



State of Industry R&D in India

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

Chemicals

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 Chemical 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 Chemical sector firms.

First published in 2024 by Foundation for Advancing Science and Technology (FAST India)

Authored by

Vibodh Nautiyal (vibodh@fast-india.org) Ayushee Thukral (Ayushee@fast-india.org) Harleen Kaur (harleen@fast-india.org) Avinash Koli (avinash@fast-india.org) Yakshith Kiran (yakshith.k@iifl.com)

For more information and other requests, write to:

Foundation for Advancing Science and Technology (FAST India) 242, Okhla Industrial Estate, Phase III, Delhi – 110020, India Email: info@fast-india.org Website: www.fast-india.org

Chemicals

Key takeaways

- Global firms outperformed Indian firms for Research and Development (R&D) intensity by **1.7x**. In proportion of PhD employees, Indian firms match global firms.
 - PI Industries ranked first among Indian firms in both the input parameters. With 3.4% of employees with a PhD, it ranked first among all firms studied for this parameter, showing a prioritization of hiring researchers.
 - Corteva led the global companies in both input parameters. It had 7.0%
 R&D intensity, more than 2.3x PI Industries, which ranked second.
 - Coromandel International ranks fifth among all firms for the proportion of PhD employees indicators.
- Global firms produced 14.1x patents per USD Billion revenue and 3.4x publications per USD Billion revenue as compared to Indian firms.
 - Tata Chemicals ranks the highest in publications by revenue among Indian firms and fourth overall, showing an impressive performance. Though Asian Paints has a higher absolute number of publications, it ranks much lower at 11th overall.
 - The top eight ranked firms are global in the patents by revenue parameter.
 LG Chem is ranked first with 2.6x patents by revenue of Sika AG, which is ranked second.
 - UPL ranks first among Indian firms in patents by revenue, more than 6.3x that of the next Indian company, showing an impressive performance.

1.1 Introduction

The chemical sector forms 7.98% of the Indian Gross Domestic Product (GDP).¹ It is a heterogeneous sector comprising various types of firms, viz fertilizers, pharmaceuticals, agrochemicals, polymers, petrochemicals and bulk and specialised chemicals. About 1/10th of exports from India consist of chemicals or chemical products.²

During World War II, India forayed into manufacturing pharmaceuticals, which formed an inroads to establishing the chemicals sector in India.³ This further expanded to basic chemicals, dyes and textile auxiliaries, and fertilizers industry.⁴ The sector depends on oil and gas and needs R&D to become less energy intensive.⁵ Outside of industry experts, an inventory of various types of chemicals in the sector, and issues specific to them are not available readily in the public domain.

Some key areas of consideration relevant to the sector include increasing demand for chemical products and consumer preference for environmentally friendly products, a move towards self-reliance after the global supply-chain disruptions during COVID-19.⁶ For this study, we selected firms solely based on their qualification to be a part of *Chemical* industry and market capitalisation. No further subclassification was performed for this exercise. Therefore, the present exercise provides insights into the performance of a varied group of chemical firms such as paints, fertilizers, adhesives, fluorochemicals, speciality chemicals and others. This study provides information that will enable perform downstream research into various types of firms that form a part of the chemicals industry.

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

¹Invest India (2024). "Sectors in India". In: (). URL: https://www.investindia.gov.in/sector/ chemicals#:~:text=The%20market%20size%20of%20Chemicals,in%20the%20year%202020%2D21. (visited on 05/10/2024).

²Ibid.

³Ravi Raghavan and JB Joshi (2024). "India's Expanding Chemical Industry". In: (). URL: https://www.aiche.org/resources/publications/cep/2018/december/indias-expanding-chemical-industry (visited on 05/10/2024).

⁴Ibid.

⁵PwC and FICCI (2024). "India: A global manufacturing hub for chemicals and petrochemicals". In: (). URL: https://www.pwc.in/assets/pdfs/publications/2021/india-a-global-manufacturing-hub-for-chemicals-and-petrochemicals.pdf (visited on 05/10/2024).

⁶Ibid.

