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ARTICLE

### **Could Exports Induce Firms to Have Higher Productivity?: Difference in Differences and Propensity Score Matching Analyses of Firms in Six ASEAN Developing Countries**

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# Could Exports Induce Firms to Have Higher Productivity?: Difference in Differences and Propensity Score Matching Analyses of Firms in Six ASEAN Developing Countries

Utumporn JITSUTTHIPHAKORN\*

## Abstract

This study explores the benefits of exporting on firm productivity in ASEAN developing countries. Firm-level studies in the ASEAN region remain limited to single-country analyses. Using a unique panel database from the World Bank Enterprise survey and adopting the Propensity Score Matching Model (PSM) allow assessing the benefit of exporting on firm productivity while avoiding heterogeneous firm bias. The current study finds that the impact of exporting on firm productivity is not significant. Although the firms with higher productivity tend to engage themselves in exporting activities (confirming the self-selection hypothesis), the study does not confirm improvements in productivities through exporting. Evidence of a benefit in firm productivity, measured by TFP and labor productivity, is weak: productivity's exporting firm and non-exporter do not significantly differ.

**Keywords:** Firm Survey, Export, Firm Productivity, ASEAN, Propensity Score Matching Model

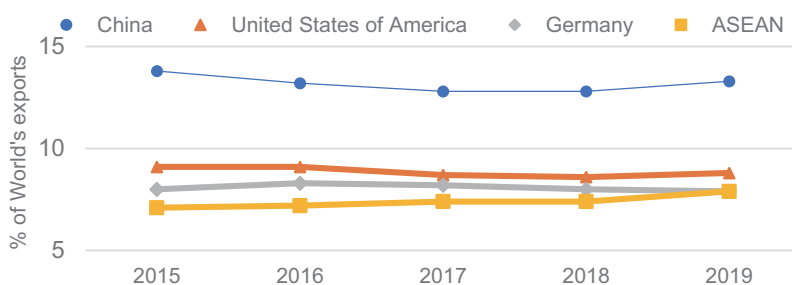
## 1. Introduction

The Association of Southeast Asian Nations (ASEAN) emerged as a critical player in the global economy with the ASEAN Economic Community (AEC) in 2015. As confirmed in Figure 1, which shows the rankings of the world's top four export countries from 2015 to 2019, ASEAN's global export share increased from 7.1% in 2015 to 7.9% in 2019. By 2019, ASEAN countries accounted for the third-largest share-the same as Germany-and they trailed only China and the United States (ITC Statistics 2020).

Promoting productivity in the ASEAN region is one of the important strategies according to the AEC blueprint toward 2025 to ensure sustainable and inclusive growth, and many governments in ASEAN developing countries are supporting exporting to accelerate productivity (The ASEAN Secretariat 2019).

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**Figure 1 Top Four Export Countries' Rankings From 2015–2019**

Source: ITC statistics, WTO

Analyses with firm-level data should help policymakers better understand firms' behavior that is associated with participating in export markets and the impact of exports on productivity. If only firms with relatively higher productivity levels tend to engage in exporting, then the policies should be tailored to improve the productivity of non-exporter. Likewise, if exporting does not lead to higher productivity, policymakers should know why and deal with those impediments.

In order to cope with these research needs, this study, by utilizing the World Bank Enterprise Survey data from six developing countries in the ASEAN region, will analyze firms' behavior that is associated with participating in export markets (testing the self-selection hypothesis) and the impact of exporting on their productivity improvements (testing the learning-by-exporting hypothesis).

The paper is organized as follows. Section 2 reviews the literature on these topics. Section 3 provides data and descriptive statistics. Section 4 presents the methodology, and section 5 provides results and discussion. The last section reviews conclusions and policy implications.

## 2. Literature Review

This study starts by attempting to understand the behavior of the firms that enter the export market. It is connected to the self-selection hypothesis (Roberts & Tybout 1997). This hypothesis considers heterogeneity in productivity, size, and other characteristics of firms. Firms with larger sizes are more likely to self-select into the export market. Likewise, firms that have more productivity are more willing to pay the additional costs of entering foreign markets. It is because there is a sunk cost when entering the export market. Therefore firms will export in the current period if its expected profit is non-negative.

