DOI : 10.18843/ijms/v5i3(5)/04 DOIURL :<u>http://dx.doi.org/10.18843/ijms/v5i3(5)/04</u>

Research and Development Intensity and its Impact on the International Trade Performance of Automobile Firms

S. Felix Sophia,

Dr. J. Gayathri,

Ph.D Research Scholar Department of Commerce and Financial Studies, Bharathidasan University Tiruchirapalli, India Assistant Professor, Department of Commerce and Financial Studies, Bharathidasan University, Tiruchirapalli, India.

ABSTRACT

International Trade focuses on the resources of the globe and objectives of the organisations on global business opportunities and threats, in order to produce buy, sell or exchange of goods or services world-wide. The objective of the study is to examine the level of impact of the Research and Development activities on the Export Performance of the sample firms. Data for the study was collected from CMIE Prowess Database for the period of 10 years from 2008 to 2017. The statistical tools namely Correlation, Regression and Granger Causality were used for the study. The study revealed that the Research and Development activities did not have its impact on the Export Performance of the study period.

Keywords: Research and Development, International Trade, Correlation, Regression and Granger Causality.

INTRODUCTION:

During the post-independence era, the actual number of MNCs; who entered was small. The entry was generally made through collaboration with Indian business done on a large scale. The term foreign trade of a country, refers to its imports and exports of merchandise from other countries under contracts of sale. The residents of two or more different countries do the transactions of sale and purchase of goods or services. The transactions made are referred as Foreign trade (or) International trade transactions. The principle argument for international trade is based on the Theory of Comparative Advantage which is mutually beneficial for countries if they specialise in the production of those goods they produce more efficiently and trade those among them. Liberalisation of international trade will enhance the welfare of the world's citizens. Currently, international trade is becoming further liberalised at both the global and regional levels. The investigative activities undertaken by a business in order to improve the prevailing products and techniques or to enhance the development of new products and procedures is referred to as Research and Development (R&D). In order to make improvement in the existing product lines and enhance growth by means of developing new products and services the industries and corporations spend more on R&D. R&D is different from most activities performed by a corporation in the process of operation. Developing an effective R&D; requires a large capital investment that numerous small businesses may not be able to afford. The research and development is typically not performed with the anticipation or goal of instant profit. Instead, it is concentrated on long-term profitability for a company.

REVIEW OF LITERATURE:

Chandan Sharma (2012) examined the impact of Research and Development (R&D) activities on firms' performance for the Indian pharmaceutical industry. The study found that the performance of foreign firms operating in the industry is more sensitive toward R&D than the local firms and propose further encouragement

