Imports of Raw Materials, Spillover of Foreign Investment and Technical Efficiency of Indonesia's Manufacturing Industry Exports

(Impor Bahan Baku, Limpahan Investasi Asing, dan Efisiensi Teknis Ekspor Industri Manufaktur Indonesia)

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Abstrak

Penelitian ini menggunakan data dari 15 industri manufaktur Indonesia selama 6 tahun. Penelitian ini mengkaji dua poin utama: pertama, apakah industri manufaktur di Indonesia efisien secara teknis; kedua, apakah impor bahan baku, spillover investasi asing, dan efisiensi teknis memengaruhi kecenderungan ekspor. Penelitian ini menggunakan metode Analisis Batas Stokastik untuk menilai efisiensi teknis dan model logit untuk memperkirakan pengaruh impor bahan baku, spillover investasi asing, dan efisiensi teknis terhadap efisiensi ekspor. Hasil estimasi menunjukkan bahwa industri manufaktur Indonesia belum efisien secara teknis. Selain itu, hasil model logit menunjukkan bahwa impor bahan baku berpengaruh positif terhadap ekspor, spillover horizontal berpengaruh negatif terhadap ekspor, dan efisiensi teknis berpengaruh positif terhadap ekspor. Kami merekomendasikan agar pemerintah (a) mendorong pengembangan industri hulu domestik yang kompetitif untuk meningkatkan nilai tambah domestik di industri manufaktur; (b) bekerja sama dengan negara lain untuk transfer teknologi; (c) meningkatkan kegiatan Penelitian dan Pengembangan (R&D) di dalam perusahaan; dan (d) meningkatkan arus masuk FDI untuk mendorong kecenderungan ekspor.

Kata Kunci: Efisiensi teknis, Ekspor, Impor, Industri manufaktur, Limpahan investasi

Abstract

This research uses data from 15 Indonesian manufacturing industries during 6 years. It examines two main points: first, whether the manufacturing industry in Indonesia is technically efficient; second, whether imports of raw materials, foreign investment spillovers, and technical efficiency influence export tendencies. The study employs the Stochastic Frontier Analysis method to assess technical efficiency and logit models to estimate the effects of raw material imports, foreign investment spillovers, and technical efficiency on export efficiency. The estimation results show that the Indonesian manufacturing industry is not yet technically efficient. Additionally, the logit model results reveal that raw material imports positively affect exports, horizontal spillovers negatively affect exports, and technical efficiency positively affects exports. We recommend that the government (a) encourage the development of competitive domestic upstream industries to increase domestic added value in the manufacturing industry; (b) cooperate with other countries for technology transfer; (c) enhance Research and Development (R&D) activities within companies; and (d) increase FDI inflows to boost export propensity.

Keywords: *Export, Import, Manufacturing industry, Spillovers of foreign invesment, Technical efficiency*

Introduction

This study analyzed two things. First, whether the manufacturing industry in Indonesia is in a technically efficient condition. Second, whether imports of raw materials, the overflow of foreign investment, and technical efficiency determine export tendencies. The general assumption is that the tendency of companies in Indonesia to export is determined by internal company factors, namely from imports of raw materials, technical efficiency of the company and horizontal spillover effects obtained from foreign direct investment (FDI). Research on the determinants of enterprise exports is increasingly being conducted. This is influenced by the massive export activities of the company in the international market.

The general assumption of participation in export activities is influenced by imports of raw materials, the influx of foreign investment and company performance, namely the level of efficiency. Previous studies have examined the determinants of exports with several research focuses. Among them are about the export behavior of Indonesian companies (Suyanto dkk, 2021) the characteristics and competencies of companies (Widyananda & Sari, 2020), geographical factors and determinants of the company's exports (Kolte dkk, 2020), foreign investment, exports and export spillovers (Chen dkk, 2022). On the other hand, separately, analyzed separately the technical efficiency and total production factors of the Indonesian manufacturing industry (Yasin, 2022). The conclusion is that the company's export activities are influenced by internal factors of the company such as technology, production costs related to the scale of the company, size

companies, foreign market networks knowledge, foreign investment, exchange rates and export plans. In addition, the labor force, industrialization, foreign direct investment, and exchange rates are augmented by replacing agricultural sector exports with industrial exports, improving infrastructure facilities as well as the quality of human resources and policies that right to attract foreign investment to support increased exports (Uysal & Mohamoud, 2018).

Imports of raw materials become an export drive because imports of raw materials increase efficiency and profitability. Through the import of raw materials, relatively low prices and good quality export products will be obtained, thereby increasing product competition in the international market. The reason international integration allows domestic producers to obtain intermediate products (raw materials) and capital equipment from the most competitive global suppliers (Erduman dkk, 2019); (Cardoso & Rua, 2019); (Carrasco & Tovar-García, 2021). Import content (IC) and quality capital equipment will increase efficiency and profitability. International trade with export and import activities brings two benefits, namely price advantages and benefits in terms of quality (Erduman dkk, 2020). The relatively low prices for raw material imports and good quality for export products will increase product competition in the international market (Erduman et al., 2020), (Liu dkk, 2024). In addition, imports of raw materials can increase energy efficiency which means it is beneficial for the environment (Xiang dkk, 2022). This finding is corroborated by the research before which research on technical efficiency to export (Hamidi dkk, 2022); (Mikulić & Lovrinčević, 2018); (Tiryaki, 2019); (Oktaviani & Djamaluddin, 2020); (Wulandari & Lubis, 2019).

In general, existing research limits its study to the macroscale, specifically the determinants of corporate exports. This study attempts to fill this gap by incorporating export-boosting indicators at a more specific level, namely microeconomics, based on firm performance. Incorporating microeconomic indicators will provide a more precise and comprehensive analysis of the factors driving export performance.

The influx of foreign capital through FDI can have an impact on two things, namely increasing company capital through foreign ownership and increasing company knowledge and technology through horizontal spillovers for similar companies. Companies with foreign ownership reduce some of the characteristics of their parent companies, such as high competitiveness that allows export of goods [18]. While the indirect effect of the entry of FDI is in the form of horizontal overflow which is strongly influenced by physical proximity or distance between foreign companies and domestic companies. The existence of foreign companies that are too close to domestic companies can have both negative and positive impacts. This applies to companies engaged in the same sector (Zhou dkk, 2021). FDI externalities depend on the absorptive ability of resources owned by foreign companies or companies with foreign ownership. Absorption is carried out through labor mobility, demonstration effects, and competition (Anh dkk., 2018); (Kong dkk, 2020); (Sugiharti dkk, 2022). The ability of domestic companies to capture spillover effects has an impact on internal company factors, namely being at an efficient level so that companies are more productive (Orlic dkk, 2018); (Moralles & Moreno, 2020); (Vujanović dkk, 2022).This study fills a different discussion space in previous studies. While previous research focused on analyzing the macroeconomic impact of FDI, this study specifically divides FDI into two key variables: FDI as capital accumulation in the form of foreign ownership and FDI in the form of horizontal spillovers, or knowledge transfers, by multinational corporations in the host country. Including these two forms of FDI is crucial, particularly in analyzing domestic export performance. Furthermore, the inclusion of the FDI variable is necessary because growth models postulate that increased investment, both foreign and domestic, is a prerequisite for economic growth. Therefore, to improve the quality of export products, efforts are needed to increase technology-based export capacity, derived from the spillover effects of FDI.

