

# Determinants of Export Performance: New Evidence from Indian Industries

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## Abstract

*Exploring determinants of export performance is one of the most extensively investigated areas of international business. Researchers in India and abroad have investigated different firm characteristics that influence export performance of firms. The focus of this paper is to examine the determinants of export performance of Indian industries using panel data. The study presents an analysis of 171 Indian firms belonging to fourteen different industries listed in the CMIE-Prowess database for the period 2005-2012. The study highlights the differences in the export performance of high, medium-high, medium-low and low technology intensive industries based on OECD (Organisation for Economic Co-operation and Development) technology classification of industries. The analysis is presented using multiple regression method with export intensity as the dependent variable and seven other firm characteristics (research & development intensity, size of the firm, advertising intensity, capital intensity, profitability intensity, debt-equity ratio and technology) as independent variables. Advertising intensity and capital intensity are found to have a significant impact on export performance of firms in seven industries each. Debt-equity exhibited a significant impact on export performance in six industries. Technology and size of the firm have shown an influence on five industries while research & development intensity, and profitability intensity had a significant impact on export performance of three industries each.*

**Key Words:** *Determinants, Export performance, Export intensity, Indian industries, OECD technology classification*

## 1. Introduction

It has been more than two decades since India has initiated liberalisation policies in 1991 to facilitate the growth of Indian firms by providing a platform to explore the global markets. As per WTO data for the year ending 2012, India's export share in global trade is 1.60 per cent and import share is 2.63 per cent (in merchandise trade). India's export share is 3.23 per cent and import share is 3.07 per cent in commercial services trade at the end of 2012.

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In 2012, India's rank in merchandise trade exports is 19 and rank in import is 10. India's rank in commercial services exports is 7 and rank in imports is 7. Table 1 presents the data on Indian economy's exports and imports in terms of the main commodity break-up analysis. It can be observed that more than 60 per cent of India's exports come from manufacturing sector while more than 40 per cent of India's imports are attributed to fuel imports.

**Table 1: Break-down of Indian economy's total exports and imports**

Main commodity group	% Share of exports	% Share of imports
Agricultural Products	14.4	5.2
Fuels and Mining Products	21.9	42.9
Manufacturing	61.2	38.5
Others	2.5	13.4
Total	100	100

Source: World Trade Organization;

<http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=IN>

The analysis of Indian top 20 categories of exports is presented in Table 2. It can be noted that India's major manufacturing export categories include Petroleum products; Gems and jewellery, Transport equipments, Machinery and instruments and drugs & pharmaceuticals. These five export categories alone represent 50.7 per cent of India's total exports. India's total exports have shown a growth of 10.5 per cent in August 2013 and the top twenty export categories contribute to 80.9 per cent of India's total exports. Considering the significance of India's exports to the overall growth of the Indian economy, it becomes imperative to understand the various determinants affecting India's export performance. Hence, the primary objective of this research is to explore the various determinants of export performance in the context of Indian industries. Kumar & Siddharthan (1993) have earlier investigated the export performance determinants among 13 Indian manufacturing industries. This paper follows a similar approach but extends the research by covering 14 Indian industries using a representative sample from the BSE-500 classification of Indian industries. Thus, unlike the earlier researchers (Kumar & Siddharthan, 1993) this research covers not only the manufacturing industries but also services industries like information technology which was earlier not researched. This research approach is novel in several ways. Firstly, it includes more number of industries in comparison to earlier studies. Secondly, it captures both manufacturing and service industries. Thirdly, the data covered in this research is for a sufficiently long period of eight years more than any of the earlier similar studies. The other notable and novel contribution in this research is that it uses the OECD (Organisation for Economic Co-operation and Development) Technology Intensity classification which was not used by the earlier researchers in similar studies. Kumar & Siddharthan (1993) used UNCTAD (United Nations Conference on Trade and Development) technology classification and

classified the industries into high-technology, medium-technology and low-technology industries. This paper classifies the various Indian industries into four categories: High-technology; Medium-high technology; Medium-low technology and Low-technology as per OECD classification of industries. Finally, this research employs a representative sample of Indian industries using the BSE-500 classification which was an approach not followed by the earlier research studies in the context of exploring determinants of export performance of Indian industries.

