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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 multinational enterprises (MNEs) on a firm's decision to export, and on export intensity. It utilizes data from Indonesian manufacturing for the census years 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 improving technological knowledge raises the likelihood that domestic firms will enter the export market, and improves export performance. The analysis finds weak evidence to support 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 pool of technological knowledge. Other than this, strengthening trade facilitation seems to be a positive proposition, given the finding that many of the new domestic exporters seem to have been constrained in increasing their exports.

Keywords: Indonesia, multinationals, export participation

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1. Introduction

Proponents of globalization anticipate a positive impact from foreign direct investment (FDI) on development. An underlying argument justifying this is that the presence of FDI, through the operation of multinational enterprises (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, often termed technology/productivity spillover. However, there is still conflicting evidence about the existence or positive impact of the spillover. On the one hand, Gorg and Greenaway (2004) for example reported negative productivity spillover occurring in several European countries, while on the other there exist studies which find evidence of a positive spillover effect for some Asian countries, such as Takii (2006) and Kohpaiboon (2006) for Indonesia and Thailand, respectively.

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

Indonesian manufacturing provides a good case study, considering the rapid FDI flow into the country since the early 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 the late 1980s. During the same period, the country also experienced 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 an analytical framework and identifies the testable hypotheses. Section 3 describes the methodology adopted by the study. Section 4 presents the econometric results and the analysis. Section 5 summarizes and concludes the study.

2. Analytical Framework

Export spillover, 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. According to this theory, the improvement in domestic firms' export performance is the consequence or result of export spillovers.

The accumulation of evidence from a wide 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 reported 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 labor 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. The 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. This 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, as well as 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 designs and methods, from their foreign buyers (Aw *et al*. 2000, p.67). This explanation is often termed the 'learning-by-exporting' hypothesis.

Each of these theories applies to different states of the exporting status of a firm. The self-selection hypothesis applies for a firm that is not yet exporting but is 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 entered export markets.

In respect of 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, 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 presumed additional costs required for a firm 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 an exporter in the next period. While there has not been much study of 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.[1]

2.1. 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 facilities that are able to support export activities, such as seaports, airports, and other logistics infrastructure. Thus, the source of export spillovers based on this argument is governmental or public

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

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 of 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 help 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 started selling in export markets. The information classified by this channel includes, for example, information about regulations in foreign markets, taste and preference of foreign consumers, the market competition situation in foreign markets, etc. This channel emphasizes the information that directly relates to markets abroad.

The second 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 the more advanced technology used by MNEs, which is usually brought about by the demonstration effect and/or imitation. In practice, this channel usually works via – but not limited to – outsourcing practices and activities (e.g. the allocation 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 Asian 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 the competition effect. Entry of MNEs leads to increased competition initially, but after that, it creates pressure for domestic firms to become more productive. Given that higher productivity is needed to survive in export markets, the competition effect from MNEs thus encourages 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 coming from MNEs on the 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*. (2001) and Greenaway *et al*. (2004). Using the case study of manufacturing firms in Uruguay in 1988, Kokko *et al*. (2001) found that foreign ownership at sectoral level increases the likelihood of exporting. They, however, only found a positive impact for multinationals that were established after 1973, which was a more outward oriented period for the Uruguayan economy. There was no evidence of export spillover from the group of multinationals established before 1973, when the policy was more inward oriented. Greenaway *et al*. (2004), meanwhile, found that multinationals not only increase the desire 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.

2.2. Hypotheses

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

2.2.1. Technology Channel

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

Unlike the more traditional approach which underlines the link extent of ownership share with degree of control, this study defines MNEs as plants that have 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.[2]

2.2.2. 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, stemming from 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 is likely to occur if the motivation for 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 output due to the operation of MNEs decreases market price and leads to the exit of some domestic firms.

2.2.3. 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. Thus, 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 of participating in the markets. Thus, a positive relationship between *RFEXPSH* and the domestic plants' export performance is expected.

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

2.2.4. Dependency on Plant Heterogeneity

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

This proposition is motivated by the finding about the importance of firm heterogeneity in shaping firms' productivity within an industry.[3] Melitz (2003) built a theoretical model that takes into account the importance of heterogeneity in a setting of imperfect competition. 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 their productivity. Yet, at the same time, the reduction of cost for exporting brought about 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 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 levels prior to the trade liberalization results in an outcome that only the more productive-firms upgrade their technology. As a final prediction, trade liberalization only causes firms with an intermediate level of productivity to upgrade their technology so as better to compete in export market. Less productive firms, meanwhile, stay to serve the domestic market because they do not upgrade their technology. The model takes into account technology upgrading, and gives a prediction that only a fraction of firms within an industry are able to substantially increase their productivity after trade liberalization.

