Foreign Import Tariffs and a Firm's Export Product Scope:
Empirical Evidence from Indonesia

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ABSTRACT

A change in the foreign import tariff will change the net price received by the exporting firms, and hence may affect their decision to export, either in terms of quantity and/or product scope. This study analyzes the effect of foreign import tariffs on exporting firms' decisions to change their product scope. Using product-firm-level data from Indonesian manufacturing firms from 2007 to 2012, we find that a reduction of the foreign import tariff increases the chance of existing exporting firms increasing their product scope. We find that firms with a lower average labor wage tend to have a higher probability of increasing their export product scope. We also find that firms with larger employment levels tend to add new export products and at the same time drop the previously exported product.

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INTRODUCTION

Multi-product exporting firms play a significant role in the international trade in both developed and developing countries. For instance, multi-product exporting firms accounted for 98% of the US manufacturing export value in 2000 (Bernard et al., 2007). In Thailand, 52% of the total export value during 2001 – 2004 came from multi-product exporting firms (Elliott and Virakul, 2010). By exporting multiple products, a firm may reduce the risk arising from unfavorable conditions for a specific product. For example, multi-product exporting firms can adjust the changes in trading conditions by changing their export product scope, i.e., the total number of products sold in the foreign market (Bernard et al., 2011; Qiu and Yu, 2014).

One example of a change in trading conditions is the change in the import tariff in the destination country. The tariff might drive a wedge between the consumer price and producer price (i.e., the exporting firm), a change in the foreign import tariff may have an impact on a firm's export product scope. A reduction in the foreign import tariff will increase the price received by exporting firms and encourage firms to export previously unprofitable products, so the product scope might be expanded (Bernard et al., 2011). However, if the foreign import tariff reduction leads to increased competition in the destination market, exporting firms may focus on their superior export products, and thus, reduce their existing export product scope (Qiu and Yu, 2014).

Existing empirical studies on the effect of foreign import tariffs on firms' export product scope have mixed findings. For instance Iacovone and Javorcik (2010) found that a reduction of the US tariff on imports from Mexico increased the number of firms' exported products. However, Ito (2015) concluded that NAFTA membership does not increase the variety of Mexico's exports. In France, Bas and Bombarda (2013) found that lower Chinese import tariffs accounted for a 7% increase in the new products exported by a French firm. Berthou and Fontagné (2016) also found that tariffs impacted both the French firm-level average exports per product and the number of products exported to extra-European Union destinations.

Due to the differences in trading costs, a multi-product firm may export a different product scope to a different destination. Other things being constant, import tariff changes in foreign markets may affect trade costs, and subsequently, the firms' decision concerning the number of exported products. However, changing the number of products may involve a substantial cost. Switching destinations due to a change in foreign import tariff may be more profitable for a multi-product firm, rather than changing the total number of products being produced. Thus, given import tariffs vary across countries, the response of multi-product firms in deciding the number of exported product scope is better captured by analyzing the effect of import tariff changes in all foreign markets.

In this study, we analyze the effect of foreign tariffs across multiple foreign markets on the probability of Indonesian manufacturing firms to change their export product scope. Our study differs from the existing literature, which focuses mostly on one foreign market (e.g., Iacovone and Javorcik, 2010; Bernard et al., 2011; Bas and Bombarda 2013; Ito, 2015; Berthou and Fontagné, 2016). Using samples of the exporting firms available in the Indonesian Annual Survey of Medium and Large Manufacturing Firms, we find that import tariff reduction in the destination market increases the chance of exporting firms to increase their exported product scope. We also find a negative correlation between the average wage and the firms' probability of increasing the exported product scope.

The remaining sections of this paper are organized in the following way. In the next section, we will briefly discuss the analytical framework of how foreign import tariffs affect a firms' decision about their exported product scope. In section three, we will discuss the empirical strategy, followed by an analysis of the results in section four and the conclusion in section five.

