Chapter 6

Import Penetration, Export Orientation and Plant Size in Indonesian Manufacturing

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May 2016

This chapter should be cited as

Takii, S. (2014), 'Import Penetration, Export Orientation and Plant Size in Indonesian Manufacturing', in Hahn, C.H. and D. Narjoko (eds.), *'Globalization and Performance of Small and Large Firms*. ERIA Research Project Report 2013-3, pp.VI-1-VI-24, Available at: ww.eria.org/RPR_FY2013_No.3_Chapter_6.pdf

CHAPTER 6

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1. Introduction

The trade theory emphasizing firm heterogeneity suggests that globalization generates both winners and losers among firms within an industry and these effects are magnified by heterogeneity (Melitz and Trefler, 2012). Better-performing firms can grow because of market expansion while some worse-performing firms are forced to exit from markets due to increased competition, indicating that responses to globalization differ among firms even within narrowly defined industries because of firm heterogeneity. The impact of trade liberalization on inequality always attract the attention of policy makers, for the reason that it may determine the extent of public support for the engagement of a country in more globalized economic activities. One of the fears is that only relatively large firms can benefit from globalization and smaller firms tend to lose market shares. This view is consistent with prediction of firm heterogeneity theory (e.g., Melitz 2003, Helpman, Melitz, Yeaple 2004). While theoretical analyses on the impact of globalization have focused on the welfare effects of trade liberalization, only a few works have intensively examined on the effects of liberalization on the size of firms. This paper answers a question of what kinds of plants are potentially impacted by the development of globalization by empirically examining the its differential impacts on the size of plants with different characteristics including not only initial (relative) plant size but also import and export statuses, and ownership.

Only a few previous empirical studies have analyzed the impact of trade liberalization on the size of manufacturing plants (Head and Ries 1999, Gu, Sawchuk

and Renninson 2003, and Baldwin and Gu 2009). One of the differences from the previous studies, which examined Canadian manufacturing industries, is that this study focuses on manufacturing industries in a developing economy, Indonesia. Developing economies are different from developed economies in some important respects in this study. One difference stems from the fact that most of the world's advanced technology is controlled by multinational corporations based in a few advanced countries (Blomström and Kokko, 1997). In developing economies where research and development activities are limited, importing intermediate inputs in production is more important channel of access to worldwide sophisticated technology. Therefore, it is more likely in developing economies that firms importing intermediate inputs can grow in size at a faster rate compared to non-importers. In addition to the presence of the size advantage of importing inputs, this paper finds that the advantage diminishes when imported output penetrates in the local markets. Regarding to the presence of productivity advantage of importing intermediate inputs, results of empirical studies are mixed. For example, Amiti and Konings (2007) found that the reduction in intermediate inputs tariff has a positive impact on Indonesian firms' productivity while Vogel and Wagner (2010) could not find clear evidence for productivity gain from being importers in German manufacturing. The finding in this paper indicates that the advantages of importing intermediate inputs depend on the extent of import penetration of output.[1]

Market structure may also be different between developed and developing economies. In a developing economy, some strategic industries have been protected under import substitution industrialization policy. These industries tend to be dominated by a relatively small number of large (government-owned) firms. One of the reasons why developing countries have promoted trade liberalization last decades is that it has been believed that the pro-competitive effects of trade can improve efficiency in less competitive industries where a few large firms dominates.

[1] Regarding productivity advantage of exporting, some previous studies found supporting evidence for "learning-by-exporting effect" (e.g., Lileeva and Trefler, 2010) while other studies find no such effects (e.g., Clerides, Lach and Tybout, 1998; Bernard and Jensen, 1999) See Wagner (2012) for review.

Indonesian government has also undertaken policy reforms aiming to switch from import substitution to export oriented since the mid-1980s. Using plant-level microdata for the Indonesian manufacturing, the paper examines the impact of trade liberalization on plant size taking account for industry characteristics including concentration and the extent of dominance by large plants.

The reduction in trade cost due to tariff reduction can affect the size of plants via at least two channels. One is via increased factor market completion (Melitz 2003) and another is via increased product market competition (Melitz and Ottaviano 2008). The paper focuses more on the latter channel and, as indicated above, it examines the impact of import competition on the size of plants whereas the previous studies mainly examined that of tariff reductions. Tariff reduction is a part of trade cost among others including transportation costs. Furthermore, trade cost is a determinant of the degree of import competition among other factors including change in exchange rates and demand in domestic and foreign markets. These indicate that the degree of import competition changes even if tariff rates do not change, causing omitted variable biases in regression analysis.

The rest of the paper is organized as follows. Next section reviews theoretical and empirical studies related to the impacts of trade liberalization on firm/plant size. Section 3 introduces dataset examined in this paper and explains empirical methodology to examine the impacts. Section 4 presents results of the econometric estimation and Section 5 provides some concluding remarks.

2. Impacts of Trade Liberalization on Plant Size

2.1. Trade Liberalization and Plant Size

As noted above, trade theory with firm heterogeneity suggests that globalization generates both winners and losers among firms within an industry: better-performing firms can grow faster because of market-expanding effect while some worse-performing firms are forced to exit from markets due to increased competition. Melitz (2003) developed a model explaining the mechanism. In the model, firms are heterogeneous in terms of marginal cost of production. According to the level of the

cost that firms can learn after incurring a fixed cost to entry into markets, they decide whether to exit, to produce for domestic markets or to serve foreign markets. The decision is made based on cutoff points of production (C^D) and export (C^X). Firms with marginal cost higher than C^D, indicating low productivity, decide not to produce. Firms with marginal cost between C^D and C^X decide to produce only for domestic markets and firms with marginal cost lower than C^X serve foreign markets as well as domestic markets. In the model, trade leads to the expansion of production in most productive firms to serve foreign markets. On the other hand, the increased demand for labor by large, exporting firms causes higher real wages in labor markets and thus causes the decreases in the cutoff C^D forcing some least productive, small firms to exit. In its extension of Melitz and Ottaviano (2008), potential pro-competitive effects induced by increased import competition is incorporated instead of the factor market competition. The increased competition in domestic product markets forces less productive, small firms to lose market share or exit.