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, defined as the ratio of a firm's R&D expenditure to its revenue, 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. 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 Chemical Sector Firms Comparison on R&D intensity and proportion of PhD employees

Corteva has the highest R&D intensity at 7.0%, **2.3x** the R&D intensity of the second-ranking firm. Of the top five ranked firms, only one, PI Industries, is Indian. PI Industries is in the low-revenue cluster and ranks second amongst all firms in R&D intensity. SRF has the second highest R&D intensity among Indian firms (1.1%) and ranks seventh.

PI Industries ranks first in the percentage of PhD employees with 3.4%, ahead of all the other global companies studied, while Corteva ranks second. Coromandel International ranks second among Indian firms with 0.7% PhD employees, with fifth rank overall.



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

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

Ecolab ranks first in publications per USD billion revenue with 77 publications by revenue. Tata Chemicals ranks first among Indian firms and fourth overall with 36 publications by revenue. Tata Chemicals has **2.0x** more publications by revenue than the

second ranked Indian firm, Solar Industries. Both Tata Chemicals and Solar Industries fall in the low-revenue cluster of Indian firms.

The patents per USD billion revenue parameter is dominated by global firms. LG Chem ranks first with a score **2.6x** that of Sika AG, which comes in second place. UPL, which is the highest-ranked Indian firm, is ranked ninth overall.

1.3 India Chemical Sector: A Firm-Level Analysis

To enhance the depth and relevance of our analysis of the Indian Chemical 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

The composition of the high-revenue cluster is as follows:

- SRF Limited (SRF): SRF works in speciality chemicals, fluorochemicals, packaging films, technical textiles and fabric coatings
- UPL Limited (UPL): UPL focuses on the agriculture sector and produces biosolutions for sustainable agriculture
- Pidilite Industries Limited (Pidilite Industries): Pidilite Industries is an adhesive manufacturing firm
- Asian Paints Limited (Asian Paints): Asian Paints works in paints sector
- Coromandel International Limited (Coromandel International): Coromandel International is an agrochemicals firm which makes crop protection products

1.3.1.1 R&D Intensity

Figure 1.3 below compares R&D intensity across Indian chemical sector firms forming a part of the high-revenue cluster.

SRF performs best on R&D intensity in the high revenue cluster with 1.1%. UPL follows closely with 1.0%, though it has higher expenditure in R&D than SRF. Though

Coromandel International has the second highest revenue among the chemical sector firms, it places last in R&D intensity in the high-revenue cluster due to having a relatively low R&D expenditure.



Figure 1.3: R&D Intensity: High Revenue Cluster

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 chemical sector firms in the high-revenue cluster.



Figure 1.4: PhD per Total Employees: High Revenue Cluster

Coromandel International performs best for the proportion of PhD employees, whereas UPL ranks last. Pidilite Industries, Asian Paints, and SRF have a similar proportion with 0.4%, 0.3%, and 0.3% respectively. UPL which has the lowest rank has 1 PhD employee out of 13,000 total employees.

Though UPL has the highest number of employees among the chemical sector firms, it also has the lowest number of employees with a PhD in the high-revenue cluster. UPL, which is ranked last in the cluster, has one employee with a PhD out of 13,000 total employees.

1.3.1.3 Patents by USD billion revenue

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

UPL ranks first in patents per billion USD revenue in the high revenue cluster, with 676 patents by revenue. Its score is **7.5x** the second highest scoring firm, SRF.

UPL also has the highest absolute number of patents count, **11.8x** of the second highest patent count of SRF.



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.

SRF ranks first in the high-revenue cluster with 12 publications by revenue. Though Asian Paints has the highest absolute publication count of 23, it ranks second when adjusted for revenue. Pidilite Industries and UPL follow Asian Paints with 6 and 5 publications by revenue respectively. Coromandel International with 1 publication by revenue ranks last in the cluster.



Figure 1.6: Publication per Revenue: High Revenue Cluster

1.3.2 Low Revenue Cluster

The composition of the low-revenue cluster firms is as follows:

- PI Industries Limited (PI Industries): PI Industries is an agrochemicals firm, which also provides R&D as a service
- Deepak Nitrite Limited (Deepak Nitrite): Deepak Nitrite is a chemical intermediates company
- Tata Chemicals Limited (Tata Chemicals): Tata Chemicals is a specialty chemicals firm
- Berger Paints India Limited (Berger Paints): Berger Paints is a paints firm
- Solar Industries India Limited (Solar Industries): Solar Industries is an industrial and defence explosives manufacturer

1.3.2.1 R&D Intensity

Figure 1.7 below compares R&D intensity among the Indian chemical sector firms in the low-revenue cluster. Within the cluster, PI Industries ranks first with 3.0% R&D intensity.

