Foreign multinationals, selection of local firms, and regional productivity in Indonesia

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Abstract: We examine whether the entry of multinational firms into a region induces the exit of low-productivity local firms from the market and the extent to which this improves regional productivity. For this purpose, we employ establishment-level data on the food manufacturing industry in Indonesia. After controlling for spillover effects, we find a greater left truncation in productivity distribution of local firms in regions with larger number of multinational firms. In addition, we find that this effect has greater impacts on regional productivity than spillover effects. Therefore, in order to maximize the regional benefits of foreign direct investment, governments should facilitate the entry and exit of local firms.

Keywords: Firm selection; Regional productivity; Spillovers

JEL codes: F23, R12, L11

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1. Introduction

With the progress of globalization, the presence of multinational firms has increased substantially in both developed and developing countries. Although the number of multinational firms in a market is not very large, their advanced technology and production size have attracted increasing research and policy attention. For example, numerous case studies show that local firms can improve productivity through spillovers from multinationals (e.g., Javorcik 2004, Greenstone et al. 2010). Furthermore, the entry of multinationals into domestic markets brings about fierce competition that could lead to the exit of inefficient local firms (De Backer and Sleuwaegen 2003). Kosová (2010), for instance, find that inward investment by foreign firms increases the exit rate of local firms in the Czech Republic. In sum, there are two channels—spillovers and firm selection—through which foreign direct investment (FDI) affect regional productivity.

Thus far, the second channel, that is, the extent to which an increase in regional productivity is driven by the crowding out of low-productivity local firms, has not received as much research attention as the first channel. However, this does not imply that the second channel is negligible. Alfaro and Chen (2013) examine the effects of the entry of multinational firms on domestic productivity and conclude that the second channel explains most of the

increase in domestic productivity. Their results indicate that the economic benefits of multinational firms are not equally distributed among all the firms in a host country, but are instead realized through the reallocation of resources from inefficient local firms to efficient ones. Therefore, in order to maximize the benefits, governments should facilitate the entry and exit of firms.

In this study, in contrast to Alfaro and Chen's (2013) cross-country study, we focus on whether the entry of multinationals induces the crowding out of local firms from regional markets and whether it leads to an improvement in regional productivity in the context of a developing country. The significant economic contribution of FDI has often been observed empirically in developing countries (e.g., Takii 2005). However, because multinational firms tend to geographically concentrate in regions with a large market (Head and Mayer 2004), their economic impacts are not the same across all regions. Hanson (1997), for example, shows that foreign firms are attracted to the U.S. –Mexican border regions contribute to increasing regional wages in those regions. Therefore, we need to measure the economic impacts of multinational firms on each local market rather than on a national market to identify the effective development policies.

This study is related to the recent literature examining the effects of market size on firm selection (Syverson 2004, Melitz and Ottaviano 2008, Saito and Gopinath 2009, Saito et al. 2011, Combes et al. 2012). The agglomeration of firms in a large market due to large demand brings

about fierce competition between firms, and this makes low-productivity firms less profitable and induces them to exit the market. However, if the regional markets are integrated, that is, if the transport costs between markets are low, the competition from imported goods of core regions becomes fierce in remote areas and the effect of market size on firm selection, less obvious (Fujita et al. 1999, Melitz and Ottaviano 2008). Therefore, this study is an interesting extension of Combes et al. (2012), who used French data and rejected the firm selection hypothesis. Because the markets in developing countries are geographically more segmented than the markets in developed countries owing to the underdeveloped interregional transportation infrastructure in the former, firm selection is more likely to be observed in the former type of countries.

Baldwin and Okubo (2006) extend Melitz (2003) to consider the location decision effects of inter-regionally mobile firms with heterogeneous productivity. They find that the most productive firms in the economy agglomerate in large markets. As transport costs decline, the most productive firms in small regions relocate to large regions. Their model predicts that high-productivity firms are generally observed only in regions with a large market, which is in sharp contrast to Melitz and Ottaviano (2008) and Combes et al. (2012), where high-productivity firms can be observed in any region. The effect of market size on firm selection can therefore be summarized under the following two cases: (i) the exit of low-productivity firms from a large market, and (ii) the entry of high-productivity firms into a large market.

