The Role of R&D Intensity on the Export Intensity of Enterprises in Transition Economy: The Case of Vietnam

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ABSTRACT

Manuscript type: Research paper

Research aims: This study estimates the role of research and development (R&D) expense with respect to the export intensity of Vietnamese enterprises.

Design/Methodology/Approach: Building upon the resource-based review, this study postulates that the R&D expenses of an enterprise are positively associated with the export intensity of the enterprise. Data extracted from the Vietnam General Statistics Office Survey of 306 exporting Vietnamese firms were used to test the proposed hypothesis.

Research Findings: Both Robust Standard Errors and Tobit Regression models reveal that the hypothesis is strongly supported with the control of firm-level and national-level factors.

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Theoretical contribution/Originality: This study provides a new insight about the role of R&D expense with respect to the export intensity of the enterprise in transition economies.
Practitioner/Policy Implications: This study suggests firms to continuously engage in innovation to gain a sustainable competitive advantage when exporting to other countries.
Research limitation/ Implication: Further research may consider a bigger sample size and utilise time-series or panel data.

Keywords: Export Intensity, R&D Intensity, Transition Economy, Viet Nam
JEL Classification: F23, M16

1. Introduction

In recent years, the Vietnamese government has increasingly paid attention to export activities since these activities significantly contribute to stimulating economic growth and improving the international integration of the country. According to Moore (2006), for nearly two decades, the export-oriented economy has received considerable attention from policymakers and researchers as a possible pathway to economic growth. An active export industry can convert domestic resources into products to serve the needs of foreign customers. Furthermore, the entry of enterprises into foreign markets allows these entities to gain advantage from many aspects such as economies of scale in production, enhanced innovation, capital accumulation, etc. Export is also an effective way to generate income for firms facing depressed home markets (Nguyen & Le, 2019). Therefore, export helps firms increase their market share as well as profitability. Regarding social contribution, strengthened operational and export activities create more job opportunities and eventually lead to better welfare.

To sustain and promote export growth, firms have recognised the importance of innovation and placed emphasis on R&D tasks. Technology has been considered as one of the intangible resources that help businesses gain competitive advantages as well as international presence (Fernández-Olmos & Díez-Vial, 2014). R&D enables firms to create new ideas and innovate, thereby generating quality outcomes that can serve the preferences of clients. At the same time, increasing R&D expenses allows firms to obtain much information about the targeted business environment, and thus they will have relevant strategies to create competitive advantages during

the export process. On one hand, international business scholars have indicated the positive effects of R&D on export (Bertarelli & Lodi, 2018; Edeh et al. 2020; Tamini & Valéa, 2021). On the other hand, some studies concluded insignificantly negative associations (Zou et al., 2003). This discrepancy in findings has motivated new research on the same topic. In addition, only a few of these studies focus on export activities in transition economies while the majority pay attention to the export of firms operating in developed countries. According to Neupert et al. (2006), exporters in transition economies must face challenges that are different from those in developed countries, which leads to differences in foreign trade performance. For these reasons, it is believed that research on the relationship between R&D and export within the context of a transition economy will be an important contribution to the literature.

This study aims to fill the gaps in the existing literature by investigating the effect of R&D intensity on the export intensity of enterprises in a transition economy. To do so, we conceptualised a theoretical framework that would empirically test the effect of R&D intensity on the export intensity of enterprises in Vietnam. To achieve this aim, by drawing the resource-based theory (Barney, 1991), we developed theoretical arguments about the effect of R&D intensity on the export intensity of enterprises in a transition economy. It is expected that these will add new insights to help illustrate how R&D intensity affects the export intensity of enterprises in a transition economy. We believe that this study will serve as a new platform for future research in literature since it is anticipated that this will be our contribution of its kind.

Overall, the extant study examines the association between R&D expense and the export intensity of firms in Vietnam for some reasons. First, the Vietnamese government is accelerating the implementation of the overall strategy for international integration through 2020, vision to 2030. Therefore, special attention has been being paid to providing incentives to exporting firms and expanding export markets. The promotion of firms' export activities is important for the country's overall export growth and economic development, especially in the context of the economy being adversely affected by the Covid-19 pandemic. In the meantime, research and development are considered as one of the golden keys to firms remaining competitive advantage in foreign markets. Although the R&D expense of Vietnamese companies has been significantly improved in recent years, there are still many firms that have not fully recognised

the importance of investment for R&D in the survival and success of their businesses. Second, the rich stream of export research has focused mainly on developed economies (Booth & Katic, 2013) and emerging economies (Nguyen & Le, 2019; Tamini & Valéa, 2021). However, studying the association between R&D expense and export intensity of enterprise in a transition economy such as Vietnam may be an interesting case. The country's economic reform since 1986 has marked the process of opening the economy, eliminating the State monopoly of foreign trade, and allowing privately held companies to participate in international business. The speed of the transition and liberalisation process in Vietnam is also different from that of other transition economies due to distinct institutions and policies applied during the process. Such a transition economy environment significantly impacts on export strategies and performance of firms as it bears additional uncertainties (Vo et al., 2018) and can limit firms' absorptive capabilities (Meyer, 2004; Vo et al. 2021b). Third, although several studies have investigated about innovation and export activities of firms, a few studies on the field in a transition economy have been known little. Thus, the aim of the study is to enhance the understanding of how R&D expense affects the export intensity of firms in a transition economy.