Companies that have high export capacity can be seen from their performance. Company performance is measured based on efficiency (Coelli dkk, 2005). The economy will also be better if companies in a country are more efficient (Amores & Raa, 2014). Companies need to be efficient to grow and survive. If not, the company will experience stagnation and exit the market. A high level of efficiency, company size, foreign ownership, lower tax rates, producing in industrial zones, are determinants for a company to export or not (E. N. Tingum & Ofeh, 2017). Analyzing company efficiency techniques is necessary to understand competition between companies. Several literatures analyze the impact of a company's technical efficiency on export potential. The companies with a high quantity of exports in the domestic market or export-oriented companies have a higher level of technical efficiency than companies that are not export-oriented (Rawat & Sharma, 2021); (Piermartini & Rubínová, 2014); (Mazorodze, 2019); Companies in the manufacturing industrial sector must increase efficiency if they are global market oriented. A company's ability to increase efficiency will have an impact on competitiveness. This research has several advantages and disadvantages. As a research advantage, this research adds technical efficiency variables as one of the determinants of company exports. In addition, raw material imports and FDI horizontal spillovers as determinants for companies to export (Tingum, 2014). The weakness of this research lies in the limited availability of micro level data. Data that is in accordance with the objectives of this research is only available until 2015, while data for subsequent years is not complete in accordance with the objectives of this research. Apart from that, the reason why it is important to carry out analysis during this time period is necessary in order to follow up on government regulations regarding the National Industrial Development Master Plan (RIPIN) in the manufacturing industrial sector which was launched from 2015 to 2035. This is a must for us to know how the condition of the Indonesian manufacturing industry, especially the industry with the largest contribution to exports.

The purpose of this hypothesis is to analyze and make conclusions regarding the research problem. Based on the background, theoretical foundations, and previous studies, the following hypothesis is formulated:

Hypothesis for Efficiency Analysis

1). H_0 : Model *Hicks-Neutral Technological Progress* ($\beta_{kt} = 0$)
H_1 : Model Translog

2). H_0 : Model *No-Technology Progress* ($\beta_t = \beta_{tt} = \beta_{kt} = 0$)
H_1 : Model Translog

3) H_0 : Model Cobb-Douglas ($\beta_{kl} = \beta_{kt} = \beta_t = \beta_{tt} = 0$)
H_1 : Model Translog

Statistical Test

$$LR = -2[\mathrm{l}(h_0) - l(h_1)]$$

Where $\mathrm{l}(h_0) =$ Statistical value *log-likelihood* production functions other than translog (*Hicks-Neutral, no-technological progress, Cobb-Douglas*), while, $l(h_1) =$ Statistical value *log-likelihood* production functions of translog.

Decision

The decision to reject H_0 if the LR statistic value is greater than the distribution table value of *Chi-Square* (χ^2) with degrees of freedom of the number of input variables in the sub-model production function (other than) translog. If H_0 is rejected, then the chosen decision is the function with the translog model.

This research question is formulated in two ways: first, what is the level of technical efficiency of the Indonesian manufacturing industry? And second, do raw material imports, foreign investment spillovers, and technical efficiency affect exports in the Indonesian manufacturing industry? The objectives of this study are: 1) To calculate the level of technical efficiency of the Indonesian manufacturing industry. 2) To examine and analyze the effect of raw material imports, foreign investment spillovers, and technical efficiency on exports in the Indonesian manufacturing industry.

Theoritical review

Production Theory

Production function is an equation that shows the combination of inputs required to produce a particular good or product. Coelli et al. (2005) formulated the production function as a function of inputs. Inputs in a production function are called factors of production. Factors of production generally consist of land, labor, capital, and raw materials. In general, the production function is formulated as follows:

$$q = f(x) \quad (1)$$

Where q represents the output, $x = (x_1, x_2, \dots, x_N)$' is *N x 1*

The mathematical formulation of the production function above shows that the production process is significantly influenced by the variables of capital adequacy, labor, raw materials, and other determinants that influence production activities. Different production needs result in different use of production factors. A company needs a production function to determine how to optimally utilize various inputs in the production process. The combination used by each company reflects the company's technical knowledge in using inputs to produce specific outputs.

Types of Production Functions:

1) Trancendental Logarithmic Production Function: The Translog production function is an extension of the Cobb-Douglas production function. It is a general form of production function. It is called a general production function because it takes into account the effects of linear and nonlinear interactions between input variables and between input variables and time or trend variables. Here are the equations:

$$yit = \beta_0 + \sum_{n=1}^{N} \beta_n X_{nit} + \frac{1}{2}\sum_{n=1}^{N}\sum_{k=1}^{N} \beta_{nk} X_{nit} X_{kit} + \beta_t t + \frac{1}{2}\beta_{tt} t^2 + \sum_{n=1}^{N} \beta_{nt} X_{nit} t$$

2) Sub-Model Translog: Along with the advancement of science and technology, economic development, including output growth, is inevitable. Technological progress results from improvements in productivity and labor conditions, for example, due to healthier, more skilled, more educated, or more motivated workers. Therefore, the production function has also evolved to incorporate technology as a production input. Sub-translog models used in the production function. were Hicks Neutral and No – Technology Progress on Production Frontier. Here are the equations*:*

Hicks Neutral:

$$yit = \beta_0 + \sum_{n=1}^{N} \beta_n X_{nit} + \frac{1}{2}\sum_{n=1}^{N}\sum_{k=1}^{N} \beta_{nk} X_{nit} X_{kit} + \beta_t t + \frac{1}{2}\beta_{tt} t^2$$

No – Technology Progress on Production Frontier:

$$yit = \beta_0 + \sum_{n=1}^{N} \beta_n X_{nit} + \frac{1}{2}\sum_{n=1}^{N}\sum_{k=1}^{N} \beta_{nk} X_{nit} X_{kit}$$

3) Cobb-Douglas Production Function: The parameters of the Cobb-Douglas production function are the elasticity of output to each input (assumed to be constant and ranging from 0 to 1). Here are the equation:

$$Q = AK\alpha L\beta$$

The Concept of Technical Efficiency

Technical efficiency is one of the indicators a company aims to achieve. Technical efficiency measures company performance. Good company performance reflects the achievement of efficiency by observing the company's ability to produce output with a combination of existing inputs. The theory of efficiency with frontier production has been analyzed since 1957 by Farrell. The concept of technical efficiency is interpreted in two ways: output-based, or output technical efficiency, and input-based, or input technical efficiency. Output technical efficiency is how a company maximizes the level of output produced from a given combination of inputs. Output technical

efficiency can also be interpreted as the company's level of success in utilizing productive resources. The model is based on the following equation:

$$TE_i = \frac{Y_i}{\exp(x_i\beta)} = \frac{\exp(x_i\beta - u_i)}{exp(x_i\beta)} = \exp(-u_i)$$

Stochastic Frontier Analysis

Stochastic Frontier Analysis (SFA) was first used by Battese and Coelli in 1995 to estimate the technical efficiency of a company using the SFA production function in their data processing. This stochastic calculation model is used to assess the relationship between material processing production and production inputs such as capital, labor, raw materials, and energy. The SFA method includes 2 random components, namely 1 as technical efficiency and the other as random error.

