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Impact of FDI, Labor Productivity and Firm Size on the Export of Indonesian Manufacturing

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Abstract

The purpose of this study is to analyze empirically the impact of foreign direct investment (FDI), labor productivity, and firm size on the company's exports in the Indonesian manufacturing industry and measure the technical efficiency of Indonesian manufacturing industry. The result show that manufacturing industry has yet to achieve the maximum level of technical efficiency. FDI, firm size, technical efficiency, industry concentration, and the use of imported raw materials have a positive and significant impact on the company's export opportunities, meanwhile labor productivity and firm location results in a positive but insignificant relationship to the company's export opportunities. Other findings show that interactions variable between FDI and the use of imported raw materials and interaction between firm size and the use of imported raw materials resulting in a positive and significant relationship to the company's export opportunities, meanwhile interaction between FDI and industry concentration statistically insignificant on the company's export opportunities.

Keywords
Manufacturing Industry; FDI; Labor Productivity; Firm size; Technical Efficiency

I. Introduction

On the one hand, a larger international market allows a company to increase its economies of scale, while on the other hand, international markets can encourage learning processes through the abundance of technology and knowledge that comes from Foreign Direct Investment (FDI). This can increase competitive pressure, so that every company must be able to compete with companies in the domestic market and must face competition with foreign companies in the international market. Therefore, domestic companies need to increase their productivity in order to face the competitive pressures that occur. If the company cannot face a high level of competition, it will be forced out of the market (Oholm, 1999).

To increase competitiveness in order to survive in the market, companies are trying to enter the international market by exporting, including companies in Indonesia. Indonesia's exports experienced positive growth during the 2003–2008 period. However, in 2009, the export value decreased significantly by 14.97% due to the global financial crisis. Indonesia's export conditions began to improve in the 2010-2011 period. The value of Indonesia's exports reached the highest value in the last seventeen years, which was US$203.5 billion in 2011, while in 2012-2016 the value of exports decreased and increased again in 2017-2018. Furthermore, in 2019 the value of exports again decreased due to fluctuations in oil prices and several other commodities such as crude palm oil (CPO) and mining goods (BPS, 2020). These price fluctuations caused oil and gas exports to decline by 31.34% in 2019. Meanwhile, non-oil and gas exports also decreased by 4.27% in 2019. Non-oil and gas exports contributed 93% to total exports or around 155.9 billion US Dollars. While oil and gas exports contributed 7% of total exports or around 11.79 billion

US dollars in 2019 (Statistik Perdagangan Luar Negeri Indonesia Ekspor Menurut Kode ISIC 2018-2019 BPS, 2020).

In addition, the manufacturing industry or processing industry is an important sector for Indonesia because it has a large contribution to Indonesia's Gross Domestic Product (GDP). The manufacturing industry has the largest contribution, amounting to 20.79% of Indonesia's GDP in 2019 (BPS, 2020). This large contribution indicates that the manufacturing industry is an important source of growth in Indonesia.

Exports can accommodate the company's interests in expanding. Through exports, companies can make connections with the world economy and enlarge their markets, and can take advantage of economies of scale and technology transfer (Girma et al., 2004) . In this case, exports are a rational choice for companies because successful exports will have a significant impact on attracting more quantity and quality of FDI into the country and thus can generate additional growth spurts (Saputra, 2014) Based on this description, this study will analyze the effect of FDI, labor productivity and also the size of a company on the export performance of companies in the manufacturing industry in Indonesia.

II. Review of Literature

The Effect of Foreign Direct Investment (FDI), Labor Producitivity and Firm Size on The Company's Export

FDI encourages the export of the host country's economy in the following ways: increasing the host country's domestic capital for exports; facilitating the transfer of new technologies, products and services for export, providing links to new, larger markets (international markets), and helping to train the host country's workforce in improving their technical and management capabilities.

FDI is an important source of increasing the productivity and efficiency of domestic firms through positive spillover effects. Multinational companies are usually technologically and managerially superior to domestic companies in developing countries, so the presence of multinational companies can benefit domestic companies through the abundance of technology and information. This knowledge transfer effect from FDI can increase efficiency and increase productivity of domestic companies (Kim, 2015).