ANALYTICAL FRAMEWORK

In this section, we present a simple analytical framework to illustrate how tariff in the destination market affects a firm's behavior in determining the number of the export product scope. We assume a firm produces two products, namely A and B (Figure 1). The firm is a price taker in the international market, such that its decision (i.e., whether to add or reduce the quantity of product in a given market) does not have any effect on the equilibrium price of the same product in the destination country. The decision whether or not to export a given product depends on – among others - the net price received by the firm (P_p) which is equal to the consumer price

(P_c) subtracted by all trade costs (t). Trade costs is defined as all costs incurred in getting a commodity to the final consumers other than the marginal cost of the goods, such as transportation costs, tariff and non-tariff barriers (Anderson and Wincoop, 2004).
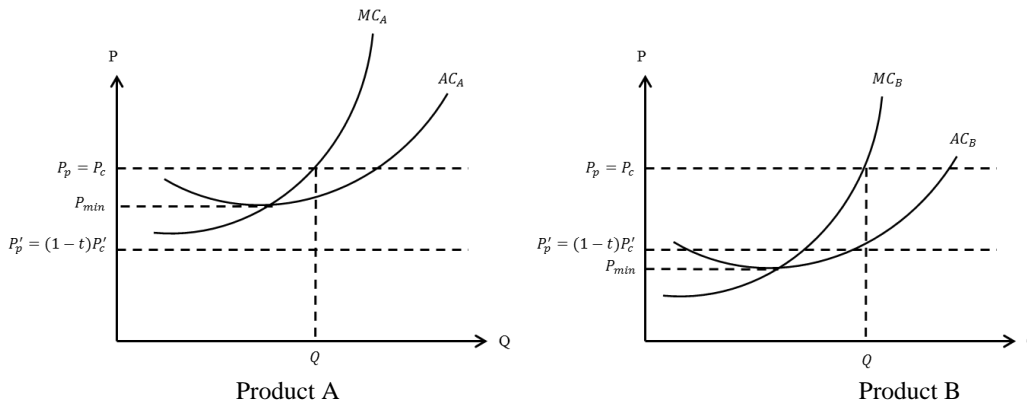

Figure 1 A firm produces two products, namely A and B

Suppose that the cost function of product A and B are identical, but A is exported to a more distant country (i.e., Country 1) than B (i.e., Country 2). A higher transportation cost for product A causes an upward shift of the average cost function and the marginal cost function of product A to the destination country. If the exporting firm's net price is greater than the reservation price (P_{min}), a firm will be willing to export its product to a given market.

An increase in the import tariff in the destination country will reduce the net price received by the exporting firm. If both products are applied with the same tariff, the effect on a firm's decision to export might be different. In the left graph, a tariff of t will cause the firm to exit from the market as the net price is lower than the reservation price. However, the firm will continue exporting B to Country 2 as the net price received by the firm is still higher than the reservation price (the right graph).

To identify whether or not the firm continues exporting product A, depends on whether or not there is a market in which the net price is at least equal to the firm's reservation price. Suppose there is Country 3, which consumes product A, but due to a high import tariff, the firm cannot export product A to Country 3 as the net price received by the firm is lower than the reservation price. Using the same approach as described in Figure 1, we can analyze the impact of a tariff reduction in Country 3 on the firm's decision to export product A. The firm may switch product A to Country 3 if the net price is the same or greater than the firm's reservation price.

The above argument implies that if there is more than one country that consumes a firm's particular product, the effect of a foreign import tariff on the firm's decision concerning the number of exported product scope is better captured by taking into account the tariff changes across all markets. As dropping a particular product from a firm's production usually incurs a significant cost, switching to a different foreign market may be more profitable for a firm than exiting from the foreign market entirely. Thus, focusing on just one particular market may eliminate the possibility of a firm to switch its market caused by import tariff changes.

