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THE EFFECT OF CERTIFICATION ON PRODUCTIVITY OF MANUFACTURING INDUSTRY IN INDONESIA

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ABSTRACT

The manufacturing industry contributed 20% to GDP in 2019, which exported 74%. Various efforts have been made to increase productivity, one of which is through certification. Certification is an activity carried out by a third party, namely a conformity assessment agency, to assess and provide assurance that a product, system or personnel has met the requirements of a certain standard. This study aims to analyze the effect of certification ownership on the productivity of the manufacturing industry in Indonesia. Productivity is measured by looking at the growth value of Total Factor Productivity (TFP) and certification is measured based on ownership of the SNI certificate for the manufacturing industry. The estimation method used in this study is in two stages, 1) using a production function estimation model to be able to estimate the Total Factor Productivity (TFP) value used as a productivity variable and, 2) regression using the productivity variable obtained in the first stage as the dependent variable and the certification variable as an independent variable in estimating the effect of certification on productivity. The variable describing the productivity (TFP) of the manufacturing industry varies between 2.24% to 3.27% with an average TFP value of 2.79% and a standard deviation of 0.22% which indicates that the distribution of TFP growth value data for the manufacturing industry in this study tends to be around its average value. The regression results show that the SNI certificate variable has a significant positive effect on the total productivity (TFP) of the manufacturing industry. From the regression results, a coefficient value of 0.8412 is obtained, indicating that if the percentage of SNI certificate ownership in a particular type of industry increases by 1 percent, assuming all other variables remain constant (ceteris paribus), the TFP growth value in the industry will increase by 0.8412 percent. The HHI coefficient value obtained is 0.0687, indicating that if the concentration of an industry increases by 1 percent, the TFP growth value in the industry will increase by 0.0687 percent. So it can be concluded that overall the estimation results from the model show that there is an influence of SNI on the total productivity of the manufacturing industry.

Keywords : Certification, Productivity, SNI, TFP

A. INTRODUCTION

Company production is a vital activity carried out by companies at all times. Product efficiency and effectiveness are carried out to control production results and are used to ensure productivity. In the manufacturing industry, every production is controlled to ensure production quality. Based on data, one of the industries that contributes to GDP by 20% is the manufacturing industry in 2019 which has exported 74% (Ministry of Industry, 2019). However, on the other hand, the competitiveness of the Indonesian manufacturing industry is still ranked 40th compared to 152 countries in the world. The productivity of the manufacturing industry sector based on data from 1988 to 2019 has a downward trend. Average productivity since the 1998 crisis was 11 percent and gradually decreased until it reached an average productivity of 5 percent per year in 2019 (Indef, 2021).

Figure 1. Productivity of the Indonesian Manufacturing Industry (Source: Indef, 2021)

Productivity can be increased through various ways, namely increasing technical efficiency, increasing business scale, implementing more advanced innovation and technology, and implementing changes to the company's organizational structure (Gordon, Zhao, and Gretton, 2015). These efforts can be achieved by considering the standardization process. Standardization according to the International Organization for Standardization (ISO) is an activity of forming or determining by considering actual or potential problems, provisions for the public and repeated use with the aim of achieving an optimal degree of regularity in a particular context. In Law No. 20 of 2014 concerning Standardization and Conformity Assessment, it is stated that standardization is a process for formulating, determining, implementing, maintaining, enforcing and supervising standards that must be implemented in an orderly manner and carried out in collaboration with all stakeholders (BSN, 2014).

Referring to the definition of standardization, standardization activities become an important process in an industry to maintain the quality of the products produced and create business efficiency. The standardization process requires an evaluation of the conformity of a product, system, or procedure with established standards, which is then validated through a process known as certification. Certification is an activity carried out by a third party, namely a conformity assessment agency, to assess and provide assurance that a product, system or personnel has met the requirements of a particular standard. Certification is generally grouped into system certification; product, process or service certification; and personal certification (BSN, 2014)

Several studies have shown the relationship between certification and company performance such as profitability, productivity, sales, and financial performance. It can be concluded that the implementation of ISO 9000 certification has a positive effect on increasing sales. Significant differences in financial performance were also found between companies that have ISO 9000 certificates and companies that do not have certificates, namely productivity and sales are more innovative and consider the use of technology. In addition, certification can increase productivity through increased business efficiency and signaling quality can also increase trust in third parties to be partners in business (Ghoedhuys and Sleuwaegen, 2013; Calza, Ghoedhuys and Trifkovic, 2019; Chen, Wu and Zhai, 2019; Siougle, Dimelis and Economidou, 2019).