Interestingly, most developed countries' studies show self-selection to enter the export market, but the impact on firm productivity after exporting is vague. Bernard and Jensen's (1999) study of U.S. plant data fails to demonstrate that productivity and wages increase after exporting. The results confirm that the more favorable firm characteristics, such as larger firm size and higher productivity,

predict a higher likelihood to engage in the export market. Evidence from a study conducted on German firms in the export market exposed to international markets showed that performance and productivity growth of exporting and non-exporter do not differ significantly, concluding that there is almost no post-ante effect of entering international markets (Bernard & Wagner 1997). Most of the effect occurs because the firms have high productivity self-select into the export market. Another related study examines firms in the U.K. manufacturing sector. Their results suggest that firms that wish to enter the export market must already have high productivity. They also find that after firms enter the exporting market, their productivity is not significantly greater than that of non-exporter. (Greenway & Kneller 2004).

This study will contribute to this literature by providing evidence of the self-selection hypothesis in ASEAN developing countries while considering other variables that determine the firm's exporting, such as sunk costs and foreign ownership.

This study further assesses the impact on firm productivity after entry to the export market and considers what firms in ASEAN developing countries learn from exporting. The term "learning" corresponds to the definition provided by Westphal (2002), who, as cited by Mendoza (2010: 5), declares that "Learning by doing refers to the capability of a firm to improve productivity, through practice, self-perfection, and minor innovations." Mendoza posits that firms learn through three main channels: (1) trading either export and import goods with foreign customers; (2) trading with advanced countries that possess more advanced technology, which leads to learning; and (3) product type-the more advanced the technology product, the greater the learning. In this study, I focus on the channel of learning through exporting.

Most results of several studies support the "learning-by-exporting" hypothesis are in developing countries. Evidence finds that most exporting firms in less developed sub-Saharan African countries self-select into the export market, and after they enter the export market, they experience productivity growth, mainly when the foreign customers are European countries. Finally, the exporting helps sub-Saharan African countries improve their productivity growth (Biesebroeck 2005).

The analysis in the ASEAN region, to date, is insufficient, being limited to only a single-country analysis. A study of Indonesian manufacturing firms from 1990–1996 found strong evidence after they entered the export market of learning and productivity. For example, in the textile sector, Japanese and German customers helped Indonesian firms improve the production process by reducing production costs and providing financial support to purchase new foreign machines that improved the cloth coloring quality (Blalock & Gertler 2004).

I will finally, therefore, contribute to the literature of learning by exporting hypothesis by providing evidence from the ASEAN region. To my knowledge, this is the first time to conduct such a study at the ASEAN region level.

### 3. Data and Descriptive Statistics

#### 3.1. Firm Data

This study focuses on six selected industries of six ASEAN developing countries: the Philippines, Indonesia, Vietnam, Laos, Cambodia, and Myanmar. These six countries are selected because the World Bank Enterprise Surveys (WBES) are available for at least two-time points, enabling me to conduct differences in differences analyses. As shown in Table 1, this study examines the panel database at two survey rounds from 2009 to 2015/16 and covers six selected industries: electronic products, nonmetallic and mineral products, rubber and plastic products, food and beverages, chemicals, and textiles and apparel. These industries comprise almost 60% of all ASEAN countries' exports. Year by country and by sector detail are shown in Appendix 1 Table A1.

In the WBES, these six selected industries comprise 52.1 percent of the total number of firms. Using the firms' export status in two survey rounds, the firms can be categorized into four groups: (1) a new entry firm starts to export in the second round of the survey; (2) an exit firm starts to export in the first round but exit in the second round of the survey; (3) a continuing exporting firm exports both two rounds of the survey; and (4) a non-exporter never exports both two rounds of the survey. Table 2 shows how sampled firms can be classified into these four groups. From Table 2, it can be observed that the textile sector is the dominant sector in the active export status (new entry, exit, and continuing exporting); meanwhile, the food and beverage sector is the dominant sector in the non-exporter groups of the resource-based countries in ASEAN.

