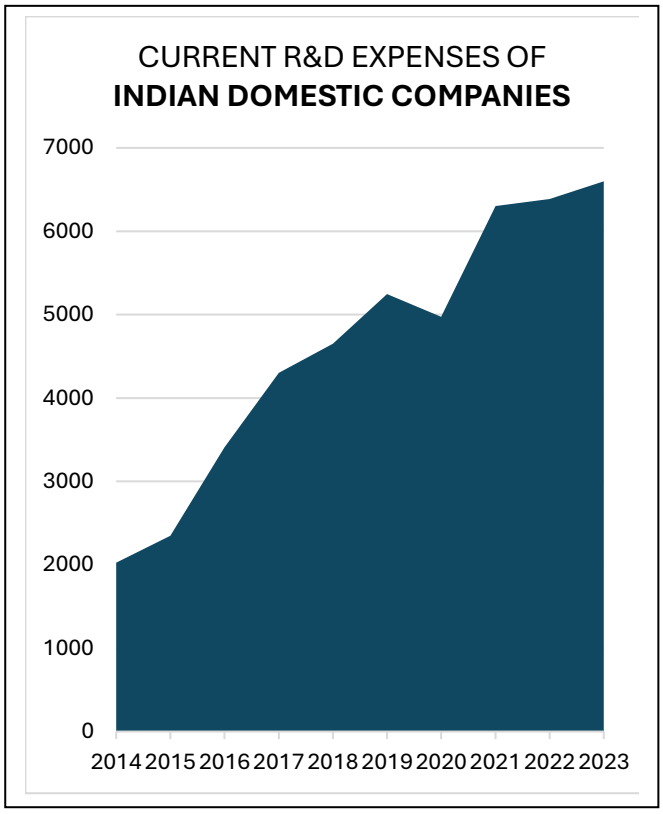
	Revenue R&D	
Year	**Indian Domestic Cos.**	**Indian MNCs**
2014	2025.6	4162.52
2015	2347.6	6177.51
2016	3407.5	10205.92
2017	4301.5	15280.36
2018	4650.6	7497.26
2019	5245.3	5940
2020	4975.8	4136.2
2021	6304.2	8962.01
2022	6387.6	14177.02
2023	6599.3	11518.34
CAGR	12.54%	10.71%
Average	4624.5	8805.72
Co-efficient of variation	35.21%	44.83%

Source: Compiled by authors

The above table shows in last 10 years, 42 sample Indian Domestic Pharmaceutical Companies have spent average Rs. 4624.5 million on Revenue R&D, whereas sample 34 Indian MNCs spent Rs. 8805.71 million on Revenue R&D, the same is approximately 2 times of what domestic pharmaceutical companies average spent. Indian Domestic Pharmaceutical Companies reported 12.45% compounded annual growth rate in Revenue R&D spending whereas Indian MNCs have reported 10.71% growth in Revenue R&D spending over the last 10 years of study. Co-efficient of variation indicates comparatively higher variability in revenue R&D spending in case of domestic pharmaceuticals.

Figure 2: Trend of Current R&D Expenditure of Indian Multinational and Indian Domestic Pharmaceutical Companies over last 10 years from 2014 to 2023:





Source: Compiled by authors

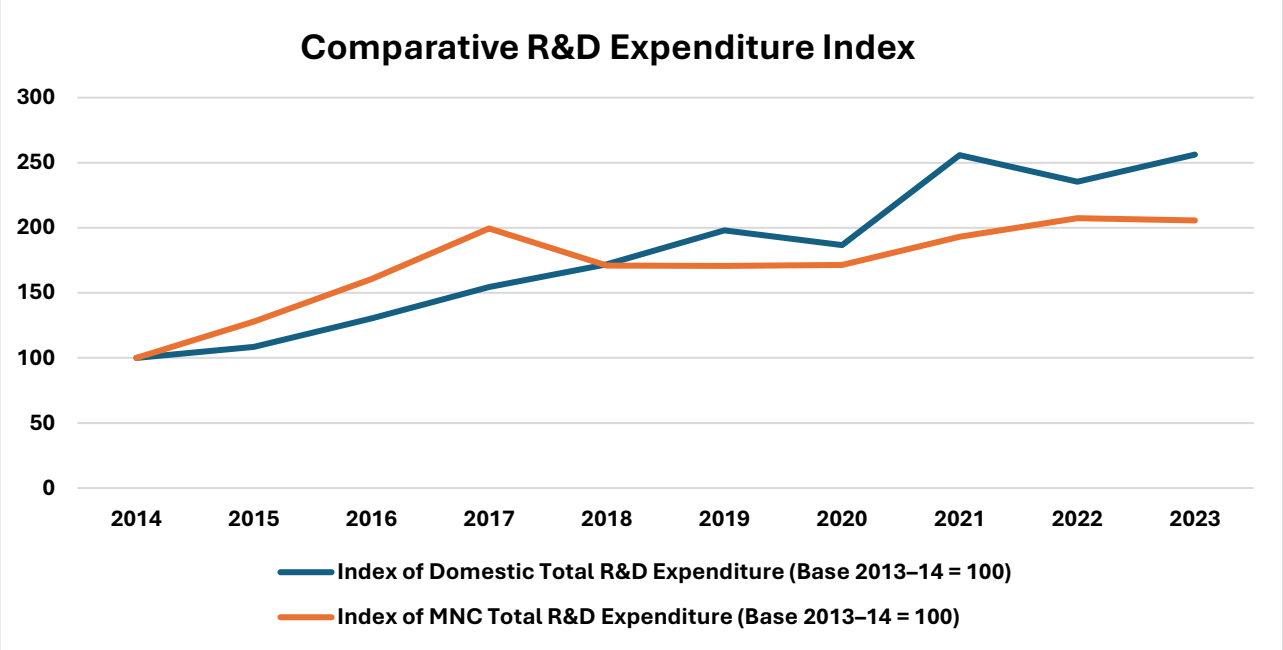
The data collected for the last 10 years (2014-2023) shows the revenue R&D expenditures of 34 Indian Multinational Pharmaceutical Companies and 42 Domestic Pharmaceutical Companies. In case of Indian Multinational Pharmaceutical Companies, it has been observed that from 2014 onwards there has been a sharp increase in the overall revenue R&D expenditure till 2017; whereas from 2017 onwards the increase has been at a comparatively slower pace. In case of Indian Domestic Pharmaceutical companies, there has been a sharp increase in the overall revenue R&D expenditure.