The remainder of this paper is as follows. Section 2 encloses relevant literature and proposes a hypothesis. The next section provides methodology, while Section 4 addresses empirical results and discussion. Lastly, Section 5 concludes the paper by presenting theoretical, and managerial implications, as well as future research directions.

2. Literature Review and Hypothesis Development

The resource-based theory of the firm (Wernerfelt, 1984; Barney, 1991) states the origins of firms' competitive advantages and addresses how superior performance relative to other firms operating in the same industry can be attained (Wernerfelt, 1984; Barney, 1991; Teece et al., 1997). The scholars stressed that the possession of strategic resources provides a firm with a golden opportunity to gain sustainable competitive advantages over its competitors (Barney, 1991). These resources are valuable, rare, difficult-to-imitate, and non-substitutable. Resources that are necessary for creating competitive advantages are classified into assets and capabilities (Zou et al., 2003). While capabilities (or competencies) are a firm's accumulated knowledge, assets are a firm's accumulated resource

endowments, and skills that allow the firm to coordinate activities by deploying its assets advantageously (Zou et al., 2003; Monteiro et al., 2019). The resource-based view supposes that the resources needed to select and implement strategies are unevenly distributed among businesses and that this difference is stable for a long time (Barney, 1991). Thus, firms with superior systems and structures demonstrate better performance because they bear substantially lower costs (cost leadership strategy) or provide customers with a substantially higher quality of products or services (differentiation strategy) (Teece et al., 1997; Bertarelli & Lodi, 2018; Reçica et al., 2019). Companies following differentiation strategies focus on producing a good or providing a service that customers recognise as unique and are willing to pay a premium price for (Porter, 1985). These strategies can be pursued through creating solid brand equity, ceaseless innovation, superior customer service, and advanced technology. To deploy such a strategy, firms must invest in costly activities including extensive R&D, product design, and brand improvement. If firms successfully differentiate themselves from their competitors, they can enjoy above-market prices as differentiation strategies can increase customer loyalty. These strategies will allow firms to gain competitive advantages, which in turn enhance business performance. Furthermore, compared with advantages achieved through cost leadership, differentiation advantages are more difficult for competitors to imitate and hence are more likely to be sustained (Barney, 2002).

The resource-based theory also contends that a firm's internal competencies drive its export behavior, which in turn affects its performance. Previous exporting studies have used R&D activities and product uniqueness (Edeh et al., 2020) as well as technological intensity (Bertarelli & Lodi, 2018) as firms' internal resources and competencies. In addition, Aulakh et al. (2000) provide a theoretical framework whereby export performance is explained by separate strategic factors related to product development and diversification. Building on this framework, export performance depends on broader strategic factors including R&D expenditure.

Adapting resource-based theory (Barney, 1991) and previous studies' findings to international business activities of firms, this study argues that when firms penetrate foreign markets, they will face fierce competition. Successful investment in R&D will allow firms to explore new knowledge and ideas, which are able to generate new products, processes, and technologies to better fulfill

the preferences of customers. Eventually, firms will be able to create differentiating capabilities that are related to innovation and gain a sustainable competitive advantage over competitors in the same industry when exporting to other countries. New products and processes play a strategic role in the export and help companies improve their profitability. As profits increase, firms are more likely to reinvest in R&D and, in turn, promote export activities.

Several studies on the effects of R&D intensity on the export performance of firms in developed economies are inconsistent. Sandu and Ciocanel (2014) confirmed a positive correlation between total R&D expenditure volume and the level of high-tech exports in Romania. They indicated that the influence of private R&D expenditure on high-tech exports is stronger than public R&D expenditure. Furthermore, Harris and Moffat (2011) concluded that spending on R&D in manufacturing had a much larger impact on the probability of exporting which implies that spending on R&D was not simply to boost the probability of producing new goods and services, but also to improve the establishment's knowledge assets which would, in turn, help it break down barriers to international markets. In non-manufacturing, spending on R&D increased the probability of innovating but had no significant impact on whether the establishment exported; rather, innovating increased the probability of exporting. Recently, Tamini and Valéa (2021) showed that investment in R&D had a positive impact on the export performance of agri-food SMEs. However, the impact was smaller when the destination was one of the states in the United States. Similarly, some studies in developing economies have provided inconsistent findings of the effect of R&D expenditure on firms' export performance. Goldar (2013) indicated that increased R&D efforts of firms were responsible in a major way for the observed increase in export intensity a positive association between R&D expenditure and export intensity in India. In addition, Leung and Sharma (2021) investigated the effects of R&D intensity on firm export performance, using 1540 firm-year observations from a balanced panel of 385 privately-owned firms listed on the Shanghai and Shenzhen stock exchanges. They found no significant effect on export (sales) performance. In contrast, Saemi and Oskooee (2019) showed that R&D intensity had a positive and significant effect on improving the export performance of industrial enterprises in Iran. In sum, despite the inconsistency, researchers have recommended that effective investment in R&D activities allows firms to become more innovative when participating in international markets (Kuemmerle, 1999). Enterprises with realised differentiating capabilities will be

better equipped to compete in the foreign market. Very few studies are known to study the effect of R&D intensity on export performance in a transition economy. Therefore, we predict that the greater the R&D expense, the greater the export intensity of enterprises.