FDI was found to play a positive and significant role in influencing the company's decision to export in several studies (Amornkitvikai & Harvie, 2018; Okechukwu, 2017; Zhang, 2015). For the case in Indonesia, FDI was found to have a significant positive impact on the company's export performance in the manufacturing industry (Rahmaddi & Ichihashi, 2013). On the other hand, according to the research of Kuntluru et al. (2012) FDI has a negative impact on the export performance of the pharmaceutical industry in India. After observing, it turns out that the pharmaceutical industry of foreign-owned companies exports less and focuses more on domestic demand and the specific advantages of the host country.

In addition, there is a relationship between the level of productivity and export activities carried out by a company. Empirically, there are two theories that explain the relationship between company productivity and company exports. The first theory is self-selection which states that companies with high productivity will choose themselves to enter the export market, which is in accordance with several studies (Ganotakis & Love, 2012; Reis & Forte, 2016; van Beveren & Vandenbussche, 2010). Companies need some additional costs or sunk costs when entering the export market. These additional costs (sunk costs) include transportation costs, distribution or marketing costs, workers who have the expertise to manage foreign networks, or production costs in modifying domestic products to be exported. These costs become an insurmountable barrier to entry for less productive firms (Demirhan, 2016).

The second theory is learning by exporting which states that companies entering the export market will become more productive and efficient. This theory is in line with research by Siba & Gebreeyesus (2017) which proves that companies will experience an increase in productivity when exporting, because the company gains knowledge in the form of new technology information and increases competitiveness by innovating and improving the quality of its products when entering the export market (Lemi & Wright, 2020). In fact, the proof of the two theories is still a debate until now, although the self-selection theory has been proven more than the learning-by-exporting theory. In fact, some studies have found biased results in proving the two theories (Pane & Patunru, 2019; Thomas & Narayanan, 2012).

Furthermore, one of the variables generally used to analyze a company's export performance is firm size. Larger companies with large resources and influential positions have advantages over smaller companies in meeting the needs of both domestic and international markets (Rodil et al., 2016).

Empirically, firm size has been shown to contribute statistically significantly in increasing the likelihood of firms entering the export market. Firm size was found to have a positive and significant influence company decisions to export and increase export intensity (Cieślik et al., 2018; Fakih & Ghazalian, 2013; Sebolao et al., 2019) Research in Indonesia by Sjöholm, (2003) also found that company size is one of the important measures as a determinant of manufacturing companies' exports. Although most studies find that there is a positive relationship between firm size and exports, Iyer (2010) and Wolf & Pett (2000) find different results indicating that firm size does not guarantee an increase in exports to a firm.

III. Research Method

The research approach used is a quantitative approach. In this study, the data used is panel data which is estimated using the Logit model. The data used to be able to see whether or not there is a relationship between the variables in this study is firm-level data in the manufacturing industry during the 2010-2015 period, sourced from the BPS Annual Survey of Large and Medium Manufacturing Industry Companies.

The analytical model used in this study is the Logit model. The software program used in this analysis is STATA 14. To determine the factors that determine the exports of manufacturing companies, this study uses the following model:

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + u_{it} \quad (3.1)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 EFF_{it} + u_{it} \quad (3.2)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 HHI_{it} + u_{it} \quad (3.3)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 IMP_{it} + u_{it} \quad (3.4)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 LOC_{it} + u_{it} \quad (3.5)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 FDI * HHI_{it} + u_{it} \quad (3.6)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 FDI * IMP_{it} + u_{it} \quad (3.7)$$

$$L_{it} = \ln\left(\frac{P_{it}}{1-P_{it}}\right) = \beta_1 + \beta_2 FDI_{it} + \beta_3 LP_{it} + \beta_4 FZ_{it} + \beta_5 FZ * IMP_{it} + u_{it} \quad (3.8)$$