In this study, we follow Syverson (2004) on whether the entry of multinational firms or an increase in market size induces firm selection. More precisely, we first quantify the spillover impacts of multinationals and market size on local firms' productivity. We use the firms' productivity net of spillovers to compute the percentiles of regional productivity distribution and examine how the percentiles are affected by the number of multinational firms or market size in the region. Finally, from the estimation results, we compare the firm selection and spillover effects on improving regional productivity.

For this study, we use establishment-level data of the Indonesian food manufacturing industry. Indonesia provides an interesting locus for examining the effects of multinational firms on the exit decision of local firms. First, Indonesia has attracted massive FDI, greatly contributing to its national and regional economic growth (Blalock and Gertler 2008). This is so even after the Asian Financial Crisis: for example, the GDP share of FDI stock steadily recovered from the substantial decline during 1997 to 1998 (Molnar and Lesher 2008). Second, Indonesia's regional markets are segmented because of its geographical position as an island and its underdeveloped interregional transportation system, implying that the economic impacts of multinationals significantly vary across regions (Perry and Yeoh 2000, Blalock and Gertler 2009). Thus, identifying whether Indonesia shows a crowding-out effect on low-productivity local firms would provide an important policy implication for regional development.

The remainder of this paper is organized as follows. In section 2, we explain the

empirical method. The data and variables used in this study are described in section 3. Section 4 presents our estimation results. Finally, section 5 concludes with a summary and policy implications.

2. Empirical Method

Consider the following productivity θ of the i-th local establishment in region r at period t:

(1) $$\ln \theta_{irt} = \beta_0 + \beta_1 \ln FDI_{rt} + \beta_2 \ln S_{rt} + d_i + d_t + \varepsilon_{irt},$$

where FDI and S respectively represent the FDI activity and market size in the region, d_i and d_t represent the establishment and time fixed effects respectively, and ε is a disturbance. Several comments are in order with respect to equation (1). First, both FDI and S are shown to be important source of spillovers (Henderson 2003, Javorcik 2004). Second, fixed effects are included in equation (1) to capture the unobserved establishment and time effects on productivity. An increase in productivity through reduction in tariffs (Amiti and Konings 2007), for instance, is captured by time fixed effects. Establishment fixed effects are especially important because they constitute the establishment's productivity net of spillovers (ω), which is referred to as raw productivity in the following discussion. By adding the current productivity shocks ε, we estimate ω for each establishment–time pair as follows:

(2) $$\hat{\omega}_{irt} = \hat{d}_i + \hat{\varepsilon}_{irt},$$

where the tilde indicates estimates.

Next, we use $\hat{\omega}_{irt}$ to estimate the *p*-th percentile of distribution of *raw* productivity in the *r*-th region at period *t*, Ω_{prt}. If the firm selection hypothesis holds, the distribution of raw productivity should be left truncated in regions with abundant FDI stock (Combes et al. 2012). In other words, the lower percentiles should be positively correlated with the FDI stock of a region in the following firm selection model:

$$\hat{\Omega}_{prt} = \alpha_{p0} + \alpha_{p1} \ln FDI_{rt} + \alpha_{p2} \ln S_{rt} + d_{pr} + d_{pt} + \xi_{prt}, \quad p = 10, 25, 50, 75, 90. \tag{3}$$

The firm selection hypothesis also predicts that the distribution should be left truncated and should have a thick right tail in regions with a large market. This can be tested by the sign of α_{p2}: lower and upper percentiles should be positively correlated with market size. We add the region and time fixed effects, d_{pr} and d_{pt}, to equation (3) to capture the unobserved effects on regional productivity distribution. For example, a reduction in tariffs causes fierce competition in the domestic markets and induces the exit of low-productivity firms (Melitz 2003). Time fixed effects are expected to control for such left truncation of productivity distribution in each market due to tariff cuts.