In addition, several prior studies have released that the export intensity of firms is also affected by firm size, firm age, gender of a top manager, foreign equity proportion, formal and informal institutional distances between the export nation and its import partners. To comprehensively demonstrate the effect of R&D on the export intensity of firms, this study considers the aforementioned factors as control variables in the research model. Prior findings on the role of these firm-level and country-level factors with respect to export can be summarised as follows.

Firm size: Firm size is one of the most important factors in developing export activities of firms. Based on the limited resources argument, Bonaccorsi (1992) stated that international engagement requires sufficient resources, including personnel, financial, and marketing. For this reason, small firms may face resource constraints and eventually fail to sustain high levels of export commitment. Additionally, Vo (2015a) suggested that large enterprises can take advantage of economies of scale to increase their competitiveness in foreign markets. When the firm size is large enough, firms can gain quick access to scientific and technological advances in the world. Therefore, previous studies have concluded that enterprise size positively affects the export intensity of the enterprise (Filatotchev et al., 2008; Goldar, 2013; Vo, 2015a; Vo et al. 2021a).

Firm age: Firm age demonstrates the ability of an enterprise to be formed through experience gained over time (Vo et al 2021a). Factors related to age are deemed to have significant impacts on firms' ability to access foreign markets (Oviatt & McDougall, 1997). Newly established businesses that have not accumulated much experience will face many difficulties when penetrating the global market, and their ability to overcome such difficulties is also lower than that of older ones. In contrast, old firms have more traditional customers and sustainable domestic and foreign business activities. Thus, these firms will have enough potential to continue expanding and innovating. For this reason, firm age is predicted to have a positive association with the export intensity of enterprises (Autio et al., 2000; Vo, 2015a).

Gender of top manager: The top manager's gender significantly influences firms' performance (Smith et al., 2006), especially those with export activities (Vo, 2015a). Felson and Gottfredson (1984) suggested that men tend to have more external interactions than women, and therefore should have more social relationships. As a result, it is easier for a firm to expand its business network when men are involved in the management process. The male manager is also expected to be more proactive in negotiating export contracts. In addition, exporting always carries more risks than selling domestically; however, women tend to be more risk-averse than men (Booth & Katic, 2013). In this study, the top manager's gender variable is defined as 1 if the top manager is male. The top manager's gender is believed to be positively correlated with the firm's exports (Vo, 2015a).

Foreign equity proportion: In the era of globalisation, countries are actively opening their economies and calling for investment from foreign partners in domestic enterprises. Therefore, recent works have increasingly paid attention to the association between ownership structure and export intensity of firms. Resource-based theory (Barney, 1991) suggests that foreign investors who own a large proportion of corporate equity may offer enterprises access to resources needed to restructure and develop international business operations. More specifically, the strategic foreign investors with large equity stakes will have an incentive to allow portfolio firms to gain access to their contractual networks and available resources (Monteiro et al., 2019). On this basis, foreign equity ownership is positively related to the export performance of firms (Filatotchev et al., 2008; Goldar, 2013).

Formal institutional (regulative) distances between Vietnam and its import partners: several scholars have stated that when firms export their products and services to foreign markets, they must deal with differences in an institutional environment, leading to changes in their export strategy and an increase in the cost of export activities (Nguyen & Le, 2019; Edeh et al., 2020; Pierre, 2020). The institutional gap is created from the difference in business practices and rules between the exporting and importing countries (Vo, 2015a; Vo et al., 2021b). This hinders enterprises from accessing foreign markets and

requires them to conduct careful market research to grasp information about the new business environment (Vo, 2015c). In addition, firms exporting to markets with low certainty will face pressure created by governments, trade organizations, and rival groups (Delios & Henisz, 2003). Therefore, the institutional distance between exporting and importing countries is deemed to be negatively correlated with the export intensity of firms (Vo, 2015a; Nguyen & Le, 2019).

Informal institutional (cultural) distances between Vietnam and its import partners: When entering the international market, it is inevitable that Vietnamese firms will interact with many countries which have cultural dissimilarities to Vietnam. These differences will determine how easy it is for domestic firms to enter export markets (Vo, 2015b). Transaction cost theory (Hennart, 1991) stresses that the cultural difference between two countries influences the export strategies of firms operating in one country and exporting to the other. Obstacles due to cultural differences are one of the main causes of the increase in management costs associated with consumer culture research and the costs of transferring firms' advantages to foreign markets (Hennart & Park, 1993; Dunning, 2000). Therefore, it is expected that the greater the cultural difference between Vietnam and the importing country, the lower the export intensity of enterprises exporting to the country (Vo, 2015b).

Based on the reviewed literature, and proposed hypothesis, the following framework (Figure 1) was developed.