Table 1. Definition of Variables

Variables	Operational Definition
Lit	Logit
Pit	Probability of manufacturing company do export.
1-Pit	Probability of manufacturing company does not export.
FDIit	Dummy variable of FDI received by the company in industry i in the period (year) *t.* D=1 if the company receives foreign investment of more than 10%, D=0 if the company does not receive foreign investment of more than 10%.
LPit	Labor productivity in industry i in the period (year) *t.*
FZit	The size of the company in industry i in the period (year) *t.* Firm size variable uses a dummy variable where D = 1 is a large company with a 100 workers or more and D = 0 is a medium, small, home-based industry with a workers less than 100 people.
EFFit	Technical efficiency obtained from the calculation of the Transcendental Logarithmic (Translog) production function model which is estimated using Stochastic Frontier Analysis (SFA)
HHIit	Industrial concentration level by using *Herfindahl-Hirschman-Index.*
IMPit	Dummy variable of imported raw materials, where D = 1 shows the company imports raw materials and D = 0 shows the company does not import raw materials.
LOCit	Dummy variable of company location, where D = 1 If the location of the company is on the island of Java, and D = 0 if the location of the company is not outside the island of Java.
*FDI*HHIit*	Interaction variables, between FDI and industrial concentration
*FDI*IMPit*	Interaction variables, between FDI and imported raw materials
*FZ*IMPit*	Variabel interaksi, between firmz size and imported raw material
εit	*Error term*

Export as the dependent variable is a dummy variable which is the export status of the company in the manufacturing industry during the period 2010 to 2015. The dummy variable will be worth 1 if the company exports and 0 if the company does not export. This Foreign Direct Investment variable is used to describe the activity of foreign investment in the company or the participation of foreign investment in the company. Foreign companies as legal entities in which foreign investors own 10% or more of their equity capital. In this case, D=1 if the company receives foreign investment of more than 10% of the company's total capital, and D=0 if the company does not receive foreign investment of more than 10% of the company's total capital or not at all. This determination is based on the OECD (2009) and IMF (2004)which defines foreign companies as a legal entity company where foreign investors have 10% or more of their equity capital.Calculation of labor productivity is formulated by the following equation:

$$LPi = \frac{Outi}{Li} \qquad (3.9)$$

Where LP is the productivity of labor, Outi is the output of firm i, L is the number of workers of firm i.

The firm size variable uses a dummy variable where D = 1 is a large company with a 100 workers or more and D = 0 is a medium, small, home-based industry with a workers

less than 100 people. This variable is measured based on the BPS classification of company size in the Manufacturing Industry which is divided into 4 groups, namely :

a) Large Industry (100 workers or more)
b) Medium Industry (20-99 workers)
c) Small Industry (5-19 workers)
d) Home Industry (1-4 workers)

In this study, the data used is secondary data which is micro data or company level data. The subjects to be studied are companies in the manufacturing industry sector in Indonesia during the 2010-2015 period. The data is sourced from the Annual Survey of Large and Medium Manufacturing Industries conducted by the Central Bureau of Statistics in raw form. The data has been constantized using the large trading price index (2010=100) and then selected to obtain data on 8486 companies.

The data used in this study is data that has been grouped based on the International Standard Industrial Classification, which is a classification system used to find data on an industrial scale. Data collection begins with collecting data sourced from Central Bureau of Statistics Annual Survey of Large and Medium Manufacturing Industries relating to related variables as determinants of export performance of the manufacturing industry in Indonesia during the 2011-2015 period. The data that has been collected is then grouped based on the five-digit ISIC.

The data is selected and adjusted and panel data balancing is carried out to obtain the required data with a total observation of 8486 companies. After all the data has been collected, the next step is to process the data using the SFA approach using Frontier 4.1 software and estimate the Logit model using the STATA 14.2 software.

The analysis technique in this study consisted of two main stages. The first is to find the value of the company's technical efficiency by estimating the parameters of the translog production function using Maximum Likelihood Estimation (MLE) using Frontier 4.1 software created by (Coelli, 1996).

The second stage uses the Logit model, which is a non-linear regression model whose dependent variable is categorical with values 1 and 0 (binary). In the logit model, the dependent variable is the log of the probability ratio, which is a linear function of the independent variable. The probability function underlying the Logit model is the logistic distribution (Gujarati & Porter, 2009).