The SFA model is useful in explaining the efficiency of input factors. The SFA approach describes the stochastic frontier as a boundary that describes the maximum output that can be produced from a combination of input factors. A company's output is actually right on the boundary (frontier) if the input factors used are efficient. However, if they are not used efficiently, the output will be within the boundary line. A larger gap or difference between the boundary line and the company's efficiency value indicates that the company is inefficient in using its input factors. As company efficiency increases, this gap can narrow. This is obtained from the development of the technology used by the company, namely changes in efficiency due to the use of input factors, changes in technology, and changes in input factors.

Stochastic Frontier Analysis (SFA) is generally used to measure the performance of economic entities in many contexts (Parman dan Featherstone, 2019). In general, in the case of measuring efficiency, companies—as economic entities—face two things: cost constraints and production constraints. Theoretically, producers do not always optimize their production function. Producers are faced with a minimum combination of inputs to produce a certain amount of output (product), or a combination of inputs and certain technologies for a maximum amount of output. Producers who are able to produce above the production limit are considered technically efficient. Meanwhile, companies that produce below the production limit are considered not to have achieved technical efficiency

Export

Exports are defined as selling goods and services produced by a country to other markets abroad (Cleary, 2016). Furthermore, exports are strongly influenced by product quality. High-quality and innovative products will be attractive to the global market. Based on these conditions, efforts to increase competitiveness by focusing on the quality of exported goods have become a concern for companies in a country, including Indonesia. There are two theories explaining export activities: self-selection theory and learning-by-exporting theory. Self-selection focuses more on a company's readiness in production before entering the global market. Meanwhile, learning-by-exporting theory, companies will increase the quantity and quality of exported products through experience in exporting goods and services. Referring to these two theories, the theory used in this study, which is in accordance with the research objectives, is self-selection theory (Olabode dkk, 2018); (Behmiri dkk, 2019); (Lemi & Wright, 2020)

Self-Selection

This theory analyzes how a company that chooses to export must first have better performance than a company that does not export. This theory explains that only large-scale and highly efficient companies will be able to penetrate the global market. This ability is supported by the availability of additional costs (sunk costs) such as transportation costs, marketing costs, market research costs, the cost of adapting products to the tastes of the destination country, and the cost of building networks (networking) in the export destination country. This is added to the costs of hiring skilled workers to manage the network in the export destination country. Because every company that decides to export must bear the very large costs of entering the market (sunk entry costs), export activities require two things: first, the company decides whether or not to export; second, how many goods to export (Jovanovic, 2020); (Kiendrebeogo, 2020); (Movahedi & Shahbazi, 2020)

Import of Raw Materials to Exports

Raw materials are essential for the production process. Setyorini (2020) state that vertically integrated companies exhibit high levels of innovation and efficiency. Furthermore, Mazumdar and Rajeev also add that companies operating using imported raw materials or companies integrated with upstream industries tend to be more efficient. Vertical integration means companies import raw materials or technology in the production process. The highest import content of raw materials is estimated to be in sectors that employ high or medium technology, such as the manufacturing industry (Fedyunina & Averyanova, 2019). Raw material imports are generally necessary due to insufficient domestic availability, low quality, or excessive prices. Raw material imports are a means of cost efficiency. Besides cost factors, raw material imports are also beneficial for the environment (Imbruno dan Ketterer, 2018). Imports themselves are the ratio of the amount of imported raw materials used in production to total output.

Foreign Direct Investment

Capital inflow as foreign investment impacts domestic companies. These impacts can be direct or indirect. Directly, foreign investment increases capital accumulation, demand for skilled labor, production capacity, and demand for goods, semi-finished goods, and finished goods. Meanwhile, the indirect effect of foreign investment is the transfer of technology and information from foreign companies through spillover effects. Furthermore, the general view regarding foreign capital inflow is that it helps increase the productivity of domestic companies (Esquivias & Harianto, 2020); (Chawla, 2022); (Genthner & Kis-Katos, 2022).

Horizontal Spillover

Horizontal spillovers are the ability to increase efficiency. Domestic companies can absorb these spillovers in several ways, including demonstration effects, labor mobility, and competition. Horizontal spillovers can be absorbed by domestic companies by imitating the products or knowledge of foreign companies to save on research and development costs Horizontal spillovers can be absorbed by domestic companies by imitating the products or knowledge of foreign companies to save on research and development costs.The ability to imitate foreign companies' products or knowledge will be used to produce similar products to compete in the market. Horizontal spillovers do not directly impact a company's exports. Instead, they go through several stages or processes. Through knowledge transmission, the presence of foreign companies can enhance the ability of domestic companies to innovate and produce goods. The ability to imitate foreign companies' products or knowledge will be used to produce similar products to compete in the market. Horizontal spillovers do not directly impact a company's exports. Instead, they go through several stages or processes. Through knowledge transmission, the presence of foreign companies can enhance the ability of domestic companies to innovate and produce goods (Vujanović dkk, 2022); (Jinji dkk, 2022); (Baslandze dkk, 2021). The model is based on the following equation:

$$Hspill_{jt} = \frac{\sum_{i \in j} Foreign_{it} * Y_{it}}{\sum_{i \in j} Y_{it}}$$

Foreign Ownership

Investment inflows have a positive impact on the host country. The direct impact of foreign investment is increased capital accumulation, demand for skilled labor, production capacity, and demand for goods, both semi-finished and final products (Nguyen dkk, 2020); (Marinescu dkk, 2019); (Iwasaki dkk, 2022); and (Dong dkk, 2022). Companies receiving capital with a minimum value of 10 percent or more are considered foreign subsidiaries (MNCs) or foreign-owned companies in a country. This minimum capital requirement refers to regulations issued by the IMF and OECD regarding domestic companies that, with a certain amount of capital, can be considered foreign-owned or foreign-owned.