and incentives for doing in-house innovative activities in the Indian pharmaceutical industry. Bishwanath Goldar (2013) found that increased R&D efforts of Indian pharmaceutical firms were responsible in a major way for the observed increase in export intensity. The results suggest that the impact of R&D intensity on exports depends on the level of productivity already reached by the firms. Pramod Kumar Naik (2014) found that R&D investment have a positive impact on the market value of firm at the beginning, however, after a point these investments lower the market performance of firms. Sizhong Sun and Sajid Anwar (2015), examined the impact of research and development (R&D) activities on the performance of firms in China's coal mining industry. The study revealed that firms in China's coal industry that conduct R&D are more productive and their sales are higher and that foreign direct investment in China's coal mining industry leads to a significant decrease in the market share of domestic firms and its impact on productivity, sales and profitability of domestic firms is insignificant. The study suggests that policies that encourage domestic firms in China's coal mining industries to conduct R&D can increase domestic production thereby reducing reliance on imports and productivity gains arising from R&D activities can also help Chinese mining firms to improve their competitive position in the international market. Chia-Wen Hsu, Yung-Chih Lien and Homin Chen (2015), investigated the effect of R&D internationalization on firm innovation performance. Results of the study reveal a curvilinear U-shaped relationship and that a firm's experience in foreign expansion may have a positive moderating impact on the relationship between R&D internationalization and innovation performance, suggesting the benefits of R&D internationalization eventually outweigh the costs after critical levels of intensity and diversity and that the effect is contingent on the firm's capability in dealing with the complexities, uncertainties inherent in international business. Omer Limanl (2015), investigated the determinants of research and development (R&D) decision in Turkey. Findings of the study demonstrate that sales, subsidy, share of foreign ownership, competition incentive, scale of enterprise, domestic and foreign trade shares are very important factors to influence probability of investment on R&D. Public policies which take into account these factors would be invaluable for growth and development of Turkish Economy. OzcanKarahana (2015), identified the relationship between the business enterprise, R&D expenditure and productivity growth via indicating the role of transformation in manufacturing sector towards high tech production. The study found that there is a strong causality from increasing business enterprise R&D intensity to the expanding share of high and medium-high manufacturing. The study concluded that business enterprise R&D expenditure is one of the main sources of improvement in the technological capability of high value-added production in Europe and that it should create an appropriate incentive for private R&D activities in order to provide a transformation in manufacturing sector towards high tech specification and continued growth in economy depending on innovation. Zied Bouaziz1 (2016), aims to reveal the relationship between R&D and firm performance by taking into account 12 companies that are listed on the BIST Technology Index for 5 years periods (between 2010 and 2014). The study found that there is no relationship between R&D and firm performance which is line with previous studies. Alexandre Nevesa, Aurora A. C. Teixeirab and Sandra T. Silvab (2016), evaluated whether, in the case of a small, open and peripheral country in which exports are the engine of economic growth despite a noticeable laggardness in terms of R&D, the firms' R&D impacts on and/or is influenced by their exports, as well as whether the interrelation between R&D and exports impacts on the performance of firms. The results of the study indicate that more productive firms self-select into exporting activities and also provide support for the learning-by-exporting. Finally, based on a panel model the study found that R&D and exports have a positive effect on sales growth, which is enhanced when both activities occur simultaneously. Ratbek Dzhumashev, Vinod Mishra and Russell Smyth (2016), examined the effect of exporting and R&D investment on firm survival for a panel of Indian IT firms. The study found that exporting has competing effects on firm survival, exporting and investing in productivity are complementary activities. Moreover exporters are particularly vulnerable to shocks in the start-up phase and over time exporters benefit more from productivity gains than non-exporters. ShilpiTyagi, D. K. Nauriyal and Rachita Gulati (2016), analyzed the R&D profile of Indian drug and pharmaceutical industry and the factors that influence a pharmaceutical firm's decision to undertake R&D activities. The findings of the study reveal that firm's size, past year profitability, past innovative output, leverage ratio; past cash flow; export and import intensities of the firm tend to significantly impact the R&D intensity. While firm size exhibits a non-linear relationship, cash flow, past innovative output shows a positive and significant relationship with R&D intensity. Further, patent count and firm's overseas presence, considered as additional important determinants of firm-level R&D intensity, influences R&D positively. Finally, global orientation of Indian pharmaceutical firms has been found to impact R&D activities considerably. DavideCastellania, Sandro Montresorb, Torben Schubertc and Antonio Vezzanid (2017), investigated the effects of multinationality on firm productivity, and contributes to the literature in two respects. The study found that

multinational depth has a positive effect on productivity, while the effect of multinational breadth is negative; multinationality (along both dimensions) has a positive effect on R&D intensity, translating into an indirect positive effect on productivity and the positive indirect effect is however not large enough to compensate the negative direct effect of multinational breadth.

The previous studies analysed the Research and Development Intensity of Firms. It was found that the research relating to the impact of Research and Development Intensity on the Export Performance of firms was not carried out. Thus the present study aims to fill the research gap.

STATEMENT OF THE PROBLEM:

Research and Development activities, may take long time to get their reward and may even go waste if there is a failure. Thus, firms may have a potential reward and also a great uncertainty in its future return. It is considered as an important determinant of trade performance of the firms and can enable firms to provide higher value added product and services to the global world. It can be argued that the uncertainty of the results may also lead to higher volatility in firm value with the increasing information asymmetries in the export market. Consequently, it is bit difficult to predict how investment on such activities will impact on firm's trade performance.

OBJECTIVES OF THE STUDY:

- To analyze the relationship between the Research and Development activities and the Export Performance of the sample firms during the study period.
- To analyze the impact of the Research and Development activities on the Export Performance of the sample firms during the study period.
- > To analyze the casual relationship between the Research and Development activities and the Export Performance of the sample firms during the study period.