**Table 1 Total Number of Survey Firms of Six Selected Industries**

Sector	% Total Export values (2017)	Number of survey firms	% of Total survey firms
1. Electronic products	26.0	111	3.6
2. Nonmetallic and mineral products	10.6	202	6.6
3. Rubber and plastic products	6.0	225	7.4
4. Food and Beverages	11.0	355	11.7
5. Chemicals	2.1	197	6.5
6. Textile and apparel	4.0	496	16.3
Selected industries (from 1. to 6.)	59.6	1,586	52.1
Others	40.4	1,458	47.9
Total	100.0	3,044	100

Source: Author's calculations using ASEAN Secretariat and the World Bank Enterprise Survey

**Table 2 Classification of Firms by Their Dynamic Export Status**

Sector	No. of survey firms	%	Export Status (% of total survey firms by sector)			
			New Entry	Exit	Continuing Exporting	Non-Exporter
1. Electronic products	111	3.6	8.1	9.9	4.0	42.3
2. Nonmetallic and mineral products	202	6.6	7.4	2.5	11.4	78.7
3. Rubber and plastic products	225	7.4	8.0	9.8	16.4	65.8
4. Food and Beverages	355	11.7	5.4	8.5	9.0	<u>77.2</u>
5. Chemicals	197	6.5	8.6	7.1	15.2	69.0
6. Textile, apparel	496	16.3	<u>10.3</u>	<u>11.1</u>	<u>25.4</u>	53.2
Selected industries (from 1. to 6.)	1,586	52.1	8.1	8.6	18.4	64.8
Other sectors	1,458	47.9				
Total	3,044	100				

Source: Author's calculations using ASEAN Secretariat and the World Bank Enterprise Survey

### 3.2. Descriptive Statistics

Table 3 provides the summary statistics of all variables used in this study. This firm-level panel dataset covers 1,125 firms (114 new-entry exporters and 1,011 non-exporters) from two rounds of surveys, covering all six selected industries and six ASEAN developing countries. This study uses an export status as a binominal dependent variable (= 1 if firm is a new-entry exporter; = 0 if firm is a non-exporter) for the “self-selection” hypothesis testing. Meanwhile, TFP, labor productivity, firm characteristics (age, employment, foreign ownership), trade impediments are used as explanatory variables. The rate of change of the TFP and the rate of change of labor productivity are used in the “learning by exporting” hypothesis testing as the dependent variables, while firm characteristics are used for propensity score matching.

The total correlations between independent variables are shown in Table A2 in Appendix 2. TFP has a highly positive and statistically significant correlation with labor productivity. Both TFP and labor productivity have negative and statistically significant correlations with age and foreign ownership. Meanwhile, firm size (employment) has a positive and statistically significant correlation with firm age and foreign ownership.

**Table 3 Descriptive Statistics**

Variables	Observation	Mean	Std. Dev.	Minimum	Maximum
Export status (1 = New entry, 0 = Non exporter)	1,125	0.10	0.30	0.00	1.00
TFP (log)	645	2.43	0.20	1.39	3.10
Labor productivity (log)	878	15.92	2.68	8.10	26.75
Age (log)	1,106	2.95	0.56	0.00	4.54
Employment (log)	1,110	3.52	1.39	0.00	8.37
Foreign ownership (%)	1,122	0.06	0.23	0.00	1.00
Trade obstacle	1,125	0.48	0.50	0.00	1.00
Rate of change of the TFP (log)	193	0.06	0.17	- 0.49	0.84
Rate of change of the Labor Productivity (log)	359	0.74	2.01	- 8.17	11.32

Source: Author’s calculations using World Bank Enterprise Survey

## 4. Methodology

### 4.1. Testing for the Self-Selection Hypothesis

To test whether firms in the six ASEAN countries self-select to participate in the export market, two groups are compared: new entry firms that decided to join the export market during the second round of the survey periods; and non-exporter that did not export in either of the survey rounds.

This study adopts the framework conducted by Roberts and Tybout (1997), who posit that firms will export in the current period at time  $t$  if its expected profit is non-negative. The study of Roberts and Tybout has been adopted and modified in the model by Pham, Hoang, Pham, and Ngo (2014), as shown in equation 1.

$$Y_i = \begin{cases} 1 & \text{if } p_{it}q_{it}^* \geq c_{it} \left( Z_{it}, \frac{q_{it-1}^*}{q_{it}^*} \right) + S(1 - Y_{it-1}) \\ 0 & \text{otherwise} \end{cases} \quad (\text{Eq. 1})$$

where  $Y_{it}$  is the current export status of firm  $i$  at time  $t$

$p_{it}$  denotes the price of goods sold abroad of firm  $i$  at time  $t$

$c_{it}$  denotes the cost of producing the optimal export quantity  $q_{it-1}^*$