**Table 2: Indian exports: Top 20 categories (Values in Rs. Thousand Crores)**

Rank	Category	Apr-Aug 2012	Apr-Aug 2013	% Growth	% Share
1	Petroleum: Crude and Products	120.2	147.9	23.1	20.4
2	Gems and Jewellery	98.4	97.7	-0.7	13.5
3	Transport Equipments	45.8	48.9	6.8	6.8
4	Machinery and Instruments	33.7	37.2	10.3	5.1
5	Drugs, Pharma. and Fine Chem.	31.9	35.5	11.2	4.9
6	Other Commodities	19.8	27.0	36.2	3.7
7	Manufactures of Metals	23.2	22.2	-4.4	3.1
8	RMG Cotton incl. Accessories	18.7	21.0	12.6	2.9
9	Cotton Yarn, Fabrics	15.3	20.2	32.4	2.8
10	Electronic Goods	18.6	18.1	-2.7	2.5
11	Plastic and Linoleum Products	13.5	15.6	15.7	2.2
12	Inorganic/Organic/Agro	12.2	14.4	18.0	2.0
13	Primary and Semi-Finished Iron & Steel	10.1	12.5	23.9	1.7
14	Rice-Basmati	7.7	12.4	61.9	1.7
15	Manmade Yarn, Fabrics	10.7	11.7	8.6	1.6
16	Dyes / Intermediates and Coal Tar Chemicals	8.9	10.4	16.9	1.4
17	Marine Products	6.5	9.8	49.6	1.4
18	Meat and Preparations	6.1	9.1	49.4	1.3
19	RMG Manmade Fibers	5.6	7.3	31.7	1.0
20	Rice (Other than Basmati)	5.3	6.8	28.0	0.9
	Total	723.9	654.9	10.5	80.9

Source: DGCIS (Directorate General of Commercial Intelligence and Statistics), Kolkatta  
[http://www.dgciskol.nic.in/data\\_information.asp](http://www.dgciskol.nic.in/data_information.asp); accessed on 2<sup>nd</sup> September 2013; % Share as per 2013 Values

The rest of this paper is structured as follows: Section 2 gives an overview of the theoretical framework and literature review of the most significant and relevant studies in the Indian and global context. Section 3 presents the methodology and data used for the study along with a descriptive note on the dependent and independent variables used

for the research. Section 4 outlines the key findings of the research along with a discussion. Section 5, the concluding section, presents a summary of the study along with a few directions for future research.

## **2. Theoretical Framework and Literature Review**

Many researchers have analyzed the export performance determinants of firms not only in developed economies but also in the emerging economies like India. Many studies have examined the various determinants of export performance with the help of the resource-based view (RBV) put forth by Barney (1991). RBV theory posits that a firm's internal resources help the firm in achieving a competitive advantage in the markets it competes. Some of the internal firm resources examined by various researchers include size of the firm, age, research and development (R&D) competencies, capital structures, advertising resources and technological capabilities among others. In this section, a few of the most pertinent Indian and global empirical studies that have used the previously mentioned internal resources of firms have been discussed as mentioned below.

Aggarwal (2002) presented an evidence of export performance of 916 MNEs operating in 33 different Indian manufacturing industries. The study classified the manufacturing industries in India based on OECD classification of technology-intensive industries. The dependent variable in the study was export intensity and the independent variables are: firm size, technology imports, R&D expenditures, skills of employees and import of raw materials. The results indicated that R&D expenditure had a significant impact on export intensity only in medium-high technology industries but not in the other industries.

Bhaduri & Ray (2004) examined the effect of technological capabilities on export competitiveness of Indian pharmaceutical (n=72) and electronics firms (n=52). The results indicated that in case of pharmaceutical and electronics industries, firm size and R&D expenditures had a positive and significant impact on export performance. Firm age had no significant on export performance in pharmaceutical industry while it exhibited a negative impact on the electronics industry.

Bhat & Narayanan (2009) investigated the role of technical competencies and firm size on export performance of 121 firms belonging to Indian chemical industry. Export intensity was considered to be the dependent variable while 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 used as independent variables. The results indicated that R&D expenditures, size of the firm, import of raw materials, choice of technology and advertising intensity had a favorable impact on export performance. Age of the firm did not show any significance 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.

Ganguli (2007) analysed the export performance of 165 firms in Indian iron and steel industry. The study attempted to determine the association of export intensity of the firms with structural factors of the firm like age, size and capital intensity. The study also analysed the association of export performance of the firms with an economic performance indicator: Return on Assets (ROA). The study found no significant relationship of export performance with size and age of the firms in the iron and steel industry but found a significant relationship with capital intensity of the firms. The study also reported no significant relationship of export intensity of the firms with the economic performance indicator, ROA.

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.

Kumar & Saqib (1996) studied the impact of in-house R&D activity of firms on export orientation of 291 Indian manufacturing firms. The study found a positive and significant effect of R&D intensity on export performance of the firms.

Kumar & Siddharthan (1993) analysed the export behaviour of 640 Indian firms across 13 different industries. The 13 industries have been categorised into three categories as per UNCTAD (1987) classification using relative technology intensity. The three categories are high technology, medium technology and low technology industries. The dependent variable used in this study was export intensity and the following independent variables were employed: R&D expenditure intensity, technology payments abroad to sales ratio, size (measured as net sales of the firm), Advertising intensity, gross fixed assets to sales ratio, profit before tax to sales ratio and total value of imports to sales ratio. The main conclusions indicate that R&D expenditure intensity showed a positive and significant association in four industries (transportation equipment, man-made fibers, paper and rubber product industries). Technology imports variable was positive and significant only with paper products, rubber products, non-electrical machinery and electrical machinery industries. Firm size was found to be positive and significant with seven industries (textiles, cement, paper, man-made fibers, rubber tyres, electrical and non-electrical machinery industries). Advertising intensity was found to be significant with a positive sign in case of five industries (fabricated metal products, paper,

transportation equipment, rubber products and pharmaceutical industries). Capital intensity was positive and significant in only two industries (electrical and pharmaceutical industries). Profitability (measured as profit before tax to sales ratio) was found to be positive and significant with only four industries (cement, transportation equipment, non-electrical equipment and pharmaceuticals).