The Logit model is estimated using Maximum Likelihood Estimation (MLE) using STATA 14 software. If the value of L (logit) is positive, it indicates that when the value of the independent variable increases, the probability of the dependent variable equal to 1 (events occur) also increases. Conversely, if the value of L (logit) is negative, it shows that the probability of the dependent variable equal to 1 (events occur) decreases as the independent variable increases (Gujarati & Porter, 2009).

Partial variable significance test aims to determine the relationship of each independent variable to the dependent variable. In the Logit model, a partial significance test can be performed using Z Statistics to find out how each independent variable affects the dependent variable. There are two ways to partially test the significance.

The coefficient of determination is a coefficient that shows how big the independent variable is in explaining the dependent variable. The value of the coefficient of determination seen in Pseudo R2 is in the range 0 to 1. If the value of Pseudo R2 is 0, it can be said that the independent variable is not able to explain the dependent variable. Conversely, if the value of Pseudo R2 is 1, it can be said that the independent variable can explain the dependent variable perfectly. So it can be concluded that the greater or closer to one, the better the coefficient of determination.

IV. Results and Discussion

The manufacturing industry or processing industry is one sector that has an important role in the Indonesian economy. This study find the value of the company's technical efficiency by estimating the parameters of the translog production function and uses the Logit model to to find out the determinants of the company's exports. Statistics Descriptive of variabel shown on Table 2.

Table 2. Statictics Descriptive

No	Variabel	Unit	Obs	Mean	St. Dev	Min	Max
1	Output (Y)	ln	50916	15.68244	2.058092	8.338078	24.5828
2	Capital (K)	ln	50916	14.19393	2.17767	0.2537891	27.45762
3	Labor (L)	ln	50916	4.150191	2.181414	2.995732	10.63041
4	Material (M)	ln	50916	14.77836	2.243883	0	23.78946
5	Energy (E)	ln	50916	11.9856	2.35228	2.231117	23.38254
6	Export	*dummy*	50916	0.2155118	0.411181	0	1
7	FDI	*dummy*	50916	0.0849438	0.2788008	0	1
8	Labor Productivity (LP)	rasio	50916	361801.3	4340060	53.86399	7.78e+08
9	Firm Size (FZ)	*dummy*	50916	0.2787336	0.4483806	0	1
10	Technical Efficiency (EFF)	rasio	50916	0.5122649	0.1412423	0.0222214	1
11	Industrial Concentration (HHI)	rasio	50916	0.0094078	0.3341206	3.98e-13	31.97272
12	Imported Raw Materials (IMP)	*dummy*	50916	0.1537041	0.3606685	0	1
13	Location (LOC)	*dummy*	50916	0.3331762	0.4713536	0	1

The estimation results of the translog production function which were estimated using the Maximum Likelihood method using Frontier 4.1 contained in table 3. The translog production function consists of 20 independent variables and it can be seen that all variables have a statistically significant effect on the company's output with a significance level of 1% or 0.01.

Sigma square is an indicator of technical inefficiency. If the value of sigma square = 0, then there is no difference between the actual production and the potential production or it can be said to be efficient, so if sigma square> 0 then it can be said to be inefficient. Because the sigma square value is 0.24 which is more than zero, the production at Indonesian manufacturing companies can be said to have not met or achieved the expected technical efficiency. The gamma value of 0.55 means that 55% of the residual comes from inefficiency in production, the remaining 45% comes from random error.