$S$  denotes the sunk costs

$Z_{it}$  denotes firm-specific factors that affect the firms’ profit of firm  $i$  at time  $t$

$Y_{it-1}$  denotes the export status of firm  $i$  at time  $t-1$

This study assumes that new entry firms have not exported previously and start to export during the second round of the survey periods. From equation 1 modifies and simplifies that developed by Espanol (2007) as shown in equation 2.

$$Y_{it} = \beta_0 + \beta_1 \text{Sunk cost}_{it-1} + \beta_2 \text{Productivity}_{it-1} + \beta_3 \text{Characteristics}_{it-1} + v_{it} \quad (\text{Eq. 2})$$

where  $Y_{it}$  denotes the decision to participate in the export market of firm  $i$  at time  $t$ , it is a dummy variable that indicates export status; 1 = new entry firm or 0 = non-exporter.

$Sunk\ cost_{it-1}$  denotes the cost of start exporting. This study uses the obstacle of custom and trade regulations from WBES to represent the cost from the start exporting, the dummy variable of the obstacle of custom and trade regulations; 1 = there is an obstacle or 0 = no obstacle.

$Productivity_{it-1}$  denotes labor productivity calculated from total value-added (sales-the cost of intermediate inputs) divided by the total employment, total factor productivity (TFP) calculated from the WBES database by using the OLS method from the study by Saliola and Seker (2012).

$$va_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + v_{it} \quad (\text{Eq. 3})$$

$$tfp_{it} = va_{it} - \hat{\beta}_k k_{it} + \hat{\beta}_l l_{it} \quad (\text{Eq. 4})$$

$va_{it}$  denotes the (log) value-added (sales-the cost of intermediate inputs) of firm  $i$  at time  $t$

$\hat{\beta}_k, \hat{\beta}_l$  the parameter for capital and labor, respectively that estimated from equation 3

$k_{it}, l_{it}$  denoted the (log) capital and the (log) labor, respectively.

The hypothesis, TFP, and labor productivity posit that these variables impact the firm's probability of entering the export market because productive firms are willing to pay extra costs of entering foreign markets.

$Characteristics_{it-1}$  are size, age, and foreign ownership. Larger firms, which can exploit economies of scale, are especially inclined to enter the export market. The firm's with higher experience are likely to enter the export market, while foreign ownership is likely to predict access marketing networks and gain know-how from parent companies.

$v_{it}$  denotes year survey, sector, and country of the firm to control each dimension's effects and errors.

#### 4.2. Testing for Learning by Exporting Hypothesis

This section will continue to explore the impact of exports on firm productivity expected to increase productivity after entering the export market. By comparing productivity between two groups of firms (new entry firm and non-exporter) in a statistically meaningful way, the study tries to identify the impact of exporting on firm productivity.

This study employs the propensity score matching approach. According to Dawid (1979), as cited by Rosenbaum and Rubin (1983), the propensity score matching approach is a non-randomization of the samples approach that minimizes the multi-dimension of the covariant into a one-dimensional covariance between the treatment group (new entry firm) and the control group (non-exporter). Called the propensity score, it balances scores. This study uses the propensity score matching approach, developed by Haidar (2012) and Rosendaum and Rubin (1983) that can be written as the equation below:

$$ATT = E(\Delta P / \rho(X), Y_{it} = 1) = [E(P_1 | \rho(X), Y_{it} = 1) - E(P_0 | \rho(X), Y_{it} = 0)] \quad (\text{Eq. 5})$$

ATT is the Average treatment effect on change in firm productivity of new entry firms.



$\Delta P$  is the rate of change in firm productivity that is the rate of change of the (log) TFP and the rate of change of the (log) labor productivity of the new entry firms (robustness test with the other group study which is exit firm) between the first round and the second round survey.

$P_i$  is the productivity outcome of a firm that is the (log) TFP and the (log) labor productivity if it has undergone intervention by changing its export participation, export status.

$P_0$  is the productivity outcome of a firm that is the (log) TFP and the (log) labor productivity if it has reported that it has not undergone intervention through changing its export status.