Foreign import tariff changes may also encourage firms to focus on the best performing product (Xu, Mau and Tong, 2016; Chatterjee, Rafael, and Vichyanond, 2013). If inputs within a firm are mobile across products, moving the capital and labor from product A to product B will shift the average cost function. This means that a firm can produce more B more efficiently (i.e., lower average cost) by dropping product A and moving those existing resources to producing product B. Thus, there are four possible firms' responses to a change in the foreign import tariff, namely: (1) does not change the number of export product scope, (2) add to the export product scope, (3) reduce the export product scope, and (4) add to the export product and at the same time drop the previously exported product.

EMPIRICAL STRATEGY

Because there are four possible firm's responses, we employ multinomial logit regressions to investigate the effect of foreign tariff changes on a firm i's exported product scope in year t as described in the following specification:

$$
\begin{aligned}
Prob\left(Y_{i,t} = 1,\ldots,4\right) \\
= \beta_0 + \beta_1 ForeignTariff_{i,t-1} + \beta_2 \ln\left(Wage_{i,t}\right) + \beta_3\ln\left(Labor_{i,t}\right) + \beta_4 \ln\left(Age_{i,t}\right) \quad (1) \\
+ \beta_5 Ownership_{i,t} + \beta_6 Import_{i,t} + \beta_7 \ln(GDP_t) + \beta_8 \ln(REER_t) + \varepsilon_{i,t}
\end{aligned}
$$

There are four possible values of the dependent variable (Y_{ijt}), namely; (i) equals to 1 if a firm neither adds nor drops its export products (*no changes*); (ii) equals to 2 if a firm adds a new export product without dropping the previously exported product (*add-only*); (iii) equals to 3 if a firm drops the previously exported product (*drop-only*); and (iv) equals to 4 if a firm changes the composition of the export products by adding a new export product and at the same time dropping the previously exported product (*add and drop*).

The data for the dependent variable comes from the Indonesian Annual Survey of Medium and Large Manufacturing Firms (hereinafter, IBS) from 2007 to 2012. To classify an export product, we use a 7-digit code classification. A firm is classified to have a new export product if the same 7-digit code was not previously exported. Similarly, a firm is classified to drop an export product if it stops exporting the same 7-digit code.

Our variable of interest is $ForeignTariff_{i,t-1}$, which reflects the foreign tariff faced by a firm i in year t. The ideal calculation of a foreign tariff faced by a firm requires the information on the export destination data at the firm-product level, which unfortunately does not exist in the IBS dataset. As a solution, we measured the tariff at the industry sector level (i.e., 4-digit Standard Industrial Classification). Then, we used Turco and Maggioni's approach (2016) as follows:

$$
ForeignTariff_{j,t-1} = \sum \left(\frac{x_{jmt-1}}{\sum x_{jt-1}}\right) \times \tau_{jmt-1} \quad (2)
$$

where x_{jmt} is the value of industry j's export to country m; x_{jt} is the total value of industry j's, and τ_{jmt} is industry j's import tariff imposed by country m[1]. The ratio $\frac{x_{jmt-1}}{\sum x_{jt-1}}$ represents the share of the industry j's product exported to country m; it captures the relative importance of τ_{jmt} in affecting the industry j's product export. We use the World Integrated Trade Solution (WITS) dataset from the World Bank to construct our variable of interest. To link the tariff data, which is based on the Harmonized System (HS) and the firm industrial sector classification, we use the ISIC-4 digit and HS 6-digit correspondence from the World Bank WITS.

We also use alternative measures of foreign import tariff based on Takii (2014). We use 20 major trading partner countries based on the total value of Indonesian manufacturing exports during 2007-2012. The foreign import tariff is calculated as a simple average of the tariffs imposed on Indonesian exports to 20 major trading partners for each 4-digit ISIC level.