Table 3. Maximum Likelihood Estimation Result of Production Funsction

Produksi Function : Dependen Variable Y				
Variabel	**Parameter**	**Coefficient**	**Standard-error**	**t-ratio**
Constant	β0	3.9001***	0.1065	36.5943
lnK	β1	0.1406***	0.0106	13.2449
lnL	β2	0.8236***	0.0236	34.8959
lnM	β3	0.0905***	0.0117	7.7022
lnE	β4	0.3729***	0.0108	34.2514
$(lnK)^2$	β5	0.0056***	0.0003	16.7472
$(lnL)^2$	β6	0.5944***	0.0023	25.3030
$(lnM)^2$	β7	0.0600***	0.0004	122.2821
$(lnE)^2$	β8	0.0310***	0.0005	58.8021
(lnK)(lnL)	β9	0.0221***	0.0013	15.9735
(lnK)(lnM)	β10	-0.0195***	0.0008	-22.4533
(lnK)(lnE)	β11	-0.0037***	0.0008	-4.5953
(lnL)(lnM)	β12	-0.0774***	0.0017	-43.6281
(lnL)(lnE)	β13	-0.0226***	0.0015	-14.7513
(lnM)(lnE)	β14	-0.0535***	0.0008	-59.8019
t	β15	0.1343***	0.0090	14.9107
t^2	β16	0.0024***	0.0006	3.9443
(lnK)(t)	β17	-0.0025***	0.0006	-4.1276
(lnL)(t)	β18	0.0173***	0.0012	14.2516
(lnM)(t)	β19	-0.0071***	0.0006	-10.3700
(lnE)(t)	β20	-0.0020***	0.0006	-3.2889
sigma-squared		0.2433***	0.0057	42.3680
Gamma		0.5581***	0.0058	96.0010

Source: Frontier 4.1 output, data processed
Note : level of significance ***p <0.01, **p <0.05, *p <0.1

The results of the estimation of the value of the company's technical efficiency in the manufacturing industry during the period 2010 to 2015 are shown in Figure 1. During the 6-year period, the technical efficiency of companies in the manufacturing industry showed a declining trend. The company's technical efficiency value in the manufacturing industry was the highest in 2010 at 0.541 and the lowest in 2015 at 0.482. If the average value of technical efficiency is calculated during the research period, the average value of technical efficiency is 0.51. The value of technical efficiency which is relatively low and still below the number one indicates that the use of inputs in production is not optimal or it can be said that it is not efficient.

The company's highest technical efficiency in the manufacturing industry was achieved by the following companies. The highest technical efficiency score of 1 was achieved by companies in the drinking water and mineral industry (11050), companies in the inorganic basic chemical industry of industrial gases (20112), companies in the organic basic chemical industry for raw materials for dyes and pigments (20116), companies in the chemical industry non-aluminum goods made of ready-to-install metal for buildings (25111), companies in the service industry for various special metal and metal goods (25920), companies in the industry of cutting tools and hand tools for agriculture (25931), companies in the television industry and/or television assemblies (26410), and companies in the spare parts and accessories industry for four or more wheeled motor vehicles (29300). These companies have a technical efficiency of 1 during the 2010-2015 period, so it can be said that these companies have been operating very efficiently or fully efficiently.

Meanwhile, there are companies that have the lowest level of technical efficiency during the 2010-2015 period, namely companies in the cigarette spice industry and other

cigarette accessories (12099). The company operates with an average efficiency level of 0.031 during the 2010-2015 period. This means that the company reaches its maximum production potential of only 3.1%.