$Y_{it}$  is a new entry firm that first entered the export market (1) or if it has never been exported (0) and for robustness test with the other group study,  $Y_{it}$  is an exit firm that first entered the export market and exit in the second round of the survey (1) or if it is continuing exporting both two rounds of surveys (0).  $\rho(X)$  is propensity score matching of ( $X$ ), which is the characteristic of firms.

The estimation of ATT by the difference in differences approach (DID) with propensity score matching (PSM) between new entry firms and non-exporter or the exit firms and continuing exporting firms is described in equation 5. There are several matching approaches; the nearest-neighbor matching approach is the most commonly used, while the radius matching approach is suited for small sample sizes of the treatment group (new entry firm) that are smaller than the control group (non-exporter) (Pham, Hoang, Pham & Ngo 2014). Therefore this study uses both the nearest-neighbor matching approach and the radius matching approach for robustness checks, and the results from radius matching are similar to the nearest-neighbor matching approach. Therefore, the results of this study will show only by using the nearest-neighbor matching approach. Matching was done using package *psmatch2*, developed by Leuven and Sianesi (2003), and the *Teffect psmatch* command in Stata.

## 5. Results and Discussion

### 5.1. Determinants of Export Decision of Firms

Table 4, by using the OLS fixed effect to estimate equation 2, confirms the self-selection hypothesis of the firm heterogeneity. A firm that has higher productivity, either TFP in the model (1) or labor productivity in the model (2), is more likely to participate in the export market. As Melitz (2003) observes, trade participation helps firms with high productivity reallocate the resources to participate in the export market. Low productivity firms will withdraw from exporting.

The higher number of employees has a significant positive effect on the new entry firm in developing ASEAN countries in line with the expectation that the larger firm has more advantages in access to finance and economy of scale. Larger firms are more likely to enter the export market. Similarly, the result confirms that foreign ownership is a crucial driver that encourages firms to engage in the export market.

Meanwhile, (firm) age represents which firm experience does not show a statistically significant

**Table 4 Testing the Self-Selection Hypothesis: New Entry Firm and Non-Exporter**

VARIABLES	Binary variable 1 = New entry firm 0 = Non-exporter	
	(1)	(2)
Trade obstacle	- 0.012	- 0.006
	(0.024)	(0.020)
TFP (log)	0.238 **	
	(0.095)	
Labor productivity (log)		0.016 **
		(0.006)
Age (log)	- 0.007	- 0.007
	(0.023)	(0.020)
Employment (log)	0.060 ***	0.054 ***
	(0.010)	(0.008)
Foreign ownership (%)	0.148 ***	0.234 ***
	(0.054)	(0.046)
Electronic products	0.067	0.041
	(0.069)	(0.056)
Nonmetallic and mineral products	0.027	0.044
	(0.047)	(0.039)
Rubber and plastic products	0.017	0.004
	(0.047)	(0.039)
Food and Beverages	- 0.000	0.014
	(0.044)	(0.036)
Textile, apparel	0.111 **	0.090 **
	(0.043)	(0.035)
Country Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Constant	- 0.563 **	- 0.259 **
	(0.226)	(0.107)
Observations	638	868
R-squared	0.138	0.138

Note: Standard errors in parentheses \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

The chemical sector was used as the base industry

Source: Author's calculations using World Bank Enterprise Survey

effect on whether new entry firms decide to participate in a foreign market. By controlling the sector, the results suggest that the textile sector is the dominant sector for the new entry group that is consistent with Table 2's data and descriptive statistics, showing that the textile sector is the dominant sector.

The dependent variables are applied to the other group to check the results' robustness, consisting of exit firms and continuing exporting firms, using the OLS fixed effect to estimate equation 2, which already takes the sunk cost (Trade obstacle) into the model. The result is shown in Table 5. Most explanatory variables, representing the firm characteristics, have a negative sign consistent with the previous group's results between the new entry and non-exporter. The TFP in model (1) shows a negative sign, but it is not statically significant. However, the exit firm's labor productivity in model (2) shows a negative sign that is statically significant-the other control characteristics of exit firms are consistent with the previous group between new entry and non-exporter. Exit firm size is smaller than the continuing exporting firm. The percentage share of foreign ownership is negative and statistically significant.

For the sector variables, plastic and rubber, electronics, and food and beverages are the exit firms' dominant sectors.

