FOREIGN OWNERSHIP AND PRODUCTIVITY OF FOOD INDUSTRIES IN INDONESIA

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Abstract

The Indonesian government issued a policy that restricts foreign ownership in several industries including the food industry, with the objective of protecting the domestically owned firm. This research analyzed the productivity differences between foreign-owned and domestically owned plants in the Indonesian food industry and whether the percentage of foreign ownership is related to productivity. Micro data on the food industry were obtained from the Annual Survey of Large and Medium scale Industries (IBS) in 2015 conducted by Statistics Indonesia. The results showed that there were productivity differences between the foreign-owned and domestically owned plants. The foreign-owned plants had higher productivity than the domestic plants. The productivity of plants with minority foreign ownership (less than 50 percent) was not significantly different from that of domestically owned plants. Meanwhile, the productivity of plants with foreign ownership more than 50 percent was significantly different from that of plants with domestic ownership. Wholly foreign-owned plants (100 percent) did not demonstrate the highest productivity difference. When the data were disaggregated at the sub-sector level, the results varied among industries.

Keywords

Foreign, cobb douglas, productivity, food industry

1. Introduction

Economic growth is one of the development goals of a country. Neo-classical theory states that foreign capital is one of the factors that influence economic growth. Foreign capital can be used to cover the gap between the availability of domestic savings, foreign currency, government revenue and human resource skills to achieve the desired growth rate (Todaro and Smith 2003).

For host countries, foreign capital also has advantages and disadvantages. Benefits of foreign capital include creating jobs, transferring technology, increasing managerial capacity and access to global markets (Gillis et al., 1992). Although foreign capital provides capital, it can have a negative impact: reducing domestic savings and investment rates in the long run; decrease foreign exchange earnings with increased imports; giving companies the opportunity to invest their profits abroad; reduce tax revenue because of the provision of tax concessions; increase destination country spending on subsidies and tariff protection; causing domination of foreign companies in the domestic market and can hamper the growth of domestic companies (Todaro and Smith 2003). In addition, the entry of foreign companies can disrupt the market balance and cause the output produced by domestic companies to decrease and the average cost curve of domestic companies to increase (Aitken and Harrison 1999).

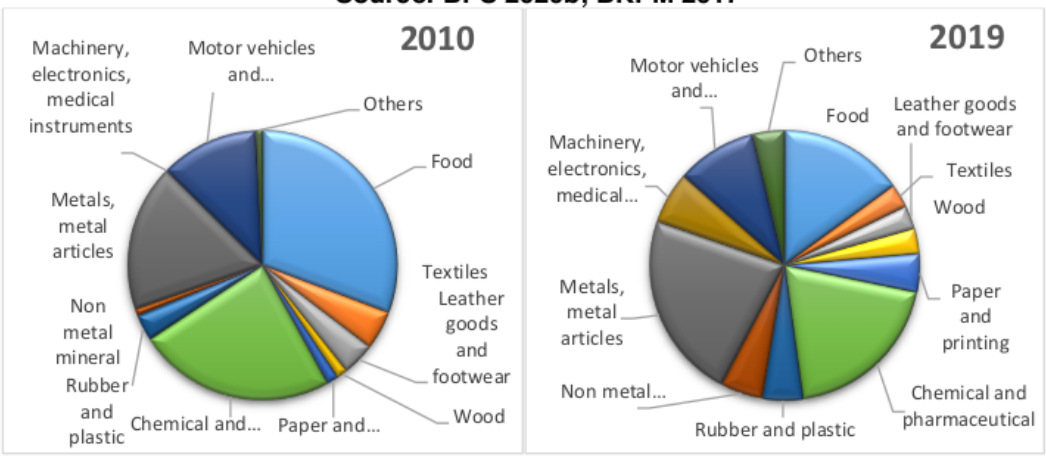
Debate about foreign capital takes place in Indonesia. An assessment of the performance of foreign capital has always been linked to nationalist goals of policy makers by controlling inflows of foreign capital (Lindblad, 2015). Indonesia is one of the countries which imposes restrictions on foreign capital ownership; therefore, the government of Indonesia issued Presidential Regulation (Perpres) No. 44 of 2016 concerning the List of Closed and Open Business Sectors with requirements in the sector of investment. One of the objectives is to increase the protection of micro, small and medium enterprises; cooperatives; and various national strategic sectors. One of the regulations is to regulate the percentage of foreign ownership allowed. The regulation states that the vegetable and animal fat oil, copra, coconut oil, palm oil, cocoa and coffee, sugar, black/green tea, cashew and pepper, cotton fiber and seed, dry tobacco, crude castor oil, rubber and clove flower

industries are limited for foreign ownership. The maximum foreign capital allowed in these industries is 95 percent. Most of these industries are food industries.