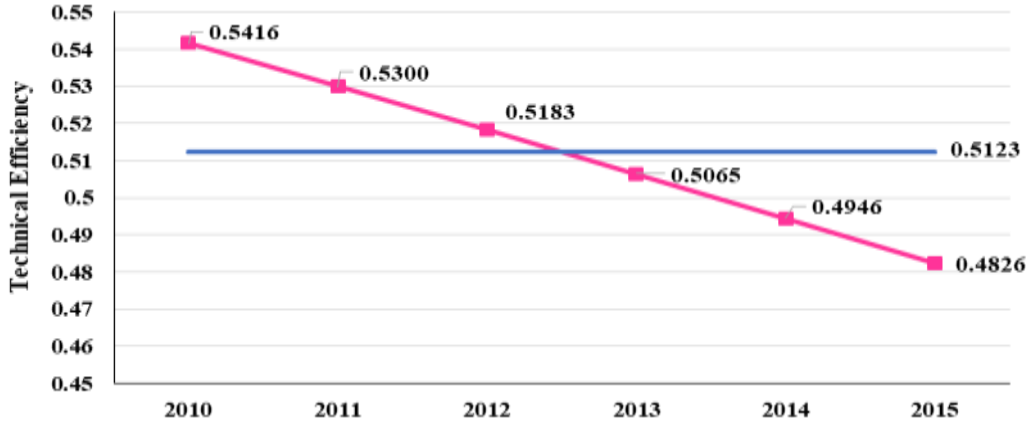

Figure 1. *Technical Efficiency of Industry Manufacture Company 2020-1025*

Table 4. Maximum Likelihood Estimation Results on the Logit Model

Dependen Variable : Export			
Variabel	**Logit**	**Odds Ratio**	**Mfx**
Cons	-2.063932***	0.1269538***	0.18364564
	(0.016394)	(0.0020813)	
FDI	1.648078***	5.196981***	0.3404815***
	(0.036622)	(0.1903241)	(0.00883)
Labor Productivity (LP)	1.96e-09	1	2.94e-10
	(2.20e-09)	(2.20e-09)	(0.00000)
Firm Size (FZ)	1.547671***	4.70051***	0.2796969***
	(0.0242134)	(0.1138155)	(0.00472)
Technical Efficiency (EFF)	0.8071202***	2.241444***	0.1206988***
	(0.0819132)	(0.1836038)	(0.01223)
Industrial Concertration (HHI)	0.0654292*	0.1270311*	0.00981*
	(0.0363087)	(0.0020828)	(0.00545)
Importerd Raw Materials (IMP)	0.925043***	2.521977***	0.1649944***
	(0.020432)	(0.0767489)	(0.00628)
Company Location (LOC)	0.0292511	1.029682	0.0043988
	(0.0253462)	(0.0260986)	(0.00382)
FDI*HHI	-0.0620261	0.1269216	-0.0092984
	(0.0487598)	(0.0020811)	(0.00731)
FDI*IMP	0.8755272***	2.40014***	0.1637628***
	(0.0699278)	(0.0020893)	(0.0155)
FZ*IMP	0.927741***	2.52879***	0.1718745***
	(0.03875)	(0.0979906)	(0.00849)
n			50.916
Pseudo R^2			0.1721
LR Chi^2 (4)			9131.50***

Source: STATA 14.2 output, data processed
Note : level of significance ***p <0.01, **p <0.05, *p <0.1

To find out what factors are the determinants of company exports in the manufacturing industry, an estimate is made using a logit model approach or logistic regression using STATA 14.2. From Table 4 it can be seen that most of the variables

showed statistically significant results, except for the variables of labor productivity, company location, and the interaction between FDI and industrial concentration which were not statistically significant. Most of the significance levels are at the 1% level, and only one variable, namely industry concentration, is at the 10% significance level.

The coefficient value from the regression estimation results of the logit model is only used to see the positive or negative relationship between the independent variable and the dependent variable, so the estimation results cannot be interpreted directly.

Because the estimation results from the regression model cannot be interpreted directly, it must be converted into antilog form first to get the odds ratio or called the odds-ratio. The slope coefficient on the logit model cannot show the level of change in probability for every one unit change of the independent variable, so the marginal effect is used to determine the level of change in probability. Simultaneously, the independent variables together have a significant influence on the probability of the company's exports with a significance level of 1%. However, partially, the variables of labor productivity, company location, and FDI*HHI interactions are not statistically significant in influencing the exports of manufacturing industry companies.

FDI variable has a positive and significant coefficient at the 1% level, this indicates that companies that receive foreign capital or FDI have a higher probability of exporting than companies that do not receive FDI. This estimation result is in line with most studies such as Zhang (2015) which examines how FDI influences export competitiveness in 21 manufacturing industry sectors in China which shows that FDI is the main driver of export in China.