To obtain the net effect of foreign tariff changes on a firm's exported product, we use several control variables at firm level. First, the average wage received by the labor at the firm i $\left(Wage_{i,t}\right)$. A higher average wage will shift the short run firm's average cost upward and raise a firm's reservation price. Thus, given the same foreign tariff reduction, firms with a lower average wage have a higher probability to expand their product scope. The second control variable is the total number of the firm's employment $\left(Labor_{i,t}\right)$, as the proxy for firm size. Third, we use the firm's age to capture the differences in a firms' ability to change export product scope due to different lengths of experience. A multinational company may have a greater chance to expand its export product scope, compared to a domestic company. To allow such possibility, we use an ownership dummy as the fourth control variable. The dummy variable takes a value of one if the share of foreign ownership is greater than 50% and zero otherwise. As the tariff changes are most likely to follow the global trend, and tariff reduction in the foreign market may be correlated with tariff reduction for the domestic market. For firms that use imported intermediate inputs, tariff reduction will reduce the average production cost and thus increase the probability to

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[1] As all firms in the same sector face the same tariff, the subscript for industry sector (j) can be replaced with subscript for firm (i).

expand the export product scope. Thus, we use an import dummy variable which equals to one if a firm has a positive imported intermediate input, and zero otherwise. All of these control variables come from IBS dataset.

To control for macro variables affecting a firms' export decision, we use a weighted average GDP per capita of Indonesian export destination countries $(GDP_t)^2$ and the real effective exchange rate $(REER_t)$. The data for the GDP per capita comes from the World Development Indicators (https://data.worldbank.org), while the real effective exchange rate comes from the Bank of International Settlements.

ANALYSIS

Indonesian Manufacturing Exporting Firms Profile

The share of exporting firms compared to the total number of firms in the IBS dataset varies from 8.72% in 2007 to 16.38% in 2012, with a simple average of 13.67% (Table 1). To identify whether or not there is a change in the export product scope, we need to have firms which export for at least two consecutive years. As shown in Table 2, the total number of firms which export in at least two consecutive years is 3,836, but only 15.93% (611 firms) export consistently in all the years of observation. In the second year of consecutive export, we compare the current and the previous years exported products using the 7-digit product classification code to classify the firms' decisions. We can see from Table 3 that the majority of exporting firms do not change their product composition (category *no changes*). The second largest group is firms who both add new products and remove the previously exported product (category *add and drop*). The other two categories (*add-only* and *drop-only*) alternatively contribute as the third largest sample contributor during 2007-2012. The descriptive statistics for each category by year, is presented in Table 4.

Table 1 Number of exporting and non-exporting firm

Firm	2007	2008	2009	2010	2011	2012
Export	2,163	2,884	3,266	2,932	3,241	3,452
Do not Export	22,656	21,328	18,941	17,063	17,478	17,625
Total	24,819	24,212	22,207	19,995	20,719	21,077

(Source: BPS – author's calculation)

Table 2 Distribution of firms that export in two consecutive years

Pattern*	Number of firms	Percentage
1 1 1 1 1	611	15.93
. . . . 1	488	12.72
. . 1 1 1	448	11.68
1	366	9.54
. 1 1 1 1	331	8.63
. . . 1 1	272	7.09
1 1 . . .	223	5.81
. . 1 . .	166	4.33
. 1 . . .	140	3.65
Others	791	20.62
Total	3836	100.00

(Source: BPS – author's calculation)

Note: * "1" indicates firm exports in two consecutive years, while ".". reflects missing observation

Table 3 Number of firms based on changes in the current export products compared to the previous year

Category	2008	2009	2010	2011	2012
(1) *No changes*	1,174	920	1,183	1,173	1,213
(2) *Add-only*	73	115	76	106	124
(3) *Drop-only*	111	98	111	86	84
(4) *Add and drop*	181	556	487	482	566
Total	1,539	1,689	1,857	1,847	1,987

(Source: BPS – author's calculation)

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[2] We use the ratio of Indonesian export to country *i* to total Indonesian export as the weight.