Other opinions support to attract foreign capital to facilitate disparities in domestic savings and technology transfer in production (Lindblad, 2015). Those who are pro to foreign capital argue that foreign firms have faster technology transfer rates and increase incentives to adopt technology (Boddin et al. 2017). Technology transfer occurs because multinational companies will transfer technology to their branches and provide a competitive advantage (Blomström and Kokko 1997). Foreign-owned firms carry out production processes using better technology than domestic (Hill 1988; Ramstetter 1999b ; Takii and Ramstetter 2000 ; Bernard and Jensen 2004a).

One sector that is much in demand by foreigners is the manufacturing industry. The realization of foreign capital investment in the manufacturing sector in 2010 and 2019 can be seen in Figure 1. The food industry in 2010 absorbed the most foreign capital, which was 31 percent. Although in 2019 there has been a decline in this industry to 15 percent, it is still included in the top three manufacturing industries.

Figure 1 Comparison of Realization Percentage of Foreign Capital Investment in Manufacturing Sector 2010 and 2019
Source: BPS 2020b; BKPM 2017



The problem to be analyzed in this study is whether there are differences in productivity of foreign and domestic plants and whether the degree of foreign ownership is related to plant productivity. Different from previous research that conducted research on plants level analysis in Indonesia (Takii 2014; Takii and Ramstetter 2000), this research specialize on food industry. In addition, this research disaggregated the food industry into several sub-sector in order to analyze the foreign share restriction conducted on Indonesian food industry.

2. Literature Review

There are a number of studies discussing the differences in productivity between foreign-owned and domestic firms by using firm-level or plant-level data. These studies include those conducted by Blomström (1988), Haddad and Harrison (1993), Aitken and Harrison, (1999), Ito (2004), Takii (2004) dan Mugendi et al. (2015). These studies included that foreign-owned firms were more productive than domestic firms. In contrast, Menon (1998), Oguchi et al. (2002) and Ramstetter (2004) found no significant difference between the performance of foreign-owned and domestic firms.

The empirical evidence regarding the relationship between the percentage of foreign ownership in a firm and its productivity is still uncertain. Blomström and Sjöholm (1999) stated that foreign ownership is an important factor that determines productivity but the

degree of foreign ownership does not affect the productivity of a firm. This finding is supported by Ramstetter (2004) that the correlation between labor productivity and foreign ownership is generally weak. Takii (2004) analyzed the productivity differences between local and foreign-owned plants in the Indonesian manufacturing industry in 1995. The results showed that plants with 100 percent foreign ownership (wholly foreign-owned) had higher productivity than other plants. Domestically owned plants had the lowest productivity; however, this difference was not always significant at the industrial level. Takii and Ramstetter (2000) found that plants with foreign ownership more than 90 percent had a higher labor productivity than domestically owned plants in the late 1980s and in 1998 but that they had lower or equal productivity from 1990-1997. Takii and Ramstetter (2005) found that companies with more than 90 percent of foreign ownership had lower productivity than those with 50-89 percent of foreign ownership.

Some research has also been carried out in other countries. Ramstetter and Ngoc (2013) found that wholly foreign-owned and joint ventures in the Vietnamese manufacturing industry had higher labor productivity than domestic firms. In addition Thuyen et al. (2017) conducted a study using data from 2005-2010 in Vietnam suggesting that in 2005-2007, wholly foreign multinational enterprises had higher productivity than domestically owned firms, yet their productivity was lower than that of joint ventures. In 2008-2010, the productivity of wholly foreign multinational enterprises and private firms was not significantly different.

3. Methods

This research utilized micro data obtained from the Annual Survey of Large and Medium Scale Industries (IBS) conducted by the Statistics Indonesia. The cross-section data of the food industry sector were taken in 2015. The data were used because at the time this research was being conducted, no recent data were available. The IBS data are often used to analyze the performance of the manufacturing industries in Indonesia, such as in studies conducted by Blomström and Sjöholm (1999), Hill (1988;1990a;1990b), Takii (2004), Takii and Ramstetter (2005).

