The simultaneous relationship between labor productivity and exports: The case of small and medium-sized enterprises in Vietnam

Duy Phan Khanh Nguyen[1], Thong Le Pham[1*]

[1]Can Tho University, Can Tho, Vietnam

[*]Corresponding author: plthong@ctu.edu.vn

ARTICLE INFO

DOI:10.46223/HCMCOUJS.econ.en.15.3.3770.2025

Received: October 02nd, 2024

Revised: November 05th, 2024

Accepted: November 19th, 2024

JEL classification code:

C36; D22; F16

Keywords:

3SLS; exports; firm performance; labor productivity; SMEs; Vietnam

ABSTRACT

This study explores the simultaneous relationship between labor productivity and exports of Small and Medium-sized Enterprises (SMEs) in Vietnam, using data from the 2013 and 2015 SME surveys conducted by the UNU-WIDER in cooperation with the Institute of Labour Science & Social Affairs (ILSSA), the Department of Economics (DoE) of the University of Copenhagen, and the Central Institute of Economic Management (CIEM) of Copenhagen University. The Three-Stage Least Squares regression is estimated with time-demeaned variables to address the potential endogenous problem caused by the simultaneous relationship between the two variables of interest and to control for the fixed effects of firms in the panel dataset. This study confirms a simultaneous relationship between labor productivity and exports. Firms with higher productivity are more likely to become exporters, and at the same time, participating in exports boosts firms' labor productivity. The findings suggest that SMEs should invest more resources in human capital, such as skill intensity, capital intensity, and wages, in order to increase labor productivity. This, in turn, may lead to a higher chance to participate in exports. Simultaneously, export-led strategies could further boost labor productivity, creating a mutually reinforcing loop that strengthens SME competitiveness in international markets.

1. Introduction

Ever since Bernard and Jensen (1999) published their seminal work that set the foundation for using plant-level data in examining the relationship between labor productivity and exports, this nexus has drawn much attention from scholars in the past few decades. Their findings indicate that exporting firms generally outperform their non-exporting counterparts in terms of labor productivity. However, it is challenging for any firm to enter the overseas markets as there are many caveats they must circumnavigate, such as researching customer preferences, ensuring quality standards, establishing distribution systems, and building customer services. All are pivotal facets that need to be addressed in order to nurture a fruitful export cascade (Ciarli et al., 2023; Dong et al., 2022; Melitz, 2003; Roberts & Tybout, 1997). Thus, only highly productive firms possess enough resources to offset these entry costs.

Another way to address this nexus is to approach it from the exporting side. Salomon and Shaver (2005) argue that exporters are exposed to superior knowledge and highly advanced technology while operating in foreign markets, which they may not have access to in their home country. The acquired knowledge will circulate back to benefit the firm. Moreover, the intense competition from foreign competitors fosters firms to constantly innovate, update facilities, recruit high-quality employees, and plan appropriate business strategies. All of the aforementioned activities will eventually improve the firm's labor productivity (Grossman & Helpman, 1994; Sahoo et al., 2022; Wagner, 2007).

Export is regarded as one of the most crucial factors that has contributed to the miraculous recovery of Vietnam since the early 1990s. Since the "Doi Moi" (reform policy) was launched in 1986, Vietnam has reopened trading to the world and implemented many export inducement policies, which include introducing monetary policy (i.e., maintaining a fixed exchange rate regime with the US Dollar), attracting foreign direct investment, joining regional as well as global organizations (e.g., ASEAN, WTO) and focusing on public investments in tandem. All these export-led policies boosted the performance of many sectors and consolidated Vietnam's position as one of the most dynamic countries in Southeast Asia. Despite the overall rapid export growth, Small and Medium-sized Enterprises (SMEs) have yet to fully utilize the benefits of participation in exporting. As of 2022, the number of SMEs is nearly 870,000, accounting for approximately 98% of total number of enterprises in Vietnam but contributing only 30% to total export values. This is due to the surprisingly low number of SMEs engaged in exports, ranging from only 5% to 7% since 2001 (Organization for Economic Cooperation and Development [OECD], 2021). This problem can be attributed to the low labor productivity of SMEs in Vietnam, as most SMEs still heavily rely on unskilled labor, have limited access to advanced technologies, and use outdated production techniques (Vu et al., 2016). Additionally, most SME exporters in Vietnam are foreign-owned, emphasizing the supportive role of their parent companies in mitigating the obstacles to participating in exports (i.e., MNEs that act as SMEs' main buyers relocated their factories nearby Vietnam to reduce the economic distance). Therefore, it is crucial to address whether high labor productivity is linked to higher export participation and vice versa, as SMEs are often considered the backbone of the Vietnamese economy (OECD, 2021). The above concerns and arguments clear a path toward a solution to increase the engagement of Vietnamese SMEs in participating in exports. It also raises a need to develop a framework that fully captures the relationship between the firms' labor productivity and exports. This study is aimed at addressing the research question of whether a simultaneous relationship between labor productivity and export does exist among SMEs in Vietnam.

Although the relationship between labor productivity and exports has been studied extensively, this paper contributes to the literature threefold. Firstly, this paper aims to extend the current knowledge of the relationship between productivity and export in the context of an emerging economy like Vietnam by examining whether highly productive firms are more inclined to export and, at the same time, whether firms with high export intensity are associated with higher labor productivity. Secondly, this study explores how firms' characteristics are associated with labor productivity and exports while dealing with firms' endogenous choices that might have been ignored in previous research. Finally, this study uses the Three-Stage Least Squares (3SLS) regression with time-demeaned variables to control the fixed effects of firms in the panel data in the context of the simultaneous equations of labor productivity and exports. We find that there is a simultaneous interaction between labor productivity and exports; that is, more productive firms are more likely to become exporters, and on the other hand, participating in exports improves the firm's labor productivity. Therefore, estimates using the 3SLS are more consistent and efficient than those using the individual equation estimation.

The rest of the paper is structured as follows. Section 2 presents the literature review of existing knowledge about the relationship between labor productivity and exports. Section 3 introduces the applied research method. Section 4 reports the empirical results and discussion sections of the paper. Finally, Section 5 shows the conclusions, limitations, and suggestions for further research.

2. Literature review

It is generally an axiom that exporters are more productive than their non-export counterparts (Aw & Hwang, 1995; Bernard & Jensen, 1999; Wagner, 2012). The benefits of the "export premium" phenomenon are often explained by two fundamental perspectives: self-selection and learning-by-exporting theory. As they are alternative but not mutually exclusive, together, they demonstrate a complementary effect of the simultaneous causal relationship between labor productivity and exports (Girma et al., 2004).