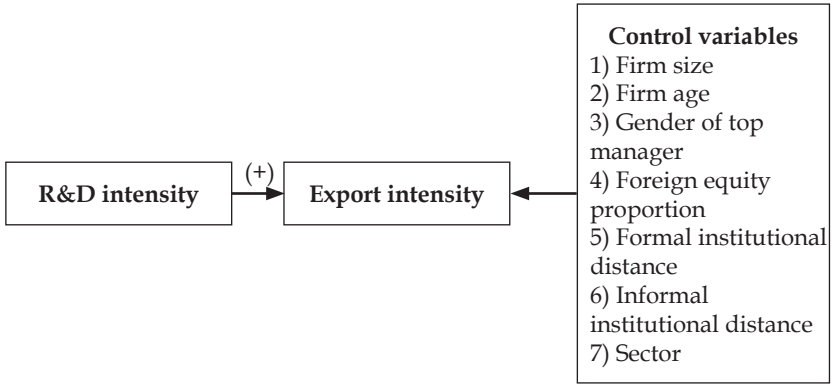

Figure 1: Theoretical framework

3. Methodology

3.1. Data and Sample

We employed the 2018 dataset on Vietnam. This was extracted from the General Statistics Office of Vietnam (GSO)'s Survey, conducted in 2018. The samples were obtained through a stratified random sampling method. Three levels of stratification were applied, including industry, establishment size, and region. The industrial strata consisted of five manufacturing industries and two services industries, which include food and beverages, garments, non-metallic mineral products, fabricated metal products, other manufacturing, retail, and other services. Size stratification was designed as follows: small (5 to 19 employees), medium (20 to 99 employees), and large (more than 99 employees). Regional stratification for this survey was done across four regions of Vietnam: Red River Delta, North Central Area, and Central Coastal Area, Southeast, and Mekong River Delta. A total of 560,000 eligible firms (both domestic- and foreign-owned firms) were selected. As reported by the Ministry of Planning and Investment of Vietnam, among 560,000 firms, there are 16,878 ones, who are foreign-owned firms (including both partly and wholly foreign-owned firms) and the rest are domestic firms (including SMEs and large firms). The selected firms were then used as a frame for the selection of a sample, with the aim of obtaining interviews at firms with five or more employees, according to the GSO's plan. The survey was conducted through the questionnaire sent in advance to the director/owner/manager of SMEs, followed by telephone calls and/or fax with the assistance of local Statistics Offices. As a result, 3,883 out of the domestic firms agreed to participate. Following the data cleaning process, 1,031 responding domestic firms were found to have fulfilled the standard requirements of the survey, resulting in a 26.56 per cent response rate. Since this study focus on export activities, we only selected those domestic firms which are engaged in selling and marketing products in overseas markets. Following the correction for missing values due to incomplete responses, the final samples which were usable for this study amounted to 306 firms. The latter was engaged in export activities and had provided sufficient information for the purpose of this study.

As the 306 selected enterprises exported to 27 different countries, this information allows us to calculate the formal institutional distances between Vietnam and these importing partners (27 country pairs). To capture such distances, the World Development Indicator's

(WDI) 2018 database of the World Bank[1] was used. This database covers six dimensions of governance quality that were identified by Kaufmann et al. (2006). The study also utilised Hofstede, Hofstede, and Minkov's (2010) cultural dimensions dataset obtained from Geert Hofstede's website[2] to measure the informal institutional distance between Vietnam and each of the 27 importing countries (Vo, 2015b; Vo et al., 2018; Vo et al. 2021b).

3.2. Variables and Measures

3.2.1. Dependent Variable

Dependent variable (Y) refers to the export intensity of firms operating in Vietnam, which is measured by the percentage of export sales in firm's total sales (Filatotchev et al., 2008; Goldar, 2013; Marques, 2015; Vo, 2015a, 2015b; Nguyen & Le, 2019). The values of this variable vary from 2% to 100%, with greater values representing higher export sales.

3.2.2. Independent Variable

Independent variable (X_1) refers to R&D intensity of firms, which is measured by the percentage of the firm's R&D expenses in its total sales (Hall & Bagchi-Sen, 2007; Goldar, 2013). The values of this variable range from 0.1% to 60%. Technology is considered as one of the intangible resources that help firms gain competitive advantages as well as international presence (Fernández-Olmos & Díez-Vial, 2014).

3.2.3. Control Variables

In addition to R&D intensity, export intensity is significantly influenced by other firm-level and country-level factors (Filatotchev et al., 2008; Goldar, 2013; Vo, 2015a, 2015b; Vo et al. 2021a, b), including:

[1] http://www.worldbank.org/
[2] http://www.geerthofstede.com/

Firm Size

Firm size *(X2)* is an important and the most common determinant off export performance found in empirical studies (Nguyen & Le, 2019, Vo 2015a; Vo et al., 2021a, b). Firm size is normally measured by total assets, total sales, or total employees. For this study, given available data, we measured firm size by the natural logarithm of the number of employees working at the firm (Filatotchev et al., 2008; Vo, 2015a; Nguyen & Le, 2019), with values ranging from 1.10 to 8.01. The greater firm size results in a higher export intensity (Goldar, 2013; Vo, 2015a; Booltink & Saka-Helmhout, 2018; Nguyen & Le, 2019; Vo et al., 2021a, b).

Firm Age

Firm age *(X3)* is measured by the number of years between the firm's foundation and 2015 (Filatotchev et al., 2008; Vo, 2015a). The youngest firm had been established for 2 years and the oldest had been running for 35 years since 2015. A firm's age positively affects its ability to understand customers' needs as well as its ability to meet these needs, which in turn enhances export activities (Vo, 2015a).

Gender of top manager

The top manager's gender *(X4)* is a dummy variable, defined as 1 if the firm's top manager is male and 0 if the female. The male manager tends to be less risk-averse and more proactive in promoting the export activities of the firm (Vo, 2015a; Pierre, 2020). For this reason, the gender of the top manager is deemed to be positively correlated with export intensity (Vo, 2015a).

