Exploring the Determinants of Export Performance of Indian Pharmaceutical Industry - A Quantile Regression Approach

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ABSTRACT

Examining determinants of export performance is a widely researched stream of international business. Many researchers across the world have attempted to investigate the various determinants of export performance in various research settings. Majority of the previous studies that examined the determinants of export performance have been undertaken in the context of developed economies. The main objective of this research is to understand the determinants of export performance in the context of Indian pharmaceutical industry. Quantile regression method, which was rarely used in the earlier studies, has been employed to analyze the findings of this research. Export sales have been considered as the dependent variable and the independent variables considered for the study are size of the firm (measured as sales), research and development expenses, profitability, age, advertising expenses, capital intensity, import of raw materials and import of capital goods. The research presents an analysis of firms belonging to 147 pharmaceutical firms operating in India for the period 2000-2013. The analysis is presented using OLS regression method and further to that, quantile regression method was employed to understand the impact of various determinants of export performance for pharmaceutical firms in India. The findings of this research indicate that six out of the eight independent variables considered for the study have a significant impact on the export performance of Indian pharmaceutical firms.

Introduction

The Indian pharmaceutical industry is considered to be one of the most attractive pharmaceutical markets in the world. It has very high export potential due to the demand for Indian pharmaceutical products which offer medicines at affordable prices. The rising healthcare costs in different nations across the world provide an opportunity to expand the scope of pharmaceutical exports from India. It can be seen from Table 1 that India's drug and pharmaceutical exports are ranked fifth among all the product categories that are exported from India.

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Table 1 : Top Five Indian Export Product Categories

Rank	Category	Apr-Aug 2013	% Growth	% Share
1	Petroleum: Crude and Products	147.9	23.1	20.4
2	Gems and Jewellery	97.7	-0.7	13.5
3	Transport Equipments	48.9	6.8	6.8
4	Machinery and Instruments	37.2	10.3	5.1
5	Drugs, Pharmaceuticals and Fine Chemicals	35.5	11.2	4.9

Source: *DGCIS, Kolkatta http://www.dgciskol.nic.in/data_information.asp; accessed on 2nd September 2013; % Share as per 2013 Values*

Therefore it is noteworthy to investigate the issues that affect the export performance of Indian pharmaceutical industry. This research study is an attempt to explore the various determinants of export performance of Indian pharmaceutical industry. The research is structured as follows: After the introductory section, a brief literature review regarding the most relevant studies is presented in Section 2. Section 3 gives a description of the methodology, data sources used and the variables considered for the study. Section 4 discusses the key results of the study. Finally, this research paper presents the conclusions of the study along with a note on the avenues for future research.

Literature Review

Globally, many scholars have investigated the determinants of export performance in the context of various industries. A few notable contributions in this area include the research done by Bonaccorsi (1992) on Italian manufacturing industry; Calof (1994) on Canadian manufacturing firms, Cassiman and Golovko (2011) on Spanish firms belonging to various industries.

Bhaduri & Ray (2004) investigated the impact of technological expertise on export performance of 72 healthcare and 52 electronics firms in India. The results showed that in case of healthcare and electronics firms, size of the firm and R&D investments had a positive and significant impact on export performance. Age had no significant impact on export performance in healthcare industry while it exhibited a negative impact on the electronics industry.

Bhat & Narayanan (2009) explored the role of technical competencies and firm size on export competence of 121 Indian chemical firms. Export intensity was taken as the dependent variable. R&D intensity, import of capital goods intensity, import of raw materials, size of the firm, age of the firm, advertising intensity, choice of technology (measured as wages and salaries divided by gross fixed assets) and outsourcing intensity were employed as independent

variables. Findings indicated that R&D expenditures, size of the firm, import of raw materials, choice of technology and advertising intensity had a positive impact on export performance. Age of the firm did not show any significance influence on the export performance.

Chadha (2009) examined the export performance of 131 healthcare firms in India during the period 1989-2004. Export sales were considered to be the dependent variable and the independent variables were: technology (measured as number of foreign patent rights); sales and profitability. The results indicated that export sales were positively and significantly impacted by technology (investments in R&D), sales and profits of the pharmaceutical firms in India.