2.1. Self-selection theory

The self-selection theory suggests that only firms with high productivity are able to bear the additional fixed and sunk costs that occur when selling their products in the international markets (e.g., the additional distribution costs, transportation fares, marketing expenses, licenses and permission fees). Additionally, innovation is also a vital aspect of self-selection theory. Investing in R&D activities enables firms to stay technologically updated and grants organizations the ability to meld firm-specific advantages and external resources in novel ways, enhancing their competitiveness to compete in the foreign market (Love & Mansury, 2009; Yi et al., 2013). Hence, the more the firm innovates, the higher the probability it participates in exports, owing to its higher level of productivity (Filipescu et al., 2013). Thus, the idea of self-selection theory is that highly productive firms self-select to engage in exporting, not vice versa (Yeaple, 2005).

Regarding firms that are less productive, the self-selection theory indicates that they often face entry barriers that prevent them from penetrating overseas markets as they are not adept enough to tackle the upcoming intricacies (Bernard & Jensen, 2004; Bernard & Wagner, 2001; Helpman et al., 2004; Meyer et al., 2009). Roberts and Tybout (1997) adduce that low level of productivity firms in less developed countries often encounter hurdles when entering overseas markets, which make it difficult to export or establish a geographically dispersed subsidiary network. Furthermore, the prevalence of foreign competitors compels the exporters to reallocate resources and upgrade facilities to ensure the firm's viability before entering foreign markets (Greenaway & Kneller, 2007; Vendrell-Herrero et al., 2022; Vernon, 1979).

2.2. Learning-by-exporting theory

On the other hand, the learning-by-exporting theory argues that export is essential to firms' productivity growth. Grossman and Helpman (1994) propose that exporters must constantly innovate to compete in the international market, as innovation can lead to technological progress and productivity enhancements. Moreover, when engaging in the world market, firms are exposed to newly accessed technology that is not available in the home country and benefit from their international partners as they encounter and acquire advanced knowledge in a superior market (Clerides et al., 1998; Love & Ganotakis, 2013). This is because the overseas partners are more willing to share valuable knowledge with the exporters (e.g., through establishing a joint venture partnership or granting licenses), particularly those from developing countries, as the technologies in their countries are unlikely to fulfill the international requirements (Pack & Saggi, 2001; Verbeke, 2013). Moreover, firms can also study consumers' needs and expectations for high-quality products and adjust the manufacturing process to satisfy them (Atkin et al., 2017). All of the aforementioned reasons encourage firms to specialize in their products, eventually enhancing labor productivity. Therefore, export-oriented firms will have competitive advantages vis-à-vis their insulated domestic counterparts (Aw et al., 2000).

However, there is a productivity margin that limits the amount of knowledge that firms can gain from exports (Salomon & Jin, 2010). Therefore, firms in less developed countries, which have lower productivity points upon access to overseas markets, will tend to gain more than their developed counterparts as they have more significant marginal gains (Vendrell-Herrero et al., 2022). Moreover, exposure to international trade will pressure export industries to maintain low costs and render the technology change (Crespi et al., 2008; Kunst & Marin, 1989). This motivates firms to shift from traditional technology to a more modern one, thereby enhancing firms' efficiency. For those reasons, the impact of exports on firm productivity is more pronounced in developing countries due to the limited numbers of firms participating in exporting and the low globalization level (Wagner, 2012). Therefore, it is important to examine the impact of exports on labor productivity in an emerging economy like Vietnam, especially among SMEs - a sector that has a relatively low level of export participation.

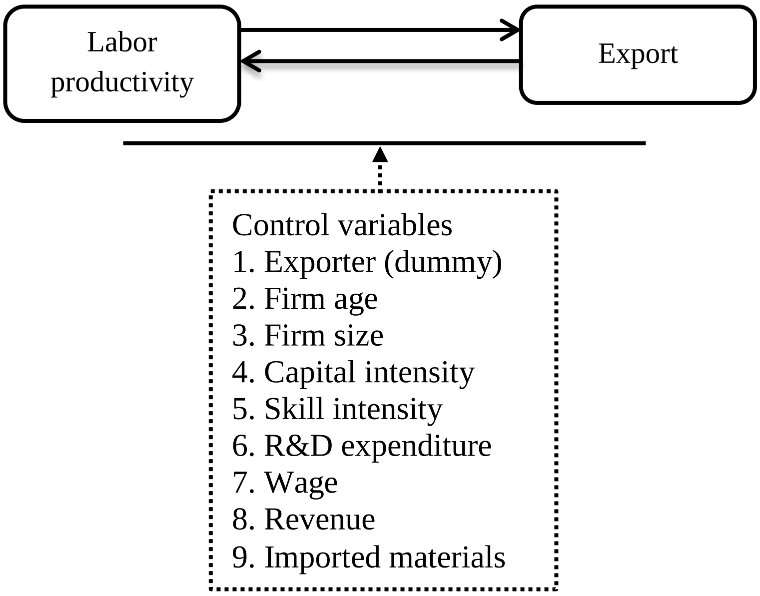
2.3. The simultaneous relationship between labor productivity and exports

Many scholars have tested the relationship between labor productivity and exports using self-selection and learning-by-exporting hypotheses. Most studies conclude that firms engaged in exporting are more productive than their non-export counterparts are and usually affirm the self-selection hypothesis (Bernard & Jensen, 1999; Delgado et al., 2002; Fabling & Sanderson, 2013; Roberts & Tybout, 1997; Wagner, 2007). In contrast, the learning-by-exporting assumption documented mixed and unclear findings, including both supporting evidence (Benkovskis et al., 2020; Blalock & Gertler, 2004; Clerides et al., 1998; Fernandes & Isgut, 2015; Golovko et al., 2023; Love & Ganotakis, 2013; Siba & Gebreeyesus, 2016) and non-supporting evidence (Arnold & Hussinger, 2005; Aw & Hwang, 1995; Bernard & Jensen, 1999; Castellani, 2002; Greenaway et al., 2005). However, these two alternatives are distinctive but not mutually exclusive since some studies point out the complementation effect of both theories (Alvarez & López, 2005; Bigsten & Gebreeyesus, 2009; Gkypali et al., 2021; Greenaway et al., 2005) and even reject both hypotheses (Arnold & Hussinger, 2005; Greenaway et al., 2005).

Many efforts have been made to examine the bilateral relationship between exports and firm productivity in Vietnam. However, most of them approach this nexus by estimating exports and productivity functions individually. For instance, Newman et al. (2016) use firm-level data from the annual survey conducted by the General Statistics Office (GSO) of Vietnam from 2005 to 2012 to examine the effect of self-selection theory and learning-by-exporting theory. The findings strongly support both theories, suggesting that foreign-owned and established firms are more inclined to export due to the support they receive from their parent companies when entering overseas markets, and cumulative post-export knowledge acquired through the learning effect will stimulate the growth of labor productivity. Similarly, Vu et al. (2016) adapt a panel dataset of Vietnamese manufacturing SMEs between 2005 and 2009 to analyze the reciprocal relationship between exports and productivity by employing the Generalized Method of Moments (GMM) estimation. The results advocate self-selection theory, indicating that more productive firms select themselves to engage in the international markets. However, the paper could not explain the reverse effect of exports on productivity, as engaging in exports is ineffective if not complemented with other productivity-enhancing strategies in tandem. If the simultaneous relationship between two variables is present, estimating each equation separately will produce inconsistent and inefficient estimates (Wooldridge, 2010). This study aims to address the simultaneous causal relationship between labor productivity and exports by applying the 3SLS regression associated with firms' fixed effects in the panel data in Vietnam from 2013 to 2015.