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

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 expect a positive relationship for the following interaction variables: $FTECH * LP$, $FEMPSH * LP$, and $RFEXPSH * LP$.

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 to the rich Indonesian large and medium plant manufacturing data for the census years 1996 and 2006. The models utilize the panel-data feature of the data, although they use 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 firms 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:

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

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

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 intends to enter foreign markets (i.e. Roberts and Tybout 1997; Campa 2004).

Equations (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.

The estimations are made only for the data of 1996 and 2006. This is because, key information needed to construct a variable that is commonly used to proxy the pool of technology and knowledge, namely the expenditure for research and development (R&D) activities, licenses and royalties, and training, is only the data of these years.

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

Having argued for the use of only the census years' 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 used into the sample. As explained, this creates a reduction in the number of observations. However, as also explained, it is still worth going in this direction, given that the key information to reflect the technological capability of MNEs is 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. 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.[4]

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 the 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.[5] The approach that Heckman proposed is to include the inverse Mills ratio

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[4] 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's purpose is to obtain the direction of the effect of explanatory variables.

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

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. In the second step, equation (3.2) is regressed with the estimated inverse Mills ratio as an additional regressor. A test for a selectivity problem can be done by evaluating the statistical significance of the estimated coefficient of the inverse Mills ratio.

3.2. Data

The data for the empirical analysis in this study are drawn from the census of medium- and large-scale manufacturing establishments (*Statistik Industri*, or SI) for the years 1996 and 2006. The establishments are defined as those with 20 or more employees. The surveys were undertaken by the Indonesian Central Board of Statistics (*Badan Pusat Statistik*, or BPS).[6]

As noted in many studies, SI data are considered to be among the best, by the standards 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 utilization, share of output exported), material costs and various types of expenses, labor (head-count and salary and wages), capital stock and investment, and sources of investment funds.

The data, however, have several limitations. Among others, they do not include information which can identify whether an establishment is a single-unit or is 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 counted: some plants may have been counted as firms whereas in practice they are not.

3.3. Measurement of Variables

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

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

3.3.1. Export Spillover Variables

Three export spillover variables are included, each of which represents the channel of the spillovers, these are foreign technological capability ($FTECH_j$), foreign employment share ($FEMPLSH_j$), and foreign exporting activities ($RFEXPSH_j$). 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&D, training activities, and license fees.[7] For industry j, the formula is

$$FTECH_j = \frac{\sum_f (\text{R\&D cost + training cost + license and royalties fees})_f}{\sum_i (\text{total number of employees})_f}$$

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,

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

$RFEXPSH$ 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,

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

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

3.3.2. 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 labor as a proxy for labor productivity (LP_i).[8] Wholesale price indices at the 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

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

3.3.3. Industry Level Variables (Control Variables)

As explained, this study includes a set of industry-level variables that account for the determinants of MNEs' operations in their host country (i.e., the matrix $Y_{j,t}$). The following lists and details these variables which are also defined at the four-digit ISIC level.

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

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 requirements and high capital intensity. As explained in Aswicahyono and Hill (1995), MNEs are usually accustomed to large-scale operations in their home countries and thus to the use of advanced technology. The advanced technology presumably could be adopted by any 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 in investing in export oriented sectors. For industry *j*, it is defined as the ratio of exports 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 industries with high levels 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 in entering industries with either less competitive activity or with high import protection. This is particularly true for the market-seeking MNEs. Two variables are included to proxy the extent of competition, namely the Herfindahl Index (*HHI*) and the nominal tariff (*TARIFF*). The latter is included to capture the extent of import protection which is likely to affect 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 the three-digit ISIC level, drawn from the WTO database through the service of the WITS database.