Foreign equity proportion

Foreign equity proportion *(X5)* is captured by the percentage of shares owned by foreign investors (Goldar, 2013). The lowest value recorded is 0% and the highest is 100%. The higher the ownership ratio of foreign investors, the more opportunities the firm will have to access necessary resources for international business activities (Filatotchev et al., 2008; Goldar, 2013).

Formal institutional distance

Formal institutional distance *(X6)* is reflected through six dimensions (Kaufmann et al., 2006), including voice and accountability, political

stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption. Following Vo (2015a), the formal institutional distance between Vietnam and its import partner was calculated using the Kogut and Singh's (1988) formula, as follows:

$$ID_{vj} = \frac{\sum_{i=1}^{6}\{(I_{ij} - I_{iv})^2 / V_i\}}{6} \quad (1)$$

where ID_{vj} is the formal institutional distance between Vietnam and the jth importing country; I_{ij} is the i^{th} institutional dimension of the j^{th} importing country; I_{iv} is the ith institutional dimension of Vietnam, where v is the abbreviation of Vietnam; V_i is the variance of the i^{th} institutional dimension. Based on formula (1) and the secondary data extracted from WDI, the formal institutional distance was calculated. The recorded range of this variable was from 0.28 to 9.68, with higher values reflecting greater formal institutional distances between Vietnam and the importing countries.

Informal institutional distance

Informal institutional distance (X_7) is captured by the cultural distance between Vietnam and its import partner (Vo et al. 2021b). This country-level variable can be measured in terms of the difference in Hofstede et al.'s (2010) national culture dimensions, including power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence. These six dimensions are scaled from 0 to 100 (percent). The larger the scale that is assigned to each of the six dimensions of a country, the higher the power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, or indulgence levels the country has. To measure the cultural distance between Vietnam and the importing country, Kogut and Singh's (1988) formula was used as follows:

$$CD_{vj} = \frac{\sum_{i=1}^{6}\{(I_{ij} - I_{iv})^2 / V_i\}}{6} \quad (2)$$

where CD_{vj} is the index of cultural difference between Vietnam and the j^{th} importing country; I_{ij} is the i^{th} cultural aspect of the j^{th} importing country; I_{iv} is the i^{th} cultural aspect of Vietnam, where v

is the abbreviation of Vietnam; V_i is the variance of the i^{th} cultural aspect. The cultural distance index was calculated based on formula (2) and the secondary data on national culture dimensions that were obtained from Hofstede's website3. The values of this variable vary from approximately 0 to 3.90. The greater the value of the index, the greater the cultural difference between Vietnam and the importing country.

Sector

Since the export of different products is subject to different regulations, assistance, or restrictions, it is argued that the Sector (*X8*) should be added as a control variable to see the impacts in individual sectors that have a higher tendency to export for firms. Based on the four-digit ISIC classification, we categorised sectors into two groups including manufacturing and services. One dummy was created to represent the two categories (Vo et al. 2021a).

Measurement for the variables in the research model is summarised in Table 1.

Table 1: List of the Variables of the Study

Variables	Measurement	Reference	Expected Sign
Dependent variable			
Export intensity (Y)	Export sales in firm's total sales are measured in percentage of total sales	Filatotchev et al. (2008); Goldar (2013); Marques (2015); Vo (2015a, 2015b); Vo et al. 2021a; Nguyen & Le, 2019	
Independent variable			
R&D intensity (X_1)	Measure of R&D expenditures of firm based on percentage (%)	Cohen & Levinthal (1990); Hall and Bagchi-Sen (2007); Goldar (2013); Vo et al. 2021a	+
Control variables			
Enterprise size (X_2)	The natural logarithm of the number of firm's employees (%)	Filatotchev et al. (2008); Vo (2015a); Nguyen & Le (2019)	+

[3] http://www.geerthofstede.com/

Table 1: List of the Variables of the Study (continued)

Variables	Measurement	Reference	Expected Sign
Enterprise age (X_3)	Measured in year based on the establishment time of firm to the current research (year)	Filatotchev et al. (2008); Vo (2015a), Leung and Sharma (2021)	+
Gender of top manager (X_4)	Dummy (1: Male, 0: Female)	Vo (2015a)	+
Foreign equity proportion (X_5)	The percentage of shares owned by foreign investors (%)	Goldar (2013)	+
Formal institutional distance (X_6)	Six institutional dimensions identified by Kaufmann et al. (2006); and the formula suggested by Kogut and Singh (1988)	Kaufmann et al. (2006); Kogut and Singh (1988); Vo (2015a); Vo et al. (2021b)	–
Informal institutional distance (X_7)	Six cultural dimensions introduced by Hofstede et al. (2010); and the formula suggested by Kogut and Singh (1988)	Hofstede (1980); Kogut and Singh (1988); Vo (2015b) Vo et al. (2021b)	–
Sector	Dummy (1: Manufacturing, 0: others)	Vo et al. (2021a)	+

3.3. Estimation Method

Since the percentage of export sales (dependent variable) is measured using a continuous scale, multiple regression model was employed in to test the hypothesis in this study. On the attempt to explore how R&D intensity affects firms' export intensity, the regression model as follows was employed:

$$Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + \beta7X7 + \beta8X8 + \varepsilon$$

where,
Y is the dependent variable (export intensity of firms),
β0 is the intercept, the value of Y when X is zero,
β1 is the regression coefficient of the independent variable,
X1 is the observed value of the independent variable,
β2→8 is the regression coefficients of the control variables,
X2→8 is the observed values of the control variables,
ε is the error term of the regression model.