Figure 1

The Conceptual Framework



Sources. Proposed by the authors

3. Model specification and data description

3.1. Empirical model

As labor productivity and exports are interconnected through a simultaneous causal relationship, they are jointly identified by simultaneous equations where labor productivity acts as an independent variable in the exports equation and vice versa. Therefore, this study uses two simultaneous equations to examine this two-way relationship, including the first equation to determine the effect of export on labor productivity to test the self-selection theory and the second equation to determine the effect of labor productivity on exports to test the learning-by-exporting theory. The simultaneous equations for labor productivity and export are proposed below:

$$\begin{cases} \ln LP_{it} = \alpha_0 + \alpha_1 EXPSHARE_{it} + \gamma'\mathbf{X}_{it} + \mu_{1i} + v_{it} & (1) \\ EXPSHARE_{it} = \beta_0 + \beta_1 \ln LP_{it} + \delta'\mathbf{Z}_{it} + u_{2i} + e_{it} & (2) \end{cases}$$

Where:

$\ln LP_i$ is the labor productivity of observation i, which is measured by the natural logarithm of total outputs per worker (million VND); $EXPSHARE_i$ is the proportion of export revenues to total revenues, measured by the ratio of export sale revenues to total revenues of the firm; in order to minimize the potential risk of omitted variable bias, *vectors of control variables* $\boldsymbol{X}_i$ *and* $\boldsymbol{Z}_i$ *are added into the two equations. The vector* $\boldsymbol{X}_i$ *includes* the dummy variable indicating an exporter, firm's age, firm's size, skill intensity, the natural logarithm of capital intensity, total R&D expenditure, the dummy variable for imported materials and employee's wage, while $\mathbf{Z}_i$ consists of all control variables in $\mathbf{X}_i$ but the exporter dummy. For identification, the natural logarithm firm's revenue is also added in $\mathbf{Z}_i$. The rationale for the variable selection is argued as follows. The exporter dummy variable takes the value of 1 if the firm is involved in exporting and 0, if otherwise. Exporting firms are likely to exhibit better performance due to their ability to take advantage of economies of scale and scope, resulting in higher labor productivity (Yang & Chen, 2012). Firm size is measured by the total number of employees (Bernard & Jensen, 1999).

Firm age is calculated by using the difference between the current year of survey (2013 or 2015) and the year in which the firm was founded. Aged firms possess a wealth of experience, managerial competencies, and a high level of reputation, which results in better performance and higher productivity (Yang & Chen, 2012). In addition, Research and Development (R&D) expenditure is measured by the amount of money or funds that a firm spends on research and development activities to enhance the quality of products, services, or processes of that company. Firms that spend more on R&D are expected to have higher labor productivity (Yi et al., 2013). Capital intensity is measured by the natural logarithm of the ratio of capital to labor, which reflects the current innovation state of a firm as it represents the amount of money used to purchase modern machinery and maintain infrastructure (Yang & Chen, 2012). Skill intensity is measured by the ratio of white-collar employees to total employees. It is expected that skill intensity may positively affect productivity due to the increased adoption of new technologies (Yang & Chen, 2012). To examine whether a firm utilizes domestic inputs or not, a dummy variable for direct imports is included in the model. Direct imports take the value of 01 if firms import raw materials and 0 otherwise. Wages may potentially affect the labor productivity and exports of the firm. Wage is measured by the natural logarithm of the amount of wage expenditures spent on employees. High wage rates may motivate workers to work more efficiently and achieve high productivity, but restrict the limited resources of the firm to allocate to other activities (Greenaway et al., 2005). Finally, a firm's revenue is measured by the natural logarithm of the total revenue of a firm. It is a crucial factor that may influence a firm's choice to engage in exports. Control variables are firm characteristics. Macro factors that affect labor productivity and export intensity are not addressed in this study because they are homogeneous across firms in the sample.

α, β, γ, δ are parameters to be estimated; μ_{1i}, μ_{2i} are unobserved factors of firm i that are assumed to have fixed effects on ln*LP* and *EXPSHARE* and may be correlated with other independent variables; v_{it}, $_{it}$ is random errors of observation i at the time t.

Since labor productivity and export intensity appear as the dependent variable in their own equation and as the independent variable in the other equation, the possibility that random errors v_{it}, $_{it}$ in equations (1) and (2) can be correlated is raised (Zellner & Theil, 1962). Then, the OLS estimates of parameters in each single equation may be biased, inefficient, and inconsistent. In cases of a recursive model, the Two-Stage Least Squares estimates (2SLS) with instruments appear to be more efficient and consistent than the OLS ones (Wooldridge, 2010). The 3SLS regression takes advantage of the 2SLS by using the estimated moment matrix of the structural disturbances (error terms) to simultaneously estimate all coefficients of the entire system. As there is extra information to estimate their parameters (over-identified), 3SLS may yield more efficient and consistent estimates of the system of equations. Further, the 3SLS can take account of restrictions on parameters in different structural equations, and it is relatively simple to calculate, apart from the inversion of one big matrix (Zellner & Theil, 1962). Therefore, this paper applies the 3SLS estimation to obtain more asymptotically efficient and consistent estimates for the simultaneous relationship between labor productivity and exports (Zellner & Theil, 1962; Wooldridge, 2010).

3.2. Data description

The data used in this paper was adopted from the biennial survey led by the UNU-WIDER in cooperation with the Institute of Labour Science & Social Affairs (ILSSA), the Department of Economics (DoE) of the University of Copenhagen, and the Central Institute of Economic Management (CIEM). Stratified sampling according to the number of enterprises in each province was used to select sampled firms. Firm selection took place in a two-step sampling procedure. In the first step, districts within each province were selected using Probability Proportional to Size (PPS) sampling. The number of selected districts in each province is proportional to the number of districts in each province. In the second step, firms within a selected district were randomly selected from the population list of formal/registered non-state and household manufacturing firms. Over the years, the survey team re-interviewed surviving firms in a tracer survey. Attrited firms were randomly replaced with new firms in the updated population. Attrition related to dropping out of firms in the panel data often raises analytical concerns. However, it is not likely the case over the period 2013 - 2015 since the number of dropping out firms was estimated at 177, accounting for a relatively small proportion of the surveyed firms in 2013, about 7%. Most of the dropping-out firms were due to closure rather than due to refusal of survey participation or mobility reasons (Berkel et al., 2020).

The 2013 and 2015 SME surveys collected data from 2,542 and 2,647 firms, respectively, in 09 different provinces in Vietnam, namely Hanoi, Hai Phong, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh City, and Long An. There are 2,116 firms participating in both surveys. However, due to the data omission, the final dataset comprises 3,121 observations. This paper employs time-demeaned variables to remove the time-invariant firms' characteristics that are usually encountered when dealing with panel data analysis and focus on analyzing the pure effect of time-varying variables.