PI Industries has the highest R&D intensity across high and low clusters in the sector, at 3.0%. It also has the highest R&D by profits in its sector, at 15.3%. Solar Industries had the lowest R&D intensity and spent the least R&D by profits at 0.1%. It also has the lowest R&D expenditure in the sector at 0.1 USD MM. The nature of business of Solar Industries is different from that of other companies in the sector, i.e., manufacturing industrial and defence explosives. The comparatively lower R&D inputs may likely be due to the unique R&D related requirements in its niche segment. Nevertheless, the company mentions R&D as an important factor of its business on its website.⁷



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 chemical sector firms in low-revenue cluster.

PI Industries ranks first for this parameter amongst its peers with 3.4%. There is a sharp drop off after that with Solar Industries ranking second with 0.4%. Though Tata Chemicals has twice the number of PhD employees as Solar Industries, it ranks third due to a higher employee base. Deepak Nitrite ranks last in the cluster with 0 PhD employees.

⁷"Company Overview: Technology" (2024). In: (). URL: https://solargroup.com/technology/#about (visited on 05/13/2024).



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 chemical sector firms in the low-revenue cluster. Tata Chemicals and PI Industries have the first and second highest number of patents both in absolute terms and when adjusted for revenue. There was no patent information available for Berger Paints and Solar Industries.



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. Tata Chemicals ranks first with 36 publications by revenue, **2.0x** of Solar Industries which ranks second. However, Tata Chemicals has **4.5x** the absolute publication count as Solar Industries. There was no publication information available for Deepak Nitrite.



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 1.11: Indian Chemical Sector Firms' performance in the High Revenue Cluster



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

1.3.3 Conclusion

A few key firms exhibit a strong performance in comparison to their global counterparts. Firms like PI Industries, UPL, and SRF show impressive performance and punch above their weight.

While Indian firms are competitive with global firms in input parameters, there is still a substantial gap in patents and publications per revenue, highlighting the need for increased focus on innovation and intellectual property.

Annexure

No.	Firm	Market Cap	Avg. Standalone	Revenue Cluster
		(USD Bn)	Revenue (USD	
			MM)	
1	Asian Paints	36.5	2,257	High
2	Coromandel International	3.5	1,798	High
3	UPL	6.2	1,292	High
4	SRF	9.2	819	High
5	Pidilite Industries	16	813	High
6	Berger Paints	7.5	728	Low
7	Tata Chemicals	3.1	505	Low
8	PI Industries	6.3	433	Low
9	Deepak Nitrite	3.2	235	Low
10	Solar Industries	4.1	228	Low
	Median	6.3	770.5	

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	Gujarat Fluorochemicals	R&D data could not be found even though information	
	Limited	about operational parameters was available	
2	The Supreme Industries	R&D expenditure is declared as negligible for certain	
	Limited	years during study period	
3	Linde India Limited	Complete data was not found	

 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



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.

Bibliography

- "Company Overview: Technology" (2024). In: (). URL: https://solargroup.com/ technology/#about (visited on 05/13/2024).
- Invest India (2024). "Sectors in India". In: (). URL: https://www.investindia.gov.in/ sector/chemicals#:~:text=The%20market%20size%20of%20Chemicals,in%20the% 20year%202020%2D21. (visited on 05/10/2024).
- PwC and FICCI (2024). "India: A global manufacturing hub for chemicals and petrochemicals". In: (). URL: https://www.pwc.in/assets/pdfs/publications/2021/ india-a-global-manufacturing-hub-for-chemicals-and-petrochemicals.pdf (visited on 05/10/2024).
- Raghavan, Ravi and JB Joshi (2024). "India's Expanding Chemical Industry". In: (). URL: https://www.aiche.org/resources/publications/cep/2018/december/indiasexpanding-chemical-industry (visited on 05/10/2024).







242, Okhla Industrial Estate, Phase 3, Delhi – 110020, INDIA info@fast-india.org www.fast-india.org