HYPOTHESIS OF THE STUDY:

- ➢ H01: There is no significant relationship between Research and Development activities and the Export Performance of the sample firms during the study period.
- H02: There is no significant impact of Research and Development activities on the Export Performance of the sample firms during the study period.
- ➢ H03: There is no casual relationship between Research and Development activities and the Export Performance of the sample firms during the study period.

METHODOLOGY OF THE STUDY:

Selection of the Sample Size:

The constituents of the BSE S&P Auto Index is considered for sample selection. The Index constitutes of 16 companies. Out of these 16 companies, the data was available only for 15 companies. Thus the sample companies are: Tata Motors, Maruti Suzuki Ltd., HERO Motor Corporation, Ashok Leyland, Motherson Sumi Systems Ltd., Mahindra & Mahindra Ltd., Eicher Motors Ltd., Bajaj Auto Ltd., Apollo Tyres, Exide Industries Ltd., Bharat Forge Ltd., BOSCH Ltd., Balkrishna Industries Ltd., Cummins India Ltd and M R F Ltd.

Period of the Study:

The study covers the period of 10 years from 2008 to 2017.

Source and Collection of the Data:

The secondary data relating to the study was collected from the CMIE "PROWESS" Database.

LIMITATIONS OF THE STUDY:

This study suffers from the following limitations.

- All the limitations of secondary data are also applicable to this study.
- The study covers only the firms listed in BSE S&P Auto Index.
- The period of study covers data only for 10 years.
- All the constraint of the tools are also applicable to this study.

ANALYSIS AND INTERPRETATION:

Computation of the Variables:

The study considers Export Intensity as the dependent variable which is computed by Exports as a percentage of Sales. The independent variables are:R&D Intensity, Labour-Capital Ratio, Capital Import Intensity and Raw Material Import Intensity. R&D Intensity is computed as Research and Development expenses (in Rs. Million) as a percentage of sales (in Rs. Million). Labour- Capital Ratio is defined as Employee compensation (in Rs. Million) as a percentage of net fixed capital (in Rs. Million). Capital Import Intensity is defined as the Import of Capital Goods (in Rs. Million) as a percentage of sales (in Rs. Million).

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
CGII	0.015	0.012	0.968	3.244	2.379
EI	0.153	0.178	1.962	6.144	15.803
LCR	19.391	39.283	3.212	11.848	74.721
RDI	0.009	0.006	0.421	1.873	1.237
RMII	0.100	0.103	0.901	2.402	2.254

Table 1: Results of Descriptive Statistics of the Sample Automobile Firms

Source: Data collected from Prowess Database and computed using E-views 7.0

EI= Export Intensity,LCR= Labour Capital Ratio, RDI = Research and Development Intensity,CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

Table 1 shows the results of Descriptive Statistics for the sample firms during the study period. The mean value was positive for all the variables such as Export Intensity, Research and Development Intensity, Raw Material Import Intensity, Capital Goods Import Intensity and Labour Capital Ratio for all the sample firms during the study period. Labour Capital Ratio recorded the highest mean value 19.391 and Research and Development Intensity recorded the lowest mean value 0.009. The volatilities (Standard Deviation) exhibited low volatility except Labour Capital Ratio exhibited high volatility. The skewness was positive and skewed towards right for all the variables. The Kurtosis value was greater than the normal distribution value 3 and its indicates leptokurtic distribution except for the variables. Research and Development Intensity and Raw Material Import Intensity which was lesser than 3 and indicated platykurtic distribution. The Jarque-Bera value was lesser than 5 which indicates non normality of the distribution except for the variables Export Intensity and Labour Capital Ratio it was greater than 5 indicating normality of distribution.

 Table 2: Results of Correlation Analysis of the Sample Automobile Firms

		RDI	RMII	CGII	LCR					
ы	Pearson Correlation	-0.46	0.421	0.369	-0.15					
C1	Sig. (2-tailed)	0.084	0.118	0.176	0.594					
*. Correlation is significant at the 0.05 level (2-tailed).										
**. C	**. Correlation is significant at the 0.01 level (2-tailed).									