Firm Size

Company size influences a company's ability to export. The relationship between company size and export capability is considered a reflection of economies of scale in production and distribution processes. Furthermore, company size also serves as a benchmark for the superiority of large companies over small ones, as larger companies have advantages in terms of financial resources and managerial capabilities to mitigate various risks that may arise in the global market (Bekteshi, 2020); (Hernández, 2020); and (Wagner, 2021). The model is based on the following equation:

$$Firmsize_{it} = \frac{Output_{it}}{\Sigma Output_{jt}}$$

Industrial Concentration

Industry concentration indicates the level of competition between companies. Two theories explain how a company's industry concentration can affect its product exports: national champion rationale and national rivalry. Industrial concentration plays a crucial role as it serves as an indicator of a company's ability to produce at its best. Industrial concentration can be measured using the Herfindahl-Hirschman Index (HHI). Studies using the HHI as a proxy for industrial concentration by (Lee dkk, 2020); (Qu dkk, 2022) and (Johan & Vania, 2022); (Peleckis, 2022); (Kvålseth, 2022) found that industrial concentration had a significant positive effect on export activity. The model is based on the following equation:

$$HHI_{jt} = \sum_{i=1}^{n} S_{it}^2$$

Method

This study used a two-step analysis. The first step is to estimate the company's technical efficiency using theproduction function with the Stochastic Production Frontier (SFA) approach. The second step is to analyze the variable effect of raw material imports, foreign investment overflow (FDI) and technical efficiency on exports. logarithmic transcendental model (Logit). Furthermore, to determine the robustness of the selected research model continued by testing the interaction between variables by adding variables of industry concentration and company size.

The first stage in the research is to estimate the level of efficiency in the manufacturing industry in Indonesia. Looking at the level of efficiency, the production function is used as a basic function. The production function is an equation that shows the combination of the number of inputs to make a particular good or product. The production function as an input function (Coelli dkk., 2005). Inputs in the production function are called factors of production. Factors of production generally consist of land, labor, capital or capital, and raw materials. The technical efficiency formula is as follows:

$$\begin{aligned} lnY_{it} = {} & \beta_0 + \beta_1(lnK_{it}) + \beta_2(lnL_{it}) + \beta_3(lnM_{it}) + \\ & \beta_4(lnE_{it}) + \tfrac{1}{2}\beta_5(lnK_{it})^2 + \tfrac{1}{2}\beta_6(lnL_{it})^2 + \\ & \tfrac{1}{2}\beta_7(lnM_{it})^2 + \tfrac{1}{2}\beta_8(lnE_{it})^2 + \beta_9(lnK_{it})(lnL_{it}) + \\ & \beta_{10}(lnK_{it})(lnM_{it}) + \beta_{11}(lnK_{it})(lnE_{it}) + \\ & \beta_{12}(lnL_{it})(lnM_{it}) + \beta_{13}(lnL_{it})(lnE_{it}) + \\ & \beta_{14}(lnM_{it})(lnE_{it}) + \beta_{15}t + \beta_{16}t^2 + \beta_{17}(lnK_{it})(t) + \\ & \beta_{18}(lnL_{it})(t) + \beta_{19}(lnM_{it})(t) + \beta_{20}(lnE_{it})(t) + v_{it} - \\ & u_{it} \end{aligned} \quad (1)$$

Where Y is the value of the company's output; K is the capital value of the company; L is the amount of labor employed by the company; M is the raw material used by the company; E is the energy that the company uses in the production process; β is the estimate parameter; i is the 1st, 2nd, 3rd, etc....n company; t time span used in the study; and v is the error term.

This technical efficiency is in the range of 0 to 1. This result indicates the amount of output at the company that can be produced by the company efficiently using the same input. The existence of different needs of each company for the amount of production results in the use of production factors such as capital, labor, raw materials and energy that are also different. The difference in the use of this level of input combination reflects the skill level and engineering knowledge of the company. The use of production inputs such as skilled labor will certainly be very different from the use of less skilled labor. Likewise, the level of difference in knowledge and motivation of a diverse workforce will also affect the company's output.

The second stage is to analyze the effect of independent variables, namely raw material import variables, FDI spillover and technical efficiency on bound variables. In the second stage, this study estimated the influence of the independent variable on the dependent variable using the Logit (Logistic Regression) model. The logit model is used because it is in accordance with the purpose of this study, which is to see the influence of raw material import variables, horizontal overflow and technical efficiency on the possibility or probability of companies exporting. Estimating the likelihood or opportunity more precisely using the Logit model (Atalık dkk, 2019); (Ramadhani dkk, 2022); and (Abid dkk, 2024).

Logistic Regression is an extension of binary logistic regression where logistic regression is one of the statistical methods for analyzing data with bound variables being ordinal scales consisting of two or more categories and independent variables are covariates (if using interval or ratio scales) or can be factors (if using nominal or ordinal scales) (Ramadhan dkk, 2021). In economic research, there are many cases found in regression analysis where the dependent variables are qualitative. This bound variable has two classes or categories (binary) and more than one (multinominal). One approach that can be used to estimate regression models with this type of data is to use logistic probability models or logit models for short. In general, the logit model used is:
To test the interaction between variables, the model used is as follows:

$$L_{it1} = ln\left(\frac{P_t}{1-P_t}\right) = \beta_1 + \beta_2 IBB_{it} + \beta_3 HS_{it} + \beta_4 Eff_{it} + \beta_5 HHI_{it} + \beta_6 FO_{it} + \beta_7 FS_{it} + \beta_8 IBBxHS_{it} + u_{it} \quad (2)$$

$$L_{it2} = ln\left(\frac{P_t}{1-P_t}\right) = \beta_1 + \beta_2 IBB_{it} + \beta_3 HS_{it} + \beta_4 Eff_{it} + \beta_5 HHI_{it} + \beta_6 FO_{it} + \beta_7 FS_{it} + \beta_8 IBBxEff_{it} + u_{it} \quad (3)$$

$$L_{it3} = ln\left(\frac{P_t}{1-P_t}\right) = \beta_1 + \beta_2 IBB_{it} + \beta_3 HS_{it} + \beta_4 Eff_{it} + \beta_5 HHI_{it} + \beta_6 FO_{it} + \beta_7 FS_{it} + \beta_8 HSxEff_{it} + u_{it} \quad (2)$$

Data Types and Sources

The data used in this study is secondary data which is micro-level data or companies in the manufacturing industry in Indonesia using data for six years during the period 2010 - 2015. The data is the result of an annual survey report conducted by the Central Statistics Agency (BPS) in the form of raw data. The data was selected and adjusted to obtain the data needed in the study by following changes in industrial classification for 6 years, namely referring to KBLI 2009. The use of data in this period was carried out due to the lack of data availability and there has been no update of company-scale data and in accordance with the research needs published by the Central Statistics Agency (BPS). Although the use of data in a very limited time period, the cumulative results of the data processing can still support the conditions and regulations of the industrial sector initiated in the National Industrial Development Master Plan (RIPIN) 2025 to 2035. Furthermore, the data in this study were identified based on the five-digit ISIC (International Standard Industrial Classification) code in Indonesia which is classified into types of processing industries. From this classification, the number of observations was obtained as many as 10,464 companies.