The descriptive statistics presented in Table 1 reveal that the mean labor productivity is approximately 325 million VND, accompanied by a large standard deviation of 550.98. This indicates a large variation in productivity among firms in the sample. The mean value of export share stands at 1.26%, implying that most SMEs have yet to enter international markets. The moderate to high variations observed in most variables can be attributed to the distinct operational indicators among firms, such as differences in industry, years of operation, and economic scale. In general, the labor productivity, export share, and R&D expenditure of SMEs in 2015 have increased in comparison to 2013. This implies that SMEs have started to lay the foundation for engaging in the international market by investing in value-added activities.

Table 1

Variable Definitions and Descriptive Statistics

Variable	2013		2015		Total	
	Mean	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**
Labor productivity (million VND)	307.60	497.90	353.40	623.20	325.90	550.90
Export share (%)	0.02	0.13	3.19	15.45	1.26	9.77
Exporter	0.08	0.27	0.10	0.30	0.09	0.28
Total years of operation (year)	16.69	65.48	15.69	9.16	16.30	51.43
Company's size (number of worker)	19.38	50.93	22.64	48.18	20.65	49.89
Skill intensity (%)	0.28	0.14	0.33	0.20	0.30	0.17
Capital intensity (million VND)	8.85	44.81	4.52	31.94	7.74	40.49
R&D expenditure (million VND)	1.44	25.90	4.19	80.01	2.52	53.94
Raw material imported	0.05	0.21	0.01	0.10	0.03	0.18
Average wage (million VND)	3.71	1.51	3.13	1.36	3.89	1.70
Plant's revenue (million VND)	1,837.36	1,067.64	1,825.99	1,068.81	1,832.92	1,067.94

Source. Computed from the 2013 and 2015 SMEs survey data

Looking at Table 2, both exporters and non-exporters increased their labor productivity in 2015. This is mostly due to Vietnam's stable economic growth, which creates a dynamic business environment for SMEs to develop. Additionally, Vietnamese SME exporters possess higher labor productivity than their non-export counterparts, which is likely to confirm the hypothesis that exporters are more productive than non-exporters.

Table 2

Labor Productivity of Vietnamese SME Exporters and Non-exporters (Million VND)

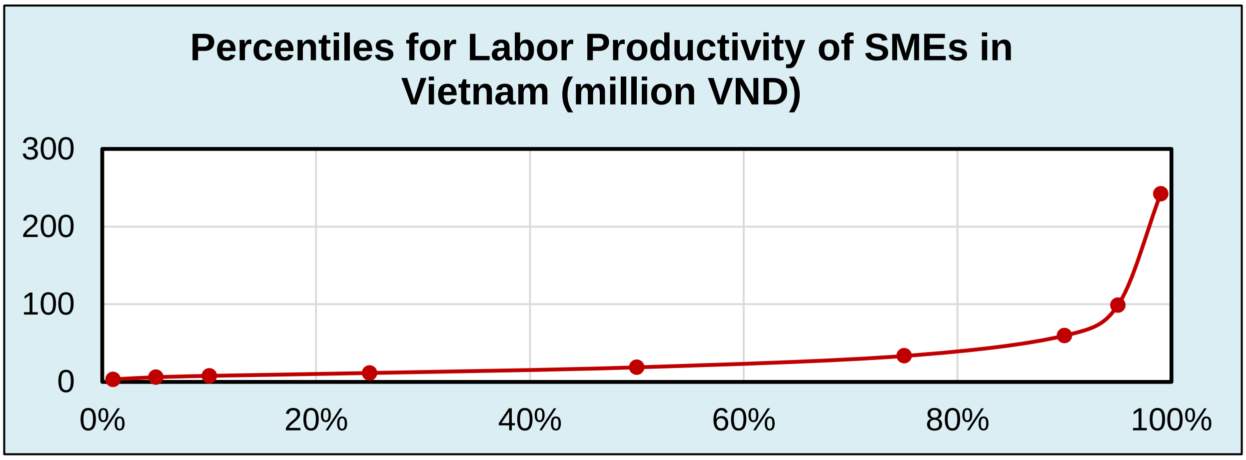
	2013		**2015**	
	Mean	**S.D**	**Mean**	**S.D**
Exporter	254.29	429.14	286.87	471.79
Non-exporter	455.86	613.00	511.28	891.84
Total	267.90	445.70	302.52	516.03

Source. Computed from the 2013 and 2015 SMEs survey data

Moreover, Figure 1 provides more insights into the current status of labor productivity among SMEs in Vietnam. It indicates that the majority of SMEs in Vietnam, ranging from 0 to under the 90th percentile, have relatively low productivity (under VND 500,000 hundred) while the rest show a sudden surge in productivity level. The inadequate distribution of labor productivity can be explained by the fact that most of the SMEs in Vietnam have yet to take up export activities (OECD, 2021). Moreover, the OECD also reports that around 10% of SMEs contribute to approximately 80% of the export value. Therefore, firms that are actively engaged in exports result in higher labor productivity than their non-exporting counterparts.

Figure 2

Percentiles for Labor Productivity of SMEs in Vietnam



Source. Data collected from the surveys

4. Estimation results and discussions

To examine the problem of multicollinearity, the correlation matrix of all independent variables included in the empirical models is computed and presented in Table 3. Figures in Table 3 show that all correlation coefficients between each pair of independent variables are relatively small, from 0.44 or less, indicating that multicollinearity is not a concern in the estimation. This ensures the precision of the FEM and 3SLS estimates.

Table 3

Correlation Matrix among Independent Variables

	EXPORTER	***AGE***	***SIZE***	***SKILL***	**ln*KL***	***RDR***	***DIMP***	**ln*WAGE***	**ln*REV***
EXPORTER	1								
AGE	–0.012	1							
SIZE	0.315	–0.009	1						
SKILL	–0.161	–0.001	–0.231	1					
ln*KL*	0.042	–0.016	0.026	–0.016	1				
RDR	0.051	–0.004	0.039	–0.017	0.025	1			
DIMP	0.242	–0.013	0.206	–0.040	0.046	0.173	1		
ln*WAGE*	0.104	–0.013	0.118	–0.438	0.131	0.016	0.063	1	
ln*REV*	0.238	–0.034	0.218	–0.230	0.159	0.044	0.132	0.262	1

Source. Computed from the 2013 and 2015 SMEs survey data

Before estimating the 3SLS regression for the simultaneous equations regression, we also estimate the Fixed Effect Model (FEM) for each single equation to compare estimates from the single equations and equation system. The FEM estimations of each equation are presented in the columns (1) and (2) of Table 4.

The 3SLS estimation results to examine the simultaneous relationship between productivity and exports of small and medium-sized enterprises in Vietnam are presented in columns (3) and (4) of Table 4. The χ^2 test for both equations is all statistically significant at the 1% level, indicating that the selected independent variables in each equation affect the dependent variables. Besides, the estimated coefficients on the endogenous variables in the equation systems are statistically significant at the 1% and 5% levels, proving a simultaneous relationship between labor productivity and exports.