Lall (1986) studied the relationship between export performance (measured as export intensity) and technological development among 100 leading Indian engineering and 45 chemical firms. The independent variables considered were: size; age; subsidies for exports; advertising expenditure; HPE (highly paid employees); royalty; licenses; R&D expenditure and FS (foreign equity). For engineering firms, the study found a significant and positive relationship with size, subsidies and licenses but a significant and negative relationship with R&D expenditure. Subsidies; advertising expenditure and foreign equity were positively and significantly associated in the chemical firms but size of the firms found no significant association unlike engineering firms. But in chemical firms, R&D expenditure was positively and significantly associated with export intensity.

Jauhari (2007) presented an analysis of the export intensities of 164 firms belonging to Indian electronics industry. The independent variables considered for the analysis are: size of the firm (measured by log sales); Research and Development (R&D intensity); Advertisement Intensity; Capital Imports of the firms; Imports of Spares and Stores; Payment of Loyalty; Capital Labour Ratio; Capital Output Ratio; and FDI (foreign equity in the firm). The study concluded that among all the independent variables, export intensity has a significant relationship with only size of the firm, capital output ratio and FDI.

Table 2 presents a summary of the empirical studies reported in the Indian context. The table gives the details of the research context along with the key findings that indicate the various determinants of export performance investigated in the context of Indian various industries. In most of the studies reported by earlier researchers, the dependent variable considered was either export intensity (export sales divided by total sales) or export sales of the firms.

Table 2: Review of Indian Studies on the Influence of R&D Investments on Export Performance

Author (Year) & Industry (Sample Size)	Dependent Variable	Determinants of Export Performance with Significant Impact
Aggarwal (2002); Multi-industry (916)	Export Intensity	Firm size; R&D expenditures; Import of raw materials; Import of capital goods
Bhaduri & Ray (2004) Pharmaceuticals (72) & Electronics (52)	Export Sales	Firm size; R&D expenditures;
Bhat & Narayanan (2009) Basic Chemicals (121)	Export Intensity	R&D expenditures; Firm size; Import of raw material; Choice of technology; Advertising intensity
Chadha (2009) Pharmaceuticals (131)	Export Sales Profitability	Technology (R&D) investments; Firm Size;
Jauhari (2007) Electronics (164)	Export Intensity	Firm size; Capital-output ratio and FDI
Kumar & Saqib (2006) Multi-industry (291)	R&D Intensity	Firm size; Competitive pressure; Export orientation; In-house production;
Kumar & Siddharthan (1993) Multi-industry (640)	Export Intensity	R&D expenditures (four industries); Technology imports (four industries); Firm size (seven industries); Advertising intensity (five industries); Capital intensity (two industries); Profitability (four industries)
Lall (1983)Multi-industry (100)	R&D Intensity	Firm size; Firm age; Foreign equity; Royalties paid for technology;
Lall (1986) Engineering Firms (100) & Chemicals (45)	Export Intensity	Size; R&D expenditures; subsidies and licenses (for engineering firms); R&D expenditures; subsidies and licenses; advertising intensity; foreign equity(for chemical firms)
Lall & Kumar (1981) Multi-industry (100)	Export Intensity	Profitability; R&D expenditure; Firm size
Majumdar (2010) Information Technology (112)	Export Intensity	R&D expenditure
Pradhan (2007) Multi-industry (3951)	Export Intensity	Firm size; Outward FDI; R&D expenditures; capital goods imports; raw material imports
Pradhan (2011) Multi-industry (5237)	R&D Intensity	R&D investments
Raut (2003) Multi-industry (415)	Export Intensity	R&D expenditures; Firm size
Siddharthan & Nollen (2004) Information Technology (145)	Export Intensity	FDI; Technology imports; Capital imports; Firm size; Import of raw materials
Singh (2009) Multi-industry (3542)expenditure	Export Sales	Domestic sales; R&D expenditure; Advertising

Methodology, Data And Variables

Data regarding the Indian pharmaceutical firms has been obtained from the Centre for Monitoring Indian Economy (CMIE)-Prowess database. Out of all the pharmaceutical firms listed in the data base, 147 pharmaceutical firms have been included in the study considering the availability of data. The time period considered for the study was from 2000-2013 (14 years). The data taken for the study is an unbalanced panel with 16464 firm observations.