4. Empirical Results

4.1. Descriptive Statistics and Correlation

Table 2 illustrates the mean, standard deviation, variance inflation factor (VIF) and correlation between the variables in the model. As indicated by the correlation matrix, the maximum value of the correlations among independent variables was 0.155, which was well below the threshold of 0.8 and thereby, indicating that there is no issue with multicollinearity (Farrar & Glauber, 1967). In order to test for possible biases caused by collinearity among the variables, the indicator of VIF of independent variables is presented. As depicted in Table 2, the VIF values for all variables were below 2.0, which was well below the cut-off value of 10.0 recommended by Hair et al. (1995). Hence, there is no bias in the value estimation of the variables. Additionally, the mean in Table 2 represents where the central tendency of the data of each variable in the model is located. For instance, the mean export intensity of the 306 firms in the sample was 64.167. The number shows that on average, the export performance of firms in the sample is about 64 percent.

Looking at the correlations between the dependent variable and each of the independent variables, Table 2 shows that R&D intensity and firm size were positively correlated with export intensity because the correlation coefficients of those two pairs of variables (0.394 and 0.157, respectively) were statistically significant at 1%. In addition, firm age and gender of top managers were found to be positively associated with export intensity with the statistical significance of 5% and 10%, respectively. Meanwhile, the association between foreign ownership proportion and the export of enterprises was slightly negative as the correlation coefficient of -0.096 was statistically significant at 10%. The other control variables had no statistically significant correlation with export intensity ($p > 0.1$).

4.2. Findings and Discussion

While preparing the data for the regression analysis, White test (White, 1980) was performed to detect heterokedasticity. The result of the White test revealed that p-value was 0.000 ($p<0.01$). This implies that the null hypothesis of homokedasticity is rejected and thereby, heterokedasticity is present in the research model. To obtain reliable estimates, the Heterokedasticity Consistent Standard Errors model was used instead of Ordinary Least Squares. The results obtained from the Robust Standard Errors are summarised in Table 3.

Table 2: Mean, Standard Deviation and Correlation of the Variables in the Model (n = 306)

Variables	VIF	Mean	Std. Dev.	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7
EI (Y)		64.167	35.821	1.000							
RD (X_1)	1.593	7.093	4.816	0.394***	1.000						
FS (X_2)	1.067	4.453	1.434	0.157***	-0.018	1.000					
FA (X_3)	1.401	9.222	6.118	0.125**	0.043	0.146**	1.000				
GM (X_4)	1.219	0.343	0.476	0.102*	0.073	0.010	0.102*	1.000			
FO (X_5)	1.373	17.980	14.655	-0.096*	0.043	-0.027	0.155***	0.044	1.000		
FD (X_6)	1.047	4.369	2.302	-0.058	-0.071	-0.015	0.033	0.019	-0.018	1.000	
ID (X_7)	1.106	1.690	1.232	-0.049	-0.080	0.075	0.014	-0.001	-0.083	-0.134**	1.000
SE (X_8)	1.009	0.383	0.301	0.017	0.107*	0.032	0.001	0.046	0.168	0.004	0.075

Note: EI = Export intensity (%), RD = R&D intensity (%), FS = Firm size (log), FA = Firm age, GM = Gender of top manager, FO = Foreign ownership proportion (%), FD = Formal institutional (regulative) distance, ID = Informal institutional (cultural) distance, SE = Sector. *, ** and *** indicate statistically significant levels at 10%, 5% and 1%, respectively.

Model 1 shows the relationship between control variables and export intensity of firms operating in Vietnam. In this model, the value of adjusted R^2 was 0.048, indicating that a 1% change in all of the control variables will lead to a 4.8% change in the export intensity of firms. The p-value of 0.002 indicates the statistical significance of this model as 1%. Based on the results of model 1, both firm size (X_2) and firm age (X_3) had positive correlations with export intensity at the significance level of 5% ($\beta_2 = 3.513$, $p < 0.05$; $_{\beta 3} = 0.685$, $p < 0.05$). This implies that the larger the firm, the higher the ratio of exports to total sales. Similarly, businesses that have been operating for a longer time tend to export a higher share of their output. In addition, the gender of top managers (X_4) was also positively associated with the export of Vietnamese firms, as shown by the regression coefficient (β_4) of 7.161 at the significance level of 10% ($p < 0.1$). This result indicates a firm that has a male leader is deemed to generate a higher export sales proportion. On the other hand, the inverse relationship between foreign ownership (X5) and export intensity of firms was statistically significant at 5% ($\beta_5 = -0.127$, $p < 0.05$). These figures confirm that, with very few exceptions, the higher shares owned by foreign investors, the lower the percentage of export sales in enterprise's total sales (Nguyen & Le, 2019), while Manogna et al. (2021) found empirical evidence of Indian firms that an increase in export make a raise its annual foreign investment. This partly explains that the foreign investors with a high share pay more attention to the local market rather than the export market. The other two control variables, including formal institutional distance (X_6) and informal institutional distance (X_7), had been found to have no effect on export activities of Vietnamese firms since the estimated coefficients of these variables were statistically insignificant ($p > 0.1$) (Table 3).