Lall (1983) explored the impact of R&D expenditures by top 100 manufacturing firms in India. The independent variables considered in this study were: size, age, foreign equity, foreign licensing agreements, royalties paid for technology, export intensity, percentage of wages paid to high-level managers & technical personnel and average wages paid to employees. The results indicated a positive and significant association of all the variables with R&D expenditures excepting export intensity and wages paid.

Lall (1986) studied the relationship between export performance (measured as export intensity) and technological development among leading Indian engineering (n=100) and chemical firms (n=45). 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.

Lall & Kumar (1981) analysed the export performance of the 100 largest firms belonging to Indian engineering industry. The dependent variables considered in the study are export intensity, export sales and export growth. Firm size, profitability (profit before tax), and technological activity (R&D) are the independent variables employed in this study. The study reported a negative association of export performance with profitability and technological activity but a positive association with firm size.

Majumdar (2010) investigated the impact of innovation (measured as R&D expenditures) on export intensities of 112 Indian information technology and software firms. Export intensity was the dependent variable and the following were the independent variables: R&D expenditure; capital intensity, size, profitability, margins, imports, capital, cash, leverage (debt-equity ratio) and foreign borrowings as a percentage of total debt. The results indicated that R&D expenditure exhibited a significant and positive impact on export performance of Indian IT firms.

Pradhan (2007) examined the export intensity of Indian manufacturing firms (n=3951 firms) using a range of independent variables: Age of the firm, size of the firm, outward FDI by the firm, R&D intensity, technology imports (royalties and technical fees remitted

abroad), capital goods imports, raw material imports, advertising and sales promotion expenses and labour productivity. The study also included a few of industry - specific dummy variables to estimate the inter-industry differences in the export behavior among twenty three industry sectors. The study concluded that all the variables excepting age of the firm, technology imports and advertising expenses have shown a significant and positive relationship with export intensity of the firms.

Pradhan (2011) in a study on the relation between R&D expenditures and export orientation of small, medium and large Indian firms (n=5237 firms) found that there is a positive and significant link between R&D investments and export performance among all the small, medium and large Indian firms.

Raut (2003) studied the effect of firm size, R&D expenditures and competitiveness on export performance of 415 Indian private firms by classifying them into technologically-light and technologically-heavy industries. The results indicated that R&D expenditures increased the firms' likelihood to export across all the firms. Firm size had no impact on the technologically-light industries but exhibited a negative and significant association with firms in the heavy industry.

Sanyal (2004) investigated the impact of R&D investments on bilateral trade patterns among the OECD countries. The results indicated that innovative outcomes with R&D investments had a positive and significant effect on the bi-lateral trade performance of OECD nations. The study also concluded that the impact of R&D investments on export performance is significantly higher among the high-technology industries.

Siddharthan & Nollen (2004) examined the relationship between firm size and export performance among firms in Indian information technology industry. The firms were classified as MNE affiliates, licensees and domestic firms. Export intensity was used as the dependent variable and the independent variables employed for the study were: technology imports, FDI (foreign equity in firms), import of capital goods, import of raw materials, capital output ratio and size of the firm. The results concluded that FDI and technology imports had a positive and significant relationship with export intensity among MNEs while capital imports and size of the firm exhibited a significant but negative relationship. In the licensee firms, capital output showed a positive and significant relationship with export intensity while technology imports showed a significant but negative relationship. Among the domestic firms, import of raw materials, size of the firm and capital output have shown a positive and significant relationship with export intensity while capital imports has shown a significant but negative relationship.

Singh (2009) investigated the export performance of 3542 Indian firms using export sales as dependent variable. The independent variables employed in the study are domestic sales, R&D expenditure, advertising expenditure, group affiliation, world GDP, exchange

rate and age of the firms. The study concluded that domestic sales positively affect export sales of the firms and that they are interdependent on each other. R&D expenditure exhibited a positive and significant relationship while advertising expenditure has shown a negative relationship.

It needs to be noted that though there have been a few studies on determinants of export performance in the Indian context, this paper tries to present a new evidence by considering the data for a different and more current time-period. Based on a comprehensive review of the previous empirical studies, the next section describes the methodology, data and the variables used for the study.