Export intensity was considered as the dependent variable and eight independent variables have been included in this research to understand their impact on export performance of Indian pharmaceutical firms. The operational definitions of the dependent and independent variables are presented in Table 2. Multiple regression approach (OLS method) was used to investigate the impact of various determinants on export performance of Indian pharmaceutical firms. The regression equation used for the analysis is given as follows:

$$Exp = \alpha + \beta_1 Sales + \beta_2 RD + \beta_3 PAT + \beta_4 AGE + \beta_5 ADV + \beta_6 NFA + \beta_7 ICG + \beta_8 IRM + \varepsilon$$

Table 3 : Operational Definitions of Dependent and Independent Variables

S. No.	Variables	Operational Definition of Variables
1	**Dependent Variable**	
	Export	Export Sales of the firms (Rs. millions)
	Independent Variables	
1	RD	R&D Expenditure of the firms (Rs. millions)
2	SALES	Total sales of the firms (Rs. millions)
3	ADV	Advertising Expenditures of the firms (Rs. millions)
4	PAT	Profit after Tax of the firms (Rs. millions)
5	NFA	Net Fixed Assets of the firms (Rs. millions)
6	AGE	Age of the firms from date of incorporation (Rs. millions)
7	ICG	Import of Capital Goods of the firms (Rs. millions)
8	IRM	Import of Raw Materials (Rs. millions)

Further to the multiple regression analysis a quantile-regression (Koenker and Basset, 1978) approach was applied to understand the impact of all the independent variables at different quantiles of the dependent variables. A comparison of the results of OLS regression method and quantile-regression approach is presented in section 4.

Finding and Discussion

Table 3 gives the information regarding the descriptive statistics of the dependent variable and various independent variables used in the study. Table 4 presents the OLS regression results of the various determinants of export performance of the Indian pharmaceutical firms.

Table 4 : Descriptive Statistics

	Mean	Std. Dev.	Maximum	Minimum
ADV	58.568	232.735	3036.200	0.0
AGE	29.330	20.197	113.000	7.0
ES	1632.075	5199.480	62865.000	0.0
ICG	57.228	200.005	2773.000	0.0
IRM	23.300	24.813	258.010	-45.8
NFA	1410.451	2938.114	34182.900	0.0
PAT	517.317	3265.420	128969.100	-30517.3
RD	190.263	652.849	7988.400	0.0
SALES	3817.615	7953.335	83946.000	0.0

It can be observed that among all the independent variables, except profitability and import of raw materials, all the other independent variables (sales, research and development expenditure, age of the firm, advertising expenditure, net fixed assets and import of capital goods) have exhibited a significant impact on the export performance of Indian pharmaceutical firms.

Table 5 : OLS Regression Results for Export performance

Variable	Coefficient	t value	p value	VIF
Constant	211.311	0.812	0.417	
Sales	0.424	23.426	0.000*	4.298
RD	1.050	7.211	0.000*	8.706
PAT	0.006	0.531	0.595	1.122
AGE	-26.227	-2.832	0.005*	6.017
ADV	-1.640	-6.259	0.000*	1.140
NFA	0.275	6.788	0.000*	1.387
ICG	2.720	8.143	0.000*	2.909
IRM	-3.364	-1.623	0.105	1.123
Adj. R^2	0.916			
F value	147.47			

* indicates statistical significance at 1 % levels

Sales, research and development expenditure, net fixed assets and import of raw materials show a significant and positive impact on export performance while age of the firm and advertising expenditure exhibit a significant but negative influence on export performance of Indian pharmaceutical firms.

Table 5 presents the results of the quantile-regression approach as applied to the study on the determinants of export performance of the Indian pharmaceutical firms. The impact of the independent variables on the dependent variable is examined by analyzing the impact in nine different quantiles. It is quite interesting to note that unlike the results from the OLS method, findings from the quantile-regression approach indicate that all the eight independent variables exhibit a significant impact on the export performance of Indian pharmaceutical firms. Size of the firm (represented by sales) shows a significant impact in all the quantiles of the dependent variables except in one of the lower quantiles (2nd quantile) and the median quantile (5th quantile). Likewise, research and development expenditure exhibits a significant impact in all the quantiles except the median quantile (5th quantile). Profitability, which has not shown any significance in the OLS method, exhibits a significant relationship with export performance in all the first four quantiles. It fails to show any relationship between the 5th and the 9th quantiles. Age of the firm exhibits a significant relation in all the quantiles except 1st, 8th and 9th quantiles. Advertising shows a significant influence in all the quantiles except 1st and 2nd quantiles. Net fixed assets exhibit a significant relation in all the quantiles excepting the upper quantiles (7th and 9th). Import of capital goods show a significant impact in all the quantiles except 2nd, 5th, 7th and 9th quantiles. Lastly, import of raw materials which did not exhibit any significant relationship with export performance using the OLS method, shows a significant impact on export performance only in the lower-most quantile (1st quantile) but not in any other quantile.