Source: Data collected from Prowess Database and computed using SPSS 16.0

EI= Export Intensity, LCR= Labour Capital Ratio, RDI = Research and Development Intensity, CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

Table 2 shows the results of the correlation analysis of the sample firms during the study period. The variable Export Intensity did not witness significant 'p' value with the variables Research and Development Intensity, Raw Material Import Intensity, Capital Goods Import Intensity and Labour Capital Ratio. Hence the null hypothesis, H01: "There is no significant relationship between the Research and Development activities and the export performance of the sample firms" is accepted.

Model	R	R Square	Std. Error of the Estimate					
1	0.604	0.365	0.111	0.168				
a. Predictors: (Constant), LCR, CGII, RDI, RMII								
b. Depe	b. Dependent Variable: EI							

Table 3: Model Summary of Regression Result for the Sample Automobile Firms

Source: Data collected from Prowess Database and computed using SPSS 16.0

EI= Export Intensity, LCR= Labour Capital Ratio, RDI = Research and Development Intensity, CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

Table 3 shows the results of model fitness for the Export Performance of the sample firms with Export Intensity as dependent and Raw Material Import Intensity, Capital Goods Import Intensity, Research and Development Intensity and Labour Capital Ratio as independent variables. It is noted that 60.4% of relationship was noticed between Export Intensity and other independent variables. Further only 36.5% of variation in Export Intensity was explained jointly by the other independent variables. However the R square value indicates that the model is not fit.

Model		Sum of Squares	df	Mean Square	F	Sig.			
1	Regression	0.162	4	0.041	1.437	0.292			
	Residual	0.282	10	0.028					
	Total	0.445	14						
a. Predictors: (Constant), LCR, CGII, RDI, RMII									
b. Deper	ndent Variable	e: EI							

 Table 4: Anova Results of the Sample Automobile Firms

Source: Data collected from Prowess Database and computed using SPSS 16.0

EI= Export Intensity, LCR= Labour Capital Ratio, RDI = Research and Development Intensity, CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

The results of Analysis of Variance for the Research and Developmnt Investments and Export Performance of the Sample firms with Export Intensity as dependent and Capital Goods Import Intensity, Raw Material Import Intensity, Research and Development Intensity andLabour Capital Ratioas independent variables are presented in Table 4. The F statistic value was found to be 1.437. The 'p' value was 0.292 which is greater than 0.05 at 5% level. Hence the H02: There is no significant impact of Research and Development Investments on Export Performance of the sample firms" is accepted.

Model		Unstandardized Coefficients	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	0.243	0.146		1.658	0.128
	RDI	-12.213	9.399	-0.409	-1.299	0.223
	RMII	0.409	0.676	0.237	0.606	0.558
	CGII	0.999	5.452	0.065	0.183	0.858
	LCR	-0.002	0.001	-0.352	-1.303	0.222
a Denen	dent Variable	• FI				

Table 5: Co-Efficient Result for the Sample Firms During the Study Period

Source: Data collected from Prowess Database and computed using SPSS 16.0

EI= Export Intensity, LCR= Labour Capital Ratio, RDI = Research and Development Intensity, CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

Table 5 explains the co-efficients of Export Performance and Research and Development Investments of the sample firms during the study period. It is to be noted from the results that the 'p' value of none of the variables was less than 0.05. Hence it is clear that the variables Research and Development Intensity, Raw Material Import Intensity, Capital Goods Import Intensity and Labour Capital Ratiodid not have its impact on the Export Performance of the sample firms during the study period.

Null Hypothesis:	F-Statistic	Prob.
EI does not Granger Cause CGII	1.216	0.346
CGII does not Granger Cause EI	0.297	0.751
EI does not Granger Cause LCR	0.019	0.982
LCR does not Granger Cause EI	0.714	0.518
EI does not Granger Cause RDI	0.790	0.486
RDI does not Granger Cause EI	1.280	0.329
EI does not Granger Cause RMII	0.147	0.866
RMII does not Granger Cause EI	0.983	0.415
RDI does not Granger Cause EI EI does not Granger Cause RMII RMII does not Granger Cause EI	1.280 0.147 0.983	0.329 0.866 0.415

Table 6: Results of Granger Causality Test for the Sample Automobile Firi	Fable 6	6:]	Results	of	Granger	Causa	lity	Test	for	the	Samp	le A	Automobile Firm	S
---	----------------	-------------	---------	----	---------	-------	------	------	-----	-----	------	------	-----------------	---

