Knowledge sources and export performance: A tri-decadal perspective on the determinants of the India's pharmaceutical exports

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Abstract

The Indian pharmaceutical industry has rapidly grown to become the world's largest provider of generic drugs, driven by product and process innovation. This growth has been influenced by both domestic and global policies, notably the TRIPS agreement, which has significantly impacted the industry's innovation ecosystem and international business strategies. This change has led Indian pharmaceutical firms to rely on a combination of internal and external knowledge-based sources for international business activities, especially in the post-TRIPS period (2004-05 onwards). This research is posited to be the first and a unique investigation to examine the export performance of the Indian pharmaceutical industry over a period of 3 decades (1994-2023). Various determinants of export performance that were classified as internal knowledge-based resources and external knowledge-based resources were investigated for the 3 different decades - 1994-2003; 2004-2013; 2014-2023. This research employed a sample of 79 Indian pharmaceutical firms. The results indicate that both internal and external knowledge-based resources were found to have a significant impact on export performance during the first decade (1994-2003). In the next 2 decades (2004-2013 & 2014-2023), external knowledge-based resources have demonstrated a significant impact on the export performance of the Indian pharmaceutical industry.

*Key Words**:** Export performance; Indian pharmaceutical industry; Resource-based view*

Track: International Marketing & Marketing in Emerging Countries

1. Introduction

Emerging-market firms need to make strategic choices particularly about how they have to become globally competitive by adapting to institutional transitions and ecosystem changes in their home markets in the recent decades (Sahasranamam, Rentala, and Rose, 2019). Emerging-market firms, such as those in the Indian pharmaceutical industry, used different strategies for internationalization in the last 3 decades (1994-2023). While exporting is a key strategy for market-seeking, foreign direct investment (FDI) is primarily driven by knowledge-seeking motives, especially when targeting advanced economies for sustainable growth of emerging market firms. In a first-of-its-kind research, this study explores how changes in the IP regime in the last 3 decades, have influenced firms' strategies related to internal and external knowledge-based sources. It posits that in the post-TRIPS period, external knowledge sourcing has become more influential due to strong patent systems.

Investigating the factors that influence firms' export competitiveness has long been a central focus in international business research (Peng, 2004). This area offers significant opportunities for empirical studies, as it allows for testing a wide range of variables across diverse contexts. The variety of factors affecting export performance provides a basis for developing and validating different theoretical approaches, contributing to the growth of cumulative knowledge in this domain. Export performance is a heavily researched area in international business, yet it remains characterized by inconclusive findings (Katsikeas, Leonidou, & Morgan, 2000). Research by Sousa, Martínez-López, and Coelho (2008) identified almost 40 factors that influence export performance, emphasizing the critical role of firm-specific resources. According to the Resource-Based View (RBV), firms can achieve sustained competitive advantages through their unique resources (Barney, 1991). Foundational studies by Penrose (1959), Robinson (1931), and Wernerfelt (1984) have explored the relationship between a firm's resources and its export performance.

The Resource-Based View (RBV) framework (Barney, 1991) has significantly contributed to research on the determinants of export performance across different contexts. It emphasizes that a firm’s unique combination of tangible and intangible resources is key to achieving competitive advantages. Researchers such as Kotabe, Srinivasan, and Aulakh (2002) have explored how research and development (R&D) and marketing capabilities influence firms' export performance. Overall, the RBV framework provides a robust

theoretical foundation for understanding and empirically validating the determinants of export performance.