Furthermore, the labor productivity variable which does not have a statistically significant effect on the probability of a company's exports with a positive sign coefficient. The insignificantness of the labor productivity variable is in line with the research by Siba & Gebreeyesus (2017) which examines the manufacturing industry in Ethiopia and states that self-selection is not statistically significant, this is because it is not productivity that affects exports, but exports that affect company productivity. However, most research in Indonesia uses the variables of company efficiency and total factor productivity (TFP) and proves that the self-selection theory applies to the Indonesian manufacturing industry as in the research of Saputra (2014) and Rachbini (2020). Due to differences in variables in proving the self-selection hypothesis and labor productivity variables are rarely used in the case of companies in Indonesia, this can cause differences in estimation results, so that self-selection is not proven significant when using labor productivity variables in influencing company exports.

One of the variables that determine the probability of a company's export is the size of the company which shows positive and significant results at the 1%. This means that large company sizes have a higher probability of exporting than companies with medium or small sizes. The results of this research on the firm size variable are in accordance with the empirical studies conducted by Sebolao et al. (2019) which states that company size has been shown to contribute statistically significantly to increase the likelihood of companies entering the export market.

In terms of efficiency, the company's technical efficiency variable has a positive and significant at the 1%, which means that the more efficient a company is, the more likely it is to export. This finding is consistent with the self-selection hypothesis, where more productive and efficient firms are more export-oriented. Competition in the industry is the only factor that can accelerate higher efficiency thereby encouraging companies to participate in foreign markets (Pušnik, 2010). On the other hand, these results are in line with the research of Kolte et al. (2020) found that firms with higher technical efficiency

scores showed higher export earnings growth. On the other hand, companies with lower technical efficiency show lower export performance, both in terms of export revenue and export revenue growth.

The industrial concentration variable have a significant positive relationship at the 10% in influencing the probability of firms influencing exports. This means that the higher the industrial concentration, the higher the probability of companies to export. This result is in line with the theory of the national-champion rationale which states that high industrial concentration (low competition) in the domestic market allows companies to earn large profits in the export market through economies of scale. This finding is supported by research by Galdeano-Gómez (2010) which examines the food processing industry in Spain using the Herfindahl Hirschman Index (HHI) as a proxy for the industrial concentration variable. It was found that industrial concentration had a significant positive relationship with the company's export intensity, where when the concentration level was higher, the company's export intensity would increase.

The raw material import variable is also one of the determining variables for company exports which show significant positive results at the 1%, where when the company imports raw materials, the company has a higher probability of exporting than companies that do not import raw materials. Research by Feng et al. (2016) support these results which find that companies that expand their input imports can expand their export volume and export scope.

The company's location variable is not significant because the company can increase its export probability through other factors such as FDI flows, high technical efficiency, and large company size so that wherever the company's location does not affect the company's probability of exporting. In addition, it is not the location of the company that affects exports but the international involvement (exports and imports) of companies that affect the need for a better company location related to infrastructure in line with the results of research by (Rasmussen et al., 2011).

The results on the interaction between FDI variables and industrial concentration showed a negative but not statistically significant relationship. This shows that companies that receive FDI and high industrial concentrations have no effect on the probability of the company's exports. Meanwhile, the interaction between FDI variables and imported raw materials has a positive relationship and is statistically significant at the 1% level. However, the coefficient of odds ratio is not greater than the coefficient of imported raw materials, so it can be said that companies that receive FDI and import raw materials do not have a greater probability of exporting than companies that only import raw materials without receiving FDI.

Furthermore, the interaction between company size variables and imported raw materials has a positive and statistically significant effect at the 1% level on the probability of exports and the coefficient of odds ratio is greater than the coefficient of imported raw materials. This result means that companies with large company sizes and importing raw materials will have a greater probability of exporting than companies that only import raw materials without having a large company size.

The robustness check shown on Table 5 to obtain the validity of the research results by comparing the results of the initial estimation using the logit model with the estimation results of the endurance test using the probit model. The results are declared valid if the estimation results on the probit model are in accordance with the initial estimation results that have been carried out using the logit model.