IBS data represented the plant level. In 2015, IBS survey represented 6445 plants. However, not all of the data could be used. Some data excluded in this research. The steps taken were (1) exluding all data with no capital value (capital value equals zero) and (2) exluding all data with no raw material value. After conducting this stage, the data obtained that fulfilled the research criteria were 3906 plants.

Productivity (A) used in this study was the ratio of output to input. Value added proxy (V) was used to estimate plant output. The calculation of value added did not include labor costs. Labor costs need to be exluded because wages in Indonesia are related to variations in labor productivity. If labor costs were used, it was generally doubted that the productivity variations occurred because of differences in wages. This assumption covered two inputs: labor (L) and capital (K). Production was described as a function of labor and capital, and productivity was formulated as follows:

$$A = \frac{V}{f(K,L)} \qquad V = A * f(K,L) \tag{1}$$

$$\ln V = \ln A + \alpha_1 \ln L + \alpha_2 \ln K \tag{2}$$

If the data of V, K and L were identified, then value of ln A and α_n could be estimated. The estimated value of ln A showed the difference in productivity and was a constant. In addition, other variables, including foreign ownership, trade propensity, labor skills, and plant size were added to the model.

$$V_i = \alpha_0 + \alpha_1 D_i^f + \alpha_2 E_i + \alpha_3 M_i + \alpha_4 N_i + \alpha_5 S_{ij} + \alpha_6 ln\, L_i + \alpha_7 ln\, K_i$$
$$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7 > 0 \tag{3}$$

in which:

V = value added (millions rupiah)
L = number of laborers (person)
K = value of capital (millions rupiah)
D^f = dummy variable (1= foreign-owned)
E = ratio of value export to output
M = ratio of value import to raw material purchase
N = ratio of amount nonproduction laborers to the total of laborers
S_{ij} = ratio of plant-i output to the average output in industry-j group

The correlation analysis between foreign ownership and plant productivity in this study conducted in three stages. First using model (3) to find out if there were differences in productivity between foreign and domestic plants. Foreign-owned plants were plants which partly or wholly foreign investment while domestic plants are plants which entire capital comes from domestic investment. The difference in productivity occurs if the coefficient on the dummy variable was statistically significant. The dummy variable D^f was one if there was foreign ownership and zero if none. If foreign plants have higher productivity than domestic plants, the coefficient α_1 is expected to be positive.

Variable E was the export propensity (export-output ratio), and M was the import propensity (import-total ratio of raw material costs). Both are trade propensities. Plants that conducted exports or imports were expected to be more productive. N was the share of nonproduction labor known as white collar workers. This variable showed the skill intensity or the labor quality while S showed the relative size of the plant-i in industry-j. The value of S would be above one if the plant produced more than the average output in the industry.

The second stage is carried out if there are differences in productivity between foreign and domestic plants. At this stage the analysis was conducted to determine the correlation between the degrees of foreign ownership with plant productivity. This stage uses model (4):

$$\ln V_i = \beta_0 + \beta_1 D_i^{050} + \beta_2 D_i^{5099} + \beta_3 D_i^{100} + \beta_4 E_i + \beta_5 M_i + \beta_6 N_i + \beta_7 S_{ij} + \beta_8 ln\, L_i + \beta_9 ln\, K_i$$

$$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9 > 0 \qquad (4)$$

D^{050} = dummy variable (one if the foreign-owned share is 0% < n< 50%)
D^{50100} = dummy variable (one if the foreign-owned share is 50% ≤ n< 100%)
D^{100} = dummy variable (one if the foreign-owned share is 100%)

In model (4), foreign ownership was analyzed by using percentage of foreign ownwership divided into four categories; i.e., domestically owned plants with no foreign capital, plants with foreign capital under 50 percent (minority of foreign ownership), plants with foreign capital between 50 and less than 100 percent (majority of foreign ownership) and plants with wholly foreign ownership (100 percent). If the result showed a significant dummy variable coefficient, then the coefficients were statistically tested using the Wald test.