Table 4 Descriptive Statistics of Firms

Year	Category*	Average Number of labor (person)	Average Age (years)	Average Wage (Million Rp/person)	Percentage of foreign firm (percent)	Percentage of importing firm (percent)
2008	1	332.22	14.56	104.57	23	29
	2	253.84	13.41	104.33	29	26
	3	376.51	16.38	70.50	14	18
	4	301.72	14.37	91.54	19	23
2009	1	411.03	16.44	93.48	23	30
	2	535.99	14.79	87.00	27	40
	3	366.55	14.76	71.03	17	14
	4	439.66	16.03	104.00	28	40
2010	1	513.30	17.92	118.01	29	39
	2	308.92	16.47	94.04	25	25
	3	384.32	16.72	96.46	20	27
	4	494.70	16.96	105.94	27	39
2011	1	523.97	19.20	166.75	29	40
	2	375	17.67	117.23	21	32
	3	604.97	17.53	117.68	29	42
	4	606.73	18.50	158.79	29	43
2012	1	565.77	19.83	160.51	29	42
	2	409.87	17.39	145.37	32	34
	3	552.51	19.76	148.61	26	38
	4	564.80	20.17	152.57	28	40

(Source: BPS – author's calculation)
Note: *Category:
1: Firms that do not make composition changes in the exported product (*no changes*);
2: Firms that only add export products (*add only*);
3: Firms that reduce the export product (*drop only*);
4: Firms that change the composition of the export product by adding and dropping its export product (*add and drop*).

Foreign Import Tariff Profile

The import tariff for major export destinations in the Indonesian manufacturing sector is presented in Table 4, which shows a different pattern. In the US, there is an upward trend of tariffs during 2007-2102. However, the import tariff in Japan and China exhibits a downward trend during the same period. The average import tariff in Japan fell from 2.70 percent in 2007 to 1.86 percent in 2012, as well as China's declining average import tariffs from 6.84 percent in 2007 to 1.81 percent in 2011. The average import tariff of Singapore was zero percent in all years except in 2011. The average rate in 2011 was due to the importation of beer products from Indonesia, which was subject to a high import tariff in Singapore.

Table 5 Import Tariff Imposed on Indonesian Manufacturing Export in Indonesian Major Export Destinations

No	Country	2007	2008	2009	2010	2011	2012
1	United States	1.92	1.61	1.60	1.78	3.29	3.05
2	Japan	2.70	1.75	1.83	2.06	1.75	1.86
3	China	6.84	6.72	3.03	1.59	1.81	-
4	Hongkong, China	0.00	0.00	0.00	0.00	0.00	0.00
5	Taiwan, China	5.85	6.74	7.31	6.34	0.00	-
6	Singapore	0.00	0.00	0.00	0.00	3.71	0.00

(Source: WITS – author's calculation)

RESULTS

The regression results are presented in Table 6. We use category *no changes* as the base group. A positive parameter implies that an increase in the explanatory variable increases the chance of a firm to fall into a certain category (and hence reduces the probability to fall in the base category), while a negative parameter indicates the opposite. From Table 6, we can see that an increase in the tariff and the average labor wage are significant in all categories.