3.3.4. Other Control Variables

In addition to the control variables above, the estimations include dummy variables for provinces, to control for regional differences in plant operations 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 periods 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 export markets. To do so, we define the export entry rate, in terms of number of plants ($ENX1_{j,t}$) and value added ($ENX2_{j,t}$) as the following:

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

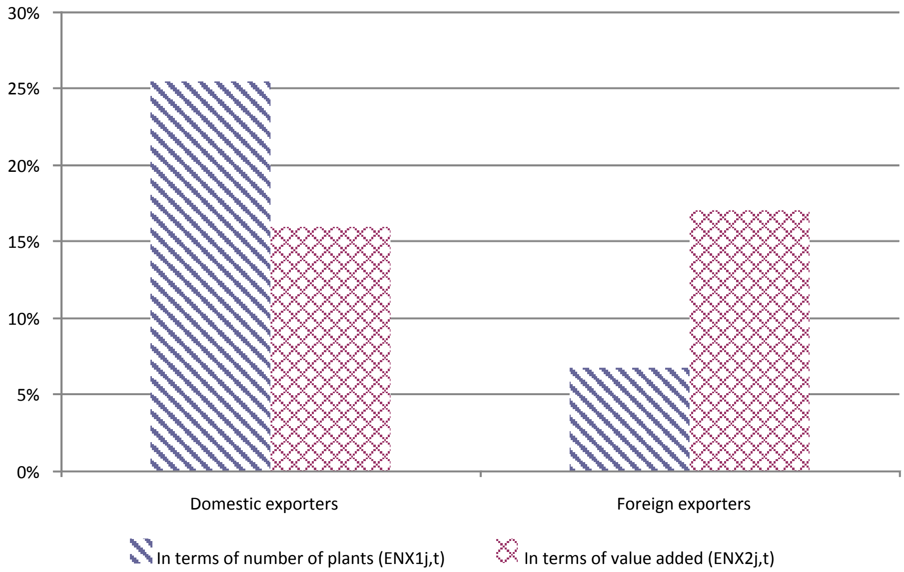
where: $ENXP_{j,t}$ = Total number of plants in industry j that become exporters in time t

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

$ENXVA_{j,t}$ = Exported value added of plants that become exporters 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 Rates of Domestic and Foreign Plants in Indonesian Manufacturing, Average 1996 and 2006.



Source: Statistik Industri, 1996 and 2006.

Figure 4.1 presents the average 1996 and 2006 exporting entry rates for the group of foreign and domestic plants in Indonesian manufacturing. In terms of number of plants, the figure reveals that entry into exporting is substantially higher for the group of domestic plants. The rate is about 25 percent, in contrast with the rate for the group of foreign plants, which is about 7 percent. This is a favorable observation from the policy perspective, because it indicates that domestic plants were actively seeking to sell into export markets. Meanwhile, in terms of value added, entry into exporting is about the same between the two groups, which is measured at about 16 percent.

However, looking at the figure more carefully, there is indeed an issue regarding the favorable performance. Comparing the two of entry rates (i.e., $ENX1_{j,t}$ and $ENX2_{j,t}$) across the domestic and foreign plants groups, it appears that many of the new domestic exporters are 'small', in terms of their exported output. This is in contrast to the picture of the new foreign exporters, which seem to be much 'larger' in terms of their exported output. The comparison suggests that a new foreign exporter exports twice as much as 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 comprises all domestic plants operating in 1996 and 2006. The regressions are the first step in the Heckman selection model. Some specifications were tested and the table reports the most favorable ones in terms of model fit and estimated coefficients. The industry dummy variables are included at the two-digit ISIC level.[9] The table reports robust standard errors for the reason of heteroscedastic variance. The Wald test for overall significance in all reported specifications passes at the 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 the technology channel in facilitating export spillovers. The estimated coefficients of $FTECH_{j,t}$, which represent the channel, are positive, large, and statistically very significant in the results of specification (4.1) and (4.2). They support the hypothesis of the existence of the demonstration/imitation effect from the technology brought by MNEs. The magnitude of the coefficients suggests the demonstration effect is substantially important in determining whether or not a domestic plant participates in exporting activities in time *t*.

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

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)**
$HHI_{j,t}$	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 findings in respect to the other export spillover channels, namely the competition and information channel. Consider first the results for the 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 have any impact on the export participation of domestic firms. The positive estimated coefficient in specification (4.4), however, indicates that the forces tending to improve the productivity of domestic firms created by this channel might exist, although they may be very small.

Turning to the results for the 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 would seem to reduce the likelihood of domestic firms participating in export markets. This does not accord with the hypothesis for the impact of this channel.