The third stage was using model (5). This equation is different from the one used by Takii (2004) The difference between previous study is that this study distinguishes majority foreign ownership. It was conducted to analyze whether 95 percent ownership percentage has a greater productivity difference than others. Therefore the equation utilized as follows:

$$\ln V_i = \beta_0 + \beta_1 D_i^{050} + \beta_2 D_i^{5094} + \beta_3 D_i^{95} + \beta_4 D_i^{9699} + \beta_5 D_i^{100} + \beta_6 E_i + \beta_7 M_i + \beta_8 N_i + \beta_9 S_{ij} + \beta_{10} ln\, L_i + \beta_{11} ln\, K_i$$

$$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11} > 0 \qquad (5)$$

D^{5094} = dummy variable (1 if the foreign-owned share is 50% ≤ n ≤ 94%)
D^{95} = dummy variable (1 if the foreign-owned share is 95%)
D^{9599} = dummy variable (1 if the foreign-owned share is 96% ≤ n ≤ 99%)

4. Results and discussion

The number of plants in the food industry in 2015 used in this study can be seen in Table1. The data showed that in 2015 there were 5.02 percent of foreign plants in the Indonesian food industry. There were 51.53 percent of the foreign-owned plants were wholly foreign-owned plants. Most foreign-owned plants were in the cooking oil, vegetable and animal fat industries (37.76 percent of the total foreign-owned plants in the food industry). Approximately 39.2 percent of the plants in the food industry were wholly foreign-owned plants, followed by the fish processing and preservation industry (24.49 percent), in which 56.25 percent of foreign-owned plants in the industry were also wholly owned by foreigners.

Table 1. Number of plants in Indonesian food industries, 2015

ISIC	Industry	Total of plant	Total of foreign-owned plant	Wholly foreign plant
10	Food Industry	3906	196	101
101	Meat processing and preservation industry	55	5	3
102	Fish processing and aquatic biota industry	775	48	27
103	Fruit and vegetable processing and preservation industry	150	3	2
104	Cooking oil and vegetable oil industry	372	74	29
105	Milk processing and dairy and ice cream product industry	35	8	4
106	Grain, flour and starch milling industry	527	9	6
107	Other food industry	1927	38	22
108	Animal feed industry	65	11	8

Source: Statistics Indonesia, 2015

Table 2 showed the statistical description of the data utilized in this study. The average labor productivity in the foreign-owned plants was greater than that of domestically owned plants in the food industry. A high average labor productivity was also observed in the existing industrial groups (three-digit ISIC). The largest difference in labor productivity was in the fruit and vegetable processing and preservation industry.

The foreign-owned plants exported more than the domestically owned plants. In total, the foreign-owned plants exported up to 33.19 percent of the output produced, while domestically owned plants only exported 8.47 percent. The largest ratio of exports was found in fruit processing and preservation 62.18 percent by foreign-owned plants and 29.16 percent by domestically owned plants. Foreign-owned plants in the animal feed industry did not conduct exports, indicating that all outputs were marketed in Indonesia.

The average ratio of raw material imports showed that foreign-owned plants in the food industry imported more than the domestically owned plants in total. The largest import ratio was in the milk processing industry, and dairy and ice cream products amounted to 69.66 percent. This finding means that on average, 69.66 percent of the raw materials in this industry were obtained from imports. While domestically owned plants in the same industry only imported 8.07 percent of their total raw materials, foreign-owned plants in the fruit and vegetable processing and preservation industries did not import at all. This finding highlights that foreign-owned plants in this industry obtain all of their raw materials from Indonesia. In the same industry, domestically owned plants obtained 12.53 percent of their raw materials on average from imports.

Foreign-owned plants had an average ratio of nonproduction labor greater than that of domestically owned plants. This finding shows that foreign-owned plants employed more skilled workers in the nonproduction sector. The largest average ratio of nonproduction labor

was in the meat processing and preservation industry. In this industry, foreign-owned plants employed twice as many nonproduction workers as domestically owned plants. Additionally, in the fruit and vegetable processing and preservation industries, foreign-owned plants employed more nonproduction workers than domestically owned plants.