Table 3: The Effect of R&D Intensity on Export Intensity of Firms in Vietnam (Robust Standard Errors)

	Model 1		Model 2	
	Coefficient	Std. Error	Coefficient	Std. Error
Intercept	51.078***	8.244	27.616***	8.902
Independent variable				
R&D intensity			2.871**	1.378
Control variables				
Firm size	3.513**	1.378	3.693***	1.190
Firm age	0.685**	0.276	0.598**	0.284
Gender of top manager	7.161*	4.132	5.143	3.982
Foreign ownership proportion	-0.127**	0.061	-0.136**	0.063
Formal institutional distance	-1.158	0.839	-0.645	0.775
Informal institutional distance	-2.373	1.637	-1.378	1.495
Sector	1.023	0.801	1.106	0.098
Log-likelihood	-1518.02		-1491.18	
Adjusted R^2	0.0451		0.201	
Number of observations (N)	306		306	
P-value	0.001		0.000	

Note: *, ** and *** indicate statistically significant levels at 10%, 5% and 1%, respectively.

Model 2 examines the impacts of the independent variable, which is R&D intensity, and all of the control variables on export intensity of firms operating in Vietnam. As shown in Table 3, this model was statistically significant at 1% with p-value of 0.000. Noticeably, adjusted R^2 in Model 2 was much higher than that in Model 1, which was 20.1%, whereas log-likelihood had also improved from -1518.02 to -1491.188. These numbers imply that, compared to Model 1, the estimation results are better explained in Model 2 when additionally considering the impact of R&D expense on the export intensity of enterprises. The impacts of the independent variable and all the control factors on export can be analysed in detail as follows:

R&D intensity (X1): The results in Model 2 indicate that R&D intensity had a positive relationship with export intensity of Vietnamese enterprises at a significance level of 5% ($\beta 1 = 2.871$, $p < 0.05$). This reveals that the higher the percentage of R&D expenses in a firm's total sales, the higher the proportion of the firm's sales that are exported. This is consistent with the prediction of the resource-based theory (Barney, 1991) which states that the possession of strategic resources, including technology, will help firms gain a sustainable competitive advantage. Therefore, when entering international markets, exporting firms with high investment in innovation activities will outperform their competitors. The estimation result also provides empirical evidence to support the hypothesis of this study, which proposed that the higher the R&D intensity, the higher the export intensity. Thus, the hypothesis is fully supported in both theoretical and empirical base. Our findings are similar to the results of the previous studies in developing economies (Leung & Sharma, 2021; Tamini & Valéa, 2021; Saemi & Oskooee, 2019; Goldar, 2013; Sandu & Ciocanel, 2014). The result confirms again that the higher firm's R&D intensity, the higher firm's export performance in transition economy.

Control variables: Compared to Model 1, the results in Model 2 on the effect of control variables on export of firms have some differences in terms of statistical significance.

Firm size (X_2): Model 2 shows that there was a positive effect of firm size on export intensity, but at a significant level of 1% ($\beta_2 = 3.693$, $p < 0.01$). This indicates firms with larger sizes and more stable resources can afford to assume more risks and achieve higher efficiency in export activities. The results completely align with the argument on limited resources of Bonaccorsi (1992) and Pierre (2020) and economies of scale by Nguyen and Le (2019).

Firm age (X_3): Similar to Model 1, the positive effect of enterprise age on export intensity had been reinforced in Model 2 since the regression coefficient (β_3) equals 0.598 and was significant at 5%. It has been proven that the number of years a firm is in operation is associated with the experience it has accumulated, allowing the firm to assert its brand and position in the global market. Once the firm has successfully built customer trust and loyalty, it can boost its

exports and eventually gain higher profitability. This result shows no difference compared to the earlier findings of Marques (2015), Reçica et al., 2019).

Foreign ownership proportion (X_5): The figures in Model 2 reflected the inverse correlation between foreign ownership proportion and export intensity of firms operating in Vietnam at the significant level of 5% (β_5 = -0.136, $p < 0.05$). This result is similar with Model 1. This is contrary to the conclusions of several previous studies such as Filatotchev et al. (2008), Goldar (2013) and Leung and Sharma (2021). To explain this result, this study argues that foreign-invested firms may take domestic needs and available advantages of the host country into accounts such as low production costs and R&D opportunities rather than expanding their business through export. In other words, these firms try to increase their market share in the host country. Under the pressure of foreign-invested enterprises, domestic firms tend to seek overseas markets to secure their revenue and profitability. Hence, compared to firms with a high foreign ownership proportion, domestic firms or those with lower foreign investments are more likely to focus on export activities and consequently gain higher export intensity.

Gender of top manager, formal and informal institutional differences, and sector: Based on the results in Model 2, these four control factors have no effect on the export of Vietnamese firms as the estimated coefficients of these variables were not statistically significant at any level.

4.3. Robustness Analysis

In addition to the results obtained from the Robust Standard Errors in Table 3, this study also used Tobit regression to test the hypothesis with the end purpose of verifying the reliability of the above findings. Since the values of export intensity of enterprises range from 2% to 100%, these two figures present the lower and upper bounds of the dependent variable. Thus, the Tobit regression is considered appropriate when employed to test the hypothesis (Wooldridge, 2002; Vo, 2015a). Estimation results from this additional analysis are reported in Table 4.