### **3. Methodology, Data and Variables**

In this section the methodology used for the study, the data considered and the variables employed are presented as follows:

#### *3.1 Methodology of the Study*

In line with the classification used by Kumar & Siddharthan (1993), this research has employed the OECD classification (1997) which segments various industries into four different categories based on their technology intensities. This classification was not available for earlier researchers and hence they used UNCTAD (1987) classification of industries that divided various Indian industries into three categories. Hence, in this study, all the 14 industries included in the sample were divided into four categories namely: High-technology industries (Information technology and healthcare); Medium high-technology industries (Transportation, Capital goods, Diversified and consumer durables); Medium low-technology industries (Oil & gas, Metal & metal products, Housing-related, Chemicals and agriculture) and Low-technology industries (FMCG, Textiles and miscellaneous firms). This research uses multiple regression approach to explore and present a new evidence for the export performance determinants of Indian industries.

The regression equation is represented as follows:

$$\text{Expint} = \alpha + \beta_1 \text{RDint} + \beta_2 \text{Sales} + \beta_3 \text{Advint} + \beta_4 \text{Capint} + \beta_5 \text{PBTint} + \beta_6 \text{DE} + \beta_7 \text{Tech} + \varepsilon$$

#### *3.2 Data*

The data for this research is considered from the CMIE (Centre for Monitoring Indian Economy)-Prowess Database which provides the information regarding various firms across twenty different Indian industries. Taking the data availability into consideration, firm-level data for 171 firms belonging to 14 different industries were considered for this research. The initial sample set of firms constitute 73.6 per cent (368 firms) of all BSE-500 firms. The final sample size considered for the study account for 34.2 per cent of all the BSE-500 firms. The final sample set is highly representative since the combined export sales of these sample firms constitute nearly 70 per cent of all the firms (based on



authors' calculations) listed in the BSE-500 classification of industries. The research undertaken in this study gives an opportunity to understand the phenomenon of export performance determinants across all major Indian industries and highlights the inter-industry differences of determinants of export performance in a single study.

Out of the twenty different industries as per BSE-500 classification, six industry categories could not be considered for the study due to data unavailability. The categories are media, tourism, finance, power, telecommunications and the firms placed in 'Others' category. Firms belonging to financial sector could not be considered for the study since they do not have any export component. Finally, the data includes firms belonging to 14 different industries categories. They are information technology, FMCG, oil & gas, transportation, metal & metal products, healthcare, capital goods, housing related, chemical, diversified firms, textiles, agriculture, consumer durables and miscellaneous categories. The period considered for the research was from 2005-2012. This period is appropriate since it captures the performance of Indian organizations post-WTO era after India became a signatory to WTO starting from 1<sup>st</sup> January, 2005.

### 3.3 Dependent and Independent Variables

In line with many of the earlier studies as mentioned in the literature review section, the present research used export intensity as the dependent variable. Many independent variables have been used by previous empirical studies to study the determinants of export performance in the Indian scenario. This study has chosen seven appropriate independent variables based on a comprehensive examination of earlier studies. The operational definitions of the dependent and independent variables are presented in Table 3.

**Table 3: Dependent and independent variables**

S. No.	Variables	Operational Definition of Variables
1	Dependent Variable	
	Export Intensity	Export Sales/Total Sales
	Independent Variables	
1	R&D Intensity	R&D Expenditure/Total Sales
2	Size	Total sales of the firm
3	Advertising Intensity	Advertising Expenditure/Total Sales
4	Capital Intensity	Net Fixed Assets/Total Sales
5	Profitability Intensity	Profit Before Tax/Total Sales
6	Leverage (Debt Equity Ratio)	Debt/Equity
7	Technology	(Salary & Wages)/Net Fixed Assets

#### 4. Key Findings and Discussion

Table 4 presents the descriptive statistics for the dependent and independent variables. It can be observed that the information technology (IT) industry has the highest export intensity of 0.64 among all the fourteen industries considered for the study. The data has been checked for multicollinearity issues and autocorrelation and it was found that there is no multicollinearity when the variance inflation factor (VIF) values were analyzed. Serious autocorrelation among the variables does not exist as per the values reported by the Durbin-Watson test.