Table 2. Food industry descriptive statistics in Indonesia, 2015

ISIC	Industry	Labour Productivity (Billion Rp)		Share of Export to Output (%)		Share of Import to Raw Materials (%)		Non-Production Labor Ratio	
		F	D	F	D	F	D	F	D
10	Food Industry	3.70	0.57	33.19	8.47	11.12	1.8	25.74	13.12
101	Meat processing and preservation industry	0.48	0.56	20.00	11.53	4.32	5.1	44.96	19.16
102	Fish processing and aquatic biota industry	1.97	0.32	62.18	29.16	2.75	1.1	16.31	10.14
103	Fruit and vegetable processing and preservation industry	6.29	0.15	10.64	2.33	-	12.5	44.16	11.35
104	Cooking oil and vegetable oil industry	6.00	2.50	17.31	6.45	0.57	0.3	26.68	15.95
105	Milk processing and dairy and ice cream product industry	2.54	0.94	35.95	0.94	69.66	8.0	42.10	26.38
106	Grain, flour and starch milling industry	1.67	0.75	56.24	4.13	24.35	1.3	44.12	16.85
107	Other food industry	2.84	0.18	34.56	2.71	16.40	0.8	22.21	12.11
108	Animal feed industry	1.99	5.80	-	1.57	53.11	27.2	32.08	30.02

Source: Statistics Indonesia, 2015
Notes:
F = Foreign
D = Domestic

Regression results are shown in Table 3 Columns (1) and (2) show the stages of the analysis carried out using model (3) and (4). If in the first stage the coefficient D^f is not significant, no further stage analysis is performed. The coefficient for D^f in model (3) indicated that foreign-owned plants were more productive than domestically owned plants. This finding was significant at the 1 percent level.

The estimates obtained in models (4) demonstrated that foreign ownership more than 50 percent did not have a significant effect but that foreign ownership more than 50 percent showed a significant effect. This result means that in minority foreign ownership (less than 50 percent), there was no significant difference between the productivity of foreign-owned and domestically owned plants. In contrast, there was a significant difference in dominant foreign ownership (more than 50 percent).

A test of the difference between majority ownership (50-99 percent) and wholly foreign ownership (100 percent) shows that there is no significant difference between the two types of ownership. This means that the productivity of plants with 100 percent foreign ownership was equal to majority ownership (50-99 percent). The results of this research were different from those proposed by Takii (2004) who conducted an analysis at the level of the manufacturing industry. The study showed that the percentage of foreign ownership was significant in all groups.

From the export propensity, the export ratio (E) showed a nonsignificant result. These results indicated that the export ratio did not correlate with plant productivity in the Indonesian food industry, while the import ratio (M) showed a significant result at the 1 percent level. This result showed that the ratio of raw material imports was significantly and positively correlated with plant productivity in the food industry.

Table 3. Productivity differences between foreign and domestic big plants in food industry

Variable	(1)	(2)
Constant	16.510***	16.507***

	(0.000)	(0.000)
D^f	0.692***	
	(0.000)	
D^{050}		0.200
		(0.432)
D^{50100}		0.873***
		(0.000)
D^{100}		0.679***
		(0.000)
ln L	0.933***	0.932***
	(0.000)	(0.000)
ln K	0.261***	0.261***
	(0.000)	(0.000)
E	0.037	0.036
	(0.616)	(0.632)
M	0.475***	0.497***
	(0.003)	(0.002)
N	0.742***	0.744***
	(0.000)	(0.000)
S	0.049***	0.050***
	(0.000)	(0.000)
Number of Observation	3906	3906
R^2	0.669	0.669
Ho: $D^{50100}=D^{100,}$ *p-value*		0.405

*** Significant at 1% ** significant at 5% and * significant at
Numbers in parentheses indicate p-value

The ratio of nonproduction labor (N) was significant, indicating that the share of skilled labor (white collar workers) had a positive correlation with plant productivity. Skilled workers were more innovative and able to work more efficiently, causing higher productivity. In addition, skilled workers could adopt new technologies more easily (Mugendi et al. 2015). The ratio of plant output to average industry (S) highlighted a positive and significant, showing that the size of the plant in the food industry was also positively correlated with plants productivity.

Based on these results, limitation of the existence of foreigners in plants by a maximum of 95 percent can be done. This is because the productivity will not be different from the higher percentage of foreign presence. The foreign ownership in food industry plants must be greater than 50 percent so that these plants have higher productivity.

Then the analysis was performed using only large plants data to find out the consistency of the results obtained. Table 4 indicate the regression results for large plants. The large plants are defined as plants that had a ratio of plant output to average output in the same industry greater than one, meaning that their output was greater than the average output.

The results showed that there was a significant difference between the productivity of foreign-owned and domestically owned plants. The coefficients obtained were greater than those of the previous results. This result demonstrated that the productivity difference between foreign-owned and domestically owned plants was greater among large plants. Similar to the previous results, foreign ownership under 50 percent was not significantly different from domestically owned plants, while foreign ownership above 50 percent showed a significant difference.