Data Analysis Methods

This study used a two-step analysis. The first step is to estimate the company's technical efficiency using theproduction function with the Stochastic Production Frontier (SFA) approach. The second step is to analyze the variable effect of raw material imports, foreign investment overflow (FDI) and technical efficiency on exports. logarithmic transcendental model (Logit).

Results And Discussion

Result

Descriptive statistical analysis is an analysis used to analyze data in a research model by describing the collected data before further processing. The purpose of descriptive statistical analysis is to provide an overview of data in variables seen from the mean, minimum, maximum and standard deviation values (Shakirani & Ghozali, 2021). In addition, the use of descriptive statistical analysis is also able to provide an overview of research in the form of the relationship of independent variables to dependent variables. From the results of statistical calculations of the variables used in this study, both independent and dependent variables in technical efficiency analysis and dependent and independent variables in logistic regression obtained the following results:

Table 1. Description of Variable Statistics

No	Variable	Obs	Mean	St. Dev	Min	Max
1	Output (Y)	10464	17.03723	2.068468	8.940017	24.5828
2	Capital (K)	10464	15.40009	2.208729	2.700326	28.06909
3	Labor (L)	10464	4.504719	1.338808	2.302585	10.09398

4	Material (M)	10464	15.95758	2.350219	4.781133	23.94659
5	Energy (E)	10464	13.25299	2.301904	2.231117	21.2212
6	Export	10464	0.278479	0.448272	0	1
7	IBB	10464	4.745939	7.494834	0	22.90618
8	HS	10464	1.214718	2.807059	-2.10737	13.19416
9	EFF	10464	0.375092	0.248554	0.000745	0.984751
10	HHI	10464	89396.15	2363810	1.79E-06	1.91E+08
11	FO	10464	0.161411	0.367927	0	1
12	FS	10464	49.02877	294.9587	0.001337	13826.86

Source: secondary data, 2024

It can be known that the total observations or N of each valid variable amounts to 10464. From 10464 data observations for technical efficiency estimation, it can be seen that the output data (Y) has a minimum value of 8.9400, a maximum value of 24.5828, with a time span during the time, the mean value is 17.0372 and the standard deviation value is 2.0684 which means the mean value greater than the standard deviation value which can mean that the data deviation that occurs is low, so the spread of the value is even. Then the data of independent variables, namely capital, labor, material and energy, each also has a mean value higher than the standard deviation value, so that all independent variables in technical efficiency estimates have low data deviations so that they are concluded to have an even distribution.

Furthermore, in observations for logistic regression, export data (dummy) as the dependent variable (Y) has a minimum value of 0, a maximum value of 1. It is known that the mean value is 0.2784, while the standard deviation value is 0.4482. From these data, it is known that the mean value is smaller than the standard deviation value, so it can be concluded that the data deviation that occurs is relatively high so that the distribution of values is less even. Meanwhile, the values of the independent variables, namely IBB, HS, FS and FO variables, have a mean value that is smaller than the standard deviation value, which means that in these four variables the distribution of data is relatively smaller so that the distribution of values is less even. While the results of statistical tests on other independent variables, namely Efficiency and HHI, have a mean value greater than the standard deviation value so that it can be concluded that the data deviation that occurs is low so that the distribution of values is even.

Table 2. Results of *Maximum Likelihood Estimation* in the Production Function

Variable	Parameter	Coefficient		Standart-error	t-ratio
Constant	b0	1.427462	***	0.383736	3.719908
ln K	B1	0.156454	***	0.036613	4.273173
ln L	B2	0.538353	***	0.062641	8.594310
ln M	B3	0.302439	***	0.039376	7.680837
ln E	B4	0.416819	***	0.036110	11.543048
(ln K)^2	B5	0.009311	***	0.001171	7.951830
(ln L)^2	B6	0.024171	***	0.004527	5.339685
(ln M)^2	B7	0.047668	***	0.001527	31.225343
(ln E)^2	B8	0.022670	***	0.001804	12.570119
(ln K) (ln L)	B9	-0.008221	***	0.003548	-2.317067
(ln K) (ln M)	B10	-0.023873	***	0.002598	-9.188946
(ln K) (ln E)	B11	-0.002224		0.002589	-0.859010
(ln L) (ln M)	B12	-0.021927	***	0.004133	-5.304775
(ln L) (ln E)	B13	-0.000799		0.004249	-0.188038
(ln M) (ln E)	B14	-0.046861	***	0.002736	-17.125379
t	B15	1.300746	***	0.045943	28.312181
t^2	B16	0.089511	***	0.003813	23.476064
(ln K) (t)	B17	0.060829	***	0.002634	23.090790
(ln L) (t)	B18	-0.086811	***	0.004545	-19.099842
(ln M) (t)	B19	-0.090462	***	0.002948	-30.684134
(ln E) (t)	B20	-0.031855	***	0.003002	-10.609516
sigma-squared		2.194847	***	0.033196	66.118584
gamma		0.816474	***	0.005588	146.111600

Remarks : Significance Level ***p < 0.01, **p < 0.05, *p < 0.1

Table 2 show the result of estimation of the translog production function (model 4.1) which is estimated using the Maximum Likelihood (MLE) method with the help of Frontier 4.1 software. Estimation of the production function with model 4.1 uses 20 independent variables. Of the 20 independent variables estimated, there are 18 independent variables that prove significant or influential on company output with a significance level (p) of 0.01 or 1%.

The estimation results show that the variables of capital (K), labor (L), raw materials (M), and energy (E) have a significant positive effect on output. Furthermore, the variables K2, L2, M2, and E2 each showed significant positive contributions to output. A significant positive contribution indicates a unidirectional relationship, namely an increase in company inputs which include capital, labor, raw materials, and energy will increase company output. The inclusion of interaction variables aims to determine the interaction relationship between inputs, whether there are substituted or complementary relationships. Substitution relationships are characterized by positive directions, while complementary relationships are characterized by negative directions. There are two pairs of insignificant interaction variables, K and E, and L and E. In addition to these two pairs of interaction variables, other pairs of interaction variables have a significant relationship with the direction of negative relationships, which means they have complementary relationships. The pairs of interaction variables are K and L, K and M, L and M, and M and E. The variables that interact with time (t) have different results, namely there are positive and negative results. Significant positive results are shown in the interaction between capital (K) and t. These results show that there is technological progress over time. Meanwhile, the interaction variables between L and t, M and t, and E and t produced significant negative influences. Significant

negative influence indicates that technological regression occurs. A small sigma square indicates that the inefficiency is normally distributed, while the gamma value indicates the ratio between the inefficiency and random error. The gamma value of 0.81 or 81% residual comes from inefficiencies in production, the remaining 19% comes from random error.