Table 6 Estimation Results using Multinomial Logit

Variables		Specification		
		1	2	3
Add-only	**Lag of foreign import tariff**	**-0.046**	**-0.029**	**-0.036**
		(3.49)***	**(2.06)****	**(2.31)****
	Foreign's GDP per capita		0.678	0.718
			(1.45)	(1.53)
	REER		-0.607	-0.680
			(0.67)	(0.75)
	Age		-0.066	-0.052
			(0.81)	(0.63)
	Labor		-0.036	-0.046
			(0.91)	(1.18)
	Ownership Dummy		0.162	0.154
			(1.35)	(1.28)
	Import Dummy		-0.063	-0.084
			(0.52)	(0.70)
	Wage		-0.114	-0.125
			(2.61)***	(2.90)***
	Constant	-2.270	-5.707	-5.625
		(35.54)***	(0.95)	(0.93)
Drop-only	**Lag of foreign import tariff**	**-0.031**	**-0.016**	**-0.027**
		(2.45)**	**(1.14)**	**(1.87)***
	Foreign's GDP per capita		-0.814	-0.800
			(1.62)	(1.59)
	REER		-1.249	-1.272
			(1.41)	(1.44)
	Age		0.055	0.069
			(0.68)	(0.85)
	Labor		-0.009	-0.011
			(0.22)	(0.29)
	Ownership Dummy		-0.078	-0.086
			(0.60)	(0.67)
	Import Dummy		-0.255	-0.271
			(2.05)**	(2.17)**
	Wage		-0.147	-0.155
			(3.51)***	(3.72)***
	Constant	-2.352	12.271	12.348
		(36.35)***	(1.98)**	(1.98)**
Add and Drop	**Lag of foreign import tariff**	**-0.011**	**-0.016**	**-0.021**
		(1.77)*	**(2.32)****	**(2.91)*****
	Foreign's GDP per capita		-0.339	-0.317
			(1.36)	(1.27)
	REER		1.210	1.170
			(2.52)**	(2.44)**
	Age		0.055	0.066
			(1.29)	(1.51)
	Labor		0.069	0.064
			(3.36)***	(3.20)***
	Ownership Dummy		-0.003	-0.009
			(0.05)	(0.14)
	Import Dummy		0.084	0.072
			(1.37)	(1.19)
	Wage		-0.061	-0.069
			(2.57)**	(2.90)***
	Constant	-0.011	-3.142	-3.099
		(1.77)*	(0.96)	(0.94)
	Observations	9,899	8,919	8,919

Note :
*, **, *** indicate 10%, 5%, and 1% significance respectively
Specification 1: Only takes into account the effect of foreign import tariff
Specification 2: Baseline regression
Specification 3: Using a simple average approach to build foreign import tariff variable

An increase in the foreign import tariff reduces the probability of a firm to increase its export product scope. A negative and significant parameter for wage variable indicates that firms with lower wages have a greater probability to add to their export product scope. A lower average wage may decrease the firm's reservation price, which enables them to enter a foreign market and gain profit.

In the second category (*drop only*), we find similar results. The negative coefficient of foreign import tariffs implies that an increase in the foreign tariff reduces the probability of a firm to drop the existing exported product. However, the significance level is lower compared to the other two categories (*add only* and *add and drop*). Using a foreign import tariff based on Turco and Maggioni's approach (2016), we do not find a significant

effect of foreign tariff changes on the probability of a firm to drop the previously exported product. However, using Takii's approach (2014), the parameter is significant only at 10%. Due to the different results, we cannot conclude whether or not a change in the foreign tariff affects the chance of a firm to drop its exported product.

In the third category, in addition to foreign import tariff and wages, we found real effective exchange rates and labor, significantly affect the probability of a firm to fall into the *add and drop* category. A depreciation of the exchange rate increases the incentive for a firm to expand its exported products and at the same time drop the previously exported product. This implies that firms focus more on the best performing product. The result on the effect of real exchange rate changes on firm export product scope is in line with the Xu, Mao and Tong (2016) study of China and the Chatterjee, Rafael, and Vichyanond (2013) study of Brazil. The positive parameter for variable labor can also support the conclusion that firms tend to focus more on its best performing product. Firing labor (due to dropping a particular product) would cause the firm a cost (e.g., severance payments), we argue that a firm with a large level of employment is more likely to discontinue the existing product (the poor performing product) and mobilize the labor to produce a new product. Such decisions may be more profitable than firing labor as the firm has to bear a significant amount of severance payment and other associated costs.

CONCLUSIONS

In this study, we provide the evidence that the foreign import tariff and labor wage are two important determinants behind a firm's decision concerning their exported product scope. The average labor wage will affect a firm's reservation price. A lower average wage and lower foreign import tariff, increases the probability of the export price to be above the firm's reservation price. Hence, the probability of a firm to expand its export product scope increases. We also found evidence that firms with larger employment tend to drop their previously exported product and create a new export product.

We are aware that our study contains a potential measurement error, especially in calculating the foreign import tariff faced by a firm and the GDP per capita of the trading partners. Such measurement errors can only be addressed if the information on the export destination is available at firm-product level. Thus, if in the future such information is available, further research can be carried out to address the potential measurement error that exists in our research.

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