**Table 4: Descriptive Statistics (Sample Size = 171 firms; No. of Industries = 14)**

Industry		Exp	RD	Sales	Advint	Cap	PBT	DE	Tech
High technology									
IT (11)	Mean	0.64	0.01	51263.6	0.00	0.31	0.36	0.19	1.89
	SD	0.38	0.01	82593.5	0.00	0.34	0.93	0.30	1.06
Healthcare (30)	Mean	0.38	0.05	14599.1	0.02	0.38	0.27	0.63	0.67
	SD	0.30	0.15	13964.1	0.03	0.29	1.30	1.32	1.45
Medium high technology									
Transportation (20)	Mean	0.16	0.01	69305.6	0.01	0.24	0.10	0.75	0.26
	SD	0.18	0.01	99805.0	0.01	0.15	0.06	2.35	0.22
Capital goods (19)	Mean	0.18	0.01	53600.2	0.00	0.22	0.13	0.31	0.55
	SD	0.17	0.01	95339.4	0.01	0.21	0.06	0.51	0.45
Diversified (5)	Mean	0.08	0.00	29662.0	0.00	0.27	0.09	0.36	0.70
	SD	0.08	0.00	25291.9	0.01	0.20	0.06	0.33	0.86
Consumer durables (5)	Mean	0.07	0.00	20954.7	0.03	0.11	0.06	5.24	0.61
	SD	0.05	0.00	17007.0	0.02	0.05	0.04	25.6	0.21
Medium low technology									
Oil & gas (9)	Mean	0.58	0.00	926898.1	0.01	0.41	0.10	1.17	0.11
	SD	2.34	0.00	1013553.8	0.01	0.48	0.13	1.34	0.18
Metal (12)	Mean	0.27	0.00	117079.2	0.00	0.51	0.25	0.78	0.15
	SD	0.20	0.00	126076.5	0.00	0.26	0.17	0.96	0.20
Housing-related (9)	Mean	0.05	0.00	27901.2	0.01	0.59	0.12	1.12	0.23
	SD	0.05	0.00	22093.4	0.01	0.31	0.09	0.97	0.44
Chemicals (9)	Mean	0.11	0.00	18808.8	0.02	0.29	0.12	0.41	0.28
	SD	0.11	0.00	14900.8	0.02	0.26	0.06	0.51	0.14
Agriculture (13)	Mean	0.13	0.00	24032.7	0.01	0.36	0.12	0.87	0.17
	SD	0.15	0.00	20758.2	0.01	0.18	0.11	0.77	0.13
Low technology									
FMCG(18)	Mean	0.09	0.00	36853.9	0.06	0.30	0.14	0.41	0.34
	SD	0.13	0.00	63495.9	0.06	0.46	0.06	0.90	0.18
Textile (4)	Mean	0.19	0.00	36577.5	0.02	0.55	0.13	0.87	0.14
	SD	0.12	0.00	31564.7	0.02	0.17	0.11	0.52	0.09
Misc (7)	Mean	0.15	0.00	10638.4	0.01	0.61	0.12	0.84	0.90
	SD	0.21	0.00	7260.2	0.03	0.45	0.09	1.07	1.93

Table 5 presents the results for high-technology and medium high-technology industries. Among the two high-technology industries (Information technology and healthcare) it can be observed that information technology industry has exhibited a significant but negative relationship with only advertising intensity and debt-equity and not with the other independent variables. On the other hand, healthcare industry has shown a significant and positive relationship with R&D intensity, size of the firm and capital intensity but has shown a significant and negative relation with advertising intensity and technology variables. Healthcare industry did not exhibit any significant relationship with profitability intensity and leverage (measured as debt-equity) variables.

Among the four industries (Transportation, Capital goods, Diversified and Consumer durables) in the medium high-technology classification, transportation industry has shown a positive and significant effect with only capital intensity and profitability intensity variables and exhibited a negative relationship with technology variable. The capital goods industry has shown a positive and significant relation with only profitability and debt-equity variables but a negatively significant relation with R&D intensity, advertising intensity and technology variables. The firms belonging to the diversified category have shown a significant and positive relation with only advertising intensity and capital intensity but a negatively significant relation with profitability. On the other hand, the fourth industry in this category, consumer durables has shown a positive and significant relationship with only capital intensity and technology variables and exhibited no relationship with any of the remaining independent variables.

**Table 5: Regression results for high-technology and medium high-technology industries**

Industry	Constant	Rdint	Sales	Advint	Capint	PBTint	DE	Tech	Adj. R <sup>2</sup>	F-stat
High technology										
Information technology	0.618**	-2.007	0.000	-49.677**	0.158	-0.063	-0.385**	0.097	0.256	5.286
	(-4.052)	(-0.554)	(-0.471)	(-3.243)	(-0.867)	(-1.405)	(-3.039)	(-1.503)		
Healthcare	0.299**	0.259*	0.000**	-3.118**	0.166*	0.014	0.016	-0.035**	0.33	17.817
	(-7.697)	(-2.089)	(-3.994)	(-4.745)	(-2.4)	(-1.178)	(-1.257)	(-2.800)		
Medium high technology										
Transportation	0.001	-4.169	0.000	1.533	0.343**	1.422**	0.006	-0.161*	0.324	11.871
	(-0.013)	(-1.881)	(-1.313)	(-1.014)	(-3.922)	(-6.163)	(-1.206)	(-2.387)		
Capital Goods	0.128**	-1.979*	0.000	-7.299*	0.042	0.868**	0.112**	-0.113**	0.453	18.863
	(-3.129)	(-1.996)	(-1.579)	(-3.430)	(-0.506)	(-4.306)	(-3.604)	(-3.476)		
Diversified	0.075*	-1.32	0.000	6.413**	0.215**	-0.416**	-0.077	-0.012	0.765	19.127
	(-2.372)	(-0.821)	(-0.158)	(-5.122)	(-4.391)	(-3.892)	(-1.918)	(-0.856)		
Consumer durables	-0.148**	2.545	0.000	-0.153	1.104**	0.276	0.000	0.146**	0.692	13.514
	(-4.076)	(-1.885)	(-1.740)	(-0.544)	(-6.214)	(-1.605)	(-1.785)	(-4.105)		