Based on the estimation results of the probit model, it can be seen that each variable shows the same significance result as in the logit model with coefficients whose values are

not much different. The FDI variables, firm size, technical efficiency, imported raw materials, FDI*IMP interactions, and FZ*IMP interactions show positive and statistically significant at the 1% level of the company's export probability, while the industrial concentration variable is positive and significant at 10% to the probability of the company's exports. On the other hand, the variables of labor productivity, company location, and FDI*HHI interactions show results that are not statistically significant to the probability of company exports. Therefore, the model is declared valid because it is able to maintain the relationship between the variables. So it can be said that the model is consistent, because it shows the same results between the initial estimation results with the logit model and the results of the endurance test estimation with the probit model.

Table 5. Robustness Check (Probit Model)

Dependen Variable: Eksport		
Variable	**Probit**	
	Probit Regression	***Marginal Effect***
Cons	-1.218061***	0.18867493
	(0.0086638)	
FDI	0.9886762***	0.3419088***
	(0.0217326)	(0.00841)
Labor Productivity (LP)	1.27e-09	3.42e-10
	(1.37e-09)	(0.00000)
Firm Size (FZ)	0.8998942***	0.2791218***
	(0.0140952)	(0.00468)
Technical Efficiency (EFF)	0.5361816***	0.1443716***
	(0.0256843)	(0.01262)
Industrial Concertration (HHI)	0.0338831***	0.0091555*
	(0.0196034)	(0.0053)
Imported Raw Materials (IMP)	0.5436954***	0.1684923***
	(0.0088652)	(0.00635)
Location (LOC)	0.0208018	0.0056375
	(0.014227)	(0.00387)
FDI*HHI	-0.035121	-0.0094894
	(0.0305263)	(0.00825)
FDI*IMP	0.5156041***	0.1654937***
	(0.0411112)	(0.015)
FZ*IMP	0.5661766***	0.1810198***
	(0.0235331)	(0.00854)
n	50.916	
Pseudo R^2	0.1721	
LR Chi^2 (4)	9136.14***	

Source: STATA 14.2 output, data processed
Note : level of significance ***p <0.01, **p <0.05, *p <0.1

V. Conclusion

This study found that FDI have a positive and significant effect which indicates that companies that receive FDI can increase their chances of exporting. While the labor productivity variable has a positive sign but does not have a significant effect on the company's export probability. Companies with large company sizes show a positive and significant influence, so it can be said that companies with large sizes are able to increase the probability of companies to export. In terms of technical efficiency, it shows that the higher the technical efficiency of the company, the higher the probability of the company to export, as evidenced by a positive and significant sign. Furthermore, the industrial concentration variable has a positive and significant influence on the export probability. This means that the higher the industrial concentration, the higher the probability of companies to export. Furthermore, the imported raw material variable also shows a positive and significant relationship with the export probability, which means that companies that import raw materials will have a higher probability of exporting. Finally, the location variable shows a positive sign but does not have a statistically significant effect on the company's export probability.

Based on the interaction of the three variables, only two variables showed positive and statistically significant results due to the interaction between FDI and imported raw materials and the interaction between company size and imported raw materials. Companies that receive FDI and import raw materials do not have a greater probability of exporting than companies that only import raw materials without receiving FDI. Meanwhile, companies with large company sizes and importing raw materials will have a greater probability of exporting than companies that only import raw materials without having a large company size. The technical efficiency of the company studied in this study is in the manufacturing industry during the 2010-2015 period which has an average of 0.512. The average value of technical efficiency below 1 indicates that the manufacturing industry is still not operating with maximum efficiency. In addition, 8486 companies in the manufacturing industry have technical efficiency values with a decreasing trend every year. So it can be said that the manufacturing industry has not been able to maintain and even improve its efficiency in a sustainable manner.

The author's suggestion for the government is that the government needs to implement policies that are able to attract investment in the manufacturing industry in Indonesia, such as simplifying bureaucracy and making it easier for investors to operate in the domestic market. However, this must be accompanied by policies that provide protection for domestic companies. Meanwhile, suggestions for the manufacturing industry, namely the manufacturing industry, need to make efforts to increase the level of technical efficiency. The government needs to make several efforts, such as implementing programs that lead to increased technical efficiency, such as introducing the importance of research and development (R&D), conducting training to improve the skills of the workforce, and increasing investment, especially in production technology.

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