**Table 5 Testing the Self-Selection Hypothesis: Exit Firm and Continuing Exporting Firm**

VARIABLES	Binary variable 1 = Exit firm 0 = Continuing exporting firm	
	(1)	(2)
Trade obstacle	- 0.093 (0.067)	- 0.053 (0.057)
TFP (log)	- 0.240 (0.202)	
Labor Productivity (log)	- 0.032**	(0.014)
Age (log)	- 0.128 (0.081)	- 0.099 (0.068)
Employment (log)	- 0.051** (0.025)	- 0.049** (0.021)
Foreign ownership (%)	- 0.318*** (0.085)	- 0.279*** (0.075)
Electronic products	0.394*** (0.149)	0.342*** (0.127)
Nonmetallic and mineral products	0.154 (0.162)	0.002 (0.146)
Rubber and plastic products	0.303** (0.130)	0.352*** (0.112)
Food and Beverages	0.280** (0.139)	0.173 (0.116)
Textile, apparel	0.159 (0.114)	0.094 (0.099)
Country Fixed Effects	Yes	Yes

Year Fixed Effects	Yes	Yes
Constant	1.349**	1.138***
	(0.564)	(0.318)
Observations	191	256
R-squared	0.249	0.247

Note: Standard errors in parentheses \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

The chemical sector was used as the base industry

Source: Author’s calculations using World Bank Enterprise Survey

## 5.2. Learning by Exporting

In this section, this study tries to identify the possible positive impact of exporting on firm productivity (TFP and labor productivity). In order for us to single out this impact by comparing productivity differences between new-entry and non-exporter on the one hand and between the exit and continuing exporting firms, on the other hand, the study should control for the firm heterogenous by a balancing score method of selected variables with a different mean value between the treatment group (new entry firm/exit firm) and the control group (non-exporter/continuing exporting firm) before matching. After the balancing score, a series of t-tests confirmed the null hypothesis, which implies that the mean value of the treatment group and the control group are similar, as shown in Figure 2, and Figure 3, showing t-test results.

**Figure 2 Balancing Score Test Results for New Entry Firm and Non-Exporter**

Variable	Unmatched (U)	Mean		% reduct		t-test	
	Matched (M)	Treated	Control	%bias	bias	t	p >  t
Age (log)	U	2.877	2.866	1.7	28.9	0.08	0.933
	M	2.989	2.997	- 1.2		- 0.05	0.962
Employment (log)	U	4.788	3.385	107.6	96.3	4.91	0.000
	M	4.655	4.604	3.9		0.13	0.898
Foreign ownership (%)	U	0.163	0.051	39.5	89.1	2.18	0.030
	M	0.083	0.095	- 4.3		- 0.16	0.873

Source: Author’s calculations using World Bank Enterprise Survey

**Figure 3 Balancing Score Test Results for Exit Firm and Continuing Exporting Firm**

Variable	Unmatched (U)	Mean		% reduct		t-test	
	Matched (M)	Treated	Control	%bias	bias	t	p >  t
Employment (log)	U	4.757	5.648	- 61.0	98.7	- 2.27	0.027
	M	4.757	4.768	- 0.8		- 0.03	0.979
Foreign ownership (%)	U	0.016	0.467	- 140.1	96.3	- 4.42	0.000
	M	0.016	0.033	- 5.2		- 0.76	0.449

Source: Author’s calculations using World Bank Enterprise Survey

**Table 6 Average Treatment Effect on Rate of Change in Firm Productivity Change between New Entry Firm and Non-Exporter from the First Round Survey and the Second Round Survey**

	(1)	(2)
Rate of Change in firm productivity	Rate of change of the (log) TFP	Rate of change of the (log) Labor Productivity
$Y_{it}$	0.048	0.287
( = 1 if New entry firm, = 0 if Non-exporter)	(0.066)	(0.513)
Observations	189	355

Note: Standard errors in parentheses

Source: Author's calculations using World Bank Enterprise Survey

**Table 7 Average Treatment Effect on Rate of Change in Firm Productivity between Exit Firm and Continuing-Exporting Firm from the First Round Survey and the Second Round Survey**

	(1)	(2)
Rate of Change in firm productivity	Rate of change of the (log) TFP	Rate of change of the (log) Labor Productivity
$Y_{it}$	- 0.014	- 0.178
( = 1 if Exit firm, = 0 if Continuing Exporting firm)	(0.062)	(0.626)
Observations	61	106