This study explores the role of specific resources as determinants of export performance in the Indian pharmaceutical industry, which has experienced extensive institutional reforms over the last three decades. The research framework builds on the research by Sahasranamam et al. (2019) which examined the impact of knowledge-based sources on the international business performance of the Indian pharmaceutical industry. Historically, India has operated under varying patent regimes. The establishment of the World Trade Organization (WTO) prompted nations to align their patent laws with the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement to promote international trade. As a WTO signatory from January 1, 1995, India was granted a 10-year transition period to move from a process patent regime to a product patent regime, completed by January 1, 2005. The Indian pharmaceutical industry experienced substantial shifts following the implementation of TRIPS. This study evaluates the impact of internal and external knowledge-based resources on the export performance of Indian pharmaceutical firms over a duration of 3 decades (1994–2023). The research analyses the effects of TRIPS, focusing on a comparative assessment of the determinants of export performance during the transitory-TRIPS period (1994–2003) and post-TRIPS periods (2004–2013 and 2014–2023).

2. Research objectives

- To investigate the determinants of export performance over a period of 3 decades
- Examine the impact of internal and external knowledge-based resources for 3 decades

3. Brief review of literature

- Bhattacharya et al., (2024) investigated the impact of patent rights on pharmaceutical exports in India, addressing challenges such as rising costs and limited global presence. The study employed a simultaneous equation framework to analyze the relationship between patent grants and export performance, revealing that patents significantly enhance exports. The study also highlights the influence of the patent administration regime on patent filings and exportability. By utilizing a 3SLS method, the research contributes novel insights into the dynamics of the Indian pharmaceutical sector, emphasizing the importance of innovation and patenting for sustaining market share and profitability.

- Tyagi and Nauriyal (2017) investigated the relationship between research and development (R&D) expenditure, patent counts, and export performance of Indian drug and pharmaceutical firms from 2000 to 2014. The research finds that increased R&D intensity and higher patent counts significantly enhance firm-level export performance. The study employs a dynamic panel data model, revealing that firms with substantial R&D investments are more likely to innovate and maintain competitiveness in global markets.

- The research by Rentala et., al. (2014) investigated the determinants of export performance in the Indian pharmaceutical industry using OLS and quantile regression methods, focusing on 147 firms from 2000 to 2013. Eight independent variables were analyzed, including firm size, R&D expenses, profitability, age, advertising expenses, capital intensity, and imports. The findings reveal that six out of the eight variables significantly impact export performance, with quantile regression providing superior insights compared to OLS.

- Tyagi, Mahajan and Nauriyal (2014) investigated the trends in exports, imports, R&D performance, and patenting activities within the Indian drug and pharmaceutical industry from 2000 to 2012. This research established a functional relationship between exports as the dependent variable and patents granted and R&D expenditure as independent variables. The findings indicate that lagged R&D expenditure and lagged total patents granted significantly and positively influence exports. The study advocates for enhanced public-private R&D partnerships to foster innovation that can be commercially utilized by private sector partners.

- The research by Banerji and Suri (2019) investigated the relationship between R and D intensity, patents, regulatory filings, and export intensity in the Indian pharmaceutical industry. It highlights that R&D is crucial for innovation and revenue generation, with nearly sixty percent of the industry's revenue derived from exports. The study finds that current R and D intensity positively impacts export intensity, while lagged regulatory filings also contribute significantly. The authors conclude that the focus has been primarily on developing generics for regulated markets, indicating insufficient investment in innovative patented products.

- Aggarwal (2006) examined the factors influencing the export performance of Indian pharmaceutical firms, utilizing data from the PROWESS database and primary surveys. The research results emphasized the significance of firms' research and development (R&D) efforts, fiscal incentives, and technological capabilities in determining their propensity to export. The study finds that small firms primarily compete on cost containment and high quality, leveraging India's cost advantages in pharmaceutical production. The analysis reveals that various determinants collectively contribute significantly to the export competitiveness of these firms.

- Rentala and Anand (2014) explored the determinants of export performance specifically within the Indian pharmaceutical industry, a sector noted for its high export potential due to affordable medicine offerings. Utilizing quantile regression, a method infrequently applied in prior studies, the analysis encompasses data from 147 pharmaceutical firms over the period from 2000 to 2013. The study identified eight independent variables, including firm size, research and development expenses, and advertising, with six showing significant impacts on export performance. The findings contribute to understanding export dynamics in emerging markets, contrasting with previous research predominantly focused on developed economies.