Equations (1) and (3) clearly show how multinational firms improve regional productivity. If β_1 in equation (1) is significant, an increase in FDI stock in region *r* leads to productivity improvement for all establishments in the region. In addition, if α_{p1} in equation (3) is significant, the exit of low-productivity establishments from the *r*-th region due to increase in FDI stock improves the productivity of the region. Most previous studies have focused on the

first type of FDI benefit, but to appropriately understand the economic benefits of attracting multinational firms, we need to quantitatively compare the two types of benefits to identify the one that contributes most to an increase in regional productivity. For this purpose, we decompose the elasticity of the *p*-th percentile of regional productivity distribution with respect to FDI stock in the spillover and firm selection effects. Following equation (1), we define the *p*-th percentile of regional productivity distribution in the *r*-th region at period *t*, Θ_{prt}, as follows:

$$\ln \Theta_{prt} = \hat{\beta}_0 + \hat{\beta}_1 \ln FDI_{rt} + \hat{\beta}_2 \ln S_{rt} + \hat{d}_t + \hat{\Omega}_{prt}. \quad (4)$$

We now obtain the elasticity of the *p*-th percentile of regional productivity distribution with respect to FDI stock by differentiating equation (4) with respect to $\ln FDI$:

$$\frac{d \ln \Theta_{prt}}{d \ln FDI} = \hat{\beta}_1 + \frac{\partial \hat{\Omega}_{prt}}{\partial \ln FDI} = \hat{\beta}_1 + \hat{\alpha}_{p1}, \quad p = 10, 25, 50, 75, 90. \quad (5)$$

The first term in equation (5) represents spillover effects and the second term measures the firm selection effects (Saito and Gopinath 2009). Therefore, the quantitative comparison of these two parameters indicates which channel—spillover or the firm selection channel—contributes most to regional productivity.

3. Data and Variables

The *Annual Manufacturing Surveys* for 1990 to 2008 are the primary data sources for this study. This survey conducted by the Statistics Indonesia (BPS) covers all manufacturing establishments

having 20 or more employees. The database contains information on the output, input, industry classification, and geographic location of each establishment.

Indonesia consists of thousands of islands, but most of its economic activities are concentrated in two islands, Java and Sumatra. We basically follow Blalock and Gertler (2008) who use each of the 27 provinces of Indonesia as a geographical unit (region), but for provinces outside Java and Sumatra, we combine the provinces in an island or island group into a single region to ensure enough observations in each region (table 1). Thus, we have 18 regions in total (13 provinces in Java and Sumatra and 5 regions outside those islands).

We focus on the food industry (ISIC 311–313 for 1990–1997 and ISIC 15 for 1998–2008) in this study; the industry, accounting for 29 and 23 percent of manufacturing GDP and employment respectively in 2010, is the largest manufacturing industry and constitutes an important source of employment in Indonesia. This is so at the regional level too: the third column of table 1 shows that on average 76 percent of the domestic food firms are located in Java Island; the number of local firms in other islands is not negligible. In contrast, most of the firms in other industries are concentrated in Java Island and do not show geographical dispersion. A small number of observations of those industries in the hinterlands hinder us from constructing the regional productivity distribution.

In addition, the food industry is one of the largest recipients of foreign investment. Note that the type of FDI matters when discussing the effects of multinationals on competition in

local markets. Inward investments in Indonesia are generally the export platform-type investment; that is, multinationals invest in Indonesia to produce goods at low costs for export to third countries (Blalock and Gertler 2008). In this case, local firms do not face tough competition from multinational firms in the output market and only upstream local firms receive spillover benefits. According to the survey, 45 percent of multinational food firms export their products, with an average export share of 69 percent (table 1). Although there are regional variations—multinational firms locating outside Java and Sumatra islands, for example, tend to export more products—, multinational firms in general supply goods to domestic consumers too. In other words, local food firms still face tough competition from multinational firms in each local market.