Table 4: Robustness Analysis of the Effect of R&D on Export of Firms in Vietnam (Tobit non-linear regression)

	Original results (Robust Standard Errors)		Additional test (Tobit Regression)	
	Coefficient	Std. Error	Coefficient	Std. Error
Intercept	27.654***	9.469	27.654***	9.345
Independent variable				
R&D intensity	2.871**	1.378	2.872**	1.379
Control variables				
Firm size	3.693***	1.190	3.690***	1.171
Firm age	0.598**	0.284	0.598**	0.281
Gender of top manager	5.143	3.982	5.143	3.930
Foreign ownership proportion	-0.136**	0.063	-0.136**	0.062
Formal institutional distance	-0.645	0.775	-0.645	0.765
Informal institutional distance	-1.378	1.495	-1.378	1.475
Sector	1.106	0.098	1.101	1.099

Note: *, ** and *** indicate statistically significant levels at 10%, 5% and 1%, respectively.

Table 4 shows that the Tobit non-linear regression delivers the same results as Model 2 of the Robust Standard Errors. On one hand, R&D expense, enterprise size and enterprise age (X_3) had been found to positively affect export intensity of Vietnamese firms ($\beta_1 = 2.873$, $p < 0.05$; $\beta_2 = 3.695$, $p < 001$; $\beta_3 = 0.598$, $p < 0.05$). On the other hand, the negative relationship between foreign ownership proportion (X_5) and export was statistically significant at 5%, which was reflected through the regression coefficient (β_5) of -0.136 and p-value lower than 0.05. The remaining control variables, including the gender of top manager (X_4), regulative distances (X_6) and cultural distances (X_7) between Vietnam and importing countries, had no statistically significant impact on export intensity. In brief, the results remain unchanged, and the hypothesis of this study is consistent with two different estimation methods.

5. Conclusions

5.1 Implications

From the theoretical perspective, adapting the resource-based view (Barney, 1991), this study has reinforced the theory based on empirical evidence from a transition economy – in this case, Vietnam. It can be said that technology is deemed as one of the intangible resources that facilitate firms to generate sustainable competitive advantages and international presence. Innovation capabilities are likely to facilitate companies to successfully differentiate themselves from their competitors and eventually gain customer trust as well as loyalty (Leung & Sharma, 2021; Tamini & Valéa, 2021). R&D activities also form a foundation for the improvement of production efficiency and business activities in general, increasing market share and ultimately the profitability of the firms. In addition to R&D intensity as an independent variable, the study also points out the positive effects of control variables such as enterprise size and enterprise age along with the negative effect of foreign ownership proportion on the export of Vietnamese enterprises (Saemi & Oskooee, 2019; Nguyen & Le, 2019; Vo et al. 2021a). These findings have advanced the understanding of export activities of firms operating in transition economies, given that international business literature has so far been relatively silent on such a topic. Furthermore, exports do not only stimulate a country's economic growth but also allow it to actively participate in global value chains. Especially for Vietnam, as a developing country that is deeply involved in the global production system, being able to produce and supply inputs for production to firms in foreign countries is of great importance for seeking entry into new industries.

From the practical perspective, the research has pointed out that increasing investment in R&D will help firms to promote international trade. Innovation activities motivate firms to come up with cutting-edge technologies and advanced production processes that are cost-effective and time-saving (Pierre, 2020; Vo et al. 2021a). Additionally, product and service innovation enables companies to differentiate themselves from their competitors and successfully meet customers' diverse needs by offering high-quality yet reasonably priced products. In the context of a fierce global race for innovation, many products life cycles have been shortened and thus, it is required that firms implement effective R&D strategies to survive and grow sustainably. Even firms with limited financial

resources are still advised to have a stable budget for research and development activities (Edeh et al. 2020; Tamini & Valéa, 2021). The funding may come from either firms' revenues or their stockholders' equity if revenues have not yet been generated. In other words, they should actively make investment decisions instead of waiting for external support. If firms can develop appropriate R&D spending strategies, they will be able to improve their technological capabilities and competitiveness when conducting export activities in the global market (Pierre, 2020). Apart from firms' efforts, the Vietnamese government should play its role by establishing financial aid policies for R&D and exports along with adequately informing enterprises of these newly adopted regulations. Renovating the education program and promoting cooperation between enterprises and universities are also necessary to improve the quality of human resources for R&D activities.

5.2 Limitations and Future Research

The study has some limitations that may provide avenues for further research. Firstly, this study only considers a small number of firms, which is 306, out of a very large number of total businesses operating in Vietnam. As the outcome of this study may not be highly representative, subsequent research is advised to increase the number of observations included in the sample. Secondly, the data used to analyse the factors affecting the export of firms were cross-sectional data. However, export performance, as well as its determinants, may change over time and this study has not reflected such change. In future research, time-series or panel data should be obtained to examine changes in the variables over time. Thirdly, the author has drawn a general conclusion about exports of firms from different industries. While the industry sector possibly affects export activities, this study did not take industry characteristics into consideration. Therefore, it would be interesting to classify firms according to their sectors and investigate the impact of industries on export performance. Finally, future studies could employ alternative measures of export and R&D based on existing literature or even develop new proxies to evaluate the effect of R&D on the export of firms. On this basis, managerial implications could be developed to help enterprises come up with more effective export promotion strategies and serve as a foundation for following studies in international business research. Despite the limitations of this research, it is strongly believed that this study has contributed to the

academic discussion and managerial implications about the impact of R&D on export of firms in different ways.

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