- A study by Rentala et al., (2016) evaluated the export performance of the Indian pharmaceutical industry during the transitory and post-TRIPS periods, highlighting significant changes since the implementation of TRIPS in 1995. It analyzed various determinants classified as knowledge-based and property-based resources using three different models over a twenty-year period involving 211 firms. The findings indicate that firm resources were more crucial during the transitory-TRIPS period compared to the post-TRIPS period, contributing to the understanding of export performance in emerging economies. The study aims to provide insights for managers and policymakers regarding the factors influencing export performance in the pharmaceutical sector.

4. Data, variables and analysis

The data employed for the research has been extracted from PROWESS database which is compiled by Centre for Monitoring Indian Economy (CMIE) for a period of three decades

from March 1993 till March 2023. The research has divided the thirty-year data into 3 time periods to study the export performance of Indian pharmaceutical industry. The first period considers the data for the 1st decade during1994-2003. The 2nd decade covers 2004-2013. Lastly, the 3rd decade covers the duration from 2014 to 2023.

The Prowess database presents the data pertaining to nearly 606 firms belonging to the Indian pharmaceutical industry. The final sample considered for the research consists of 79 firms. These firms have been selected based on the premise that all these firms should have had export sales in the 3rd decade (2014-2023) and then the entire data of 3 decades for all the 79 firms with regards to the dependent and independent variables have been considered. This is a very highly representative sample since these 79 firms constitute to nearly 70% of the total export sales of the Indian pharmaceutical industry.

4.1 Variables

4.1.1 Dependent Variable:

Export Intensity (Export sales / Total Sales)

4.1.1 Independent variables:

Internal knowledge-based resources

1. R&D Intensity (R&D Expenses / Total Sales)
2. Marketing Intensity ((Advertising + Distribution + Promotion Expenses) / Total Sales)

External knowledge-based resources

3. Import of Capital Goods Intensity (Import of Capital Goods Expenses / Total Sales)
4. Import of Raw Materials Intensity (Import of Raw Materials Expenses / Total Sales)
5. Royalties Intensity (Payment of Royalties and Technical Fees / Total Sales)

Control Variables:

1. Size of the firm (Natural logarithm of Total Sales)
2. Profitability Intensity (Profit after Tax / Total Sales)
3. Debt Equity Ratio (Borrowings / Net Worth)

It can be observed from Figure 1 that the export intensity of the Indian pharmaceutical industry has significantly increased during the 3 decades. The increase of export intensity

from 33.9% to 51.2 during the first 2 decades coincides with the Indian pharmaceutical industry's complete transition into a product-patent regime. The export intensity has continued its growth story from the 2nd decade (2004-2013) into the 3rd decade (2014-2023) further aided by the pandemic during 2020-2022 which has seen a significant export sale by the Indian pharmaceutical industry. Interestingly, R&D intensity has shown a consistent growth throughout the 3 decades. Import of raw material intensity was higher in the first 2 decades in comparison to the 3rd decade indicating that the Indian pharmaceutical industry's dependence on imports is showing a decline which augurs well for the industry in future.