Source: Data collected from Prowess Database and computed using E-views 7.0

EI= Export Intensity, LCR= Labour Capital Ratio, RDI = Research and Development Intensity, CGII= Capital Goods Import Intensity and RMII = Raw Material Import Intensity

Table 6 exhibits the results of Granger Causality for Research and Development Investments and Export Performance of the sample firms during the study period. The F – Statistic and the Probability values revealed no Causation with the Export Performance and Research and Development Investments of the sample firms during the study period. Hence the null hypothesis **H03**:"There is no causal relationship between the Research and Development Investments and Export Performance of the sample firms during the study period."

FINDINGS AND IMPLICATIONS:

The study examined the impact of the selected variables on the Export Performance of the sample firms during the study period. The major findings of the study were: The results of correlation analysis indicated that the variables Research and Development Intensity, Raw Material Import Intensity, Capital Goods Import Intensity and Labour Capital Ratio did not witness significant relationship with the Export Performance of the sample firms. The results of Regression analysis indicate that the selected did not have their impact on the Export Performance of the sample firms. The Granger Causality results indicate that the variables does not exhibit any Casual relationship with the Export Performance of the Sample firms.

SUGGESTIONS OF THE STUDY:

To further improve exports, the government and the industry players have to provide support and exposure to the firms to encourage them to make use of the latest Research and Development activities to grasp the international markets and promote their exports.

CONCLUSION OF THE STUDY:

The study analysed the impact of Research and Development Investments on the Export Performance of the sample firms for the period of ten years from 2008 to 2017. The study revealed that the selected variables did not have their impact on the Export Performance of the sample firms.

REFERENCES:

- Alexandre Nevesa, Aurora A. C. Teixeirab, et.al., (2016). Exports-R&D investment complementarily and economic performance of firms located in Portugal, *Investigation Económica*, vol. LXXV, núm. 295, enero-marzo de 2016, pp. 125-156.
- Chandra Sharma (2012). R&D and firm performance: evidence from the Indian pharmaceutical industry, Journal of the Asia Pacific Economy, ISSN: 1354-7860 (Print) 1469-9648.
- Chia Wen Hsu and Yung Chih Lien, et.al., (2015). R&D Internationalization and Innovation Performance, International Business Review, 24(2015) 187-195.
- Davide Catellani and Sandro Montresor, et.al., (2017). Multinationality, R&D and Productivity: Evidence from the top R&D Investors Worldwide, *International Business Review*, 26 (2017) 405-416.
- Omer Limanli (2015). Determinants of R&D Investment Decision in Turkey, *Procedia Social and Behavioral Sciences*, 195 (2015) 759 – 767.
- Özcan Karahan (2015). Intensity of Business Enterprise R&D Expenditure and High-Tech Specification in

European Manufacturing Sector, Procedia - Social and Behavioral Sciences, 195 (2015) 806 - 813.

- Pramod Kumar Naik (2014). R&D Intensity and Market Valuation of Firm: A Study of R&D Incurring Manufacturing Firms in India, *Journal of Studies in Dynamics and Change (JSDC)*, ISSN:2348-7038 Vol. 1, No. 7, November 2014 Pages 295-308.
- Ratbek Dzhumashev and Vinod (2016). Exporting R&D Investment and Firm Survival in the Indian IT Sector, Journal of Asian Economics, 42 (2016) 1-19.
- Shilpi Tyagi, D. K. Nauriya and Rachita Gulati (2016). Firm level R&D intensity: evidence from Indian drugs and pharmaceutical industry, *Spiringer Verlag Berlin Heidelberg* 2016, Rev Manag Sci DOI 10.1007/s11846-016-0218-8.
- Sizhong Sun and Sajjid Anwar (2015). R&D Status and the performance of Domestic Firms in China's Coal Mining Industry, *Energy Policy*, 79 (2015) 99-103.
- Zied Bouaziz (2016). The Impact of R&D Expenses on Firm Performance: Empirical Witness from the Bist Technology Index, *Journal of Business Theory and Practice*, ISSN 2372-9759 (Print) ISSN 2329-2644 (Online) Vol. 4, No. 1, 2016.