While they are 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 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 of domination of the foreign plants in the exports of the industry. Therefore, unlike in Greenaway *et al.* (2004), this variable reflects more the competition effect rather than the contribution of information spillover.

Another point for discussion is that much of the information spillover from MNEs relating to export markets could in fact be transferred by activities which are very hard to measure, and some of this may even be very difficult to be linked to the presence of MNEs. Personal contacts, for example, provide 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 concerning the 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 protect their firm-specific assets very effectively, presumably including their precious information about foreign markets (Greenaway *et al*. 2004, p. 1029).

Table 4.2 reports the OLS regression results of the export intensity equation (i.e., equation (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 the 1 percent level, implying that the disturbance in the export participation and export intensity equation is correlated. As explained, the use of the Heckman method corrects the potentially biased estimates from this correlation. The F-test for overall significance passes at the 1 percent level and 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, the technology channel is positively related to the export intensity of the domestic plants that become exporters, and the competition effect from 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 the 1 percent level. Thus, exports of domestic exporters tend to be lower when there is a strong presence of MNEs. Hence, MNEs seem to crowd out domestic exporters. This finding, while it does not accord with the hypothesis of the positive impact of export spillovers, seems to capture the strategic motive of market-seeking hypothesis by MNEs. Competition in the domestic final-goods market between MNEs and domestic firms could decrease market prices, 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 become ready to export.

As underlined by the theory that recognizes plant heterogeneity (e.g. Melitz 2003), the impact of trade liberalization takes time to work, through the dynamics of competition, in improving the productivity level of both industry and the 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)**
$HHI_{j,t}$	-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)**
Inverse 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 concerns 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 for 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 the 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 find ways to improve their productivity even once they have successfully entered export markets. The results suggest that the domestic plants continue to learn from the pool of technology brought by MNEs. This accords the impression given by Figure 4.1, which indicates that many, or perhaps most, of the new domestic 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 spillover channels on the 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.

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)).

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)**
$FTECH_{j,t}* LP_{i,t}$	0.00002 (0.67)		
$FEMPSH_{j,t}* LP_{i,t}$		4.74[a] (1.85)+	
$RFEXPSH_{j,t}* LP_{i,t}$			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)**
$HHI_{j,t}$	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, 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 the 10 percent level, and is very small. Nonetheless, this indicates that 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 levels. Firms with intermediate productivity levels are predicted to upgrade their technology – and hence improve their productivity and export performance – while firms with low levels of productivity continue using traditional technology and do not seek entry 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 the 10 per cent level (see the result of specification (4.11)). This, of course, presumes 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 with that of the previous one (i.e., the interaction between competition effect and labor productivity), and together the findings suggest that only the more productive firms are able to utilize the positive effect of export spillovers from the presence of MNEs.

Table 4.4 shows the OLS estimation results that test the effect of the interactive variables on export intensity. The results are similar to those of the export participation equation except in that the estimated coefficients 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, there is in general 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 the productivity level 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.

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)**
$FTECH_{j,t}$* $LP_{i,t}$	3.03[b] (0.33)		
$FEMPSH_{j,t}$* $LP_{i,t}$		-5.26[a] (0.45)	
$RFEXPSH_{j,t}$* $LP_{i,t}$			-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)**
$HHI_{j,t}$	-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)**
Inverse 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.

5. Summary and Conclusion

This study examines the positive externalities from the presence of MNEs 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 Indonesian manufacturing as a case study, utilizing the rich data of the national manufacturing census.

In its empirical analysis, the study attempts to answer the question stated above by examining the channels through which the positive export spillover effect can be transmitted to domestic firms. In particular, it examines whether or not the pool of technology, and information about foreign markets, brought by MNEs, as well as the competition effect from the MNE operations, are able to increase the likelihood of domestic firms participating in export markets, 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 behavior according to the market-seeking hypothesis by MNEs in 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 weakness in the proxy used by the estimations. Further analysis gives some evidence that the positive impact of export spillovers in Indonesian manufacturing depends on the level of productivity of domestic firms. Specifically, the impact of the competition effect in export participation is higher for the more productive domestic plants.

Notwithstanding the mixed findings, this study still supports the importance of policies that invite MNEs into the domestic economy. In terms of the 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 facilitation seems to be a good policy proposition. As the analyses show, many of the new domestic exporters in the country's manufacturing sector are somehow still constrained. Policies that improve trade facilitation, therefore, should be able to also 'unlock' these constrained exporters.

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