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

Table 6 gives an account of the results of the regression analysis for medium-low technology and low-technology industries. Among the five industries (Oil & gas, Metal & metal products, housing-related, chemicals and miscellaneous categories) in the medium-low technology industries, oil & gas industry has exhibited no significant relationship with any of the independent variables. Among the other industries, metal & metal products industry has exhibited a positive and significant relation with only size and showed a significant but negative relationship with capital intensity and technology variables. Firms from the housing-related industry have shown a positive and significant relationship with only size and technology variables. Firms belonging to the chemicals industry have shown a negative and significant relationship with only advertising intensity and capital intensity variables. Agriculture firms, the other industry in this category, exhibited a significant and positive relationship with R&D intensity, size and debt-equity variables.

When we examine the results from the low-technology industries, firms from the FMCG industry have shown a positive and significant relation with capital intensity but a negative relationship with advertising intensity. The firms in the textile industry have shown a positive and significant relationship with size but a negative relation with advertising intensity. Finally, the firms from the miscellaneous industry category failed to show any significant relationship with all the independent variables except debt-equity variable where a positive relationship is observed.

Considering the fact that the OECD classification is done based on the R&D intensities of various industries, it is interesting to note that the results of this research throw up some interesting findings. R&D intensity, one of the variables used in this research, was expected to show a positive impact on export performance of many industries. It is surprising to note that information technology industry which was classified under the high-technology category (along with healthcare industry) failed to show a significant impact of R&D intensity on export performance. In fact, among all the 14 industries considered for this research, R&D intensity had a significant impact on export performance only in case of three industries: healthcare (high-technology); capital goods (medium high-technology) and agriculture (medium low-technology). In the case of capital goods industry, R&D intensity has shown a significant but negative impact on export performance while it exhibited a positive impact in case of firms belonging to the healthcare and agriculture industries. In comparison to the results of the earlier study by Kumar & Siddharthan (1993), R&D expenditure intensity showed a positive and significant association in four industries (transportation equipment, man-made fibers, paper and rubber products industries). This implies that the industries like healthcare have improved their R&D expenditures in the past twenty years keeping in view the changing patents laws in India owing to WTO regulations. R&D expenditure was shown to have a positive and significant impact on export performance in various studies reported by earlier researchers. Aggarwal (2002), Bhaduri & Ray (2004), Bhat & Narayanan (2009), Chadha (2009), Kumar & Saqib (1996), Lall (1986), Lall & Kumar (1981),

Majumdar (2010), Pradhan (2011) Raut (2003), Sanyal (2004), Siddharthan & Nollen (2004) and Singh (2009) reported a positive and significant impact of R&D expenditures on export performance of Indian firms belonging to various industries. Only one study by Jauhari (2007) did not find any significant influence of R&D expenditure on export performance of Indian electronics firms.

Among the other variables, size of the firm, which is considered to be one of the most influential variables on export performance showed mixed results. Only in five industry categories did size exhibit a significant impact on export performance: healthcare; capital goods (negative relationship), metal and metal products, agriculture and textiles. In contrast to the results of this research, in the study by Kumar & Siddharthan (1993), firm size was found to be positive and significant in seven industries (textiles, cement, paper, man-made fibers, rubber tyres, electrical and non-electrical machinery industries). Earlier studies by Bhaduri & Ray (2004), Bhat & Narayanan (2009), Chadha (2009), Jauhari (2007), Lall (1986), Lall & Kumar (1981), Pradhan (2007), Siddharthan & Nollen (2004) and Singh (2009) reported a significant impact of the size of the firm on export intensity of the firms. Only two studies by Ganguli (2007) and Raut (2003) failed to report a significant impact of size of the firm on export performance.

Advertising intensity, which is generally expected to influence the performance of firms positively, exhibited a significant and negative relationship with six industries and has shown a positive impact on export performance only in case of diversified firms. This is surprising and can possibly be explained by the fact that the firms considered in the study do not report the advertising expenditure related to export activities separately and hence it may be difficult to assess the influence of advertising expenditure only on export performance. Notwithstanding this difficulty, it would still be expected that advertising expenditure positively influences export performance. Contrary to general belief, the results of this research give an overall negative influence of advertising expenditure on export performance of firms. In the study by Kumar & Siddharthan (1993), advertising intensity was found to be significant with a positive sign in case of five industries (fabricated metal products, paper, transportation equipment, rubber products and pharmaceutical industries). Among the other previous studies, Bhat & Narayanan (2009) reported a positive influence of advertising expenditure on export performance, Lall (1986) and Singh (2009) reported negative relationship while Jauhari (2007) and Pradhan (2007) reported no significant impact of advertising intensity on export performance of firms.