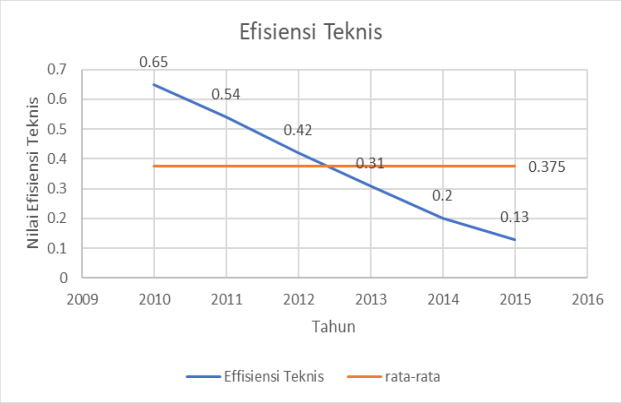

Figure 1. Technical Efficiency of Indonesian Manufacturing Industry Companies

Figure 1. shows the results of estimating the technical efficiency of the enterprise. This study measured the value of the company's technical efficiency using SFA (Stochastic Frontier Analysis) with the help of Frontier 4.1 software. The output table of technical efficiency measurement results per year will be presented in table 5.3. During the period of 6 years of observation, the level of company efficiency in the manufacturing industry in Indonesia decreased by 1 percent per year. The average level of technical efficiency of the company has not reached the efficient scale. From a scale between 0 and 1, the average efficiency rate over a period of 6 years is 0.37. The highest efficiency value with a value of 0.64 in 2010 and the lowest efficiency value with a value of 0.12 was in 2015. This value as a whole is still not close to 1 which means it is far from efficient.

In table 2. displays the results of the estimated level of technical efficiency of the Indonesian manufacturing industry. Over a period of 6 years, namely from 2010 to 2015, the trend of technical efficiency of the manufacturing industry in Indonesia decreased from year to year. This shows that companies in the manufacturing industry in Indonesia are not yet at the level of technical efficiency. The highest level of technical efficiency is in the pet food industry with the code ISIC 10801 with an efficiency level close to efficient of 0.94 in the first year to the sixth year. Meanwhile, companies that have the lowest level of efficiency are companies that enter the wood building materials industry with ISIC 16221 with an efficiency level of 0.05 which means that the company only reaches a maximum production potential of 5%.

The results of this study are reinforced by the findings of Difa Darajah (2018) regarding the strengthening of the manufacturing industry at the ASEAN-6 level in a similar time period, namely 2004 to 2015. The findings in this study explain the contribution of the manufacturing industry to the growth of each country that relies on technological strength. These findings rank countries with the highest to lowest manufacturing value added. From this ranking, the position of each country can be seen regarding technological mastery that has an impact on the internal side of the company, one of which is efficiency. The following is the ranking of manufacturing value added from highest to lowest in ASEAN-6:

Tabel 3. Average Manufacturing Value Added (MVA) in ASEAN-6 2004-2015.

Negara	Persentase
Vietnam	7.38
Singapura	5.82
Filipina	5,24
Indonesia	4.67
Malaysia	4.41
Thailand	3.38

Source: World Bank, 2004 - 2015

Table 4 shows that the six ASEAN countries with the highest average MVA are Vietnam, followed by Singapore, the Philippines, Indonesia, Malaysia, and Thailand. This means that companies in these six countries are using technological advances as a basis for driving industrial growth to boost economic growth.

These findings also emphasize the importance of technological advancement as a key factor in supporting and enhancing export activities in each country. The application of technology, including technical efficiency, can boost product competitiveness in the international market and the era of globalization.

Table 4. Results of Maximum *Likelihood Estimation* in the Logit Model

Variable	Logit	Odds - Ratio	Mfx
Cons	-1.7241260	0.1783288	
	0.0467359	0.0083344	
IBB	0.0056857	1.0057020	0.0011095*
	0.0029852	0.0030022	0.0005800
HS	-0.0482702	0.9528763	-0.0094197*
	0.0283732	0.0270361	0.0055300
EFF	1.3094470	3.7041240	0.2555325***
	0.0947358	0.3509130	0.0183500
HHI	-0.0000003	0.9999997	-0.0000001***
	0.0000001	0.0000001	0.0000000
FO	1.3671490	3.9241470	0.3075504***
	0.2118216	0.8312192	0.0500900
FS	0.0011153	1.0011160	0.0002176***
	0.0002474	0.0002477	0.0000500
IBB*HS	0.0022841	1.0022870	0.0004459**

	0.0009082	0.0009103	0.0001800
IBB*EFF	0.0447985	1.0458170	0.0087442***
	0.0118674	0.0124111	0.0023200
HS*EFF	0.2208302	1.2471120	0.0432564***
	0.0334253	0.0416851	0.0065800
n			**10464**
LR chi2			**662.67**
Username R2			**0.0535**

In table 3, it can be seen that the results of logistic regression seen from the odds-ratio value show that companies that import raw materials have a 1 time greater chance of exporting than companies that do not import raw materials, assuming other variables are considered constant. Companies with a high horizontal spillover effect will lower their chances of exporting 0.95 times greater than companies that do not receive the horizontal spillover effect, assuming the other variables are considered constant. If each company has a high level of efficiency, the company's opportunity to export is 3.70 times greater than companies with a low level of efficiency. Companies that are in a high concentration of companies, then the opportunity to export decreases 0.99 times than companies that are not in the concentration of companies, assuming other variables are considered constant. Companies with foreign ownership are 3.92 times more likely to export than non-foreign-owned companies, assuming other variables are considered constant. The larger the size of the company, the opportunity to export is 1 time higher than the smaller company, assuming other variables are considered constant. If a company imports raw materials followed by the ability to capture the horizontal spillover effect, then the opportunity to export is 1 time greater than a company that does not import raw materials and is also unable to capture the horizontal spillover effect, assuming other variables are considered constant. If a company imports raw materials followed by the ability of a high level of technical efficiency, then the opportunity to export is 1.05 times greater than a company that does not import raw materials and is inefficient, assuming other variables are considered constant. Companies with horizontal spillover effects accompanied by high levels of efficiency, will have the opportunity to export 1.24 times greater than companies that do not capture horizontal spillover effects and are not in efficient conditions, assuming other variables are considered constant.

The results of the LR Chi2 test estimation can be seen that simultaneously the variables affecting the company's exports simultaneously affect the level of 1% while the variable of raw material imports and the variable of horizontal overflow affect the confidence level of 10%. While the interaction variable between the raw material import variable and the horizontal spillover effect affects the company's chances of exporting at the level of 5%.

