



State of Industry R&D in India

An R&D investment and disclosure analysis of Indian and global firms in six key strategic sectors

Pharmaceuticals, Biotechnology and Life Sciences

> Foundation for Advancing Science and Technology India FAST India in collaboration with IIFL Securities

This brief builds upon the findings of the State of Industry R&D report that presented overall and sector-level findings for selected firms. The present brief provides a detailed examination of the Pharmaceuticals, Biotechnology and Life Sciences (hereinafter Pharmaceutical) Sector at the firm level, comparing the findings of Indian and Global firms. The continuity between these reports ensures a thorough understanding of macro and micro factors influencing R&D in Indian Pharmaceutical sector firms.

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Key takeaways

- Global firms outperformed Indian firms for Research and Development (R&D) intensity by **3.0x**. In proportion of PhD employees, Indian firms lag by a factor of **7.1x**.
 - Dr Reddy's Laboratories Limited (Dr. Reddy's) ranked first among Indian firms in both the input parameters. Zydus Life Sciences (Zydus Lifesciences) ranks first amongst low-revenue cluster of Indian firms for the parameters.
 - Global firms occupied the top 9 positions in R&D intensity and the top 7 in the proportion of PhD employees, with Indian firms lagging significantly.
- Global firms produced **5.6x** patents per USD Billion revenue and **8.4x** publications per USD Billion revenue as compared to Indian firms.
 - Biocon Limited (Biocon) ranks first in publications by revenue among Indian firms and third overall, showing an impressive performance.
 - Sun Pharmaceutical Industries Limited (Sun Pharma) ranks first in patents by revenue amongst Indian firms and third overall, with 636 patents per USD billion revenue and outranking many global and Indian firms.
 - Indian firms perform comparatively better in patents by revenue parameter than publications by revenue parameter, occupying four positions amongst top ten in patents by revenue. In publications by revenue parameter, only one Indian firm occupies the top ten position amongst all firms studied.

1.1 Introduction

The Pharmaceutical sector forms 1.72% of Indian Gross Domestic Product (GDP).¹ As of 2021, there were about 3000 pharmaceutical companies in India and over 10563 industrial units.² During liberalisation, the Indian government introduced various policy reforms to promote the sector.³ These reforms include amendments in the *Patents Act, 1970*, allowing Foreign Direct Investment (FDI) and Production Linked Incentives (PLIs). These government-directed policy reforms helped establish Indian firms as leading drug manufacturing companies globally. It ranks third in the world for the volume of drugs produced and has a 20% share of the global supply of generic drugs.⁴ Indian pharmaceutical industry exports, including bulk drugs, drug intermediates, drug formulations and biologicals was USD 23.5 Bn in the Financial Year (FY)2022.⁵

After liberalisation, the R&D expenditure by private pharmaceutical companies increased in India.⁶ However, Indian pharmaceutical firms continue to lag in comparison to global firms for R&D activities. For instance, the top ten global firms studied in this report have a median R&D intensity of 17.3%, while the corresponding Indian firms have a median R&D intensity of 5.8%.

We present our findings on R&D-related inputs and outputs for Pharmaceutical sector firms.

1.2 India vs. Global Comparison

For inputs, we study R&D intensity and PhD employees as a proportion of total employees. R&D intensity helps us to identify the proportion of revenue input in R&D activities, while the PhD employee number represents an approximate number of researchers in the firm.

¹Government of India, Department of Pharmaceuticals (2024). *Annual Report 2020-21*. URL: https://pharmaceuticals.gov.in/sites/default/files/english%20Annual%20Report%202020-21.pdf (visited on 03/20/2024).

²Competition Commission of India (2021). *Market study on the pharmaceutical sector in India*. Tech. rep. URL: https://www.cci.gov.in/images/marketstudie/en/market-study-on-the-pharmaceutical-sector-in-india1652267460.pdf (visited on 05/06/2024).

³Reji K Joseph (2011). "The RD Scenario in Indian Pharmaceutical Industry". In: URL: https://papers.srn.com/sol3/papers.cfm?abstract_id=2009229 (visited on 05/06/2024).