Table 4. Productivity differences between foreign and domestic big plants in food industry

Variable	(1)	(2)
Constant	11.882***	11.859***
	(0.000)	(0.000)
D^f	0.864**	
	(0.000)	

D^{050}		0.084
		(0.828)
D^{50100}		1.343***
		(0.000)
D^{100}		0.779**
		(0.011)
ln L	-0.289***	-0.290***
	(0.000)	(0.000)
ln K	0.264***	0.260***
	(0.000)	(0.000)
E	-0.094	-0.108
	(0.523)	(0.467)
M	0.176	0.212
	(0.602)	(0.529)
N	0.739***	0.765***
	(0.004)	(0.003)
S	0.192***	0.198***
	(0.000)	(0.000)
Number of Observation	688	688
R^2	0.280	0.290
$D^{50100}=D^{100}$, *p-value*		0.167

*** Significant at 1% ** significant at 5% and * significant at 10%
Numbers in parentheses indicate p-value

Unlike the previous results, the export ratio and import ratio did not significantly correlate with plant productivity for large plants. The ratio of nonproduction labor (N) to plant size (S) was also positively correlated with plant productivity. A test of the difference between the coefficients for D^{50100} and D^{100} were done. This result showed that no differences in the productivity of plants that had foreign ownership were between 50-99 percent and wholly foreign-owned plants (100 percent foreign ownership).

The food industry had different characteristics. Therefore, an analysis was carried out at a more specific level by dividing the food industry into eight sub-sector as indicated by three digits number in the ISIC. This aggregation issue was also raised by Ramstetter (2001) who argued that there was an issue of aggregation in the research regarding the differences in domestic and foreign-owned plant productivity in Thailand, and further research was required at the level of disaggregation. The results estimation of foreign ownwership correlation with plant productivity in various classifications of the Indonesian food industry can be seen in Table 5.

The food industry was classified into the meat processing and preservation industry (ISIC 101); fish processing and aquatic biota industry (ISIC 102); fruit and vegetable processing and preservation industry (ISIC 103); cooking oil and vegetable oil industry (ISIC 104); milk processing, dairy and ice cream product industry (ISIC 105); grain, flour and starch milling industry (ISIC 106); other food industry (ISIC 107); and the animal feed industry (ISIC 108). Other food industry include bread and cake products; sugar and cocoa; chocolate and confectioneries; macaroni, noodles and similar products; processed food; coffee, tea and herbal processing; and spices and other cooking product industries.

Table 5. Estimation Result on the Difference between Foreign and Domestic Plant among Food Industry Sub-sector (3 digit ISIC)

Variable	ISIC 101	ISIC 102	ISIC 103	ISIC 104	ISIC 105	ISIC 106	ISIC 107	ISIC 108
Constant	15.720***	15.243***	15.088***	17.710***	16.679***	15.699***	16.066***	16.425***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D^f	0.098	0.255*	2.714***	0.103	0.854	0.177	0.768***	-0.243
	(0.857)	(0.094)	(0.005)	(0.587)	(0.168)	(0.462)	(0.001)	(0.603)
ln L	0.631***	0.933**	0.541***	0.826***	0.618***	0.595***	0.902***	0.862***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.007)
ln K	0.087	0.042**	0.099	0.378***	0.378***	0.154***	0.223***	0.083
	(0.488)	(0.012)	(0.106)	(0.000)	(0.000)	(0.000)	(0.000)	(0.564)
E	1.117**	0.599***	0.097	0.111	-2.073***	0.254	-0.010	-2.230***
	(0.029)	(0.000)	(0.833)	(0.673)	(0.002)	(0.327)	(0.952)	(0.000)

M	0.679	0.529	0.193	0.426	1.319*	0.877***	0.490*	0.262
	(0.499)	(0.110)	(0.239	(0.118)	(0.069)	(0.005)	(0.065)	(0.645)
N	0.164	0.295*	0.080	0.599*	-0.277	0.820***	0.808***	2.726***
	(0.840)	(0.070)	(0.869)	(0.076)	(0.751)	(0.000)	(0.000)	(0.002)
S	0.350***	0.076**	0.241***	0.217***	0.183	0.189***	0.037***	0.365***
	(0.017)	(0.026)	(0.000)	(0.001)	(0.113)	(0.002)	(0.000)	(0.000)
Observation	55	775	150	372	35	527	1927	65
R^2	0.671	0.668	0.670	0.698	0.885	0.505	0.931	0.638