The variable coefficient of raw material import is positive and significant at the level of 10%, which means that companies that import raw materials have a higher chance of exporting their products than companies that do not import raw materials. This is in line with the findings that the import of raw materials is profitable for companies because the import of raw materials can provide benefits, namely benefits in terms of price, that the price of imported raw materials is more competitive when compared to raw materials from domestic (Liu dkk, 2024); (Elliott dkk, 2019). In addition, another advantage is in terms of quality. Raw materials from the international market are of better quality compared to domestic raw materials. Low prices and good quality goods will increase product competition in the international market. From the explanation and findings above, it shows that this raw material import variable is very instrumental in the competitiveness and export capability of the company which is shown from the significance of all raw material import coefficients in regression.

Vertical integration means that companies import raw materials in their production process (Mazumdar & Rajeev, 2009). Meanwhile, by importing raw materials, companies can make cost efficiency (Xiang dkk, 2022). Cost efficiency is obtained because the price of imported goods tends to be cheaper when compared to raw materials from within the country. In addition, the findings in this study also support previous research, namely in the research (Edwards dkk, 2018) that companies that import raw materials tend to have a high level of productivity to then be able to compete in the international market (Lagaida & Novianti, 2022); (Banco, 2020); (Blaum dkk, 2014); (Edwards dkk, 2018).

The first FDI spillover effect, in the form of a horizontal spillover effect, has a significant negative effect on the company's opportunities to export. This finding corroborates the findings that found the negative impact of horizontal spillover (Ciani & Imbruno, 2017); (Djulius, 2017). Negative effects arise from competition between foreign companies and domestic companies in seizing market share. Foreign companies with the ability to master technology are able to protect products so that this cannot be duplicated by domestic companies. In line with the findings of Suyanto and Salim, the findings in this study also support (Liang, 2017); (Wang & Wong, 2016).

(Jinji dkk, 2022a). Jinji's findings actually state that horizontal spillover is very effective in impacting only countries that both have a high level of technological mastery and countries with highly developed economies, so that the effects they cause have an impact back and forth or influence each other. Countries with low mastery of technology will not get a positive influence from the horizontal spillover effect. Another reason is that this spillover effect is generally also by including intellectual property rights so that domestic countries do not benefit from horizontal spillover. In another study, the horizontal spillover effect desired by domestic countries depends largely on the agreement of domestic countries with countries that give the spilinear effect (Jinji et al., 2022b). If domestic countries have regulations and agreements with countries that have technological advances to be able to provide spillover effects, both technology and knowledge in facing the global market, then it is very

effective in encouraging FDI spillover even across countries.

In contrast to Jinji's findings the horizontal spillover effect actually has a positive effect and is able to increase opportunities for export. This statement is in line with the findings who stated that the horizontal spillover effect is able to encourage an increase in the value of domestic state exports (Rahman & Inaba, 2021); (Kim dkk, 2021). Every company is able to increase its productivity and technical efficiency because it receives benefits from the influx of foreign capital (Sugiharti dkk, 2022). Research in Spain found that the portion of horizontal overflow is very strong when compared to the effects of vertical overflow, both backward overflow and forward overflow (Barge-Gil, dkk, 2020). The influence of technological spillover is very strong on horizontal effects. This influence is due to the presence of foreign companies and the large size of the industry which means high productivity capabilities.

The second FDI spillover effect, through foreign ownership, significantly affects the company's exports at a confidence level of 1%. These findings suggest that foreign ownership can increase a company's chances of exporting its products in the global market. The influx of foreign capital will increase capital accumulation. In addition, the influx of foreign capital for domestic companies or recipients of capital flows will open opportunities as multinational subsidiaries (MNCs). As a foreign subsidiary, companies with foreign ownership (with a minimum foreign share of 10%) will adapt the production process of their parent company, so that companies with foreign ownership tend to produce more efficiently. In addition, foreign ownership is more in control of technology, especially technology brought by its parent company. With this consideration, companies with foreign ownership have a great opportunity to enter the international market by exporting their products.

The findings in this study are in line with research which states that companies with foreign ownership have a unidirectional relationship with exports (Wignaraja, 2008). This means that higher foreign share will have an impact on higher export opportunities. In addition, research on companies in China stated that foreign thinking can facilitate company exports (Yee dkk, 2016). However, this will only apply in the long term, meaning that foreign companies in the long run can help domestic companies to export their products. Furthermore, this study also compares the contribution of foreign companies to domestic private companies and the contribution of foreign companies to state-owned enterprises (SOEs) to export performance. From the estimation results, it can be seen that the performance of foreign companies on exports will be better if they enter domestic private companies compared to state-owned companies. Another obstacle is better corporate governance in domestic private companies compared to state-owned enterprises.

(Ye dkk, 2021); (Rojec & Knell, 2018); (Boddin dkk, 2017). First, domestic companies lack knowledge related to technological advances and organizational or corporate governance as well as information about potential customers in the international market. Second, domestic companies are less developed in financial markets and tend to limit the financing required in the export and import of products. These two reasons then encourage the entry of foreign capital through foreign ownership is important considering that both obstacles can be overcome through the entry of foreign capital, namely companies with foreign ownership (MNC). Meanwhile, this finding is precisely the opposite of findings which states that the influx of foreign capital will actually reduce export opportunities (Handoyo dkk, 2022). This happens if production costs are increasing as a result of company expenses facing competition, especially to get the best labor and resources that are not followed by company profits.

In terms of efficiency, the company's technical efficiency variable has a positive and significant effect on the confidence level of 1%. This shows that the higher the level of efficiency of the company, the higher the opportunity for the company to export its products. The findings in this study prove the theory of self-selection which states that only companies that have a high level of productivity and efficiency are able to export to the global market. This finding is also in line with research that productive companies are better able to innovate in the face of competition in the international market (Jovanovic, 2020).

Industry concentration has a significant negative influence on the level of confidence of 1% in export opportunities. The estimation results in this study found that high industrial concentration will actually reduce the company's chances of exporting its products. The findings of this study contradict the hypothesis of Efficient Structure (ES) which states that increasing the company's technical efficiency will reduce production costs, so that the profits obtained by the company are even greater. On the other hand, a high concentration of industry will increase the level of efficiency of the company. The high level of efficiency further opens up opportunities for companies to export (Esquivias & Harianto, 2020).

The findings in this study actually support and strengthen the Quite Life (QL) hypothesis. The QL hypothesis said that the high level of industry concentration has an impact on decreasing competition between companies (Harianto, 2020). This decrease in competition can further reduce incentives for companies which will then increase inefficiencies. This finding is in line with the research of the Indonesian manufacturing industry in 2010 – 2014 with their findings that the mainstay manufacturing industry in Indonesia which is at a high level of industrial concentration is not followed by a high level of efficiency either, on the contrary, high concentration reduces the level of company efficiency which will eventually also be followed by a decrease export capability of the company (Rustiawati & Lubis, 2019).