Previous research explains that ISO 9001 certification in the automotive industry has a significant positive impact on improving the company's operational performance and business performance (Nurcahyo, Zulfadillah, and Habiburrahman, 2021). Meanwhile, according to Tampubolon, Widyatmoko, and Louhenapessy (2013), the implementation of SNI for bottled drinking water has a higher economic value impact. Certification can emphasize the achievement of effective process planning and control, measure many things that were previously not measurable metrically, allow managers to identify and solve problems so that managerial efficiency will increase. Companies in the manufacturing sector need to adapt by implementing standards, systems and strategic perspectives to be able to improve quality (Psomas and Kafetzopoulos, 2014)

In Indonesia, the implementation of standards is carried out through the certification of the Indonesian National Standard (SNI). SNI is determined by the National Standardization Agency (BSN) which applies in Indonesia, but SNI can also be accepted by other countries with the existence of Multilateral Recognition Agreements (MLA) or Mutual Recognition Arrangements (MRA). MRA or MLA is an agreement to mutually recognize certification results so that SNI can also be accepted in countries other than Indonesia (BSN, 2016). The implementation of SNI can provide quality assurance and safety protection for products sold freely on e-commerce; SNI protects the national industry by creating healthy industrial business competition; the implementation of SNI also provides added value benefits that can increase the opportunities for domestic industry penetration into the export market (Kemenperin, 2018; BSN, 2021).

The government has also enforced the mandatory implementation of SNI in the Indonesian manufacturing industry, until 2018 there were 105 mandatory implementations of SNI in various manufacturing industry sectors. The manufacturing industry sectors include the textile and various industries, basic chemicals, downstream chemicals, metals, electronics, automotive, and the food and beverage industry (Ministry of Industry, 2018). The number of SNI applications in the industrial sector has only reached 5,062 SNI or is still at 37 percent of the total of all existing SNI, which is 13,518 SNI (Ministry of Industry, 2021). Meanwhile, the validity of SNI ownership as a commitment of the manufacturing industry in implementing certification only reached 55.05 percent (Herjanto, 2011).

B. THEORITICAL

Productivity in theory can be interpreted as the ratio of the output framework to the input (Wolff, 1994). In terms of meaning according to the Big Indonesian Dictionary (KBBI), productivity is interpreted as the ability to produce something or production power and productivity1. OECD (2001) describes productivity as the ratio between output volume and input volume, namely measuring how efficient the production inputs used such as capital and labor are to produce output at a certain level. Companies can increase their productivity through several things, including increasing technical efficiency, namely by using a combination of certain inputs and existing technology to be able to produce more maximum output; companies increase their production scale (increasing return to scale); implement or adopt more advanced technology (technological progress) and make changes to the company's organizational structure (organizational change) (Gordon, Zhao, and Gretton, 2015).

Productivity measurement is done by looking at the differences in the types of inputs used to make comparisons that are divided into two methods, namely single factor productivity measures and multi factor productivity measures. The single factor productivity measures method, productivity measurement uses a comparison of the amount of output with the amount of one type of input, for example capital or labor only or often referred to as partial productivity. The disadvantage of using this method is that the measurement only measures partially between output and one input so that it tends to ignore the influence of other inputs that may also affect productivity. An alternative method that can be used to measure productivity by using all inputs is through the multi factor productivity measures method. This method measures productivity in total, namely by comparing the total output to the combination of all inputs used. The multi factor productivity measures method is conceptually the same as total factor productivity (TFP) (OECD, 2001; Gordon, Zhao, and Gretton, 2015)

Total Factor Productivity TFP can measure efficiency with factor inputs used in production, based on the aggregate production function that connects total output with total inputs from individual factors (Burkett, 2006). The TFP theory implemented in the production function adopts Cobb Douglas, namely as follows:

$$Y = AK^{\alpha}L^{\beta}M^{Y}$$

Where Y is output, K is capital input, L is labor input, M is other inputs, α and β are output elasticity to inputs. Firm efficiency is measured by A which captures output that cannot be attributed or explained by the inputs used, in this case TFP (Beveren, 2012; Ozbudgay, 2018)

Several methods for calculating TFP include Ordinary Least Squares (OLS), fixed effect estimation, Olley Pakes (1996), Levinsohn Petrin (2003), and alternative methods found by Ackerberg, Caves and Frazer (2015). The ordinary OLS method can be used to calculate TFP but has weaknesses including not being able to solve the problem of simultaneity bias caused by the correlation between productivity (unobserved productivity) and production inputs and selection bias caused by companies entering and leaving the industry (Beveren, 2012). Meanwhile, the fixed effect method can be used in calculating TFP to overcome the problem of simultaneity and selection bias due to the assumption that productivity has an invisible value (unobserved productivity) (Ackerberg et.al, 2006). However, Olley Pakes (1996) showed that there are weaknesses in the fixed effect estimation, namely the results of the coefficient estimation are very different in balanced panel data and unbalanced panel data.