Note:
Number in parentheses denotes p-value
***significant at 1% ** significant at 5% and *significant at 10%

The coefficient of variable D^f shows insignificant results in the meat processing and preservation industry (ISIC 101), cooking oil and vegetable oil industry (ISIC 104), milk processing, dairy and ice cream product industry (ISIC 105), grain, flour and starch milling industry (ISIC 106) and the animal feed industry (ISIC 108). This means there was no difference in productivity between foreign-owned and domestic plants. Based on the results, the government does not need to regulate foreign ownership in these industries. Foreign ownership in the industry not related to plant productivity.

The productivity of plants in the meat processing and preserving industry (ISIC 101) and fish processing and aquatic biota industry (ISIC 102) was positively correlated with the export propensity. This is indicated by the significant value of the export ratio (E). In contrast, the export ratio variable (E) showed significant results with a negative sign in dairy and ice cream product industry (ISIC 105) and the animal feed industry (ISIC 108).These results indicate that exports were negatively correlated with firm productivity. This happened because the industries aim to fulfilling domestic needs. The import ratio variable (M) showed significant results in dairy and ice cream product industry (ISIC 105), grain, flour and starch milling industry (ISIC 106) and other food industry (ISIC 107). Import propensity in those industries will correlated with productivity of plants. This happens because the raw materials used by the industries come from imports.

The results showed that the plants with foreign ownership had higher productivity than domestically owned plants in the fish processing and aquatic biota industry (ISIC 102), fruit, vegetable processing and preservation industry (ISIC 103) and other food industry (ISIC 107). Correlation analysis between the degrees of foreign-owned with plant productivity in these industries is conducted. The results of the sub sector analysis using model (5) which distinguishes the majority of foreign ownership, can be seen in Table 6.

In the fish processing and aquatic biota industry (ISIC 102), the largest productivity difference among foreign-owned and domestically owned plants was when there was less than 50 percent foreign ownership. The fruit and vegetable processing and preservation industry (ISIC 103) had only two categories of foreign ownership, 100 percent and less than 50 percent foreign ownership. Both categories were significantly different from domestically owned plants. For less than 50 percent foreign-owned plants, the productivity difference was insignificant compared to domestically plants in the other food industry (ISIC 107). In other food industry (ISIC 107), productivity differences occurred when foreign ownership ranged from 50 to 100 percent. Additionally, for wholly foreign-owned plants, the productivity difference was less than foreign ownership between 50-100 percent.

Table 6. Estimation Result on the Difference between Foreign and Domestic Plant among Food Industry Sub-sector (3 digit ISIC)

Variable	ISIC 102	ISIC 103	ISIC 107
Constant	15.235***	15.149***	16.053***
	(0.000)	(0.000)	(0.000)
D_{050}	0.786**	1.737***	-0.034
	(0.015)	(0.000)	(0.934)
D_{50100}	0.190	-	1.811***
	(0.210)		(0.000)
D_{100}	0.174	3.127***	0.649**
	(0.412)	(0.009)	(0.024)

ln L	0.934***	0.569***	0.902***
	(0.000)	(0.000)	(0.000)
ln K	0.040**	0.105*	0.221***
	(0.016)	(0.084)	(0.000)
E	0.608***	0.014	-0.030
	(0.000)	(0.973)	(0.851)
M	0.555	0.195	0.647**
	(0.100)	(0.236)	(0.019)
N	0.272*	0.139	0.807***
	(0.096)	(0.769)	(0.000)
S	0.076**	0.233***	0.039***
	(0.027)	(0.002)	(0.000)
Number of Observation	775	150	1927
R^2	0.6755	0.669	0.927
Ho: $D^{050} = D^{100}$, *p-value*		0.250	
Ho: $D^{50100}=D^{100,}$ *p-value*		-	0.046

Note:
Number in parentheses denotes p-value
***significant at 1% ** significant at 5% and *significant at 10%

Third stage of the analysis is carried out for other food industries to see whether 95 percent foreign ownership has greater productivity compared to wholly foreign-owned plants. The estimation results can be seen in Table 7. The highest productivity of plants with foreign ownership is indicated by the variable D_{9699}, which means that in other food industries, the highest foreign ownership is between 96-99 percent.