From the survey, we construct three variables to estimate productivity θ: output, material, and labor. As mentioned in Blalock and Gertler (2008), many establishments do not report their fixed assets (capital) in the survey. If the non-reporting establishments are concentrated in a particular range of regional productivity distribution, the percentile estimates $\hat{\Omega}_{prt}$ obtained from the distribution excluding those observations will be biased. Therefore, we avoid using total factor productivity and instead employ labor productivity (= value added/labor) in this study. Output is deflated by the wholesale price index and material is converted into constant prices by using a deflator calculated from the 2000 Input–Output table and wholesale price index (base year 1990).

We estimate FDI stock (*FDI*) as the number of establishments in a region with foreign equity participation divided by the area of the region.[1] The number of multinational firms is obtained from the survey. We measure market size (*S*) by population density (Ciccone and Hall 1996) and obtain the data of population and area of provinces from the *Statistical Yearbook of Indonesia* and *Intercensal Population Census* published by BPS.[2] Finally, we exclude the observations falling into the 1st and 99th percentiles of distribution of establishment-level value added to weaken the influence of outliers. We repeat this process for each region–year pair when estimating the percentiles of regional productivity distribution. However, we use all observations, including outliers, when constructing the FDI stock variable. The summary statistics on each of the variables used in this study are presented in table 2.

4. Results

Table 3 gives the parameter estimates of equation (1). Both FDI stock and market size significantly improve the productivity of establishments: the productivity increases by 0.03 and 0.70 percent respectively as the FDI and population densities increase by 1 percent. The spillover effects resulting from market size are larger than those often observed in developed countries. For example, Ciccone and Hall (1996) show that labor productivity in the United

[1] We add 1 to the number of establishments because a multinational firm does not locate in a few regions.
[2] Because the population data are available for five-year periods, we use the value as of the first year for the subsequent four years. For example, the population in 1990 is used as a proxy for the population from 1991 to 1994.

States increases by 0.06 percent as the employment density increases by 1 percent. Our estimates are in line with Kuncoro (2009), who finds that labor productivity in the non-food manufacturing industries in Indonesia increases by 0.1 to 0.3 percent as the number of firms in the same industry increases by 1 percent. Thus, agglomeration economies seem to be greater in Indonesia than in other developed countries.

We use the parameter estimates shown in table 3 to compute the raw productivity of each establishment–time pair. The p-th percentile Ω_{prt} of the distribution of raw productivity can be estimated more precisely as the number of observations, that is, the number of local firms, increases. However, this reduces the sample size for estimating the firm selection model (3). In order to check whether our results are robust to the different sample sizes, we estimate equation (3) on the sample of regions with 20, 30, or 40 and more local firms. The parameter estimates of the firm selection model are presented in table 4. In general, as the number of multinational firms in the region increases, the lower percentiles, $p = 10, 25$, and the median increase. This result supports the crowding-out hypothesis: low-productivity local firms are more likely to exit from the markets having many foreign firms.

In contrast, an increase in market size tends to increase the median and upper percentiles of distribution. Therefore, regions with a large market tend to have more establishments, especially high-productivity ones. These findings are not consistent with Melitz and Ottaviano (2008), where high-productivity firms can be observed in any market regardless of market size.