⁴Ministry of Finance, Government of India (2021-22). *Economic Survey of India*. Chap. Industry and Infrastructure. URL: https://www.indiabudget.gov.in/economicsurvey/ebook_es2022/index.html#p= 312 (visited on 04/26/2024).

⁵Department of Pharmaceuticals (2023). *Annual Report*. URL: https://www.pharmaceuticals.gov.in/sites/default/files/Annual%20Report%202022-23%20Final-3.pdf (visited on 05/07/2024).

⁶Reji K Joseph (2011). "The RD Scenario in Indian Pharmaceutical Industry". In: URL: https://papers.srn.com/sol3/papers.cfm?abstract_id=2009229 (visited on 05/06/2024).

For outputs, we present our findings on the number of patents and publications per billion USD in revenue. The information regarding input parameters, i.e. R&D intensity and proportion of PhD employees is presented for the latest available year while the information regarding outputs, Patents and Publications per billion USD revenue is presented for the study period i.e. FY 2015-16 and FY 2022-23. For firms that do not provide information on a financial year basis, corresponding annual years are considered.



Figure 1.1 presents the performance of all firms studied on the input parameters.

Figure 1.1: India vs. Global Pharmaceutical Sector Firms Comparison on R&D intensity and proportion of PhD employees

Eli Lilly has the highest R&D intensity at 25.2%. Dr. Reddy's, with R&D intensity of 10.3%, is the top-ranking Indian firm for R&D intensity but ranks ninth overall. Zydus Lifesciences Limited (Zydus Lifesciences), falling in low-revenue cluster amongst Indian firms, ranks second within Indian firms studied with R&D intensity of 9.3%.

Novo Nordisk Industries ranks first in the percentage of PhD employees with 3.4%. Dr. Reddy's ranked first in the percentage of PhD employees amongst Indian firms, with eighth rank overall. Biocon ranks second amongst Indian firms for the percentage of PhD employees. Most Indian firms rank lower than global firms in the input parameters overall.



Figure 1.2 presents the performance of all firms studied on output parameters.

Figure 1.2: India vs. Global Pharmaceutical Sector Firms Comparison on publications per USD billion revenue and patents per USD billion revenue

Novo Nordisk ranks first in publications per USD billion revenue with 461 publications by revenue. Biocon ranks first among Indian firms and third overall with 352 publications by revenue. Biocon has **6.9x** more publications by revenue than the second-ranking Indian firm, Abbott India Limited (Abbott India).

Roche ranks first in patents per USD billion revenue with 1268 patents by revenue. Sun Pharma ranks third overall with 636 patens by revenue and ranks first amongst Indian peers. Cipla and Biocon rank second and third amongst Indian firms and eighth and ninth overall.

Despite not performing better in input parameters, Indian firms show competitiveness with global peers on output parameters.

1.3 India Pharmaceutical Sector: A Firm-Level Analysis

To enhance the depth and relevance of our analysis of the Indian Pharmaceutical sector, we have segmented the firms into high-revenue and low-revenue clusters. This bifurcation is based on the median of the average revenue of firms within the sector. By categorising the firms in this manner, we aim to provide a more nuanced and meaningful examination of their innovation inputs and outputs. The following is the cluster-wise firm-level comparative analysis of top market capitalisation chemical sector firms in India.

1.3.1 High Revenue Cluster

1.3.1.1 R&D Intensity

Figure 1.3 below compares R&D intensity, defined as the ratio of a firm's R&D expenditure to its revenue, across Indian pharmaceutical sector firms forming a part of the high-revenue cluster. The median R&D intensity of the cluster is 8.0%.



Figure 1.3: R&D Intensity: High Revenue Cluster

Dr Reddy's Laboratories Limited (Dr Reddy's) has the highest R&D intensity

(10.3%) amongst the Indian pharmaceutical firms. No other firm in the high revenue cluster has above-median R&D intensity for the cluster. Sun Pharma follows closely with 7.9%. Despite having the highest revenue, Cipla Limited (Cipla) stands third on R&D intensity amongst its cluster of firms. The top two R&D intensity companies in the cluster, Sun Pharmaceutical Industries Limited (Sun Pharmaceuticals) and Dr Reddy's spent 106.0% and 101.7% of their profits in R&D activities in FY 2023.