Table 4

The Comparison of Estimated Results between the Fixed Effects Model and the Three-Stage Least Squares

Variable	**Fixed effect model (FEM)**				**Three-stage least squares (3SLS)**			
	ln*LP* **(1)**		***EXPSHARE*** **(2)**		**ln*LP*** **(3)**		***EXPSHARE*** **(4)**	
	Coefficient	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**
EXPSHARE	0.0008	0.002			0.0278 **	0.013		
ln*LP*			0.5921	0.714			30.6269 ***	5.669
EXPORTER	0.1370	0.121			0.1719	0.194		
AGE	–0.0002	0.001	0.0007	0.005	–0.0002	0.001	0.0061	0.005
SIZE	–0.0023 ***	0.161	–0.0009	0.011	–0.0025 ***	0.001	0.0757 ***	0.018
SKILL	1.0210 ***	0.011	–2.3176	3.298	0.8245 ***	0.092	–25.4089 ***	5.190
ln*KL*	0.0516 ***	0.001	–0.0330	0.225	0.0556 ***	0.008	–1.7010 ***	0.371
RDR	0.0002	0.112	0.0132 **	0.005	–0.0002	0.001	0.0094 *	0.005
DIMP	–0.0624	0.029	–19.5974 ***	2.194	0.5236 **	0.235	–18.4800 ***	1.889
ln*WAGE*	0.0576 **	0.254	0.4686	0.547	0.0498 ***	0.017	–1.5180 ***	0.554
ln*REV*			0.0001	0.001			0.0002	0.001
YEAR 2015					0.0397 **	0.015	–1.1348 **	0.466
Observations	3,121		3,121		3,121		3,121	
R^2 (%)	9.67		11.58					
P-value of *F* test	0.0000		0.0000					
χ^2					2089.04		595.08	
Pr > χ^2					0.0000		0.0000	

Note. ***, **, * represent statistical significance at the 1%, 5%, and 10%, respectively
Source. Estimated from the 2013 and 2015 SMEs survey data

The large differences between FEM and 3SLS estimates in Table 4 indicate that using single equations to approach this nexus might lead to inconsistent and inefficient estimates. Therefore, the 3SLS is a more appropriate estimate when examining the relationship between labor productivity and exports.

4.1. The learning-by-exporting hypothesis

The productivity equation is presented in the third column of Table 4. The estimated coefficient on export volume is statistically significant at 5%, indicating a positive impact of exports on the productivity of SMEs in Vietnam. In particular, if the export share increases by 1%, the mean firm's labor productivity increases by approximately 0.03%. This finding supports the learning-by-exporting hypothesis. When participating in exporting, firms must constantly modernize their products, customize production chains, expand operation systems, and more in order to have a competitive edge over foreign competitors. At the same time, the competition facilitates firms' learning capabilities, enabling them to absorb knowledge and technology advances from overseas partners. Therefore, export intensity helps increase firms' competitiveness. This finding is consistent with previous studies by Greenaway et al. (2005), Grifell-Tatjé et al. (2018), Gkypali et al. (2021), Love and Roper (2015), Sjöholm (1999), Yang and Chen (2012). It is crucial to note that despite the limited numbers of SMEs engaged in exports, most SME exporters are foreign-invested firms (OECD, 2021). Since most SMEs in Vietnam have not been intensely involved in export activities, this result indicates that firms should consider implementing export-based strategies to further boost their productivity.

The effects of the remaining factors on labor productivity are similar and align with previous studies. More particularly, the coefficient on firm size reveals a detrimental impact on the productivity growth of SMEs in Vietnam. According to De Meulenaere et al. (2016), the larger the firm is, the more it exacerbates the age polarization phenomenon, which eventually decreases labor productivity. These outcomes are attributed to the fact that larger companies are more likely to have conflicts of interest and social status between groups of employees than their smaller counterparts (Boehm & Kunze, 2014). Moreover, a larger company implies a more structured hierarchical system, which enhances the propensity of senior employees to impose their will on other employees, thereby creating a dissatisfied environment and lowering productivity (Lau & Murnighan, 1998).

A positive coefficient of 0.05 on the capital intensity at a 1% significance level indicates that higher capital intensity firms are more likely to generate higher labor productivity. Capital intensity often embodies a level of innovation and the current state of a firm's wealth as it pertains to the amount of money used in the production process (i.e., investing in modern machinery, upgrading equipment, etc.). Therefore, firms with a high capital intensity ratio suggest that the production costs have been minimized due to the fact that employees have more access to better resources and tools, which enables them to produce more efficiently in the same amount of time, thereby increasing productivity (Yang & Chen, 2012). Furthermore, high capital-intensive firms are in a position to exploit the economies of scale advantages, such as increasing production capability, improving the price competitiveness of firms' products, and minimizing transaction costs (Lannelongue et al., 2017).

Looking at the employee-related variables such as skill intensity and wage, they both positively impact labor productivity, having coefficients of 0.83 and 0.05, respectively, at the 1% significance level. Investing in highly qualified employees and implementing appropriate payment policies will maintain their devotion and morale, therefore fostering better engagement, boosting motivation, and improving work performance (Akerlof, 1982; Munch & Skaksen, 2008). In addition, utilizing high-quality human resources also helps the company alleviate the pressure stemming from overseas competition as they are capable of absorbing new knowledge as well as reacting to sudden changes in working routines due to the technology integration process, which can help the company to innovate effectively, thus increasing productivity (Ozturk et al., 2020).

Lastly, directly importing intermediate materials from abroad also helps increase enterprises' labor productivity. This is partly explained by the learning-by-exporting theory, as firms importing from abroad benefit from the various quality of inputs suppliers, especially those from developed countries (Pane & Patunru, 2023). Vietnam is an export-driven economy, so importing inputs and assembling domestically to export makes it a crucial factor in boosting productivity. By procuring these high-quality inputs, firms will reduce the time and effort in manufacturing products as these international resources possess better characteristics than their domestic counterparts (Amiti & Konings, 2007; Halpern et al., 2015). Thus, firms will have more time to reallocate other resources to different operation processes.

An intriguing finding of this research is that the coefficient on a variable that reflects the firm's level of innovation is not statistically significant. This is in contrast to previous studies by Audretsch and Belitski (2020), Pariboni and Tridico (2020), Siliverstovs (2016). The fact that SMEs in Vietnam have yet to focus on process, technical, and product innovation might be due to their limited scale and lack of access to other resources (OECD, 2021). Hence, the innovation process also needs to be considered in the long term as there is a required learning period for employees to be acquainted with new equipment and adapt to such changes. When the innovation process begins, it can interrupt the workflow since the daily routine suddenly changes, which can temporarily decrease labor productivity (Foster et al., 2001). This research only analyzed the data in a short period, so the effect of innovation on productivity needs to be examined more carefully in the future.