In these models, the consequences of trade liberalization on firm size depend on the balance between reductions in import and export costs. In other words, the impacts on firms performance depends critically upon the balance between domestic firms' access to foreign markets (market-expanding effects), and foreign firms' access to domestic markets (competition effects) (Tybout 2009). Melitz and Ottaviano (2008) indicate that the gap in size between large and small firms is widened in the case of symmetric bilateral trade liberalization and, on the other hand, the gap is narrowed in the case of unilateral trade liberalization. Related hypotheses were empirically examined by Baldwin and Gu (2009). They further extended the Melitz and Ottaviano model by allowing firms to produce multiple products.[2] In their theoretical model, firms respond to the increased competition by reducing the number of products concentrating on best-performing products. This leads smaller size of firms. Using Canadian manufacturing data, they examined the impacts of bilateral trade liberalization between Canada and United States on firm performances

[2] Other papers that developed models with multi-product firms includes Nocke and Yeaple (2006), Eckel and Neary (2010), Bernard, Redding and Schott (2011), and Mayer, Melitz, and Ottaviano (2011).

such as the number of products, product diversification, plant size, and product-run length. In the analysis, symmetric bilateral trade liberalization was assumed between the two developed countries. In this present study on the Indonesian manufacturing, the import competition and market-expanding effects are separately examined allowing asymmetric liberalization.

2.2. Import and Export Status and Foreign Direct Investment

A related important prediction from the theoretical models is the differential impact of trade liberalization between exporting firms and non-exporting firms. Tariff reduction has a negative impact on the size of non-exporters via import competition while the impact on exporter depends on the balance of market-expanding and import competition effects. Baldwin and Gu (2009) provides supporting empirical evidence on this hypothesis. In the theoretical models, less productive firms are relatively small in size and less profitable so that they cannot cover the fixed costs to serve foreign markets. Therefore, it is predicted that trade liberalization have more of negative impacts on relative small firms compared to large firms. In real world, however, there are some large firms that are not exporting and there are also some small exporters. Which does determine the extent of the impact of trade liberalization on firm size, initial firm size or export status? This question is asked in empirical part of this paper. It should be noted that the size of firms can be changed in two ways in a globalizing world. First, being an exporter is thought to expand its production. This advantage over non-exporters is called as size advantage of exporting in this paper. Second, trade liberalization can increase the size advantage because import completion has more of negative impacts on non-exporters. Therefore, examining the differential impacts on exporters and non-exporters is same as examining the impact on the size advantage of exporting. This paper examines and compares the impacts on the size advantages of exporting and initial firm size.

Importing can also be an important determinant of firm size. Importing intermediate inputs can enhance firm productivity because imports from advanced economies embody sophisticated technology. For example, Kasahara and Rodrigue (2008) examined panel dataset from Chilean manufacturing and the results suggest

that being an importer of foreign intermediates can improve productivity. The results of empirical analysis by Amiti and Konings (2007) suggest that the reduction in intermediate inputs tariff has a positive impact on Indonesian firms' productivity, indicating that there exist productivity gain from importing.[3] The improvement of productivity indicates larger firm size. The difference in size between importing and non-importing firms is called as size advantage of importing in this paper. The size advantage of importing can also be affected by trade liberalization. For example, automakers importing parts and components, which embody leading technology, from advanced economies can enjoy advantage over non-importing automakers in a developing economy. However, when import tariff on automotive is reduced and import competition is increased, the advantage would diminish because imported cars embody the leading technology. Furthermore, import has been thought as an important channel of international technology diffusion for developing economies. The increase in imports can promote the improvement of technologies not only in industries producing the products but also in upstream industries producing intermediate products. The improvement of technologies in the upstream industries leads to decline in the size advantage of importing over non-importers.

Another characteristic of firms that is examined in this paper is foreign ownership. Helpman, Melitz and Yeaple (2004), which extended the Melitz model by incorporating not only exporting but also foreign direct investment as methods to serve foreign markets, predicts that the responses to trade liberalization are also different between exporting firms and FDI firms. In the model, most productive firms invest abroad and they can benefit more from trade liberalization compared to others. In the Indonesian manufacturing, only a small number of local firms are investing abroad while there are many foreign MNEs. They account for a large portion of output in some industries. For example, the share of output produced by foreign-owned plants is more than 90 percent in motor vehicle industry. Although foreign MNEs in the Indonesian manufacturing are not Indonesia-based firms, the

[3] On the other hand, Vogel and Wagner (2010), which examined panel dataset from German manufacturing, could not find clear evidence for productivity gain from being importers while their analysis provides evidence for a positive impact of productivity on importing.

prediction of different responses can be applied to the responses of exporters and foreign-owned plants in the Indonesian manufacturing sectors.

3. Methodology and Data

3.1. Previous empirical studies

Head and Ries (1999) is one of a few studies that examined the effects of trade liberalization on plant size. They empirically examined whether trade liberalization promotes efficiency through increased scale by analyzing Canadian manufacturing industries. The results suggest that reduction in Canadian tariffs decreased average plant size and reduction in U.S. tariffs increased plant size. Gu, Sawchuk and Renninson (2003) also examined the effects of tariff reduction on plant size and turnovers using Canadian manufacturing data. However, they could not find any evidence indicating that tariff cut has statistically significant effects on firm size.

More recently, Baldwin and Gu (2009) examines the impact of trade on product diversification in the Canadian manufacturing. They developed a model of trade with multi-product firm/plants to examine the effect of market size and trade on product specialization and production-run length. Their model predicts that the effect of bilateral tariff reductions on plant size depends on the export status of a plant. Bilateral tariff cuts reduce the plant size of non-exporters as they reduce the number of products while the effect of tariff cuts on the plant size of exporters is ambiguous. The results of their empirical analysis suggest that lower tariffs lead to a decline in the size of relatively large non-exporters and that the effects on plant size of smaller firms are statistically insignificant.

3.2. Estimation model

One of the important predictions derived from the firm-based theoretical model developed by Baldwin and Gu (2009) is that bilateral tariff reductions lead to a decline in the size of non-exporters. To provide empirical evidence, they estimated a following model

$$\Delta \ln Y_{it} = \beta_1 \Delta\tau_{it} + \beta_2 D_{i,t-1}^{export} + \beta_3 S_{i,t-1} + \beta_4 \Delta\tau_{it} \cdot D_{i,t-1}^{export} + \beta_5 \Delta\tau_{it} \cdot S_{i,t-1} + \alpha_i + \gamma_t + \beta_6 X_{it} + \varepsilon_{it},$$

where Y is real output (a measure of plant size), τ is output tariff, D^{export} is a dummy variable having value 1 if a plant is exporting, S is relative plant size, X is a set of other plant characteristics. In this model, the marginal of effect of tariff changes on plant size can be expressed as follows:

$$\text{M. E. of tariff changes} = \beta_1 + \beta_4 D_{i,t-1}^{export} + \beta_5 S_{i,t-1}.$$

If the coefficient β_1 is significantly positive, it indicates that a reduction in tariff rates decreases the size of non-exporters as the theoretical model predicted. The impact of tariff reduction on exporters can be measured by $\beta_1 + \beta_4$. If the sum of the parameters is significantly positive, it indicates that a reduction in tariff rates decreases the size of exporters. In their empirical analysis which examines the impact of bilateral tariff reductions between Canada and United States, tariff change is calculated as the sum of bilateral import tariff changes between the two economies because their theoretical model considers the case of symmetric bilateral trade liberalization.[4]

The model estimated in this paper is different from Baldwin and Gu (2009) in some points. One is that this paper examines impacts of the increase in import penetration instead of tariff reduction. Import penetration is thought to have more direct impacts on plant size compared to tariff reduction which can affect plant size through the increase in imports. In addition, the impacts on plant size of reduction in Indonesia's import tariffs and its trading partners' import tariffs (tariffs on Indonesia's exports) are examined separately in this paper. The developing country has diversified exports and imports and its trading partners include both developed and developing economies. Differently from the assumption in Baldwin and Gu

[4] Another reason is to avoid a multicolinearity problem arising from high correlation of import tariffs between Canada and United States.

(2009), this indicates that structure and reduction in tariffs are not always symmetric with that of main trading partners although both Indonesia and its trading partners have reduced import tariffs.

As suggested by Baldwin and Gu (2009), the impact through market-expanding effects due to trade liberalization is greater for exporters compared to non-exporters. Similarly, the impact through import competition effects can also be different between plants importing intermediate goods, in which advanced technology is thought to be embodied, and non-importers, especially in less developed economies. Therefore, the impacts of import penetration on importer and non-importers are also compared. Additionally, locally owned plants and foreign-owned plants are also compared because foreign MNCs are thought to have firm-specific intangible assets including marketing network which enables them to benefit from trade liberalization. In this present study, import dummy (D^{import}) and foreign ownership dummy ($D^{foreign}$) and their interactions with trade liberalization variables are also included in estimation model.[5] The estimated model can be expressed as follows:

$$\begin{aligned}\Delta \ln Y_{it} = {} & \beta_1^I \Delta\tau_{it}^I + \beta_2^I \Delta\tau_{it}^I \cdot S_{i,t-1} + \beta_3^I \Delta\tau_{it}^I \cdot D_{it}^{export} + \beta_4^I \Delta\tau_{it}^I \cdot D_{it}^{import} \\ & + \beta_5^I \Delta\tau_{it}^I \cdot D_{it}^{foreign} \\ & + \beta_1^X \Delta\tau_{it}^X + \beta_2^X \Delta\tau_{it}^X \cdot S_{i,t-1} + \beta_3^X \Delta\tau_{it}^X \cdot D_{it}^{export} + \beta_4^X \Delta\tau_{it}^X \cdot D_{it}^{import} \\ & + \beta_5^X \Delta\tau_{it}^X \cdot D_{it}^{foreign} \\ & + \beta_6 S_{i,t-1} + \beta_7 D_{i,t}^{export} + \beta_8 D_{it}^{import} + \beta_9 D_{it}^{import} + \beta_{10} \ln K/L_{it} \\ & + \beta_{11} \ln Ln/L_{it} + \alpha_i + \gamma_t + \varepsilon_{it},\end{aligned}$$

where the dependent variables is a change in real output in plant i at year t. $\Delta\tau^I$ refers to the change in import tariffs or import penetration variable (explained below). $\Delta\tau^X$ refers to the change in tariffs on Indonesia's export imposed by trading partners or export ratio variable (explained below). $\ln K/L$ is a log of capital labor ratio and

[5] Kasahara and Lapham (2013) indicates that there is also difference in the responses to trade liberalization between importers and non-importers.

$\ln Ln/L$ is a log of the non-production worker ratio to total number of labors employed in the plants. α_i and γ_t are plant and year dummies, respectively.

3.3. Real Output Variables

Nominal output data for each manufacturing plant was taken from annual manufacturing surveys conducted by Indonesia's statistical agency (BPS-Statistics).[6] From the raw micro-level data, I constructed a panel dataset for 1993-2011.[7] The survey covers manufacturing plants employing 20 or more and contains various information on plant performance including output, value added, ownership, capital stock, the number of workers by type, export and import status and other variables which enables us to estimate the above model. Based on the main product, each plant is classified into the Indonesian Standard Industrial Classification (ISIC) at a 5-digit level, which corresponds to the International Standard Industrial Classification.[8,9] In this empirical analysis, classification at a 3-digit level is used to make a concordance between the industrial classification and commodity classification for wholesale price index. For each category, corresponding wholesale price index was constructed from the most detailed wholesale price index which has 190 categories. Real output variable was created at constant 2000 price using the detail wholesale price index. The relative size variable (S) was defined as the difference between the log of real output and its corresponding median of each 3-digit industry. [10]

3.4. Measuring Import Penetration and Export Orientation

The increases in import and export suggest increases in competition and market size. However, the degree of the impacts of globalization is not always proportional

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[6] The aggregated figures are published in *Large and Medium Industrial Statistics* (BPS-Statistics).

[7] The survey data is available from 1975 but data on capital stock is available since 1988. Data for 1993-2011 is used in this analysis because detailed trade data is available since 1993.

[8] The two classification are almost same. One of the main differences is in detail classification of Other non-metallic mineral industry (ISIC #26).

[9] The surveys used ISIC revision 2 for 1993-1998 and revision 3 for 1999-2011. The codes of ISIC revision 2 for 1993-1998 were converted to ISIC revision 3 using concordance provided by BPS-Statistics.

[10] Another definition is to use industrial mean of the log of real output instead of median. To avoid undesirable effects of outliers, median was used instead of mean.

to the dollar values of import and export. Import penetration and export orientation would be more appropriate measures to capture the globalization effects. In addition, although tariff changes are one of the causes of the increases in import and export, they do not capture the actual impacts of trade liberalization. The reduction in import tariffs does not always induce the increase in import and reduction in tariffs on exports does not always induce the increase in export because tariff is a part of the cost incurred to import or export among other factors including change in exchange rates and demand in domestic and foreign markets.

In order to measure the impacts of globalization, which is partially induced by tariff reductions, import penetration variable and export orientation variable are included in the estimated model instead of changes in tariffs on imports and exports. The import penetration and export orientation variables are created at ISIC 3-digit level as expressed in a following equation: [11]

$$\text{Import penetration} = \frac{\text{total import}}{\text{total output} + \text{total import}},$$

$$\text{Export orientation} = \frac{\text{total export}}{\text{total output}}.$$

3.5. Trade Liberalization on Indonesian Manufacturing

During the last decades, Indonesian government undertook a rather massive policy reform aiming to switch from import substitution to export oriented. Trade and investment regime were radically liberalized along with major reforms in banking sectors. Tariffs were further reduced and more NTBs were eliminated under the reforms per the IMF agreements after the economic crisis in 1997/98.

For empirical analysis in this paper, tariff data at 3-digit level of International Standard Industrial Classification is taken from World Integrated Trade Solution

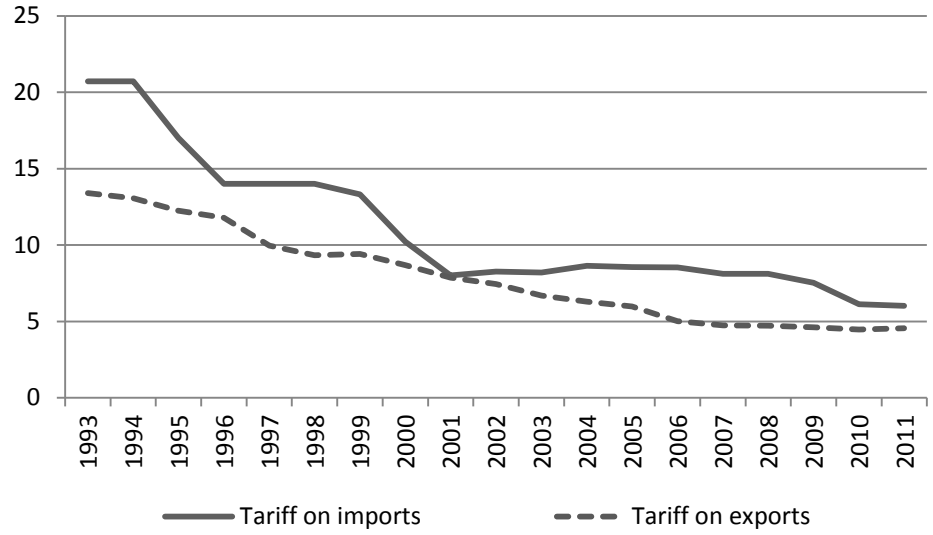
[11] These indices should be measured in real term. However, the import and export price indices are only available at a broader category level (16 categories) compared to wholesale price index (131 categories at a 4-digit level of ISIC). Partially, this causes unreliable estimates of import penetration and export ratio for some industries. Therefore, these indices are measured in nominal term.

(WITS, World Bank). In the dataset, the tariff data is calculated as an average of effective tariff rates on commodities correspond to the industrial classification code. To create import and export tariff variables, top 20 trading partners are selected using total value of import and export with each trading partners during 1993-2011. Import tariff variable is calculated as simple average of tariffs imposed on imports from the top 20 origins of imports for each category of ISIC 3-digit level.[12] Export tariff variable is also calculated by a similar way.

Figure 1 shows the trend of average tariff rates of manufacturing products in Indonesia during 1993-2011. Average rate of tariffs on manufacturing imports decreased from 21 percent in 1993 to 14 percent in 1996 and the rate further decreased after the economic crisis to 8.0 percent in 2001. In 2004, the rate increased slightly but the rise was mainly caused by the adoption of new tariff classification under "ASEAN Harmonized Tariff Nomenclature" (AHTN) as part of Indonesian commitment under AFTA.[13] More recently, the average import tariff declined further from 7.5 percent in 2009 to 6.o percent in 2011. Indonesia's main trading partners also decreased tariff rates on exports from Indonesia. The average export tariff rates was much lower than the average import tariffs but it continuously declined from 13 percent in 1993 to 4.6 percent in 2011.

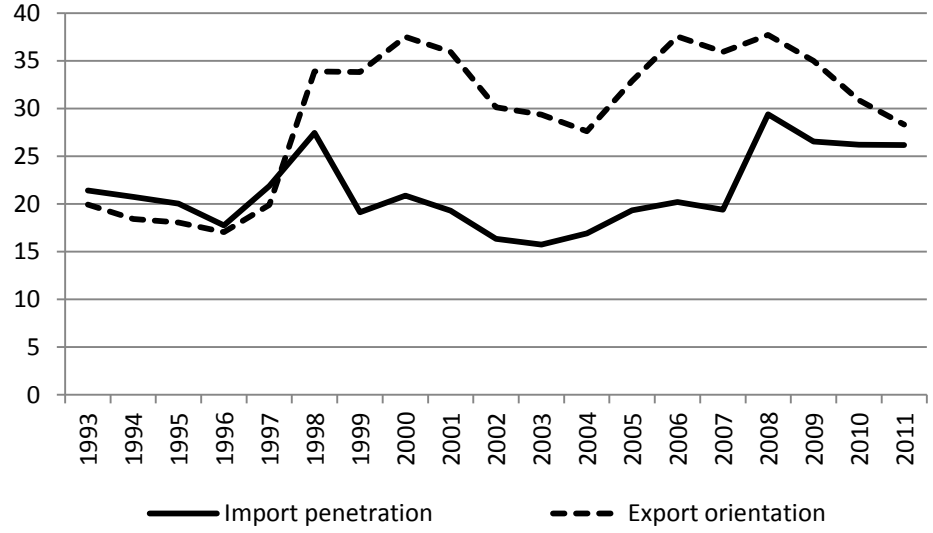
[12] In the WITS dataset, for some countries, there are several years for which tariff rates are missing. Those missing values are replaced with available tariff rates for previous years.
[13] Due to the change, total tariff lines increased drastically from 7,540 in 2003 to 11,163 in 2004.

Figure 1: Change in Import and Export Tariffs in the Indonesian Manufacturing (%)



Partially reflecting the reductions of tariffs, manufacturing imports drastically increased especially after the economic crisis from USD 39.3 billion in 2001 to USD 116 billion in 2011 while import also increased from USD 25.3 billion to USD 155 billion during the period. Figure 2 shows the trend of import penetration and export orientation. According to the average import penetration and export orientation estimated by the equations explained above, both import penetration and export orientation were about 20 percent in the manufacturing. The import penetration temporally increased during the economic crisis but declined until 2003. Since then the import penetration tended to have increased and reached 26 percent in 2011 after temporally increased to 29 percent in 2008. On the other hand, export orientation swung much more compared to import penetration. Partially reflecting weak rupiah, export orientation increased to 37 percent in 2000 before declining to 28 percent in 2004. More recently, the rate increased to 38 percent in 2008 before declining to 28 percent in 2011 reflecting sluggish foreign demand.

Figure 2: Import Penetration and Export Orientation (%)



4. Econometric Results

4.1. Effects of Trade Liberalization on Plant Size

Estimation results of above equation are presented in Table 1. As trade liberalization variable, column 1 includes import penetration and column 2 includes both import penetration and export orientation variables. On the other hand, column 3 includes import tariffs and column 4 includes both import tariffs and export tariffs (tariffs imposed by trading partners). In all equations, initial relative plant size ($\ln(size)_{-1}$), export dummy, import dummy and foreign ownership dummy are statistically significant at 1 percent significance level. The negative coefficient on the initial plant size suggest that relatively small plants grow at a faster rate compared to larger plants in terms of real output. The positive coefficient on export dummy suggests that there exists size advantage of exporting. Similarly, Plants importing intermediate inputs and foreign-owned plants grow faster compared to non-importing plants and locally owned plants, respectively. Capital intensity ($\ln K/L$) is positively correlated with the growth of real output, suggesting that plants with higher capital intensity can grow at a faster rate. The coefficient of non-production worker ratio ($\ln Kn/L$), which is sometime used as a proxy for a ratio of skilled workers, is significantly negative. This suggest that plants with a relatively large number of

unskilled workers can grow faster compared to others in the unskilled worker abundant economy.

In column 1, the coefficient on change in import penetration variable is significantly negative. This indicates that the increase in import penetration has negative impacts on the size of manufacturing plants. After including export orientation variable and its interactions (column 2), the estimated magnitude of the negative effect turns to be smaller, but still significantly negative. In both columns 1 and 2, the interaction term of initial plant size and import penetration is statistically insignificant. There is no difference in the magnitude of negative impacts of import penetration on the size of larger and smaller plants after accounting for the plant characteristics. This is confirmed by a statistical test, whose results are shown in the lower part of the table. The marginal effect of import penetration on the size of smaller plants (evaluated at the lower quartile of size distribution) is -0.207 while corresponding effect (evaluated at the upper quartile) is -0.219. The difference (-0.012) is not statistically significant even at 10 percent significance level.

On the other hand, the increase in import penetration has more of negative impacts on the size of plants importing intermediate inputs than that of non-importing plants, suggested by significantly negative coefficient on the interaction term of import dummy and import penetration. In other words, the size advantage of importing intermediate inputs is lowered when import penetration is increased. As indicated by the estimation results, some plants importing intermediate inputs in which advanced technology is embodied can enjoy size advantage, but the advantage is decreased when import of the products that they produce is increased because the advanced technology is also embodied in the imports. Therefore, import competition has greater negative impact on plants importing intermediate inputs compared to non-importing plants.

The coefficient on export orientation variable is significantly negative, suggesting that the increase in export orientation at an industry-level has negative impact on plant size. However, its interaction term with export dummy is significantly positive and the sum of the two coefficients is statistically insignificant. These suggest that the increase in export orientation does not affect the size advantage of exporting. On the other hand, the results also suggest that the increase

in export orientation has negative impact on the size of non-exporters. When export orientation at an industry-level increases, exporters can keep growing while non-exporters loses market share in domestic markets.

Table 1: Effects of Tariff Reduction/import Penetration and Export Orientation

	[1]	[2]	[3]	[4]
	Import penetration and export orientation		Import tariffs and export tariffs	
	b/se	b/se	b/se	b/se
Δimport tariff or import	-0.245	-0.128	0.074	0.063
	[0.039]***	[0.040]***	[0.054]	[0.054]
x ln (size)-1	-0.011	-0.005	-0.04	-0.038
	[0.023]	[0.023]	[0.029]	[0.029]
x Dexport	-0.043	-0.211	0.168	0.151
	[0.112]	[0.115]*	[0.133]	[0.133]
x Dimport	-0.301	-0.19	-0.342	-0.345
	[0.086]***	[0.092]**	[0.131]***	[0.131]***
x Dforeign	-0.184	-0.202	0.263	0.271
	[0.145]	[0.151]	[0.182]	[0.182]
Δexport tariff or export		-0.244		0.779
		[0.025]***		[0.124]***
x ln (size)-1		-0.011		-0.194
		[0.014]		[0.072]***
x Dexport		0.27		0.297
		[0.049]***		[0.333]
x Dimport		-0.116		-0.113
		[0.054]**		[0.385]
x Dforeign		0.064		0.024
		[0.081]		[0.687]
$\ln (size)_{-1}$	-0.502	-0.502	-0.502	-0.503
	[0.005]***	[0.005]***	[0.005]***	[0.005]***
Dexport	0.042	0.042	0.044	0.046
	[0.007]***	[0.007]***	[0.008]***	[0.008]***
Dimport	0.182	0.182	0.177	0.176
	[0.010]***	[0.010]***	[0.011]***	[0.011]***
Dforeign	0.171	0.17	0.172	0.173
	[0.029]***	[0.029]***	[0.029]***	[0.030]***
ln (K/L)	0.017	0.017	0.017	0.017
	[0.002]***	[0.002]***	[0.002]***	[0.002]***
ln (Ln/L)	-0.015	-0.015	-0.014	-0.015
	[0.003]***	[0.003]***	[0.003]***	[0.003]***
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of size	-0.308***	-0.207***	0.101***	0.084
M.E. of import at p75 of size	-0.331***	-0.219***	0.014	0.002
- difference	-0.024	-0.012	-0.087	-0.083
M.E. of export at p25 of size	-	-0.201***	-	1.000***
M.E. of export at p75 of size	-	-0.226***	-	0.577***
- difference	-	-0.024	-	-0.423***
# of plants	34,278	34,278	34,419	34,419
# of observations	203,936	203,936	204,727	204,727
Adj. R^2	0.272	0.272	0.271	0.272
F-stats.	514.622	439.332	516.697	439.298

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

The interaction term of export orientation and initial plant size is not statistically significant. Similarly with import penetration effect, there is no difference in the magnitude of negative impacts of export orientation on the size of larger and smaller plants after accounting for other plant characteristics. The negative coefficient on the interaction of export orientation and import dummy suggests that export orientation decreases the size advantage of importing. One possible interpretation is that the increase in export orientation promotes technology level of upstream industries in local markets, and this causes the decrease in the size advantages of importing intermediate inputs, although further examination of the backward linkage effects is required before interpreting so.

In columns 3 and 4, the coefficients on changes in import tariffs are positive. These results are consistent with the results of import penetration explained above and suggest that import tariff reduction has negative impact on the size of plants. However, the coefficients are not statistically significant. On the other hand, the coefficients on change in export tariffs is significantly positive, suggesting that reduction in tariffs imposed by trading partners on Indonesia's exports have negative impact on plant size. One notable difference from the results shown in column 2 is that the interaction term of export tariffs and initial relative size is significantly negative in column 4. This indicates that export tariff reduction has more of negative impact on the size of smaller plants than that of larger plants. Furthermore, the interaction term of import tariffs and import dummy is significantly negative, suggesting that import tariff reduction have more of negative impacts on the size of non-importers than that of importers. These results are inconsistent with the results of import penetration and export orientation. Probably, the inconsistency arises from the fact that tariff reductions are weakly correlated with import penetration and export orientation. Import penetration and export orientation depend on not only tariff reductions but other factors including foreign exchange rates, domestic and foreign demand and characteristics of products.