1.3.1.2 PhD employees as a proportion of total employees

Figure 1.4 below presents the number of employees with PhDs as a percentage of the total employees attributed to the pharmaceutical sector firms in the high-revenue cluster.



Figure 1.4: PhD per Total Employees: High Revenue Cluster

Dr. Reddy's performs best for the proportion of PhD employees (1.0%), whereas Aurobindo Pharma Limited (Aurobindo Pharma) and Cipla rank last with 0.3%. Biocon stands second with 0.7% and Sun Pharma is third with 0.4%.

1.3.1.3 Patents by USD billion revenue

Figure 1.5 below depicts patents per USD billion revenue for high-cluster firms.

Sun Pharma ranks first in patents per billion USD revenue in the high revenue cluster, with 636 patents by revenue. Its score is **3.0x** the second highest scoring firm, Cipla.

Dr. Reddy's ranks last in this parameter with only 8 patents per billion USD revenue despite scoring higher ranks in input parameters. The low performance of a firm in patents

by revenue cannot be used to indicate its low performance in conducting R&D activities by itself. This performance may be linked to a firm's nature of business (such as manufacturing generic drugs, Active Pharmaceutical Ingredients (APIs) vs new molecule research) and/or intellectual property management policy (such as preference for trade secrets vs patenting).



Figure 1.5: Patents per Revenue: High Revenue Cluster

1.3.1.4 Publications by USD billion revenue

Figure 1.6 below presents publications per USD billion revenue of high-revenue cluster firms.

Biocon ranks first with a high margin in the high-revenue cluster with 352 publications by revenue. It produces **9.8x** more publications by revenue compared to Aurobindo Pharma which ranks second in the cluster. Cipla ranks last in publications per USD billion revenue with only 13 publications by revenue.



Figure 1.6: Publication per Revenue: High Revenue Cluster

1.3.2 Low Revenue Cluster

1.3.2.1 R&D Intensity

Figure 1.7 below compares R&D intensity among the Indian pharamceutical sector firms in the low-revenue cluster.

Zydus Lifesciences, which forms a part of the low-revenue cluster has the second highest R&D intensity (9.3%) amongst all Indian firms studied. It spent 65.4% of its profits in R&D activities. This shows that Zydus Lifesciences focuses on R&D activities. It was the first Indian firm to have indigenously developed and approved a new clinical entity, saroglitazar in 2013.⁷ Conversely, Abbott India Limited (Abbott India) and Divi's Laboratories Limited (Divi's Labs) have the lowest R&D intensity at 0.02% and 0.9% respectively. These companies also spent the lowest R&D by profits, 3.4% (Divi's Labs) and 0.2% (Abbott India). Divi's Labs primarily focuses on the manufacture of APIs, which may explain its low expenditure on R&D activites.⁸ Abbott India is a wholly-owned subsidiary of Abbott Laboratories, a global pharmaceutical firm, which may explain its low R&D activities Limited (Torrent Pharma) and Alkem Laboratories Limited (Alkem Labs) had 5.4% and 5.2% research intensity respectively.

⁷Ritesh Agrawal (2014). "The first approved agent in the Glitazar's Class: Saroglitazar". In: *Current drug targets* 15.2, pp. 151–155. URL: https://www.ingentaconnect.com/content/ben/cdt/2014/00000015/0000002/art00001 (visited on 05/07/2024).

⁸"Company Overview" (2024). In: (). URL: https://www.divislabs.com/ (visited on 05/07/2024).



Figure 1.7: R&D Intensity: Low Revenue Cluster

1.3.2.2 PhD employees as a proportion of total employees

Figure 1.8 below illustrates the percentage of total PhD-holding employees across Indian pharmaceutical sector firms in low-revenue cluster. As seen in R&D intensity indicator for the low-revenue cluster, Zydus Lifesciences leads in the number of PhD employees as a percentage of total employees. This is followed by Torrent Pharma and Alkem Laboratories Limited (Alkem Laboratories), with Divi's Laboratories Limited (Divi's Laboratories) having the lowest number of PhD employees as a percentage of total employees. Abbott India had near **0** proportion of PhD employees.