Moreover, the dummy variable representing the year indicates that given that other factors remain constant, labor productivity in 2015 exceeds that of 2013 by approximately $4 per employee. This increment may be attributed to the time effect and technology progression, which reflects firms' ability to adapt and innovate, which resulted in higher labor productivity.

4.2. The self-selection hypothesis

The estimation of the export equation is presented in the fourth column of Table 2. The labor productivity has a noticeable positive impact on the export intensity at the 1% significant level. The results imply that a 1% increase in labor productivity will increase export intensities by 30.6 percentage points. This finding strongly supports the self-selection theory. The more productive firms are, the more likely they are to become exporters due to the fact that only productive firms can compete in foreign markets and offset the potential costs (e.g., market research costs, set-up costs, marketing costs) incurred while participating in exports (Bernard & Wagner, 2001). Furthermore, firms can delve into the knowledge pools in overseas markets to either formally exploit (i.e., technology transfer from foreign partners) or informally exploit (i.e., through studying customer requirements and expectations for a high-quality product) from it to refine the company's manufacturing process. This leads to technological progress, efficient operations, and better innovation capabilities, which can increase labor productivity and the wealth of firms. These findings are similar to many previous studies that examined the effect of labor productivity on export by Bernard and Wagner (2001), Delgado et al. (2002), Falk and de Lemos (2019), Gashi et al. (2014).

The coefficient on the firm's size also supports the self-selection theory, as its coefficient is positive and statistically significant. Bigger firms with high capacity tend to have better access in terms of resource stock; therefore, with the abundance of resources, they are more capable of investing in exports than their smaller counterparts (Wagner, 1995). Moreover, bigger firms will have economies of scale advantages (e.g., lower per-unit fixed costs, bulk purchasing benefits, and manufacturing efficiencies), thus increasing the chances of access to size-related resources and minimizing operational costs (Love & Mansury, 2009). Therefore, the larger the company, the more likely it will participate in exporting to improve productivity and profit (Bernard et al., 2003; Rashid & Waqar, 2017).

Another remarkable result is that capital intensity has a negative effect on exports. Contrary to previous studies in some developed countries (Wakelin, 1998), the labor-intensive goods of SMEs in Vietnam offer a more comparative advantage for exports than capital-intensive products. This argument can be explained by using the core competence theory. Vietnam is a developing country with low-middle income, vast resources, and abundant labor, so exporting labor-intensive products will help compete in the international market due to similarities and alignment with the country's advantages and price advantages (Belser, 2000; Yang & Chen, 2012). Thus, firms with high levels of capital intensity will waste benefits coming from the availability of natural resources, which might act as an obstacle to engaging in exports.

The estimated coefficient on the dummy variable gauged for direct importing inputs reveals that firms that mainly import intermediate goods have a lower probability of becoming exporters. This is because SMEs in Vietnam primarily rely on abundant natural resources to create competitive advantages for production and exports. Therefore, businesses that have to import raw materials from abroad will lose the availability advantage of the market, making exporting more difficult due to the burden of costs. This result contradicts Sjöholm (1999) but is aligned with the study of Yang and Chen (2012), which gave similar results, meaning that the findings about this fact are mixed and unclear. Therefore, this factor must be considered carefully based on each firm's unique characteristics and context.

The total expenditure of the firm for R&D activities is also found to have a light positive impact on R&D on exports. Many studies have supported this idea as investing in R&D activities can help firms comply with international standards and increase economies of scale, thus improving firms' competitiveness to face harsh competitors in overseas markets through decrease in markups, product quality, etc. (Bernard & Jensen, 2004; Chang & Webster, 2019; Ito & Lechevalier, 2010). Moreover, Aw et al. (2011) argue that R&D activities and exports have a two-way relationship, as participation in investing in R&D leads to better export performance, and engaging in exports induces firms to invest more in R&D activities. Therefore, participation in exporting can enhance the firm's productivity due to exposure to knowledge pools and fierce overseas competition, resulting in the improvement of physical capital (e.g., tools, machinery, equipment) and human capital (e.g., knowledge, skills, and experiences).

Estimation results also show wages have a significantly negative effect on exports. Since hiring high-quality employees requires spending a considerable amount of money, it can increase production costs and restrict the resources allocated for export activities. Moreover, in the initial export stage, where the company has yet to make profits due to the fact that they have to suffer from entry barriers (i.e., sunk costs and fixed costs when penetrating into the overseas market), maintaining a high-paying policy might increase the burden on the company's finances. Therefore, SME owners should evaluate the firm's current financial status carefully before making an adjustment to payment policy. This result is similar to the study of Greenaway et al. (2005), which also provided evidence of why high stipends can harm firms' ability to engage in export.

The aforementioned analysis stands incongruent with both the positive effect of self-selection and the learning-by-exporting effect on the productivity-export nexus. Higher export intensity generates higher productivity and vice versa. In the context of emerging economies like Vietnam, where SMEs play a vital role in driving economic growth, participating in exports is the solution for any SMEs that want to improve their sales performance. By entering foreign markets, firms benefit from access to superior knowledge and intense competition from the host country's rivals to improve their labor productivity. On the other hand, higher labor productivity firms also offer the chance for SMEs to tap into overseas markets due to the availability of resources. Hence, SME owners should consider implementing export strategies to improve labor productivity and the other way around.

5. Conclusion

This paper uses firm-level data from surveys of Vietnamese SMEs from the 2013 and 2015 surveys to examine the simultaneous relationship between labor productivity and exports. The 3SLS estimation of the equation system of export intensity and labor productivity with time-demeaned variables shows strong bilateral impacts between labor productivity and export intensity. More productive firms are likely to engage in exporting and participating in export activities boosts the firm's productivity. The presence of a simultaneous relationship between productivity and exports confirms the complementarity of both the learning-by-exporting and self-selection hypotheses. This finding poses a problem of estimating the relationship between the two variables. Simultaneous estimation of the equations for firms' productivity and export intensity is likely to yield more consistent and efficient estimates since it controls for the interaction between the two variables.

Moreover, the estimation results also document that firms' productivity is positively affected by human capital factors such as skill intensity, capital intensity, and wages. Therefore, they should invest in those to improve labor productivity, which can increase the probability of engaging in exports. At the same time, exports are negatively correlated with these variables. Firms should view exports as a pathway to increase productivity, which, in turn, may result in increased export intensity. The results imply that firms should invest in physical capital (i.e., machinery, tools, and equipment) in the initial stage of exports to improve competitiveness as they can lead to instant operational efficiency rather than focus on human capital, which requires a longer time and more efforts to absorb the external knowledge.