Instead, they favor the arguments of Baldwin and Okubo (2006) that high-productivity firms agglomerate in a large region. Finally, the 10th percentile unexpectedly decreases with market size. Institutional factors may help explain why low-productivity firms locate in a large market. As shown in Henderson and Kuncoro (1996), the easy access to government services offered in large cities is an important factor affecting the location decision of Indonesian firms. In other words, low-productivity firms, which cannot afford the travel costs to access those services, may prefer to locate in cities to save costs. Overall, these results suggest that we need to consider the location decision of heterogeneous firms when examining the factors affecting the shape of regional productivity distribution in developing countries.[3]

Finally, table 5 shows the decomposition of regional productivity increases. The firm selection effects resulting from FDI contribute to increasing the lower percentile of productivity distribution more than the spillover effects. In sum, as the number of multinational firms increase by 1 percent, the 10th and 25th percentiles and the median of regional productivity distribution increase by 0.19, 0.24, and 0.26 percent, respectively. Market size also contributes to regional productivity enhancement. As the population density in a region increases by 1 percent, spillover effects increase the productivity of establishments in the region by 0.70 percent. It additionally increases the median and the 75th and 90th percentiles of the distribution by 1.26, 2.31, and 2.49 percent, respectively, by attracting high-productivity firms to the region. The

[3] Saito and Gopinath (2009) also find that the upper percentiles of regional productivity distribution increase with market size in the Chilean food industry.

results also indicate that an increase in market size has much larger impacts on regional productivity enhancement than an increase in number of multinational firms. Overall, the comparison of spillover and firm selection effects shows that firm selection effects exceed the spillover effects in terms of regional productivity improvement (Alfaro and Chen 2013).

5. Summary and Conclusions

Attracting FDI for economic growth has been a primary concern of national and local governments in developed and developing countries. The economic impacts of FDI have been intensively examined in previous studies. However, most of the efforts went toward identifying the extent to which local firms receive spillover benefits from multinational firms and few studies have examined whether the entry of multinational firms improves regional productivity by inducing the exit of low-productivity firms from the market. Policies to maximize the regional benefits of multinational firms vary depending on which channel is more important. In this study, we test the firm selection hypothesis and quantitatively evaluate its impacts on regional productivity by employing establishment-level data of Indonesia.

Our results indicate positive and significant spillovers from multinational and local firms: the productivity of an establishment tends to increase with the number of multinational firms in the region and with its market size. After controlling for the spillover effects, we find that the lower percentiles of regional productivity distribution increase in regions with many

multinational firms, thus supporting the firm selection hypothesis. Moreover, firm selection effects have larger impacts on improving regional productivity than spillover effects. With regard to the effects of market size, we find no evidence supporting the selection of low-productivity firms from a large market. Instead, we find that high-productivity firms tend to agglomerate in a large region, implying that regional productivity is more affected by the entry of high-productivity firms than the exit of low-productivity ones. Underdeveloped interregional transportation systems in developing countries increase the benefits in particular of high-productivity firms located in large markets and thereby improve the productivity in cities.

National and local governments should facilitate the entry and exit of firms in order to maximize the benefits of FDI. This would encourage the reallocation of resources from inefficient local firms to efficient ones and enhance regional productivity. Finally, the strong spillover and firm selection effects due to market size suggest that market size is the main determinant of regional productivity enhancement in Indonesia. Thus, policies encouraging the entry and relocation of firms into cities will help increase regional economic growth.

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Table 1: Average Number of Local and Multinational Food Firms in Indonesia

Province	Island	Local firms	Multinational firms	Share of multinational exporting firms	Export share of products
Aceh	Sumatra	15.1	3.8	0.12	0.95
North Sumatera		312.2	24.9	0.40	0.63
West Sumatera		30.6	6.1	0.61	0.56
Riau		55.6	3.6	0.41	0.63
Jambi		11.8	1.4	0.14	0.43
South Sumatera		45.8	2.6	0.34	0.53
Bengkulu		4.3	0.5	0.56	0.95
Lampung		104.7	6.2	0.54	0.51
Jakarta	Java	185.5	7.4	0.26	0.31
West Java		862.0	40.3	0.37	0.58
Central Java		663.6	8.7	0.47	0.88
Yogyakarta		40.0	0.6	0.00	–
East Java		1190.2	29.2	0.50	0.70
Bali West Nusa Tenggara East Nusa Tenggara	Lesser Sunda Islands	86.3	3.2	0.44	0.83
West Kalimantan Central Kalimantan South Kalimantan East Kalimantan	Kalimantan	67.3	9.1	0.65	0.91
North Sulawesi Central Sulawesi South Sulawesi Southeast Sulawesi	Sulawesi	172.7	11.5	0.62	0.81
Maluku	Maluku Islands	10.7	0.0	–	–
Papua	Western New Guinea	9.4	4.4	0.69	0.91
Total		3867.9	163.5	0.45	0.69

Source: BPS, Annual Manufacturing Survey, Various Years.