According to Olley Pakes (1996), the problem of bias can be overcome by using investment as a proxy for the existence of unobserved productivity shocks. From the Cobb Douglas production function estimate as follows

$$y_{it} = \beta_o + \beta_k k_{it} + \beta_i l_{it} + w_{it} + \varepsilon_{it}$$

Where Olley Pakes uses investment proxies to explain productivity shocks (w_{it}), so that investment in the form of : $i_t = i_t(k_t, w_t)$ follows

$$y_{it} = \beta_i l_{it} + \Phi_{it}(i_{it}, k_{it}) + \varepsilon_{it}$$

The weakness of the Olley Pakes method is that it can only be used in companies that report their investments are not equal to zero (non-zero investment). Meanwhile, Levinsohn Petrin (2003) proposed an alternative method, namely by using intermediate inputs as a proxy. This is because companies will usually always report the use of inputs such as raw materials and electricity. The estimated production function is as follows.

$$y_{it} = \beta_o + \beta_i l_{it} + \beta_k k_{it} + \beta_m m_{it} + w_{it} + \varepsilon_{it}$$

By using intermediate input proxies and assuming monotonicity, then, $w_{it} = w_{it}(m_{it}, k_{it})$

$$\Phi_{it}(m_{it}, k_{it}) = \beta_o + \beta_k k_{it} + \beta_m m_{it} + w_{it}(m_{it}, k_{it})$$

The equation for the second stage is as follows

$$y_{it} = \beta_o + \beta_k k_{it} + \beta_m m_{it} + E[w_{it}|w_{it-1}] + \varepsilon_{it}$$

Ackerberg, Caves and Frazer (2015) stated that the Olley Pakes and Levinsohn Petrin methods can have weaknesses, namely the existence of functional dependence problems due to not identifying the labor coefficient in the first stage estimating equation. The approach used by Ackerberg, Caves and Frazer (2015) is almost the same as Levinsohn Petrin, by adding labor input as a proxy in addition to intermediate inputs. First stage estimation is as follows.

$$\Phi_{it}(m_{it}, k_{it}, l_{it}) = \beta_o + \beta_k k_{it} + \beta_m m_{it} + w_{it}(m_{it}, k_{it}, l_{it})$$

The equation for the second stage is as follows

$$E[w_{it}|w_{it-1}]E[y_{it} - \beta_o - \beta_k k_{it} - \beta_i i_{it} - g(\Phi_{t-1})] - \beta_o - \beta_k k_{it-1} - \beta_i i_{it-1}) = 0$$

Standardization requires a process of conformity assessment and validation through certification. Certification through various empirical studies shows an influence on productivity, for example through increased technical efficiency and technological progress. Through certification, it will affect the production process and efficiency (Tzelepis et.al, 2006). The curve in Figure 2 (A) shows the production frontier where companies that previously did not implement certification assume that the company has not operated efficiently in the use of resources so that it is at point A. After implementing certification, the company will operate more effectively and efficiently so that the company will move from point A to point B which is already on the frontier. If only one product is certified (for example product Y), then product Y will have a higher quantity compared to product X (at point C), because with the certification of product Y, it is expected that the quality of product Y will be higher so that production will also be higher. Likewise, conversely, if product X is certified, it is at point C. Figure 2 (B) illustrates the shift in the production frontier caused by technological advances and innovation. The application of certification encourages changes in the way of working and innovation. Companies that were previously at point A, with innovation and technology through the application of certification on products X and Y can increase the amount of output of products X and Y so that the curve shifts to point C (more productive). If only product Y is certified, then it is assumed that only product Y experiences an increase in output so that the curve shifts from point A to B, and vice versa if product X is certified, then product X experiences an increase in output so that the curve shifts to point D.

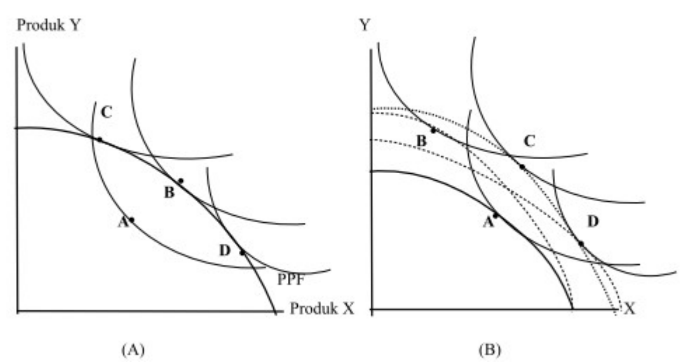

Figure 2 Production Possibility Frontier Curve (Source: Gordon, Zhao, and Gretton, 2015)

SNI is a certification that is applied for the implementation of standards in Indonesia. Some of the benefits of implementing SNI obtained by companies or producers are, 1) SNI can solve recurring problems appropriately with procedures through applicable SOPs; 2) Reducing production preparation time, production equipment, and production processes can be maintained; 3) Testing, inspection and quality control to reduce products that do not meet specifications can be more effective; 4) Providing training facilities for operators and staff; 5) Reducing additional costs on administrative work; 6) SNI facilitates marketing expansion and can increase consumer confidence; 9) Can encourage higher productivity, can create low prices, reduce or suppress costs, higher sales and greater profits (BSN, 2014).

The implementation of SNI requires a process of conformity assessment of established standards, which can be called certification. