Foreign Presence Spillovers and Firms' Export Response: Evidence from the Indonesian Manufacturing[*]

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Abstract: *This paper examines the existence of spillovers associated with the presence of multinationals (MNEs) on a firm's decision to export, and on export intensity. It utilizes data of the Indonesian manufacturing for the census year 1996 and 2006. Channels through which MNEs can affect other firms' export behavior are considered and tested. The econometric analysis suggests that the contribution of MNEs in increasing technological knowledge raises the likelihood that domestic firms will enter the export market, and improves export performance. The analysis finds weak evidence to support for the hypothesis that competition, created by the operation of MNEs, facilitates entry into export markets. Further analysis however shows that the impact of competition depends on the level of productivity of the domestic firms. In particular, the more productive firms are suggested to have been able to benefit more than the less productive ones. The overall analysis suggests that given the mixed evidence, policies to promote MNEs are still worth pursuing. The most obvious justification comes from the positive impact of the increased pooled of technological knowledge. Other than this, strengthening trade facilitation seems to be a proposition, given the finding that many of new domestic exporters seem to have constrained in increasing their exports.*

Keywords: Indonesia, multinationals, export participation

JEL Classification: F23, L16, L60

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1. Introduction

Proponents of globalization believe a positive impact of foreign direct investment (FDI) on development. An underlying argument justifying this is the believe that the presence of FDI, through operation of multinationals (MNEs) in host countries, helps to improve the productivity of domestic firms.

There is now growing literature that formalizes and collects evidence of the positive externalities, or often termed as technology/productivity spillover. However, there is yet convergence evidence about the existence or positive impact of the spillover. On the one hand, Gorg and Greenaway (2004) for example reported negative productivity spillover that occurred in several European countries, while on the other, there exist some studies find the evidence of positive spillover effect for some Asian countries, such as Takii (2006) and Kohpaiboon (2006) for Indonesia and Thailand, respectively.

This study elaborates this subject, by examining the impact the presence of MNEs on export performance of domestic firms. Specifically, it asks whether MNEs helps domestic firms to participate and perform well in export markets. This study takes the reference of the Indonesian manufacturing as a case study, utilizing the rich plant-level census data of the sector for the year 1996 and 2006.

The Indonesian manufacturing provides a good case study in examining the issue, considering the rapid FDI flow into the country since the early of 1990s, and even after the deep economic crisis of 1997/98. The rapid flow was often cited as an impact of the bold trade and investment liberalizations taken by the Indonesian government since late 1980s. During the same period, the country also experienced a rapid growth in its manufacturing exports. Given the domestic orientation of the trade and industrial policy before the liberalizations, it is only natural to argue that the Indonesian experience serves as a natural experiment for answering the research question.

The rest of this paper is organized as follows. Section 2 presents analytical framework and identifies the testable hypotheses. Section 3 describes the methodology adopted by the study.

Section 4 present the econometric results and the analysis. Section 5 summarizes and concludes the study.

2. Analytical framework

Export spillovers, or broadly defined as the positive externalities arising from the presence of MNEs, is an implication of the theory that links productivity and exporting behavior or performance. The improvement in domestic firms' export performance is the consequence or result of export spillovers.

The accumulation of evidence from a greater availability of firm or plant level data indicates a substantial difference in the productivity of exporters and non-exporters. For developed countries, Bernard et al. (1995) and Bernard and Jensen (1999), for example, documented that exporters in US manufacturing are larger, more productive, more capital intensive, pay higher wages, and employ more skilled workers. A similar finding was observed by Aw and Hwang (1995) and Berry (1992) for developing countries. For Indonesian manufacturing, Sjoholm and Takii (2003) observed that exporting plants are larger and more productive. They found that labour productivity of these plants was about twice as high as non-exporting plants and this difference seems to have increased over time during the 1990s.

Two theories were put forward to explain this phenomenon. First, which is commonly referred to as the 'self-selection' hypothesis, argues that only the most productive firms are able to survive in the highly competitive export markets. The hypothesis is based on the presumption that there are additional costs involved in participating in export markets. These costs, which usually involve high fixed costs, include transport costs and expenses related to establishing distributional channels and production costs in adapting products for foreign tastes (Bernard and Jensen 1999). The alternative explanation argues that there is a learning effect from participating in exporting activities which will result in productivity improvement. One example is that exporters are often argued to be able to gain access to technical expertise, including product design and method, from their foreign buyers (Aw et al. 2000, p.67). This explanation is often termed as a 'learning-by-exporting' hypothesis.

Each of these theories applies to different state of exporting status of a firm. The self-selection hypothesis applies for a firm that is yet exporting but about to, and the learning-by-exporting hypothesis applies when a firm has become an exporter. Thus, the theories explain that productive firms self-select themselves to become exporters, and once there, these exporters learn and become even more productive than before they enter export markets.

In respect to the self-selection hypothesis, Bernard and Jensen (1999) found that exporters in US manufacturing are more efficient, larger and grow faster several years before they become exporters. Meanwhile, as for the other hypothesis, Hallward-Driemeier et al. (2002, p.25) observed a substantial productivity difference between domestic firms that were established as exporters and domestic firms that were not. This indicates that firms participating in export markets make a conscious decision to operate differently from ones that focus on the domestic market. Supporting this interpretation, they show that domestic exporters indeed bear a resemblance to foreign exporters. In particular, they are more capital intensive and use more equipment of recent vintage than domestic non-exporters.

It is worth noting here an implication of the presumption of additional costs required to engage in exporting activities, which is persistency in export participation. Once a firm decides to service export markets in a period of time, it tends to stay as exporter in the next period. While there has not been much study on this topic, there is an indication that the extent of these costs is large and serves as an important source of exporting persistency. For example, Roberts and Tybout (1997) found that exporting experience in the previous year had a strong and positive effect in determining export participation in the current year for plants in Colombian manufacturing.[3]

Export spillovers

Another implication of the sunk cost of exporting is that, if entering foreign markets is costly, there might be localized spillovers associated with exporting by one firm that reduces the cost of foreign market access for nearby firms. This is the idea of export spillovers. Two arguments support the idea (Aitken et al. 1997). First, geographic concentration of exporters may make it feasible to construct facilitates that are able to support export activities, such as seaports,

[3] Similar findings can also be observed in Campa (2004) and Bernard and Jensen (2004) for Spain and US manufacturing plants, respectively.

airports, and other logistics infrastructure. Thus, the source of export spillovers based on this argument is government or public initiatives. The other argument comes from the existence of MNEs. It is based on the presumption that activities or some particular characteristics of MNEs allow domestic firms to reduce their cost for exporting.

Export spillovers generated by MNEs are the focus of this study, and to facilitate the empirical analysis, it is important to explain the channels through which MNEs helps domestic firms in improving their export performance.

As indicated by Aitken et al. (1997) and detailed by Greenaway et al. (2004), there are three ways or channels that facilitate export spillovers from MNEs. The first is information about foreign markets. Subsidiaries usually acquire detailed information about foreign markets, which mostly comes from their parent companies. This channel is important for both domestic firms in the preparation stage for exporting and those which have already selling in export markets. The information classified by this channel includes, for example, information about regulations of foreign markets, taste and preference of foreign consumers, market competition situation in foreign markets, etc. This channel emphasizes the information that directly related to markets abroad.

The other channel focuses on technology or information about the technology brought by MNEs. Information classified by this channel is not directly related to information about foreign markets. As explained by Greenaway et al. (2004), domestic firms can benefit by using or adopting more advanced technology used by MNEs, which usually is materialized by demonstration effect and/or imitation. In practice, this channel usually works via – but not limited to – outsourcing practices and activities (e.g. the dispacthment of engineers from MNEs to domestic firms to supervise the production of the outsourced products, etc.). Supporting this, Machikita et al. (2009) found that in many Southeast countries, upstream-downstream transactions and personal communication are important factors that moderate the technology transfer from MNEs to domestic firms.

Finally, the last channel comes through competition effect. Entry of MNEs leads to increased competition at the first stage, but after that, it creates pressure for domestic firms to become more

productive. Given that higher productivity is needed to survive in export market, competition effect from MNEs thus facilities domestic firms to join and perform well in export markets.

Using plant-level data of Mexican manufacturing for the period 1986-1990, Aitken et al. (1997) found a robust result supporting the existence of export spillover that comes from MNEs on export performance of export performance of domestic plants in the sector. However, this finding is not robust to changes in sample size. Their results suggest the lack of robustness is related to large differences in specific industry characteristics.

The positive export spillovers effect from MNEs was confirmed by Kokko et al. (1997) and Greenaway et al. (2004). Using the case study of Uruguay manufacturing firms in 1988, Kokko et al. found that foreign ownership at sectoral level increases the likelihood of exporting. They, however, only found the positive impact for multinationals that were established after 1973, which was the more outward oriented period of Uruguay economy. There was no evidence of the export spillover for group of multinationals established before 1973, when the policy was more inward oriented. Greenaway et al., meanwhile, found that multinationals not only increase the decision of domestic firms to export, but also export intensity. They used a panel of firms in the UK in finding this. Unlike other previous studies, they showed evidence of the positive impact that runs through the three channels identified above.

2.1 Hyphotheses

Drawing from the discussion above, the following presents the testable hypotheses that relate the channels of export spillovers from the presence of MNEs with export response of domestic plants.

Technology channel

The larger the technology intensity of MNEs operation increases the chances of successful imitation by domestic firms. Thus, technological capability brought by MNEs (*FTECH*) is hypothesized to increase export participation and performance of the domestic plants.

Unlike the more traditional approach which underlines the link extent of ownership share with the degree of control, this study defines MNEs as plants that has any positive share of foreign

ownership. This consideration is based on previous empirical studies which suggest the share of foreign ownership does not necessarily reflect the extent of control.[4]

Competition channel

This study defines the importance of MNEs in an industrial sector to reflect the extent of competitive pressure created by MNEs (*FEMPSH*). The hypothesis concerning *FEMPSH* however is ambiguous. On the one hand, a positive relationship is expected, for the reason of the improved productivity of domestic firms as a result of competitive pressure from MNEs. On the other, however, a negative relationship could also occur, for the reason that the operation of MNEs may crowd out the operation of the domestic plants. This likely occurs if the motivation of investing abroad by the MNEs is expanding markets (i.e., the market-seeking hypothesis). The model built by Markusen and Venables (1999), where MNEs compete with domestic firms in industries producing final goods, predicts that the increase in the output due to the operation of MNEs decreases market price and lead to the exit of some domestic firms.

Information channel

Following Greenaway et al. (2004), this study defines the relative importance of foreign plants' export activities in an industry – scaled by the relative importance of foreign plants' export activities in the whole manufacturing sector, or (*RFEXPSH*), to represent the extent of information about foreign markets embedded in the operation of MNEs. The notion of 'export activities' is proxied by the extent of exported sales. Higher *RFEXPSH* allows domestic plants to learn about export markets more easily, which in turn increase their likelihood to participate in the markets. Thus, a positive relationship between *RFEXPSH* and the domestic plants' export performance is expected.

Dependency on plant heterogeneity

Notwithstanding the theoretical prediction and evidence as discussed earlier, there is a reason to argue that the positive impact of the export spillovers may different across firms.

[4] Aswicahyono and Hill (1995) for example reported that many Indonesian case studies have demonstrated that local partners often play relatively minor role even when they hold the majority of equity.

This proposition is motivated by the finding about the importance of firm heterogeneity in shaping firms productivity within an industry.[5] Melitz (2003), in response to this, built a theoretical model that takes into account the importance of the heterogeneity in imperfect competition setting. Predictions from Melitz's model are derived from an interaction between productivity difference across firms and the existence of some level of fixed cost for exporting.

As summarized in Helpman (2006), in predicting the impact of trade liberalization, or any policy for export orientation, the dynamic version of Melitz's model results in pressures for firms within an industry to increase its productivity. Yet, at the same time, the reduction of cost for exporting borne by trade liberalization lowers productivity level required by a firm to export. Trade liberalization thus creates higher industry productivity because only the more-productive firms survive the entry into the industry, and output is reallocated towards these more-productive firms.

Other models adopt Melitz's model to include technology adoption and innovation to reflect technology upgrading by firms (e.g. Bustos 2005; Yeaple 2005; Ekholm and Midelfart 2005). In Bustos' model, some firms adopt more-advanced technology to increase their productivity in responding to trade liberalization, or a fall in cost for exporting. However, the coexistence of firms with different productivity level prior to the trade liberalization results in an outcome that only more productive-firms upgrade their technology. As a final prediction, trade liberalization only causes firms with intermediate level of productivity to upgrade technology for an intention to better compete in export market. Less productive firms, meanwhile, stays to serve domestic market because they do not upgrade their technology. The model takes into account technology upgrading gives a prediction that only part of firms within an industry that are able to substantially increase their productivity after trade liberalization.

Guided by these theories, this study predicts that the impact of the export spillovers, through the channels, varies across the domestic plants depending on the plants' productivity. Thus, we expects a positive relationship for the following interaction variables: $FTECH * LP$, $FEMPSH * LP$, and $RFEXPSH * LP$.

[5] This was born from growing evidence the variation of firms that exports cannot be derived from a random sample, or not all firms within an industry export. Eaton et al. (2004), for example, highlights this fact for the French manufacturing, and Helpman et al. (2004) also did so for the case of US manufacturing.

3. Methodology

3.1 Statistical framework

Considering the analytical framework discussed in the previous section, empirical models to gauge the impact of the presence of MNES on domestic firms' export performance are estimated. This study applies the model on the rich Indonesian large and medium plant manufacturing data for the census year 1996 and 2006. The models utilize the panel-data feature of the data, although they uses only two data series. All of these decisions are explained below whenever they are relevant.

This study adopts the general approach of model specification from the literature on firm's export supply response. In particular, two dependent variables are considered to represent the response: (1) export participation, and (2) export intensity. The adoption of this approach is motivated by empirical literature on the subject, where export supply response is often examined by evaluating the change in some measures of export performance between two points of time. Calculating these measures is straightforward at the aggregate level, but not at the firm level. This is because aggregate change in export is a result from two different, but related, firm behaviors. First, existing exporters can increase or decrease their exported output. They may increase by redirecting output to foreign markets or by expanding exports. Included in this mechanism are exporters that switch from exporting to non-exporting. The second behavior is where non-exporters that have been domestically oriented switch to participate in foreign markets. The second mechanism can also be achieved by new firms entering the industry.

The empirical models are given as the following:

$$EP_{i,j,t} = \alpha_0 + \alpha_1 EP_{i,j,t-1} + \alpha_2 EP_{i,j,t-2} + \alpha_3 ' X_{i,j,t} + \alpha_4 ' Y_{j,t} + \alpha_5 ' Z_{j,t} + \varepsilon_{i,j,t} \qquad (3.1)$$

$$EXP_{i,j,t} = \beta_0 + \beta_1 ' X_{i,j,t} + \beta_2 ' Y_{j,t} + \beta_3 ' Z_{j,t} + \mu_{i,j,t} \qquad (3.2)$$

where (3.1) and (3.2) are export participation and export intensity equation, respectively. i represent plant i, j represent industry j, defined at four-digit ISIC level, and t represents time (i.e. t=1996, 2006). $EP_{i,j,t}$ is a binary variable which takes the value of 1 if the plant was

exporting in time t. EXP_{it} is a plant's export intensity and is defined as the ratio of exports to total output. Industry and regional dummies are included in both equations, to control for differences across industries and region, respectively. $EP_{i,j,t-1}$ and $EP_{i,j,t-2}$ are defined as exporting history variables. Their inclusion in the export participation equation is motivated by the persistency in exporting behavior. As explained, there are additional and large costs that a firm needs to pay if it had an intention to serve foreign markets (i.e. Roberts and Tybout 1997; Campa 2004).

Equation (3.1) and (3.2) are estimated using the domestic plants only. This is natural given that this study examines the impact on domestic firms.

Meanwhile, estimations are conducted only for the data of 1996 and 2006. The motivation for this is twofold. First, the years are census year. Therefore, the number of observation is substantially higher for these years compared to that of the other census year, particularly for the survey post-2000. For this period, the total number of plants included in the census is about 30 percent more than that of included in the survey. Second, key information to construct a variable that commonly used to proxy the pool of technology and knowledge, which is the expenditure for R and D activities, licenses and royalties, and trainings, are not available for the data of survey years. This information is only available in the census data.

This study pooled the data for the estimations. A year time-dummy variable is included to control for different business environment affecting the data in the two census year, particularly related to the situation of before and after the 1997/98 economic crisis.

Having argued for the use only the census year data, it is unavoidable however that the estimation has to draw information on the domestic plants' exporting status from the previous two years. Thus, for the estimation of the sample of 1996, for example, the plants' exporting status in 1994 and 1995 are added up into the sample. As explained, this creates a lost in the number of observations. However, as also explained, it is still worth pursuing in this direction, given that the key information to reflect technological capability of MNEs are not available in the non-census year data.

$X_{i,j,t}$ and $Y_{j,t}$ are sets of explanatory variables capturing the plant i and industry j characteristics at time t, respectively. $Y_{j,t}$ is designed to include variables that determine the entry of MNEs into a country. As noted in Greenaway et al. (2004), failure to address these determinants likely results in biased estimates because of possible endogeneity between the exporting decision and performance of domestic firms and the factors of MNEs presence.

Meanwhile, $Z_{j,t}$ is set of variables representing the channels of export spillover from MNEs. As described below, this is to proxy the channels of the spillovers as discussed in the previous section.

Equation (3.1) was estimated within the framework of a binary choice model (i.e. probit or logit), instead of a linear probability model (LPM). This is because the predicted probability derived from LPM may lie outside the 0-1 region, which is clearly not reasonable in practice.[6]

An important statistical issue regarding the estimation is sample censoring. That is, the dependent variable of equation (3.2), or $EXP_{i,j,t}$, can only be calculated for the plants that switch to become exporters. Given that the process that determines a firm's export participation is a non-random process, estimating equation (3.2) without taking into account the truncated sample suffers from omitted-variable problem, and this would produce biased estimates. In the theoretical econometric literature, the omitted variable is often called the inverse Mills ratio.

To solve this problem, the Heckman (1976) two-step estimation approach was employed.[7] The approach that Heckman proposed is to include the inverse Mills ratio as another explanatory variable in equation (3.2). This is done in two steps. In the first, a probit model to estimate equation (3.1) is regressed and the inverse Mills ratio is estimated/constructed. In the second step, equation (3.2) is regressed with the estimated inverse Mills as an additional regressor. A test for a selectivity problem can be done by evaluating the statistical significance of the estimated coefficient of inverse Mills ratio.

[6] Despite this, a binary response model also has a number of shortcomings. An important one is that the potential for bias arising from neglected heterogeneity (i.e. omitted variables) is larger in a binary choice model than in a linear model. Nevertheless, Wooldridge (2002) points out that estimating a binary response model by a binary choice model still gives reliable estimates, particularly if the estimation purpose is to obtain the direction of the effect of explanatory variables.

[7] See Johnston and Dinardo (1997) for more detailed exposition about the Heckman two-step approach.

3.2 Data

The data for the empirical analysis in this study are drawn from the census of manufacturing medium- and large-scale establishments (*Statistik Industri*, or SI) for the year 1996 and 2006. The establishments are defined as those with 20 or more employees. The surveys are undertaken by the Indonesian Central Board of Statistics (*Badan Pusat Statistik or* BPS).[8]

As noted in many studies, SI data are considered one of the best by the standard of developing countries. The data cover a wide range of information on the establishments, including some basic information (ISIC classification, year of starting production, location), ownership (share of foreign, domestic and government), production (gross output, stocks, capacity utilisation, share of output exported), material costs and various type of expenses, labour (head-count and salary and wages), capital stock and investment, and sources of investment funds.

The data, however, have several limitations. Among other, they do not include information which can identify whether an establishment is a single-unit or a part of a multi-plant firm. As a result, establishments owned by an enterprise cannot be linked up, and hence the number of enterprises is over-numerated: some plants may have been counted as firms whereas in practice they are not.

[8] BPS provided the authors with the raw data of these surveys in electronic form.

3.2 Measurement of variables

This subsection lists and details how this study measures the variables used in the estimation.

Export spillover variables

Adopting the variables employed by Greenaway et al. (2004), three export spillovers variables are included, each of which represents the channel of the spillovers: foreign technological capability ($FTECH_j$), foreign employment share ($FEMPLSH_j$), and foreign technological capability ($RFEXPSH_j$). All these are defined at industry level, i.e., at four-digit ISIC level, to capture together the concentration effect of MNEs presence.

As commonly adopted in the literature, $FTECH_j$ is proxied by technology-related expenditure of foreign plants as a percentage of sales. The technology-related expenditure includes the expenditure for R-and-D, training activities, and license fees.[9] For industry j, the formula is

$$FTECH_j = \frac{\sum_f (\text{R-and-D cost + training cost + license and royalties fees})_f}{\sum_i (\text{output})_i}$$

where *f* and *i* denote foreign plant f and general plant *i*, respectively.

$FEMPSH$ is proxied by the share of foreign plants' employment in an industry. Thus, for industry j,

$$FEMPSH_j = \frac{\sum_f (\text{total number of employees})_f}{\sum_i (\text{output})_i}$$

[9] The inclusion of license fees to large extent is motivated by the general understanding that the major mode of technological transfer occurring in Indonesia has been through technical licensing agreements (Thee 2006).

RFEXPSH is the relative importance of foreign plants' export activities in an industry, scaled by the relative importance of foreign plants' export activities in the whole manufacturing sector. For industry *j*, the formula to compute it is the following,

$$RFEXPSH_j = \frac{\left(\frac{\sum_f (\text{total exports})_f}{\sum_i (\text{output})_i} \right)_j}{\left(\frac{\sum_f (\text{total exports})_f}{\sum_i (\text{output})_i} \right)}$$

Plant level variables (control variables)

Size ($SIZE_i$) is proxied by number of employees. The other common alternatives, such as output or profits, are not used as they tend to be more sensitive to changes in the business cycle.

This study employs real value added per labour as a proxy for labour productivity (LP_i).[10] Wholesale price indices at three-digit ISIC level are used to compute the real value added.

Government ownership (GOV_i) is proxied by the share of central and regional government in a plant's capital structure.

Import dependence ($IMDEP_i$) is proxied by the intensity of imported input in total input. For plant *i*, it is defined as

$$IMDEP_i = \frac{(value\ of\ \ imported\ \ input)_i}{(value\ of\ \ imported\ \ +\ \ domestic\ input)_i}$$

[10] Value added is chosen to proxy output, instead of gross output, because it avoids the double-counting problem and is less sensitive to the substitution between intermediate and labor inputs.

Industry level variables (control variables)

As explained, this study includes a set of industry-level variables that account for the determinants of MNEs operation in host country (i.e., the matrix $Y_{j,t}$). The following lists and details these variables which are also defined at four-digit ISIC.

Minimum efficient scale, or MES_j, is included to account for the size of an industry. It is defined as the average plant size accounting for 50 percent of industry output (Caves et al. 1975). Plant size is measured by total number of workers.

Capital intensity (ICI_j) is included to capture the likelihood of MNEs investing in industries with above-average capital requirement and high capital intensity. As explained in Aswicahyono and Hill (1995), MNEs are usually accustomed to large-based operation in their home countries and brings advanced technology. The advanced technology is presumably could be adopted by firms that have sufficient capital resources.

Following Globerman et al. (2004), for ICI in industry j , this is

$$ICI_j = \frac{(\text{energy costs})_j}{(\text{total numbers of production employee})_j}$$

$$= \frac{(\text{fuel costs})_j + (\text{electricity cost})_j}{(\text{total numbers of production employee})_j}$$

Export intensity ($IEXP_j$) is included to capture the interest of MNEs to invest in export oriented sectors. For industry *j*, it is defined as as the ratio of export to total output,

$$IEXP_j = \frac{EX_j}{Output_j}$$

where $IEXP_j$ is exported output of an industry.

MNEs usually possess brand names, and therefore, they usually invest in industry with high level of advertising activities. Advertising intensity (ADV_j) is included to capture the extent of differentiated product. For industry *j*, it is

$$ADV_j = \frac{(\text{advertising expenditure})_j}{(\text{output})_j}$$

The other variables aim at capturing the importance of competition in an industry. Inclusion of these variables is motivated by the proposition that MNEs may be interested to enter industry with either less competitive industry or an industry high import protection. This is particularly true for the market-seeking MNEs. Two variables are included to proxy the extent of competition, namely Herfindahl Index (HHI) and nominal tariff (*TARIFF*). The latter is included to capture the extent of import protection which likely affects domestic competition.

For industry *j*, the formula for HHI is

$$HHI_j = \sum_i \left(\frac{VA_i}{\sum VA_i} \right)^2$$

where VA_i is the value added of plant i in industry j.

As for TARIFF, this study uses the nominal tariff data at three-digit ISIC level, drawn from WTO database through the service of WITS database.

Other control variables

In addition to the control variables above, the estimations include dummy variables for provinces, to control for regional differences in the plant operation in Indonesia. A year dummy variable for 2006 is included to control for differences across time. As noted, this variable should capture the different business environment for the period of before and after the crisis. Finally, industry dummy variables are also included to capture other cross-industry differences which are not captured by the other variables.

4. Econometric results and analysis

Before presenting and discussing the econometric results, it is useful to describe the general picture of the entry of domestic plants into exporting markets. To do so, we define exporting entry rate, in terms of number of plants ($ENX1_{j,t}$) and value added ($ENX2_{j,t}$) as the following:

$$ENX1_{j,t} = \frac{ENXP_{j,t}}{TXP_{j,t-1}} \quad \text{and} \quad ENX2_{j,t} = \frac{ENXVA_{j,t}}{TXVA_{j,t-1}}$$

where: $ENXP_{j,t}$ = Total number of plants in industry j that switch to be exporter in time t

$TXP_{j,t-1}$ = Total number of exporting plants in industry j at time $t-1$

$ENXVA_{j,t}$ = Exported value added of plants that switch to be exporter in industry j at time t

$TXVA_{j,t-1}$ = Exported value added of all exporting plants in industry j at time $t-1$

Figure 4.1 Exporting entry rate of domestic and foreign plants in the Indonesian manufacturing, average 1996 and 2006.

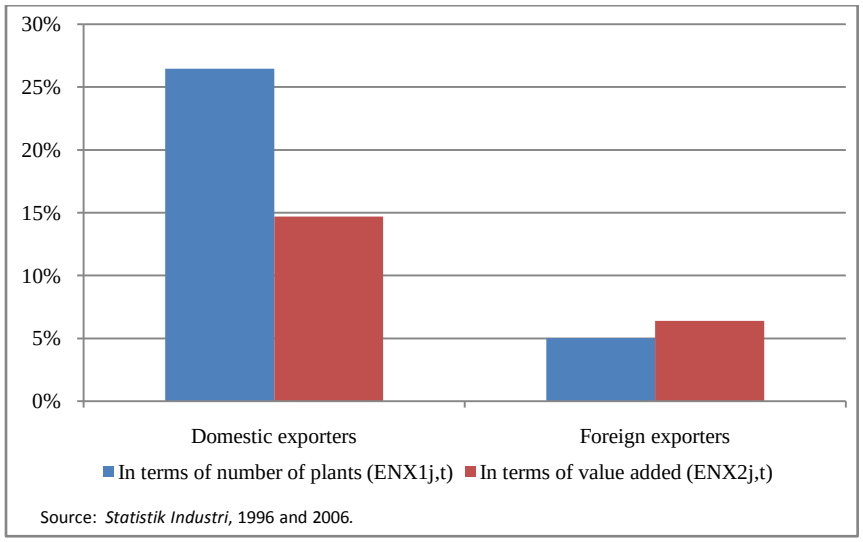

Figure 4.1 presents the average 1996 and 2006 exporting entry rate for the group of foreign and domestic plants in the Indonesian manufacturing. The figure reveals the entry into exporting is substantially high for the group of domestic plants. In terms of number of plants, the rate is about 30 percent, while in terms of value added, the rate is about 15 percent. This is in contrast with the

entry rate for the group of foreign plants, which is about 5 percent for both in terms of number of plants and value added. This is a favorable observation from policy perspective, which indicates an active effort of domestic plants selling to export markets.

However, looking at the figure more carefully, there is indeed an issue regarding the favorable performance. Comparing the two type of entry rates (i.e., $ENX1_{j,t}$ and $ENX2_{j,t}$) across domestic and foreign plants group, it is suggested that many of the new domestic exporters are 'small' exporters, in terms of their exported output. This is in contrast with the picture of the new foreign exporters, which is indicated to much 'larger' in terms of their exported output. The comparison suggests that a new foreign exporter exports two times larger than a new domestic exporter. Obviously there could be many reasons to explain this, but it seems that many new domestic exporters are more constrained than their foreign counterparts.

Table 4.1 reports the probit regression results of the export participation equation (i.e., equation (3.1)), which consists all domestic plants operating in 1996 and 2006. The regressions are the first step in the Heckman selection model. Some specifications were experimented and the table reports the most favorable ones in terms of model fit and estimated coefficients. The industry dummy variables are included at two-digit ISIC level.[11] The table reports robust standard errors for the reason of heteroscedastic variance. The Wald test for overall significance in all reported specifications passes at 1 percent level. The examination for the presence of outliers was done in the experimental stage, and the presented results have been controlled for the outliers (i.e., by introducing a dummy variable which identifies the outliers).

The results provide a strong support for the importance of technology channel in facilitating the export spillovers. The estimated coefficients of $FTECH_{j,t}$, which represent the channel, are positive, large, and statistically very significant in the result of specification (4.1) and (4.2). They support the hypothesis for the existence of demonstration/imitation effect from the technology brought by MNEs. The magnitude of the coefficients suggests the demonstration effect is

[11] At the experimental stage, initially industry dummy variables at four-digit ISIC were estimated. However, many industry-level variables were dropped for the reason of perfect collinearity. For this reason, the estimations were experimented at three- and two-digit ISIC level. Finally, the estimations with the two-digit ISIC dummy variables were chosen for the reason of a better results compared to the other estimations.

substantially important in determining whether or not a domestic plant participate in exporting activities in time *t*.

Table 4.1 The determinants of export participation in 1996 and 2006: regression results

Dependent variable	**$EP_{i,t}$**			
Specification	**(4.1)**	**(4.2)**	**(4.3)**	**(4.4)**
$FTECH_{j,t}$	21.689 (2.19)*			27.024 (2.64)**
$FEMPSH_{j,t}$		-0.19 (1.05)		0.175 (0.84)
$RFEXPSH_{j,t}$			-0.148 (5.15)**	-0.172 (5.26)**
$EP_{i,t-1}$	1.33 (30.10)**	1.332 (30.15)**	1.334 (30.15)**	1.332 (30.10)**
$EP_{i,t-2}$	0.847 (19.13)**	0.847 (19.13)**	0.842 (19.00)**	0.841 (18.97)**
$\log(SIZE)_{i,t}$	0.4 (35.98)**	0.4 (35.99)**	0.401 (35.97)**	0.401 (35.98)**
$LP_{i,t}$	2.16[a] (2.41)*	2.19[a] (2.44)*	2.1[a] (2.34)*	2.08[a] (2.31)*
$GOV_{i,t}$	-0.072 (1.14)	-0.08 (1.26)	-0.092 (1.43)	-0.085 (1.33)
$IMDEP_{i,t}$	0.308 (5.54)**	0.322 (5.79)**	0.329 (5.94)**	0.315 (5.66)**
$MES_{j,t}$	-0.00003 (4.38)**	-0.00003 (4.32)**	-0.00003 (4.81)**	-0.00003 (4.94)**
$ICI_{j,t}$	2.14[a] (0.28)	6.42[a] (0.85)	9.5[a] (1.27)	5.32[a] (0.70)
$PD_{j,t}$	0.379 (0.27)	0.044 (0.03)	-0.151 (0.11)	0.268 (0.19)
$IEXP_{j,t}$	1.038 (13.19)**	1.05 (13.04)**	1.012 (12.85)**	1.001 (12.25)**
$HI_{j,t}$	0.325 (1.89)+	0.305 (1.77)+	0.354 (2.02)*	0.374 (2.11)*
$TARIFF_{j,t}$	-0.004 (2.00)*	-0.004 (2.13)*	-0.004 (1.86)+	-0.003 (1.72)+
Dummy year 2006	0.023 (0.71)	0.005 (0.17)	-0.014 (0.47)	0.006 (0.18)
Dummy variables for provinces	Included	Included	Included	Included
Dummy variables for industries	Included	Included	Included	Included
Constant	-4.206 (17.02)**	-4.165 (16.87)**	-4.06 (16.34)**	-4.089 (16.40)**
Observations	25801	25801	25658	25658
Wald chi2	13562.23	13558.62	13528.36	13537.34
Pseudo R-square	0.535	0.5349	0.535	0.5354

Notes: [1)] Robust Z statistics in parentheses

[2)] Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

[a)] The coefficient was multiplied by 10^{-07} to improve presentation

The results, however, provide completely different finding in respect to the other export spillover channels, namely the competition and information channel. Consider first, the results for competition channel, represented by $FEMPSH_{j,t}$. The estimated coefficients of $FEMPSH_{j,t}$ are highly insignificant in the result of specification (4.2) and (4.4). Thus, the extent of competition arising from the operation of MNEs does not seem to give any impact on export participation of domestic firms. The positive estimated coefficient in specification (4.4), however, indicates that the forces to improve the productivity of domestic firms created by this channel might exist, although this may be so small.

Turning to the results for information channel, the estimated coefficients of $RFEXPSH_{j,t}$, which represents the effect of this channel, are negative and highly significant (see the results of specification (4.3) and (4.4)). Therefore, the concentration of export activities of MNEs in an industry is suggested to reduce the likelihood of domestic firms to participate in export markets. This does not accord the hypothesis for the impact of this channel.

While it is rather difficult to reconcile, one possible explanation for the results may be because $RFEXPSH_{j,t}$ is not able to fully capture the extent of the information spillovers. As detailed in section 3.3, this variable utilizes the information about the extent of exported output of all foreign plants in an industry – in capturing the extent of potential information spillovers. While useful, this variable may at the same time capture the extent domination of the foreign plants – as a representation of MNEs – in the export of the industry. Therefore, unlike in the Greenaway et al. (2004), this variable reflects more on competition effect rather than the contribution of information spillover.

Another point to argue is that, much of the information spillovers from MNEs about export markets could in fact be transferred by activities which are very hard to be measured, and some of this may even be very difficult to be linked up with presence of MNEs. Personal contacts, for example, provides an avenue for information spillover. However, this is very difficult to measure based on the available information in the dataset.

Notwithstanding the potential weakness of the variable, the results concerning $RFEXPSH_{j,t}$ may actually reflect a generally presumed behavior of MNEs which tend to protect the know-how and

other important information they posses. In this respect, the results are in line with the findings in the literature about weak observed impact of productivity spillover from the presence of MNEs (e.g. Hanson 2001; Gorg and Greenaway 2004). As indicated by these studies, the weak spillover effect may be due to the fact that MNEs protects their firm-specific assets – presumably including the precious information about foreign markets – very effectively (Greenaway et al. 2004, p. 1029).

Table 4.2 reports the OLS regression results of the export intensity equation (i.e., eguation 3.2) for all domestic plants which were exporting in 1996 and 2006. This is the second step of the Heckman estimation model for sample selection. The coefficient of inverse Mills ratio is statistically significant in all specifications at 1 percent level, implying the disturbance in the export participation and export intensity equation is correlated. As explained, the used of Heckman method correct the potential bias estimates from this correlation. The F-test for overall significance passes at 1 percent level and the While's robust t-statistics were used to correct for heteroscedasticity.

Looking at the estimated coefficients of all variables representing the export spillovers, a similar finding emerges. That is, technology channel is positively related to the export intensity of the domestic plants that become exporters, and competition effect from the foreign plants does not seem to encourage domestic plants to improve their export intensity once these plants become exporters.

However, according to the result in specification (4.6), the negative coefficient of $FEMPSH_{j,t}$ is now very statistically significant at 1 percent level. Thus, exports of domestic exporters tend to be lower with a strong presence of MNEs. Hence, MNEs seems to crowd out domestic exporters. This finding, while does not accord the hypothesis on the positive impact of export spillovers, seems to capture the strategic motive of market-seeking hypothesis by MNEs. The competition in domestic final-goods market between MNEs and domestic firms could decrease market price which in turn could lead to the exit of some domestic producers (Markusen and Venables 1999).

It is worth commenting here that the crowding out may indicate a slow process of the competition effect in creating more productive firms that ready to export. As underlined by the theory that recognizes plant heterogeneity (e.g. Melitz 2003), the impact of trade liberalization

takes time through the dynamics of competition in improving the productivity level of both industry and firms that populate it.

Table 4.2 The determinants of export intensity in 1996 and 2006: regression results

Dependent variable	**$EXP_{i,t}$**			
Specification	**(4.5)**	**(4.6)**	**(4.7)**	**(4.8)**
$FTECH_{j,t}$	6.672 (1.89)+			12.314 (1.70)+
$FEMPSH_{j,t}$		-0.203 (3.16)**		0.039 (0.52)
$RFEXPSH_{j,t}$			-0.075 (6.86)**	-0.077 (6.11)**
$\log(SIZE)_{i,t}$	-0.014 (3.54)**	-0.014 (3.69)**	-0.014 (3.55)**	-0.013 (3.52)**
$LP_{i,t}$	-4.27[a] (1.53)	-4.18[a] (1.49)	-4.64[a] (1.66)+	-4.68[a] (1.68)+
$GOV_{i,t}$	-0.01 (0.49)	-0.014 (0.71)	-0.017 (0.84)	-0.017 (0.82)
$IMDEP_{i,t}$	0.009 (0.51)	0.012 (0.66)	0.013 (0.75)	0.014 (0.79)
$MES_{j,t}$	-2.6[b] (0.98)	-3.02[b] (1.14)	-3.35[b] (1.27)	-3.18[b] (1.20)
$ICI_{j,t}$	-1.2[b] (4.55)**	-1.1[b] (4.18)**	-1.05[b] (4.02)**	-1.04[b] (3.92)**
$PD_{j,t}$	-2.773 (5.26)**	-2.676 (5.11)**	-2.684 (5.14)**	-2.735 (5.21)**
$IEXP_{j,t}$	0.416 (15.39)**	0.435 (15.80)**	0.414 (15.39)**	0.409 (14.76)**
$HI_{j,t}$	-0.14 (2.13)*	-0.15 (2.28)*	-0.148 (2.26)*	-0.146 (2.23)*
$TARIFF_{j,t}$	0.002 (3.42)**	0.002 (3.20)**	0.003 (3.60)**	0.003 (3.60)**
Dummy year 2006	0.073 (6.67)**	0.085 (8.09)**	0.072 (6.91)**	0.067 (5.83)**
Mills ratio	-0.087 (11.53)**	-0.088 (11.64)**	-0.088 (11.63)**	-0.088 (11.59)**
Dummy variables for provinces	Included	Included	Included	Included
Dummy variables for industries	Included	Included	Included	Included
Constant	0.599 (7.42)**	0.612 (7.57)**	0.646 (8.03)**	0.647 (8.03)**
Observations	4992	4992	4992	4992
R-square	0.3	0.3	0.3	0.3

Notes: [1)] Robust F statistics in parentheses

[2)] Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

[a)] The coefficient was multiplied by 10^{-08} to improve presentation

[b)] The coefficient was multiplied by 10^{-06} to improve presentation

Another point worth elaborating is about the estimated coefficient of $FTECH_{j,t}$, which is much less significant than that drawn from the export participation equation. It suggests a much less important effect of the pooled technology once the domestic plants become exporters. This is consistent with the 'self-selection' hypothesis. As explained, the hypothesis implies that firms prepare to become much more productive only before selling to export markets, and not when they are in. Therefore, it is natural to see the higher importance of $FTECH_{j,t}$ as a determinant of export participation, rather than as a determinant of export intensity.

The fact that the estimated coefficient $FTECH_{j,t}$ is still significant, albeit only at 10 percent level, is also consistent with the hypothesis of learning by exporting, however. Again, as explained earlier in Section 2, this hypothesis argues that exporters continuously learn to improve their productivity even if they have succeeded to operate in export markets. The results suggest that the domestic plants continues to learn from the pooled of technology brought by MNEs. It is in fact accord the impression given by Figure 4.1, which indicates that many, or perhaps most, of the domestic new exporters are still constrained, compared to the new foreign exporters.

All in all, the results presented in Table 4.1 and 4.2 suggest a rather mixed finding about the role of export spillovers channels on export participation of domestic plants. As discussed, there is a possibility that the impact of export spillovers – through their channels – varies across firms with different level of productivity. The following two tables present the results of testing this hypothesis on the equations, by including the interaction variables of $FTECH_{j,t} * LP_{i,t}$, $FEMPSH_{j,t} * LP_{i.t}$, and $RFEXPSH_{j,t} * LP_{i,t}$.

Table 4.3 presents the estimation results of the export participation equation. To reduce the potential multicolinearity, each channel variable and its interaction with labor productivity was included separately in the estimation.

Table 4.3 The determinants of export participation in 1996 and 2006: regression results, with the export spillover interactive effects

Dependent variable	**$EP_{i,t}$**		
Specification	**(4.9)**	**(4.10)**	**(4.11)**
$FTECH_{j,t}$	21.027 (2.11)*		
$FEMPSH_{j,t}$		-0.197 (1.09)	
$RFEXPSH_{j,t}$			-0.152 (5.26)**
$LP_{i,t}$ * $FTECH_{j,t}$	0.00002 (0.67)		
$LP_{i,t}$ * $FEMPSH_{j,t}$		4.74[a] (1.85)+	
$LP_{i,t}$ * $RFEXPSH_{j,t}$			1.22[a] (1.95)+
$EP_{i,t-1}$	1.331 (30.11)**	1.333 (30.15)**	1.334 (30.16)**
$EP_{i,t-2}$	0.846 (19.11)**	0.847 (19.13)**	0.842 (19.00)**
$log(SIZE)_{i,t}$	0.401 (36.10)**	0.401 (36.07)**	0.401 (36.04)**
$GOV_{i,t}$	-0.069 (1.08)	-0.078 (1.23)	-0.09 (1.41)
$IMDEP_{i,t}$	0.312 (5.62)**	0.323 (5.81)**	0.331 (5.98)**
$MES_{j,t}$	-0.00003 (4.36)**	-0.00002 (4.29)**	-0.00003 (4.78)**
$ICI_{j,t}$	4[a] (0.53)	7.01[a] (0.92)	1.01[b] (1.34)
$PD_{j,t}$	0.456 (0.32)	0.082 (0.06)	-0.12 (0.09)
$IEXP_{j,t}$	1.035 (13.17)**	1.049 (13.03)**	1.011 (12.83)**
$HI_{j,t}$	0.317 (1.84)+	0.304 (1.77)+	0.357 (2.03)*
$TARIFF_{j,t}$	-0.004 (2.03)*	-0.004 (2.11)*	-0.004 (1.86)+
Dummy year 2006	0.031 (0.95)	0.011 (0.36)	-0.009 (0.31)
Dummy variables for provinces	Included	Included	Included
Dummy variables for industries	Included	Included	Included
Constant	-4.201 (17.00)**	-4.161 (16.86)**	-4.055 (16.33)**
Observations	25801	25801	25658
Wald chi2	13557.15	13555.13	13525.07
Pseudo R-square	53.48	53.48	53.49

Notes: [1)] Robust Z statistics in parentheses

[2)] Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

[a)] The coefficient was multiplied by 10^{-07} to improve presentation

[b)] The coefficient was multiplied by 10^{-06} to improve presentation

The results do not suggest any variation across plants regarding the demonstration/imitation effect from technology adopted by MNEs. The coefficient of $FTECH_{j,t} * LP_{i,t}$, although positive, is very small and highly insignificant (see the result of specification (4.9)).

The results, however, suggest that the impact of competition pressure from MNEs is different across firms. In the result of specification (4.10), the estimated coefficient of $FEMPSH_{j,t} * LP_{i.t}$ is positive, although significant only at 10 percent level and very small. Nonetheless, this indicates the extent of competitive pressure on domestic firms to improve their productivity – for a higher chance of participating in export markets – is higher for the more productive domestic firms. This supports the theoretical model of Bustos (2005) which predicts that the impact of trade liberalization on technology upgrading depends on firms' productivity level. Firms with intermediate productivity level is predicted to upgrade their technology – and hence improve their productivity and export performance – while firms with low level of productivity stays using traditional technology and do not supply to export markets.

There is weak evidence that the effect of information about export markets that can be spilled over to domestic firms depends on whether the domestic firms are more or less productive. The estimated coefficient of $RFEXPSH_{j,t} * LP_{i,t}$ is positive albeit very small and significant at 10 per cent level (see the result of specification (4.11)). This, of course, presuming that $RFEXPSH_{j,t}$ captures the extent of the available information provided by MNEs (see the earlier discussion on the potential weakness of the variable in capturing the information). This finding is consistent to that of the previous one (i.e., the interactive between competition effect and labor productivity), and together, the findings suggest that only more productive firms are able to utilize positive effect of export spillovers from the presence of MNEs.

Table 4.4 The determinants of export intensity in 1996 and 2006: regression results, with the export spillover interactive effects

Dependent variable	**$EXP_{i,t}$**		
Specification	**(4.12)**	**(4.13)**	**(4.14)**
$FTECH_{j,t}$	6.728 (1.90)+		
$FEMPSH_{j,t}$		-0.202 (3.13)**	
$RFEXPSH_{j,t}$			-0.073 (6.65)**
$LP_{i,t}$ * $FTECH_{j,t}$	3.03[b] (0.33)		
$LP_{i,t}$ * $FEMPSH_{j,t}$		-5.26[a] (0.45)	
$LP_{i,t}$ * $RFEXPSH_{j,t}$			-5.37[a] (1.44)
$\log(SIZE)_{i,t}$	-0.014 (3.55)**	-0.014 (3.70)**	-0.014 (3.59)**
$GOV_{i,t}$	-0.01 (0.52)	-0.015 (0.74)	-0.017 (0.83)
$IMDEP_{i,t}$	0.008 (0.43)	0.011 (0.62)	0.013 (0.73)
$MES_{j,t}$	-2.65[b] (1.00)	-3.11[b] (1.18)	-3.48[b] (1.32)
$ICI_{j,t}$	-1.25[b] (4.75)**	-1.13[b] (4.24)**	-1.03[b] (3.88)**
$PD_{j,t}$	-2.734 (5.15)**	-2.67 (5.09)**	-2.696 (5.16)**
$IEXP_{j,t}$	0.416 (15.36)**	0.434 (15.77)**	0.412 (15.31)**
$HI_{j,t}$	-0.145 (2.21)*	-0.154 (2.34)*	-0.161 (2.45)*
$TARIFF_{j,t}$	0.002 (3.38)**	0.002 (3.18)**	0.002 (3.55)**
Dummy year 2006	0.07 (6.51)**	0.084 (7.96)**	0.071 (6.86)**
Mills ratio	-0.087 (11.53)**	-0.088 (11.65)**	-0.088 (11.64)**
Dummy variables for provinces	Included	Included	Included
Dummy variables for industries	Included	Included	Included
Constant	0.599 (7.42)**	0.612 (7.57)**	0.647 (8.04)**
Observations	4992	4992	4992
R-square	0.3	0.3	0.3

Notes: [1)] Robust F statistics in parentheses

[2)] Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

[a)] The coefficient was multiplied by 10^{-08} to improve presentation

[b)] The coefficient was multiplied by 10^{-06} to improve presentation

Table 4.4 shows the OLS estimation results that test the effect of the interactive variables on export intensity. The results are similar to that of the export participation equation except in these, the estimated coefficient of $FEMPSH_{j,t} * LP_{i.t}$ and $RFEXPSH_{j,t} * LP_{i,t}$ are now negative (i.e., changing sign). However, these coefficients are insignificant, particularly for the former where it is highly insignificant. Therefore, all in all, there is no evidence that the contribution of export spillover depends on the productivity level of exporters. To some extent, this is consistent with the 'self-selection' hypothesis, for the reasons that productivity level of within the group of exporters should not be much different – setting aside the importance of other factors that are unable to be captured by these regressions.

5. Summary and conclusion

This study examines the positive externalities from the presence of MNEs in affecting the export performance of domestic firms. It asks whether the existence of the MNEs helps domestic firms to participate and perform well in export markets. The study takes the case study of the Indonesian manufacturing as a case study, utilizing the rich data of the country manufacturing census.

In its empirical analysis, the study attempts to answer the question by examining the channels through which the positive export spillovers effect can be transmitted to domestic firms. In particular, it examines whether or not the pooled of technology and information about foreign markets brought by MNEs, as well as competition effect from the MNE operation, are able to increase the likelihood of domestic firms to participate in export market and to increase the extent of the domestic firms exports.

The empirical results provide rather mixed findings. While the extent of pooled technology brought by foreign plants was found to increase the participation and exporting performance of domestic plants, the competition arising from the operation of the foreign plants seems to crowd out domestic exporting plants. The crowding out effect suggests the behavior of market-seeking hypothesis of MNEs in the Indonesian manufacturing. The study also found a negative export spillover impact from the channel of information about foreign markets. This finding, however,

may be due to the weakness in the proxy used by the estimations. Further analysis give some evidence that the positive impact of export spillovers in the Indonesian manufacturing depends on the level of productivity of domestic firms. Specifically, the impact of competition effect in export participation is higher for the more productive domestic plants.

Notwithstanding the mixed findings, this study still suggests the importance of policies that invite MNEs. In terms of export spillover effect, the most obvious justification can be drawn from the finding regarding the demonstration/imitation effect from technology brought by MNEs. Meanwhile, the competition effect from the presence of MNEs should, in the longer run and through the dynamics of competition, produce a population of more productive exporters. In addition, strengthening trade facilitations seems to be a proposition. As the analysis show, much of the exports the new domestic exporters in the country's manufacturing sector are somehow still constrained. Policies that improve trade facilitations, therefore, should be able to also 'unlock' these constrained exporters.

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