Table 3: Comparative R&D Expenditure Index for Domestic and MNC Firms (Base Year 2013-14 = 100) (Rs. In Million)

Year	Domestic Total R&D Expenditure	Index (Base 2013-14 = 100)	MNC Total R&D Expenditure	Index (Base 2013-14 = 100)
2014	3241	100	54,194.23	100
2015	3511.9	108.35	69,308.07	127.88
2016	4222	130.26	87,082.79	160.68
2017	5005.8	154.45	1,08,169.63	199.59
2018	5573.2	171.95	92,684.33	171.02
2019	6419.8	198.08	92,570.40	170.81
2020	6049.8	186.66	92,849.70	171.32
2021	8291.5	255.83	1,04,635.54	193.07
2022	7626	235.29	1,12,378.47	207.36
2023	8304.8	256.24	1,11,472.34	205.69

Source: Calculated by researchers

Figure 3: Line Chart showing the Comparative R&D Expenditure Index for Domestic and MNC Firms (Base Year 2013-14 = 100) (Rs. In Million)



Source: Calculated by researchers

The R&D expenditure index (base year 2013-14 = 100) shows a consistent upward trend for both domestic and multinational corporations (MNCs) during 2014-2023. Domestic total R&D expenditure increased from 100 to 256.24, indicating that spending more than doubled over the decade, reflecting stronger innovation efforts and policy support for indigenous research. In comparison, the MNC R&D index rose from 100 to 205.69, signifying substantial but relatively moderate growth. While MNC expenditure exhibited short-term fluctuations between 2018 and 2020, domestic R&D showed more resilience and steady expansion. The overall trend highlights a

gradual shift in India's R&D landscape, with domestic enterprises emerging as key contributors to the nation's innovation capacity.

Difference in Capital and Revenue R&D Expenditure between Indian Domestic and Indian Multinational Companies over a period of 10 years starting from 2013-14 to 2023-24

In order to assess the statistical significance of differences in capital expenditures between Indian domestic and multinational companies from 2013-14 to 2023-24, two-sample t-test with unequal variances have been employed.

Null Hypothesis (H_0): *There is no significant difference in **Capital R&D** expenditure between Indian Domestic and Indian Multinational Pharmaceutical companies for the ten years staring from 2013-14 to 2023-24.*

Alternative Hypothesis (H_1): *There is a significant difference in **Capital R&D** expenditure between Indian Domestic and Indian Multinational Pharmaceutical companies for the ten years staring from 2013-14 to 2023-24.*

Table 4: Table showing statistical differences in Capital R&D expenditure between Indian domestic and multinational pharmaceutical companies from 2013-14 to 2023-24 (Rs. In Million)

Year	Mean Value (Rs. in Million)		Calculated t-stat (*p-value*)	Accept/Reject of Null Hypothesis (H_0)
	Domestic (Sample Size = 42)	MNCs (Sample Size = 34)		
2013-14	28.93	122.42	2.73 (0.009) **	Reject
2014-15	27.72	181.69	2.79 (0.008)**	Reject
2015-16	19.39	300.17	2.84 (0.007)**	Reject
2016-17	16.76	449.42	2.32 (0.026)*	Reject
2017-18	21.96	220.50	3.27 (0.002)**	Reject
2018-19	27.96	174.70	3.54 (0.001)**	Reject
2019-20	25.57	121.65	2.89 (0.006)**	Reject
2020-21	47.31	263.58	1.41 (0.166)	Accept
2021-22	29.48	416.97	2.43 (0.020)*	Reject
2022-23	40.60	338.77	2.14 (0.039)*	Reject

*significant at 5% level, **significant at 1% level.