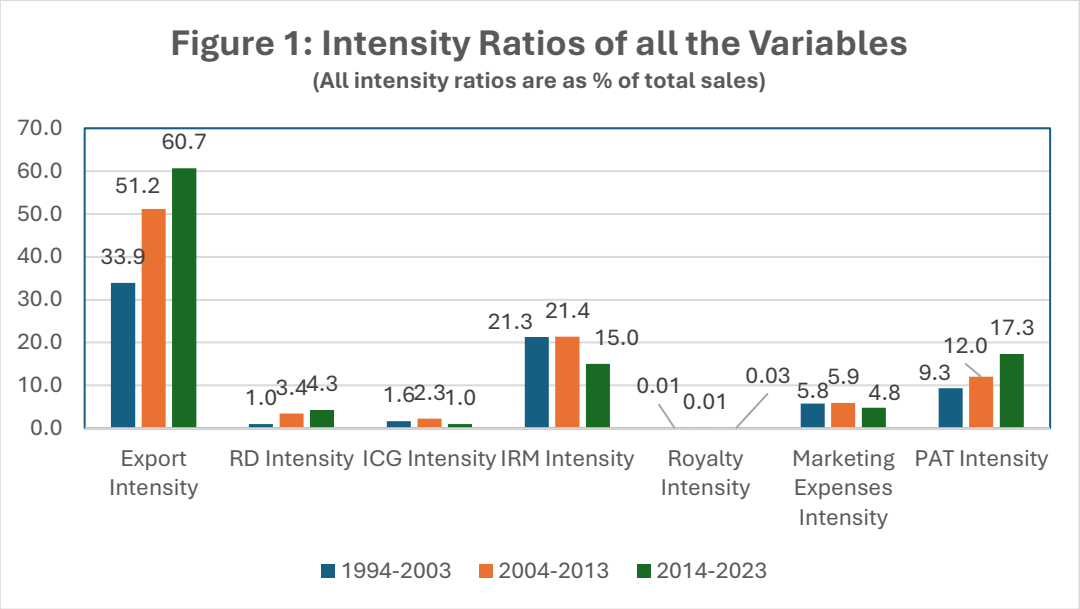

Table 1 presents the results of the regression analysis of the determinants of export performance of the Indian pharmaceutical industry over a period of 3 decades. Column 2 presents the regression results for the entire duration of 3 decades. Columns 3, 4 and 5 present the regression results for 3 decades (1994-2003; 2004-2013 and 2014-2023). It is interesting to note that all the independent variables except Royalty payments have shown a significant and positive impact on the export performance during the first decade (1994-2003) after India became a signatory to WTO (from 1995). As the Indian pharmaceutical industry continued its growth trajectory into the 2nd decade after India completely aligned with the product patent regime, it can be observed that only Import of capital goods and import of raw materials have shown a significant impact on the export performance of the Indian pharmaceutical industry. In the last decade during 2014-2023, only intensity of raw materials has shown a significant impact on the export performance. During the entire period of 3

decades, import of raw materials intensity and marketing intensity have shown a significant and positive impact on the Indian pharmaceutical industry.

Table 1: Regression Analysis				
	1994-2023	**1994-2003**	**2004-2013**	**2014-2023**
(Constant)	.704	.785	.085	.352
RD_INT	.856	.000***	.450	.609
ICG_INT	.114	.003***	.001***	.750
IRM_INT	0.000***	.000***	.000***	0.000***
Royalty_INT	.368	.361	.736	.680
MKTG_INT	.031**	.000***	.437	.338
PAT_INT	.228	.000***	.266	.067
Sales_INT	.000***	.000***	.000***	.870
DER_INT	.984	-	.804	.920
R Square	.8400	.506	.333	.879
Adjusted R Square	.8396	.502	.326	.878
*** p < 0.01; ** p < 0.05				

Conclusions:

- Decadal Variations**:** The significance of firm resources on export performance varied across decades:
    - First Decade (1994–2003): Internal and external knowledge-based firm resources played a more substantial role in determining export performance.
    - Subsequent Decades (2004–2013 & 2014–2023): The relative importance of these resources diminished, suggesting a shift in the industry's dynamics and the global environment. External knowledge-based resources have shown a significant impact on the export performance.
- Overall Impact: The study highlights how the export determinants evolved under the changing regulatory and competitive landscapes.

Significance of the research:

- Academic Significance: The research adds to the body of evidence on export performance determinants, especially in emerging economies.
- Practical Implications: Insights can guide policymakers and industry stakeholders in formulating strategies for sustaining and enhancing export competitiveness under global trade agreements.

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