Figure 1.8: PhD per Total Employees: Low Revenue Cluster

1.3.2.3 Patents by USD billion revenue

Figure 1.9 below illustrates the patents by USD billion revenue across Indian pharmaceutical sector firms in the low-revenue cluster.

Zydus Lifesciences had the most patents by revenue at 65, followed closely by Torrent Pharma which had 59 patents by revenue. Alkem Laboratories had 14 and Abbott India had 2 patents by revenue.⁹ Divi's Labs had nearly **0** patents by revenue. No patenting by Divi's Labs may be explained by the fact that it is primarily a manufacturer of APIs and may not be an R&D driven firm.



Figure 1.9: Patents per Revenue: Low Revenue Cluster

1.3.2.4 Publications by USD billion revenue

Figure 1.10 below presents the publication per USD billion revenue of low-revenue cluster firms. Divi's Labs and Abbott India, which do not fare well in other indicators, lead publications by revenue in their cluster. This may be a factor of a comparatively low revenue. Torrent Pharma performs the least with only 3 publications per billion USD revenue.

⁹Abbott Limited, the parent firm of Abbott India has a large number of patents under its name. However, Abbot India did not seem to have a similar patenting strategy.



Figure 1.10: Publication per Revenue: Low Revenue Cluster

In summary, figures 1.11 and 1.12 below present a graphical representation of a firm's performance across four parameters, R&D intensity, PhD employees as a proportion of total employees, patents and publications per USD billion revenue for high revenue and low revenue cluster firms.







Figure 1.12: Indian Pharmaceutical Sector Firms' performance in the Low Revenue Cluster

1.3.3 Conclusion

The Indian pharmaceutical sector showcases a stronger performance for output indicators as compared with input indicators.

However, the firms do not perform uniformly for the two output indicators of the study. For instance, while Sun Pharmaceuticals has the largest number of patents by revenue, it ranks 4th in publications by revenue. Biocon, with the highest number of publications by revenue, ranked 3rd on patents by revenue. Similarly, Abbott India and Divi's Labs have the highest number of publications by revenue in their cluster but have the least patents by revenue.

Annexure

No.	Firm	Market Cap	Avg. Standalone	Revenue Cluster
		(USD Bn)	Revenue (USD	
			MM)	
1	Cipla	9.2	1,537	High
2	Sun Pharma	27.9	1,488	High
3	Dr. Reddy's	9.0	1,454	High
4	Aurobindo Pharma	4.3	1,430	High
5	Biocon	3.6	1,365	High
6	Zydus Lifesciences	6.3	798	Low
7	Alkem Laboratories	5.0	774	Low
8	Torrent Pharma	6.8	709	Low
9	Divi's Laboratories	10.7	680	Low
10	Abbott India	5.5	470	Low
	Median	6.6	1,081	

Table 1.1: Firms included in the study

Note: Market Capitalisation data obtained from https://www.capitaliq.com/ as of May 2023. Revenue data for the latest year as obtained from Company Annual Reports and Bloomberg.

No.	Firm	Rationale for exclusion	
1	Mankind Pharma Limited	The firm's initial public offering (IPO) was in 2023.	
		Therefore, we cannot find relevant data for years before	
		2023.	
2	Lupin Limited	We were unable to sight standalone data	

Table 1.2: Firms excluded from the study and rationale

Sectoral Comparisons: Inputs & Outputs

R&D Intensity



% PhD Employees



Publications per revenue



Sectoral Comparisons: Inputs & Outputs

Patents per revenue



R&D Disclosures



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Notes:

1. % PhD Employees is the number of PhD employees as a proportion of total employees.

2. The publications per revenue metric indicates the number of publications in the study period per billion USD revenue.

3. The patents per revenue metric indicates the number of patents published in the study period per billion USD revenue.

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