The next variable is the size of the company (Firm Size). The size of the company is also one of the determinants of the company exporting. The results of data processing show that with a confidence level of 1%, the variable size of the company positively significantly affects the

company's exports. This finding indicates that the larger the size of the company, the greater the possibility of the company to carry out export activities. This finding is in line with research which states that companies in Eastern and Central European countries as well as Middle Eastern and African countries are strongly influenced by the size of companies in their export activities. The large size of the company is able to bear the cost of entering the international market called sunk – cost (Cieślik dkk, 2018). This capability is often not possessed by small companies, so small companies have difficulty entering the global market. This then has an impact on its production orientation, which only meets the needs of the domestic market.

The results of the analysis of the three interaction variables obtained a significant positive influence on the three interaction variables, namely, first, the interaction variable between raw material imports and horizontal overflow (IBB x HS); second, the interaction between raw material import variables and technical efficiency (IBB x Eff); and third, the interaction variable between horizontal overflow and technical efficiency (HS x Eff). Two interaction variables, namely raw material imports and technical efficiency (IBB x Eff) and horizontal spillover and technical efficiency (HS x Eff) have a significant positive effect on the level of confidence of 1% in the company's exports. Meanwhile, the variable interaction between raw material imports and horizontal spillover was significant at the level of 5%. The first interaction, namely between raw material imports and horizontal spillover , showed that the variables of raw material imports and horizontal spillovers had a significant positive effect on a confidence level of 10% with an odds value – a ratio of 0.5% greater than the horizontal spillover effect alone. This proves that the combination of competitive raw material imports and horizontal spillover, one of which is through technology transfer from foreign ownership, has a significant effect on the company's export capabilities. In addition, imports of raw materials are variables that tend to dominate their influence on horizontal spillover, this is shown in the coefficient of horizontal overflow variables that are negative for exports in regression results if they are single variables.

The result of the interaction of the second variable, namely between raw material imports and efficiency, has an odds coefficient value – ratio greater than 0.04 times than the raw material import variable. The results of this estimate indicate that companies that import raw materials and are at the level of technical efficiency will increase the chances of exporting their products compared to companies that only import raw materials. Meanwhile, from the results of the interaction of the third variable, namely between horizontal overflow and technical efficiency, it showed a significant positive influence on company exports with a confidence level of 1% with an odds coefficient – a ratio that was 0.29 times greater when compared to companies that only got horizontal spillover effects. This finding indicates that the interaction between horizontal spillover and technical efficiency plays a major role in increasing the competitiveness of the company so that the probability of the company increases.

Conclusions

The level of technical efficiency of companies in the manufacturing industry in Indonesia between 2010 to 2015 with the number of observations of 10464 companies shows a trend of the company's technical efficiency level declining. This finding can further conclude that companies in the manufacturing industry in Indonesia have internal problems related to the company's technical efficiency. Variable imports of raw materials have proven to have a significant positive effect on exports, this shows that companies that import raw materials can increase their opportunities for export. Horizontal spillovers, which is the effect of the influx of foreign capital, has a significant negative effect on the company's opportunities to export.

This means that the increase in horizontal spillover actually reduces the company's export opportunities. In terms of the company's technical efficiency, it can be seen that the increasing level of the company's technical efficiency has a significant positive effect on the company's opportunities to export. The influence of industrial concentration on the company's exports results in an insignificant relationship. This means that high industrial concentration will actually reduce the company's chances of being able to export its products in the international market. Companies with foreign ownership can increase the company's opportunities to export to international markets, it is proven that the variable of foreign ownership has a significant positive effect on exports. The effect of company size on exports produces a positive and significant relationship, this means that the larger the size of the company will be the greater the opportunity for the company to export. In terms of interaction variables, the three variables showed a significant positive relationship to the company's exports. This means that imports of raw materials followed by horizontal spillover effects will increase the company's chances of exporting.

Furthermore, the variable interaction between raw material imports and technical efficiency shows a positive and significant relationship to the company's exports, which means that if the company imports raw materials and is in an efficient condition, it will increase the company's chances of exporting. While the third variable, namely the interaction between horizontal spillover and technical efficiency, shows a significant positive relationship to company exports, this means that the effect of foreign capital inflows in the form of horizontal spillovers accompanied by increased technical efficiency can increase the company's opportunities to export to international markets.

Recommendation

1. Based on the conclusion that raw material imports have a positive impact on exports, regulations regarding import duties on raw products or raw materials can support companies in importing raw materials. Furthermore, the government can encourage the development of competitive domestic

upstream industries and maintain the availability of quality domestic raw materials to increase domestic added value in the manufacturing industry. The availability of domestic raw materials will also support the strengthening of industries that still rely on imported raw materials.

2. Based on findings showing that there is horizontal spillover received by domestic companies that positively influence the company's opportunities to export, the form of government support through regulations related to the readiness of domestic companies to capture this spillover effect needs to be increased. In addition, the government also needs to create linkages regarding the company's need for raw materials with suppliers that include small domestic companies. Furthermore, it is necessary to increase cooperation and agreements between the destination country and foreign countries in carrying out the technology transfer needed to increase the productivity of domestic companies.
3. Based on the findings that efficiency has a significant positive effect on exports, government regulations need to be optimized to encourage companies in the Indonesian manufacturing industry to improve and maintain their technical efficiency. Populist policies, such as tax cuts for industry, significantly encourage companies to face the global market. Furthermore, increased research and development (R&D) activities are also necessary for companies. Furthermore, the government has issued regulations focusing on Indonesia's economic growth, focusing on the manufacturing sector.
4. Berdasarkan temuan terkait konsentrasi industri yang berpengaruh secara positif pada ekspor perusahaan menunjukkan peran pemerintah dalam meningkatkan tingkat efisiensi perusahaan. Meningkatkan efisiensi perusahaan juga dapat dilakukan dengan mem*push* kompetisi antar perusahaan dengan tetap mengacu pada Undang-Undang Persaingan Usaha yakni Peraturan Pemerintah Republik Indonesia Nomor 44 Tahun 2021 tentang pelaksanaan pelarangan praktek monopoli dan persaingan usaha tidak sehat. Sementara, dari sisi internal perusahaan juga perlu mempertimbangan serta menyiapkan beberapa hal seperti : biaya transaksi (*transaction cost*), *business set-up*, *sunk cost export* dan *law enforcement* yang semuanya mendukung peningkatan daya saing perusahaan menuju pasar global.
5. Based on findings showing that the entry of foreign capital through companies with foreign ownership has an impact on exports, the government needs to support the entry of foreign direct investment (FDI) that favors domestic companies and the readiness of supporting infrastructure.
6. This research has not yet involved qualitative institutional variables such as regulations on investment, import of goods, taxes and so on which also have the potential to increase company exports in the future so that they need to be developed in further research.
7. Further research can add older data than the data in this study and use different analysis tools such as DEA so that the research results can be more comprehensive.

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