However, this study is not exempt from limitations. Due to data availability, we include only two years in this paper, which may not reflect the long-term effect between labor productivity and exports, as well as other factors that need to be examined in the longer run, such as R&D activities. Besides, the lack of managerial information in this dataset also constrains our study in examining the role of owners in shaping SMEs' pre-exporting strategies. Such pre-export strategies can determine the success of firms in overseas markets, which can increase labor productivity. Further research with a more extended time-span dataset should focus on the analysis of the impact of pre-export conditions compared to post-export to give a more comprehensive view of these nexus. The data attrition in panel data is also a limitation of this study. Although the number of firms attrited in 2015 was not remarkable, it might have caused self-selection bias. Due to data limitations, we were unable to examine whether systematic differences between attrition and surviving firms were present. Heteroscedasticity testing has also not been performed due to limitations in the development of testing techniques for 3SLS estimates.

ACKNOWLEDGEMENTS

The authors declare that (i) no financial support has been received from any organization that may have an interest in the submitted work, and (ii) there are no other author that could appear to have influenced the submitted work.

References

Akerlof, G. A. (1982). Labor contracts as partial gift exchange. *The Quarterly Journal of Economics, 97*(4), 543-569.

Alvarez, R., & López, R. A. (2005). Exporting and performance: Evidence from Chilean plants. *Canadian Journal of Economics/Revue Canadienne D'économique, 38*(4), 1384-1400.

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review, 97*(5), 1611-1638.

Arnold, J. M., & Hussinger, K. (2005). Export behavior and firm productivity in German manufacturing: A firm-level analysis. *Review of World Economics, 141*, 219-243.

Atkin, D., Khandelwal, A. K., & Osman, A. (2017). Exporting and firm performance: Evidence from a randomized experiment. *The Quarterly Journal of Economics, 132*(2), 551-615.

Audretsch, D. B., & Belitski, M. (2020). The role of R&D and knowledge spillovers in innovation and productivity. *European Economic Review, 123*, Article 103391.

Aw, B. Y., & Hwang, A. R. M. (1995). Productivity and the export market: A firm-level analysis. *Journal of Development Economics, 47*(2), 313-332.

Aw, B. Y., Chung, S., & Roberts, M. J. (2000). Productivity and turnover in the export market: micro-level evidence from the Republic of Korea and Taiwan (China). *The World Bank Economic Review, 14*(1), 65-90.

Aw, B. Y., Roberts, M. J., & Xu, D. Y. (2011). R&D investment, exporting, and productivity dynamics. *American Economic Review, 101*(4), 1312-1344.

Belser, P. (2000). *Vietnam: On the road to labor-intensive growth?* (Vol. 2389). World Bank Publications.

Berkel, H., Rand, J., Tarp, F., & Trifković, N. (2020). The Vietnam SME data, 2005-15. *Micro, Small, and Medium Enterprises in Vietnam*, 14-38.

Benkovskis, K., Masso, J., Tkacevs, O., Vahter, P., & Yashiro, N. (2020). Export and productivity in global value chains: Comparative evidence from Latvia and Estonia. *Review of World Economics, 156*, 557-577.

Bernard, A. B., & Jensen, J. B. (1999). Exceptional exporter performance: Cause, effect, or both? *Journal of International Economics, 47*(1), 1-25.

Bernard, A. B., & Jensen, J. B. (2004). Why some firms export. *Review of Economics and Statistics, 86*(2), 561-569.

Bernard, A. B., & Wagner, J. (2001). Export entry and exit by German firms. *Weltwirtschaftliches Archiv, 137*(1), 105-123.

Bernard, A. B., Eaton, J., Jensen, J. B., & Kortum, S. (2003). Plants and productivity in international trade. *American Economic Review, 93*(4), 1268-1290.

Bigsten, A., & Gebreeyesus, M. (2009). Firm productivity and exports: Evidence from Ethiopian manufacturing. *The Journal of Development Studies, 45*(10), 1594-1614.

Blalock, G., & Gertler, P. J. (2004). Learning from exporting revisited in a less developed setting. *Journal of Development Economics, 75*(2), 397-416.

Boehm, S. A., & Kunze, F. (2014). Age diversity and age climate in the workplace. In D. K. P Matthijs Bal & Denise M. Rousseau (Eds.), *Aging workers and the employee-employer relationship* (pp. 33-55). Springer.

Castellani, D. (2002). Export behavior and productivity growth: Evidence from Italian manufacturing firms. *Weltwirtschaftliches Archiv, 138*(4), 605-628.

Ciarli, T., Coad, A., & Moneta, A. (2023). Does exporting cause productivity growth? Evidence from Chilean firms. *Structural Change and Economic Dynamics, 66*, 228-239.

Clerides, S. K., Lach, S., & Tybout, J. R. (1998). Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco. *The Quarterly Journal of Economics, 113*(3), 903-947.

Crespi, G., Criscuolo, C., & Haskel, J. (2008). Productivity, exporting, and the learning-by-exporting hypothesis: Direct evidence from UK firms. *Canadian Journal of Economics/Revue Canadienne D'économique, 41*(2), 619-638.

Chang, F. Y., & Webster, C. M. (2019). Influence of innovativeness, environmental competitiveness and government, industry and professional networks on SME export likelihood. *Journal of Small Business Management, 57*(4), 1304-1327.

De Meulenaere, K., Boone, C., & Buyl, T. (2016). Unraveling the impact of workforce age diversity on labor productivity: The moderating role of firm size and job security. *Journal of Organizational Behavior, 37*(2), 193-212.

Delgado, M. A., Farinas, J. C., & Ruano, S. (2002). Firm productivity and export markets: A non-parametric approach. *Journal of International Economics, 57*(2), 397-422.

Dong, G., Kokko, A., & Zhou, H. (2022). Innovation and export performance of emerging market enterprises: The roles of state and foreign ownership in China. *International Business Review, 31*(6), Article 102025.

Fabling, R., & Sanderson, L. (2013). Exporting and firm performance: Market entry, investment and expansion. *Journal of International Economics, 89*(2), 422-431.

Falk, M., & de Lemos, F. F. (2019). Complementarity of R&D and productivity in SME export behavior. *Journal of Business Research, 96*, 157-168.

Fernandes, A. M., & Isgut, A. E. (2015). Learning-by-exporting effects: Are they for real? *Emerging Markets Finance and Trade, 51*(1), 65-89.

Filipescu, D. A., Prashantham, S., Rialp, A., & Rialp, J. (2013). Technological innovation and exports: Unpacking their reciprocal causality. *Journal of International Marketing, 21*(1), 23-38.

Foster, L., Haltiwanger, J. C., & Krizan, C. J. (2001). Aggregate productivity growth: Lessons from microeconomic evidence. In E. R. D. Charles, R. Hulten, & M. J. Harper (Eds.), *New developments in productivity analysis* (pp. 303-372). University of Chicago Press.

Gashi, P., Hashi, I., & Pugh, G. (2014). Export behaviour of SMEs in transition countries. *Small Business Economics, 42*, 407-435.

Gkypali, A., Love, J. H., & Roper, S. (2021). Export status and SME productivity: Learning-to-export versus learning-by-exporting. *Journal of Business Research, 128*, 486-498.

Golovko, E., Lopes-Bento, C., & Sofka, W. (2023). Learning by exporting for marketing innovation. *Industry and Innovation, 30*(5), 607-635.