Conclusion

This research paper explored the determinants of export performance of Indian pharmaceutical firms using OLS and quantile-regression approaches. Based on the resource based view (RBV) put forward by Barney (1991), this research investigated the impact of firms' internal resources on their export performance. Broadly, the results indicate that the impact of the determinants on export performance showed varied results between OLS method and quantile-regression approach. The results reported were superior in case of quantile-regression approach where all the independent variables exhibited a significant impact on export performance to some or the other extent. The results indicate the utility of the quantile-regression approach in this type of research. In case of the determinants, it is observed that size of the firm, research and development expenditures, net fixed assets and import of capital goods show a significant impact on export performance while age of the firm and advertising showed a significant but negative influence on export performance.

Table 5: Quantile Regression Results for Export Performance

Variable	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Constant	-18.727 (-3.260)**	-3.521 (-0.476)	0.000 (0.000)	5.096 (0.749)	7.244 (1.028)	13.332 (1.419)	12.747 (1.199)	11.363 (0.921)	0.000 (0.000)
Sales	0.012 (2.535)*	0.018 (1.881)	0.039 (3.361)**	0.064 (2.161)*	0.102 (1.695)	0.172 (3.234)**	0.226 (6.307)**	0.389 (7.707)**	0.513 (6.096)**
RD	1.246 (4.787)**	2.326 (2.575)**	2.243 (23.463)**	2.919 (3.461)**	3.052 (1.160)	2.989 (10.650)**	2.933 (11.844)**	2.092 (6.429)**	1.134 (2.892)**
PAT	0.027 (16.878)**	0.020 (10.218)**	0.016 (13.483)**	0.011 (2.802)**	0.008 (1.291)	0.004 (1.097)	-0.001 (-0.277)	-0.002 (-1.243)	-0.011 (-1.926)
AGE	0.090 (0.447)	-0.704 (-2.911)**	-1.304 (-3.041)**	-1.274 (-3.135)**	-1.207 (-2.627)**	-1.333 (-3.769)**	-0.818 (-3.079)**	-0.516 (-1.448)	0.000 (0.000)
ADV	-0.461 (-1.667)	-0.365 (-1.023)	-0.548 (-4.289)**	-0.740 (-3.416)**	-1.000 (-3.326)**	-1.408 (-4.514)**	-1.005 (-3.099)**	-1.315 (-3.508)**	-1.542 (-2.153)*
NFA	0.033 (2.337)*	0.068 (2.723)**	0.126 (4.994)**	0.169 (3.198)**	0.200 (3.208)**	0.245 (2.566)**	0.250 (1.309)	0.153 (5.359)**	0.237 (1.549)
ICG	3.283 (23.845)**	3.922 (0.746)	6.269 (7.287)**	5.361 (3.446)**	4.885 (2.405)	4.276 (3.764)**	3.595 (0.903)	3.376 (4.682)*	3.312 (1.332)
IRM	-0.922 (-3.697)**	-0.287 (-1.056)	-0.024 (-0.083)	-0.105 (-0.324)	-0.128 (-0.216)	0.000 (0.000)	0.300 (0.478)	0.529 (0.949)	0.972 (1.043)
Pseudo R^2	0.173	0.273	0.369	0.451	0.523	0.590	0.654	0.714	0.772

*Note: t-values reported in parentheses; * and ** indicate statistical significance at the 5%, and 1 % levels, respectively*

The results of this research can provide guidance to practitioners of export marketing in the Indian pharmaceutical industry. The results indicate the internal resources that need to be focused upon by the practitioners. The results also give future pointers to academic researchers. The research approach used in this paper can be used to extend the research to other Indian industries to facilitate better understanding of the determinants of export performance. Liberalization of the Indian economy has helped in the rapid growth of Indian industries. The Indian pharmaceutical industry, in particular, received a growth impetus due to the product patent regime that began on 1st January, 2005 after India starting adhering to the guidelines applicable to the WTO signatory countries. This trend portends well for the export potential of the firms belonging to Indian pharmaceutical industry due to the export marketing opportunities of generic and branded medicines in the developing and developed countries across the world.

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