4.2. Analysis by Industry Group

For further investigation of the relationships between import penetration and export orientation on one hand and size advantages of importing, exporting and

foreign ownership, above equation is estimated using subsamples from the plant level panel dataset. The models based on firm heterogeneity suggest that responses to tariff reduction differ not only among firms with different size and export status but also across industries with difference characteristics. For example, in the Melitz and Ottaviano model, the marginal effect of tariff change on plant size is a function of fixed sunk entry cost as well as parameters of utility function and distribution function of productivity. These are generally thought to vary across industries. In Baldwin and Gu model, the marginal effect is a function of fixed overhead cost which affects the extent of scale economies within variety. These indicates that the effect of tariff reduction on plant size differ across industries. Instead of incorporating the effects of required cost of initial investments at an industry-level, in this empirical analysis, industries are classified into groups, and then the above model is estimated using the subsamples and the results are compared.

First grouping at an industry-level is done based on shares of relatively large plants in total output. Here, large plants are defined as plants with 300 or more workers. If the share of large plants in total output is more than 70 percent in an industry, then the industry is classified into large enterprise (LGE)-dominated group. [14] Other industries are classified into less LGE-dominated group. In this group, both large and small plants are surviving, indicating that the extent of scale economy and initial entry cost are relatively small. Second grouping is done based on average capital intensity. Industries where capital intensity is higher than median of industry average are classified into capital-intensive group. Traditional trade theory suggests that a labor-abundant economy have comparative advantages in labor-intensive industries and comparative disadvantages in capital-intensive industries. Therefore, the negative impact of import penetration is expected to be greater for capital-intensive group than for labor-intensive group. Third grouping is done based on the dominance of foreign-owned plants. Similarly with LGE-dominated group, MNE-dominated group includes industries where share of foreign-owned plants in total

[14] Note that plants employing 100 or more workers are defined as large plants in the manufacturing survey. During this classification process, some industries were dropped from sample because of a small number of observations.

output is greater than 30 percent. Forth grouping is done based on concentration measured by Herfindahl index. Industries where the index is higher than median of total manufacturing are classified into Concentrated group.

Estimation results using these subsamples are presented in Table 2. For some groups, estimation results are different from the results of estimation using total sample in table 1. First, the impact of import penetration is not statistically negative in LGE-dominated (column 1), Labor-intensive (column 3) Less MNE-dominated (column 5) and concentrated groups (column 8). The coefficient is significantly positive in Concentrated group and is weekly positive in LGE-dominated groups. Regarding the former group, the impact is positive only for local non-importers because foreign dummy is significantly negative. These results suggest that the impacts of import penetration vary across industries and the negative impacts are smaller for non-importers in industries dominated by large plants, in which they can exploit market power in domestic markets.

Another difference is the negative coefficient on the interaction of export orientation and export dummy in Capital-intensive group (column 4). In this group, on the other hand, the interaction term with foreign ownership dummy is statistically positive at a 10 percent level. These results suggest that increase in export orientation decreases size advantage of exporting while it increases the advantage of foreign ownership. In the industries having comparative disadvantages, exporting status is not enough to benefit from exporting but foreign ownership is more important.

Table 2: Effects of Import Penetration and Export Orientation by Industry Group

	[1] LGE-dominated b/se	[2] Less LGE-dom. b/se	[3] Labor-intensive b/se	[4] Capital-intensive b/se
Δimport penetration	0.106	-0.377	0.012	-0.478
	[0.056]*	[0.062]***	[0.045]	[0.091]***
x ln (size)-1	-0.014	-0.028	0.004	-0.072
	[0.030]	[0.033]	[0.028]	[0.039]*
x Dexport	-0.255	-0.192	-0.210	0.153
	[0.166]	[0.159]	[0.157]	[0.178]
x Dimport	-0.477	0.016	-0.330	-0.027
	[0.128]***	[0.129]	[0.130]**	[0.145]
x Dforeign	-0.057	-0.276	0.011	-0.258
	[0.208]	[0.213]	[0.241]	[0.201]
Δexport orientation	-0.266	-0.204	-0.209	-0.243
	[0.034]***	[0.040]***	[0.028]***	[0.064]***
x ln (size)-1	-0.009	-0.005	-0.017	-0.005
	[0.017]	[0.022]	[0.015]	[0.028]
x Dexport	0.227	0.258	0.317	-0.246
	[0.063]***	[0.077]***	[0.054]***	[0.121]**
x Dimport	-0.14	-0.034	-0.111	0.092
	[0.071]**	[0.080]	[0.063]*	[0.103]
x Dforeign	0.188	-0.081	0.046	0.235
	[0.107]*	[0.129]	[0.103]	[0.136]*
ln $(size)_{-1}$	-0.516	-0.552	-0.517	-0.524
	[0.006]***	[0.007]***	[0.006]***	[0.008]***
Dexport	0.036	0.05	0.035	0.063
	[0.010]***	[0.011]***	[0.008]***	[0.014]***
Dimport	0.19	0.187	0.179	0.2
	[0.014]***	[0.016]***	[0.012]***	[0.020]***
Dforeign	0.153	0.191	0.193	0.161
	[0.039]***	[0.047]***	[0.038]***	[0.047]***
ln (K/L)	0.021	0.016	0.018	0.017
	[0.003]***	[0.004]***	[0.003]***	[0.005]***
ln (Ln/L)	-0.014	-0.017	-0.016	-0.014
	[0.004]***	[0.006]***	[0.004]***	[0.007]**
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of size	-0.001	-0.407***	-0.071	-0.400***
M.E. of import at p75 of size	-0.031	-0.471***	-0.063	-0.589***
- difference	-0.03	-0.064	0.008	-0.189*
M.E. of export at p25 of size	-0.234***	-0.158***	-0.153***	-0.229***
M.E. of export at p75 of size	-0.252***	-0.169***	-0.188***	-0.242***
- difference	-0.018	-0.01	-0.035	-0.014
# of plants	20,325	15,388	26,416	8,715
# of observations	117,078	86,858	153,076	50,860
Adj. R^2	0.284	0.294	0.279	0.291
F-stats.	260.083	244.441	320.664	156.438