In case of capital intensity, it is found that this variable has a positive and significant impact on export performance in six industries: Healthcare; Transportation; Diversified; Consumer durables; Metal and metal products and FMCG. Capital intensity was positive and significant in only two industries (electrical and pharmaceutical industries) in the study reported by Kumar & Siddharthan (1993). Ganguli (2007) also reported a positive and significant relation between capital intensity and export performance among firms in Indian iron and steel industry.

Among the remaining three variables, it is observed that profitability has shown a significant and positive influence on export performance in case of only two industries namely transportation and capital goods while it exhibited a significant but negative influence on export performance in case of diversified firms. Profitability (measured as profit before tax to sales ratio) was found to be positive and significant with only four industries (cement, transportation equipment, non-electrical equipment and pharmaceuticals) as reported by the study done by Kumar & Siddharthan (1993).

Debt-equity variable which indicates the risk-bearing ability of the firms has shown a positive and significant effect on export performance in case of information technology, capital goods, chemicals, agriculture, FMCG and miscellaneous industry categories. Majumdar (2010) did not refer to the impact of this variable on export performance. Lastly, technology variable has shown a significant and positive influence on export performance in case of consumer durables and housing-related industries but exhibited a negatively significant impact on export performance in case of healthcare, transportation, capital goods and metal & metal product industries. The results are in accordance with the results of the study reported by Bhat and Narayanan (2009) on export performance of firms in Indian chemical industry.

**Table 6: Regression results medium low-technology and low-technology industries**

Industry	Constant	Rdint	Sales	Advint	Capint	PBTint	DE	Tech	Adj. R <sup>2</sup>	F-stat
Medium low technology										
Oil & Gas	1.479	48.309	0.000	-25.158	0.422	-5.993	0.022	0.907	0.039	1.411
	(-1.817)	(-0.148)	(-1.677)	(-0.374)	(-0.504)	(-1.878)	(-0.084)	(-0.175)		
Metal	0.639**	-14.657	0.000**	119.301	-0.418**	0.128	-0.020	-0.673**	0.586	20.212
	(-9.744)	(-0.434)	(-3.496)	(-1.779)	(-6.503)	(-1.190)	(-1.040)	(-7.839)		
Housing-related	0.031	-6.817	0.000*	0.696	-0.031	-0.08	0.011	0.058**	0.45	9.305
	(-1.466)	(-0.952)	(-2.249)	(-0.983)	(-1.386)	(-1.219)	(-1.542)	(-3.862)		
Chemicals	0.212**	0.026	0.000	-3.906**	-0.165*	-0.016	0.097**	-0.050	0.461	9.691
	(-2.873)	(-0.005)	(-1.003)	(-5.145)	(-2.016)	(-0.083)	(-3.677)	(-0.333)		
Agriculture	0.140	12.451**	0.000**	-1.174	-0.069	0.011	0.066**	-0.048	0.253	5.991
	(-1.854)	(-3.191)	(-3.279)	(-0.923)	(-0.603)	(-0.088)	(-3.558)	(-0.274)		
Low technology										
FMCG	0.020	4.483	0.000	-0.401*	0.122**	0.275	0.028*	0.012	0.255	8.007
	(-0.494)	(-0.826)	(-0.525)	(-1.996)	(-5.217)	(-1.69)	(-2.273)	(-0.154)		
Textile	0.199	9.189	0.000*	-4.875*	0.145	-0.051	-0.024	0.471	0.566	6.776
	(-1.639)	(-0.894)	(-2.496)	(-2.359)	(-0.787)	(-0.211)	(-0.414)	(-1.021)		
Miscellaneous	0.099	-11.978	0.000	-1.235	-0.093	0.543	0.152**	-0.002	0.582	11.931
	(-1.299)	(-0.882)	(-1.450)	(-1.425)	(-1.479)	(-1.583)	(-6.129)	(-0.107)		

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

## **5. Conclusions and Future Research Directions**

Two decades ago, Kumar & Siddharthan (1993) have examined the determinants of export performance in the context of Indian industries. Indian economy has witnessed a lot changes due to the liberalization policies over the past twenty years. The findings of this research when compared to the findings of the earlier studies, have given interesting and varied insights. This can be attributed to the fact that many industries in India have undergone sea changes in the past two decades of post-liberalised India. Many earlier studies have analyzed the export performance of Indian industries at different points of time. This research is an attempt to understand the impact of changing dynamics of industries when Indian firms are trying to capture the global markets. Hence, the study of export performance phenomenon of Indian firms assumes importance.