The results of the food industry level differed than the sub-sector level. This distinct result was also identified by Oguchi et al. (2002) who conducted research on the productivity of foreign-owned and domestic firms in the Malaysian manufacturing industry. The results highlighted that in all sub-sectors, foreign ownership increased productivity, while at the manufacturing sector level, domestic and foreign-owned firms were equal. This finding indicates that the investigation at the aggregate and disaggregate levels exemplified a different picture. Oguchi et al. (2002) stated that investigating at the aggregate level would be more useful for the purpose of establishing or evaluating policies involving foreign ownership. At the aggregate level, the results obtained considered the effects of positive and negative spillovers. Positive spillovers, for instance, are better production technology, production management, and coordination, while negative spillovers cover labor migration and resource reallocation. These influences can be very significant and dominated by the direct influence of particular plants.

Table 7. Estimation Result on the Difference between Foreign and Domestic Plant in The Other Food Industry (ISIC 107)

Variable	Coeficient	p-value
Constant	16.080***	0.000
D_{50}	-0.067	0.871
D_{5094}	1.075***	0.001
D_{95}	1.084***	0.016
D_{9699}	1.295***	0.000
D_{100}	0.612***	0.037
ln L	0.902***	0.000
ln K	0.226***	0.000
E	0.003	0.988
M	0.648**	0.020
N	0.794***	0.000
S	0.040***	0.000
Number of observation	1927	
R^2	0.931	
Ho: $D^{5094}=D^{95,}$ *p-value*		0.987

Ho: $D^{5094}=D^{9699,}$ *p-value*	0.499
Ho: $D^{5094}=D^{100,}$ *p-value*	0.254
Ho: $D^{95}=D^{100,}$ *p-value*	0.070
Ho: $D^{9699}=D^{100,}$ *p-value*	0.026

***significant at 1% ** significant at 5% and *significant at 10%

Subsequently, an investigation at the aggregate level can provide useful information. Blomström & Sjöholm (1999), Oguchi et al. (2002) and Takii (2004) proved this notion, while Garrett (2003) also conducted regression analysis by using aggregate and disaggregate data and concluded that aggregate data could produce incorrect conclusions on firm behavior. Aggregate level analysis is useful, as it considers the spillover of an industry, while firm-level or plant-level analyses are useful to examine firm behavior. Considering the different results regarding the correlation between plant productivity and foreign ownership, government policies on foreign ownership restriction must consider these characteristics of the industries.

The results indicated that correlation between foreign ownership and productivity were very dependent on the characteristics industry. Foreign ownership in fish processing and aquatic biota industries (ISIC 102), vegetable processing and preservation industry (ISIC 103) and other food industry (ISIC 107) has a positive correlation with productivity. These three industries need advanced technology to produce the product and need foreign involvement to obtain the technology. The government needs to encourage foreign ownership in these industries. The degree of foreign ownership only affects in the other industries (ISIC 107). In this industry, the highest productivity is found in plants with foreign ownership between 96-99 percent. The government has to facilitate foreign-owned plants between 96-99 percent instead of limiting foreign ownership to a maximum of 95 percent.

5. Conclusion

There are productivity differences between foreign-owned and domestically owned plants in the food industry. Foreign-owned plants have higher productivity than domestic ones. The productivity of plants with minority foreign ownership (under 50 percent) was not significantly different from that of domestically owned plants. However, the productivity of plants with foreign ownership above 50 percent differed from that of domestically owned plants. Wholly foreign ownership (100 percent) did not indicate the highest difference in productivity.

Industrial characteristics determine the correlation between productivity and foreign ownership. In the meat processing and preservation (ISIC 101), the cooking and vegetable oil (ISIC 104), the dairy and ice cream product (ISIC 105), the grain, flour, and starch milling (ISIC 106) and animal feed (ISIC 108) industries, there are no productivity differences between foreign and domestically owned plants. Nonetheless, in fish and aquatic biota preservation (ISIC 102), fruit, vegetable preservation (ISIC 103) and other food industries (ISIC 107) found that foreign-owned plants had higher productivity than domestic plants. The degree of foreign ownership is not proven to be related to the plant's productivity in fish and aquatic biota preservation (ISIC 102) and fruit and vegetable preservation (ISIC 103) industries. For the other food industries (ISIC 107), plants with foreign ownership 96-99 percent have higher productivity compared to 100 percent.

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