Note: Standard errors in parentheses

Source: Author's calculations using World Bank Enterprise Survey

Using the nearest neighbor matching approach to estimate the export effect on firm productivity between new entry firm and non-exporter by estimation from equation 5, the results are shown in Table 6. New entry firm shows a weak improvement to all TFP and labor productivity than non-exporter as it shows a positive sign, but it does not reach being statically significant in the rate of change of the (log) TFP and the rate of change of the (log) labor productivity. Analysis confirms that in the other group, by testing with the exit firm with a continuing exporting firm. The result in Table 7 shows that the exit firm has a negative sign with the rate of change of the (log) TFP and rate of change of the (log) labor productivity but is not significant.

Overall, the results only weakly support the learning-by-exporting hypothesis. Firms that export do not significantly improve firm productivity measured by TFP and labor productivity.

## 6. Conclusions and Policy Implications

This study analyzes and compares the impact of exporting on firm productivity in two groups: new

entry firms and non-exporter. The self-selection hypothesis testing shows that firms self-select to participate in the export market in the six ASEAN countries examined. Firms with high productivity and potential tend to participate in the export market. Therefore, they were comparing how exports impact firm productivity in new entry firms, and non-exporter cannot be tested directly. The results could be misleading. Thus, this study applies the propensity score matching approach to tackle this problem.

The results of testing via the learning-by-exporting hypothesis show that firm productivity, measured by TFP, and labor productivity show a positive sign, but it is not statistically significant. Therefore, the results present weak evidence that firms in the six selected developing countries of ASEAN have higher firm productivity.

Checking for robustness, this study compares the impact of exporting on the productivity of two types of firms: firms that exit the export market and firms that remain in it. The results are consistent with those of previous comparisons of new entry and non-exporter. Among firms that self-select to participate in the export market, the difference in TFP and the labor productivity of exiting firms and firms that remain in the market show negative signs, but it is statistically insignificant. The results fail to provide strong evidence that exporting helps firms' increase productivity.

Concerning policy, to improve firm productivity, a government should not focus on subsidizing current exporting firms at the expense of less productive domestic firms. A government can help current exporters learn from exporting. Some would also argue that an export destination to advanced countries and an export product that incorporates innovation and R & D can help firms learn from exporting.

In non-exporter, a government that wants to facilitate firm entry into the export market can lower the export entry cost for non-exporter through marketing networking and adjusting transportation costs, customs, and regulations.

This raises questions appropriate for future research: Why does exporting in six ASEAN developing countries not induce firms to have higher productivity? And under what conditions can a firm learn more from exporting for ASEAN developing countries? For instance, by exporting innovative products developed through R & D, firms could potentially learn from the exporting experience.

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**Appendix 1**  
**Table A1 Sample Description**

Year	2009	2010	2013	2014	2015	2016	2017	Total
Sector								
Chemicals	86	3	1	5	79	6	2	182
Electronic products	43	0	1	1	43	2	0	90
Food and Beverages	107	5	17	39	104	54	5	331
Nonmetallic and mineral products	83	5	0	9	74	5	0	176
Rubber and plastic products	91	2	1	5	97	4	1	201
Textile, apparel	197	6	6	35	171	40	13	468
Total	607	21	26	94	568	111	21	1,448
Country								
Indonesia	297	16	0	0	313	0	0	626
Cambodia	0	0	26	0	0	26	0	52
Laos	17	0	0	0	0	17	0	34
Myanmar	0	0	0	70	0	49	21	140
Philippines	227	0	0	0	227	0	0	454
Vietnam	66	5	0	24	28	19	0	142
Total	607	21	26	94	568	111	21	1,448

Source: The World Bank Enterprise Survey

**Appendix 2**  
**Table A2 Correlation Matrix**

	TFP (log)	Labor productivity (log)	Age (log)	Employment (log)	Foreign ownership (%)	Trade Obstacle
TFP (log)	1					
Labor productivity (log)	0.956*	1				
Age (log)	-0.112*	-0.114*	1			
Employment (log)	-0.107*	0.013	0.153*	1		
Foreign ownership (%)	-0.161*	-0.115*	-0.057	0.242*	1	
Trade Obstacle	-0.029	-0.009	0.020	0.077*	0.046	1

Note: \*p &lt; 0.05

Source: Author's calculations using World Bank Enterprise Survey