Greenaway, D., & Kneller, R. (2007). Firm heterogeneity, exporting and foreign direct investment. *The Economic Journal, 117*(517), 134-161.

Greenaway, D., Gullstrand, J., & Kneller, R. (2005). Exporting may not always boost firm productivity. *Review of World Economics, 141*, 561-582.

Grifell-Tatjé, E., Lovell, C. K., & Sickles, R. C. (2018). *The Oxford handbook of productivity analysis*. Oxford University Press.

Grossman, G. M., & Helpman, E. (1994). Endogenous innovation in the theory of growth. *Journal of Economic Perspectives, 8*(1), 23-44.

Girma, S., Greenaway, A., & Kneller, R. (2004). Does exporting increase productivity? A microeconometric analysis of matched firms. *Review of International Economics, 12*(5), 855-866.

Halpern, L., Koren, M., & Szeidl, A. (2015). Imported inputs and productivity. *American Economic Review, 105*(12), 3660-3703.

Helpman, E., Melitz, M. J., & Yeaple, S. R. (2004). Export versus FDI with heterogeneous firms. *American Economic Review, 94*(1), 300-316.

Ito, K., & Lechevalier, S. (2010). Why some firms persistently out-perform others: Investigating the interactions between innovation and exporting strategies. *Industrial and Corporate Change, 19*(6), 1997-2039.

Kunst, R. M., & Marin, D. (1989). On exports and productivity: A causal analysis. *The Review of Economics and Statistics, 71*(4), 699-703.

Lannelongue, G., Gonzalez-Benito, J., & Quiroz, I. (2017). Environmental management and labour productivity: The moderating role of capital intensity. *Journal of Environmental Management, 190*, 158-169.

Lau, D. C., & Murnighan, J. K. (1998). Demographic diversity and faultlines: The compositional dynamics of organizational groups. *Academy of Management Review, 23*(2), 325-340.

Love, J. H., & Ganotakis, P. (2013). Learning by exporting: Lessons from high-technology SMEs. *International Business Review, 22*(1), 1-17.

Love, J. H., & Mansury, M. A. (2009). Exporting and productivity in business services: Evidence from the United States. *International Business Review, 18*(6), 630-642.

Love, J. H., & Roper, S. (2015). SME innovation, exporting and growth: A review of existing evidence. *International Small Business Journal, 33*(1), 28-48.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695-1725.

Meyer, K. E., Estrin, S., Bhaumik, S. K., & Peng, M. W. (2009). Institutions, resources, and entry strategies in emerging economies. *Strategic Management Journal, 30*(1), 61-80.

Munch, J. R., & Skaksen, J. R. (2008). Human capital and wages in exporting firms. *Journal of International Economics, 75*(2), 363-372.

Newman, C., Rand, J., Tarp, F., & Nguyen, A. T. T. (2016). Exporting and productivity: Learning from Vietnam. *Journal of African Economies, 26*(1), 1-25.

Organization for Economic Cooperation and Development (OCED). (2021). *SME and entrepreneurship characteristics and performance in Viet Nam*.

Ozturk, M., Durdyev, S., Aras, O. N., Ismail, S., & Banaitienė, N. (2020). How effective are labor wages on labor productivity?: An empirical investigation on the construction industry of New Zealand. *Technological and Economic Development of Economy, 26*(1), 258-270.

Pack, H., & Saggi, K. (2001). Vertical technology transfer via international outsourcing. *Journal of Development Economics, 65*(2), 389-415.

Pane, D. D., & Patunru, A. A. (2023). The role of imported inputs in firms' productivity and exports: Evidence from Indonesia. *Review of World Economics, 159*(3), 629-672.

Pariboni, R., & Tridico, P. (2020). Structural change, institutions and the dynamics of labor productivity in Europe. *Journal of Evolutionary Economics, 30*, 1275-1300.

Rashid, A., & Waqar, S. M. (2017). Exchange rate fluctuations, firm size, and export behavior: An empirical investigation. *Small Business Economics, 49*, 609-625.

Roberts, M. J., & Tybout, J. R. (1997). The decision to export in Colombia: An empirical model of entry with sunk costs. *The American Economic Review, 87*(4), 545-564.

Sahoo, P. K., Rath, B. N., & Le, V. (2022). Nexus between export, productivity, and competitiveness in the Indian manufacturing sector. *Journal of Asian Economics, 79*, Article 101454.

Salomon, R. M., & Shaver, J. M. (2005). Learning by exporting: New insights from examining firm innovation. *Journal of Economics & Management Strategy, 14*(2), 431-460.

Salomon, R., & Jin, B. (2010). Do leading or lagging firms learn more from exporting? *Strategic Management Journal, 31*(10), 1088-1113.

Siba, E., & Gebreeyesus, M. (2016). Learning to export and learning from exporting: The case of Ethiopian manufacturing. *Journal of African Economies, 26*(1), 1-23.

Siliverstovs, B. (2016). R&D and non-linear productivity growth. *Research Policy, 45*(3), 634-646.

Sjöholm, F. (1999). Productivity growth in Indonesia: The role of regional characteristics and direct foreign investment. *Economic Development and Cultural Change, 47*(3), 559-584.

Vendrell-Herrero, F., Darko, C. K., Gomes, E., & Lehman, D. W. (2022). Home-market economic development as a moderator of the self-selection and learning-by-exporting effects. *Journal of International Business Studies, 53*(7), 1519-1535.

Verbeke, A. (2013). *International business strategy*. Cambridge University Press.

Vernon, R. (1979). The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics, 41*(4), 255-267.

Vu, H. V., Holmes, M., Tran, T. Q., & Lim, S. (2016). Firm exporting and productivity: What if productivity is no longer a black box. *Baltic Journal of Economics, 16*(2), 95-113.

Wagner, J. (1995). Exports, firm size, and firm dynamics. *Small Business Economics, 7*, 29-39.

Wagner, J. (2007). Exports and productivity: A survey of the evidence from firm-level data. *World Economy, 30*(1), 60-82.

Wagner, J. (2012). International trade and firm performance: A survey of empirical studies since 2006. *Review of World Economics, 148*, 235-267.

Wakelin, K. (1998). Innovation and export behaviour at the firm level. *Research Policy, 26*(7/8), 829-841.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT Press.

Yang, C. H., & Chen, Y. H. (2012). R&D, productivity, and exports: Plant-level evidence from Indonesia. *Economic Modelling, 29*(2), 208-216.

Yeaple, S. R. (2005). A simple model of firm heterogeneity, international trade, and wages. *Journal of International Economics, 65*(1), 1-20.

Yi, J., Wang, C., & Kafouros, M. (2013). The effects of innovative capabilities on exporting: Do institutional forces matter? *International Business Review, 22*(2), 392-406.

Zellner, A., & Theil, H. (1962). Three-stage least squares: Simultaneous estimation of simultaneous equations. *Econometrica, 30*(1), 54-78.