It can be concluded from the analysis that research and development intensity has shown a significant impact on export performance in agriculture, healthcare and capital goods industries. Size of the firm (measured as sales) has exhibited a significant impact on export performance in metal, agriculture, textiles and healthcare industries. Advertising intensity has shown a significant impact on the dependent variable in case of chemicals, FMCG, textiles, information technology, healthcare, capital goods and diversified industries. Capital intensity exhibited a significant influence on export performance in case of metal, chemicals, FMCG, healthcare, transportation, diversified and consumer durables industries. Profitability (measured as profit before tax divided/sales) has shown an impact on export performance in case of transportation, capital goods and diversified industries. Leverage (measured as debt-equity ratio) has shown significance with export intensity in case of chemicals, agriculture, FMCG, miscellaneous, information technology and capital goods industries. Lastly, technology variable (sales and wages divided by net fixed assets) has exhibited a significant impact on export performance in case of only metal and housing-related industries.

The findings of this research highlight the impact of various firm characteristics on the export performance and establish the relative importance of these characteristics across different industries. The findings of this study can be a provide guidance to export practitioners in fine tuning their export strategies. The study also opens up future directions of research for scholars interested in advancing the field of international business. Earlier studies have focused only on a few industries like pharmaceuticals, electronics, chemicals and information technology industries. There is further scope for research on individual industries like oil and gas, media, power, tourism and telecom industries which could not be covered in this research. While there are a few multi-industry studies reported earlier, it is worthwhile to explore the determinants of export performance of some industries which were not covered by the previous researchers. This will facilitate a better understanding of the intra-industry and inter-industry variations to assess the impact of various firm characteristics on export performance of firms in various Indian industries.

### References

- Aggarwal, A. (2002). Liberalisation, multinational enterprises and export performance: Evidence from Indian manufacturing. *Journal of Development Studies*, 38(3), 119–137. doi:10.1080/00220380412331322371
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Bhaduri, S., & Ray, A. S. (2004). Exporting through technological capability: Econometric evidence from India's pharmaceutical and electrical/electronics Firms. *Oxford Development Studies*, 32(1), 87–100. doi:10.1080/1360081042000184138
- Bhat, S., & Narayanan, K. (2009). Technological efforts, firm size and exports in the basic chemical industry in India. *Oxford Development Studies*, 37(2), 145–169. doi:10.1080/13600810902859528
- Chadha, A. (2009). Product cycles, innovation, and exports: A study of Indian pharmaceuticals. *World Development*, 37(9), 1478–1483. doi:10.1016/j.worlddev.2009.01.002
- Economic Analysis and Statistics Division, OECD Directorate for Science, T. and I. (2011). ISIC REV. 3 Technology Intensity Definition. *OECD Working Paper*. doi:10.1787/sti http://www.oecd.org/sti/ind/48350231.pdf accessed on 21st February 2014)
- Ganguli, S. (2007). Export performance analysis of business groups and stand-alone organizations in the Indian iron and steel industry. *The ICFAI Journal of International Business*, II(4), 40–50.
- Jauhari, V. (2007). Analysing export intensity of the select electronics firms in India. *International Journal of Innovation Management*, 11(3), 379–396.
- Kumar, B. N., & Siddharthan, N. S. (1993). Technology, firm size and export behaviour in developing countries: The case of Indian enterprises. *INTECH Working Paper*, (9), 1–34.
- Kumar, N., & Saqib, M. (1996). Firm size, opportunities for adaptation and in-house R&D activity in developing countries: the case of Indian manufacturing. *Research Policy*, 25, 713–722.
- Lall, S. (1983). Determinants of R&D in an LDC: The Indian engineering industry. *Economic Letters*, 13, 379–383.
- Lall, S. (1986). Performance and export technological development in LDCs: Leading engineering and chemical firms in India. *Weltwirtschaftliches Archiv*, 1, 80–92.
- Lall, S., & Kumar, R. (1981). Firm-level export performance in an inward-looking economy: The Indian engineering Industry. *World Development*, 9(5), 453–463.
- Majumdar, S. (2010). Innovation capability and globalization propensity in India's information technology and software industry. *Information Technologies and International Development*, 6(4), 45–56.
- Pradhan, J. P. (2011). R&D strategy of small and medium enterprises in India. *Science Technology & Society*, 16(3), 373–395. doi:10.1177/097172181101600307
- Pradhan, J. P. (2007). How do Indian multinationals affect exports from home country? *MRPA Paper 19022*, University Library of Munich, Germany, (April), 1–41. http://mprapa.ub.uni-muenchen.de/id/eprint/19022 accessed on 22nd February 2014



- Raut, L. K. (2003). R&D activities and export performance of Indian private firms. *Working Paper*, Department of Economics, California State University at Fullerton, Mimeo, 24, 1-23.
- Sanyal, P. (2004). The role of innovation and opportunity in bilateral OECD trade performance. *Review of World Economics*, 140(4), 634–664.
- Siddharthan, N., & Nollen, S. (2004). MNE Affiliation, firm size and exports revisited: A study of information technology firms in India. *Journal of Development Studies*, 40(6), 146–168. doi:10.1080/0022038042000233849
- Singh, D. A. (2009). Export performance of emerging market firms. *International Business Review*, 18, 321–330. doi:10.1016/j.ibusrev.2009.03.002
- UNCTAD (1987). Classification by broad technological categories, Geneva: UNCTAD