Table 2: Summary Statistics

Variable	Unit	Mean	Std. deviation
Output	Constant Rupiah	3251492	16900000
Material	Constant Rupiah	1362910	9455753
Labor	Person	105	306
Labor productivity	Constant Rupiah/person	11655	21118
Population density	Person/km^2	975	2945
FDI density	Number of multinational firms/km^2	0.0009	0.003

Source: BPS, Annual Manufacturing Survey, Various Years.
BPS, Statistical Yearbook of Indonesia, Various Years.
BPS, Intercensal Population Census, 1995 and 2005.

Table 3: Parameter Estimates of the Spillover Model

Variable	Coefficient	Robust standard errors
ln*FDI*	0.033**	0.017
ln*S*	0.698***	0.165
F statistic	684.26	
R squared	0.734	
Observations	73491	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively. Dependent variable is labor productivity.

Table 4: Parameter Estimates of the Firm Selection Model

Case 1: Regions with 20 and more local firms

	Percentile				
Variable	10	25	50	75	90
ln*FDI*	0.132***	0.166***	0.159***	0.016	-0.068
	(0.047)	(0.046)	(0.048)	(0.049)	(0.057)
ln*S*	-1.154***	-0.452	1.660***	2.781***	2.738***
	(0.335)	(0.329)	(0.345)	(0.348)	(0.410)
F statistic	224.04	244.81	250.61	269.53	198.25
R squared	0.973	0.976	0.976	0.978	0.970
Observations	250	250	250	250	250

Case 2: Regions with 30 and more local firms

	Percentile				
Variable	10	25	50	75	90
ln*FDI*	0.161***	0.206***	0.224***	0.056	-0.094
	(0.052)	(0.050)	(0.052)	(0.052)	(0.059)
ln*S*	-1.040***	-0.504	1.259***	2.309***	2.493***
	(0.377)	(0.367)	(0.381)	(0.382)	(0.429)
F statistic	213.67	244.17	257.78	281.01	231.73
R squared	0.973	0.976	0.977	0.979	0.975
Observations	224	224	224	224	224

Case 3: Regions with 40 and more local firms

	Percentile				
Variable	10	25	50	75	90
ln*FDI*	0.118***	0.179***	0.203***	0.072	-0.061
	(0.047)	(0.047)	(0.055)	(0.054)	(0.061)
ln*S*	-0.702*	-0.264	1.321***	2.099***	1.925***
	(0.366)	(0.363)	(0.426)	(0.416)	(0.472)
F statistic	281.02	308.75	259.96	296.54	236.63
R squared	0.982	0.983	0.980	0.983	0.978
Observations	201	201	201	201	201

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively. Value in parenthesis is the standard error. Dependent variable is the *p*-th percentile of the regional productivity distribution.

Table 5: Decomposition of Regional Productivity Increases

		Percentile				
Variable	Source	10	25	50	75	90
FDI	Spillovers	0.033	0.033	0.033	0.033	0.033
	Firm selection	0.161	0.206	0.224		
Market size	Spillovers	0.698	0.698	0.698	0.698	0.698
	Firm selection	-1.040		1.259	2.309	2.493

Note: The sum of values from each source─spillovers and firm selection─is the elasticity of the *p*-th percentile of the regional productivity distribution with respect to FDI stock or market size. For example, as FDI stock increases by 1 percent, the 10th percentile of the regional productivity distribution increases by 0.194 (= 0.033 + 0.161) percent.