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

Table 2 (continued): Effects of Import Penetration and Export Orientation by Industry Group

	[5] Less MNE-dom. b/se	[6] MNE-dominated b/se	[7] Less b/se	[8] Concentrated b/se
Δimport penetration	-0.047	-0.376	-0.287	0.221
	[0.045]	[0.096]***	[0.051]***	[0.079]***
x ln (size)-1	-0.022	-0.056	0.022	-0.036
	[0.026]	[0.045]	[0.032]	[0.032]
x Dexport	-0.212	-0.027	-0.234	-0.121
	[0.147]	[0.193]	[0.156]	[0.173]
x Dimport	-0.247	-0.043	-0.166	-0.347
	[0.115]**	[0.163]	[0.124]	[0.140]**
x Dforeign	0.083	-0.325	-0.01	-0.517
	[0.206]	[0.219]	[0.225]	[0.200]***
Δexport orientation	-0.219	-0.264	-0.189	-0.398
	[0.027]***	[0.071]***	[0.029]***	[0.054]***
x ln (size)-1	-0.034	0.055	-0.022	-0.004
	[0.014]**	[0.035]	[0.016]	[0.025]
x Dexport	0.343	-0.089	0.312	0.159
	[0.053]***	[0.131]	[0.056]***	[0.110]
x Dimport	-0.136	-0.026	-0.112	-0.018
	[0.061]**	[0.117]	[0.063]*	[0.102]
x Dforeign	0.084	0.068	-0.1	0.412
	[0.098]	[0.145]	[0.104]	[0.136]***
ln (size)$_{-1}$	-0.52	-0.506	-0.52	-0.516
	[0.005]***	[0.010]***	[0.005]***	[0.011]***
Dexport	0.039	0.054	0.041	0.062
	[0.008]***	[0.016]***	[0.008]***	[0.019]***
Dimport	0.17	0.208	0.176	0.225
	[0.012]***	[0.023]***	[0.011]***	[0.029]***
Dforeign	0.152	0.194	0.167	0.177
	[0.039]***	[0.045]***	[0.032]***	[0.079]**
ln (K/L)	0.018	0.013	0.017	0.019
	[0.003]***	[0.006]**	[0.003]***	[0.006]***
ln (Ln/L)	-0.015	-0.014	-0.014	-0.017
	[0.004]***	[0.009]	[0.004]***	[0.007]**
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of	-0.092	-0.383***	-0.385***	0.142**
M.E. of import at p75 of	-0.139***	-0.532***	-0.337***	0.069
- difference	-0.047	-0.149	0.048	-0.074
M.E. of export at p25 of	-0.143***	-0.344***	-0.132***	-0.352***
M.E. of export at p75 of	-0.213***	-0.198***	-0.181***	-0.359***
- difference	-0.071**	0.146	-0.049	-0.008
# of plants	27,969	7,039	27,073	8,233
# of observations	166,206	37,730	158,651	45,285
Adj. R^2	0.279	0.291	0.282	0.281
F-stats.	346.433	112.487	374.794	96.297

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

5. Concluding Remarks

Using a plant-level panel dataset from the Indonesian manufacturing, this paper has examined the impacts of trade liberalization on the size of plant measured by real output. Several findings were emerged from empirical analysis. First, there exist size advantages of exporting, importing intermediate inputs and foreign ownership. Second, the increase in import penetration has negative impact on the plant size and decrease the size advantage of importing. Third, the increase in export orientation has negative impact on the size of non-exporting plants while it can enhance the size advantage of exporting. Forth, despite a fear that only relatively large firms can benefit from globalization and smaller firms tend to lose market shares, the results of empirical analysis suggest that both import penetration and export orientation do not have differential impacts on the size of larger and smaller plants after accounting for other plant characteristics.

These results have some policy implications. First, plant size is not necessary appropriate criteria when the extent of public support for manufacturing plants to benefit from globalization is determined. Second, more important policy is to support for non-exporters to start exporting. The empirical results suggest that exporters can benefit from trade liberalization while non-exporters are negatively impacted. Third, promoting inward foreign direct investment is also important because foreign MNEs are thought to have firm-specific intangible assets including world-wide marketing network and because foreign ownership is a crucial factor to benefit from exporting in capital-intensive industries that have comparative disadvantages in Indonesia. Finally, although the increase in import penetration decreases the size advantage of importing intermediate inputs, the promotion of the import can be an important measure because the decrease in the size advantage of importing may reflect the development of technology embodies in local products.

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