Source: Calculated by researchers

The results indicate that in most of the years during the study period, the calculated t-statistic is statistically significant at either the 1% or 5% level, leading to the rejection of the null hypothesis (H_0). This suggests that the R&D expenditure of multinational companies (MNCs) has been significantly higher than that of domestic firms in these years.

However, in 2020-21, the t-value (1.41; p = 0.166) is not statistically significant, leading to the acceptance of the null hypothesis, implying that during this particular year, no significant difference existed between the two groups' R&D expenditures. This could reflect the global economic disruption caused by the COVID-19 pandemic, which may have led to a temporary convergence in spending patterns between domestic and multinational firms.

Overall, the findings demonstrate a consistent and statistically significant disparity in R&D expenditure between Indian domestic and multinational pharmaceutical companies across the ten-year period, with MNCs maintaining a substantially higher level of R&D investment. The statistical evidence thus supports the conclusion that multinational companies dominate in R&D expenditure, reflecting their larger resource base, global operations, and greater emphasis on innovation-driven growth.

In order to assess the statistical significance of differences in Revenue R&D expenditures between Indian domestic and multinational companies from 2013-14 to 2023-24, two-sample t-test with unequal variances have been employed.

Null Hypothesis (H_0): *There is no significant difference in **Revenue R&D** spending between Indian Domestic and Indian Multinational Pharmaceutical companies for the ten years staring from 2013-14 to 2023-24.*

Alternative Hypothesis (H_1): *There is a significant difference in **Revenue R&D** spending between Indian Domestic and Indian Multinational Pharmaceutical companies for the ten years staring from 2013-14 to 2023-24.*

Table 5: Table showing statistical differences in Revenue R&D expenditure between Indian domestic and multinational pharmaceutical companies from 2013-14 to 2023-24 (Rs. In Million)

Year	Mean Value (Rs. in Million)		Calculated t-stat (*p-value*)	Accept/Reject of Null Hypothesis (H_0)
	`Domestic (Sample Size = 42)	MNCs (Sample Size = 34)		
2013-14	48.22	1471.52	3.41 (0.001)**	Reject
2014-15	55.89	1856.78	3.41 (0.001)	Reject
2015-16	81.13	1856.78	3.36 (0.001) **	Reject
2016-17	102.41	81.13	3.17 (0.003) **	Reject
2017-18	110.72	2505.50	3.59	Reject

			(0.001) **	
2018-19	124.88	2547.95	3.95 (0.000) **	Reject
2019-20	118.47	2609.22	3.89 (0.000) **	Reject
2020-21	150.1	2813.92	3.69 (0.000) **	Reject
2021-22	152.08	2888.27	3.61 (0.000) **	Reject
2022-23	157.12	2939.82	3.46 (0.001) **	Reject

*significant at 5% level, **significant at 1% level.

Source: Calculated by researchers

Across all ten years of the study, the t-statistics are found to be highly significant at the 1% level ($p < 0.01$), leading to the rejection of the null hypothesis (H_0) in every case. This clearly indicates that the mean revenue R&D expenditure of multinational companies (MNCs) is significantly higher than that of Indian domestic companies throughout the entire period.

The consistency of this result highlights a persistent and statistically significant disparity between the two groups. Multinational firms have invested substantially more in revenue-based R&D activities, reflecting their larger financial capacity, global market orientation, and focus on innovation-driven competitiveness. In contrast, Indian domestic pharmaceutical firms exhibit comparatively lower R&D intensity, possibly due to resource constraints, limited global reach, and reliance on generics production rather than innovation-led growth.

Overall, the findings demonstrate a strong and enduring gap in revenue R&D spending between multinational and domestic pharmaceutical companies in India, emphasizing the continued dominance of MNCs in innovation investment over the past decade.

CONCLUSION

The analysis of capital and revenue R&D expenditure of selected Indian domestic and multinational pharmaceutical companies between 2018-19 and 2022-23 reveals distinct investment patterns and strategic orientations. Multinational companies consistently recorded substantially higher overall R&D expenditure compared to Indian domestic companies. Their spending was more diversified, with a greater proportion directed toward capital R&D, reflecting long-term infrastructure building, advanced laboratory facilities, and technology acquisition. In contrast, Indian firms devoted a larger share to revenue or current R&D, focusing mainly on product development, bioequivalence studies, and incremental innovation supporting their generics-driven models.

A steady increase in total R&D expenditure was observed across most companies, although growth was more pronounced among multinationals. The year 2020-21, marked by the pandemic, saw a temporary shift as several domestic firms increased revenue R&D to support vaccine, diagnostic, and formulation research, while MNCs

maintained stable capital outlays. Post-pandemic recovery periods indicate renewed divergence, with MNCs scaling up capital investments faster.

Overall, the findings reaffirm that Indian firms are gradually enhancing their R&D intensity but remain constrained in large-scale, capital-intensive research. Strengthening collaborations, improving access to research finance, and leveraging government incentives for innovation will be crucial for bridging this gap. Achieving a balanced growth in both capital and current R&D expenditure will ultimately determine the sector's transition from process-oriented innovation to discovery-led global competitiveness.

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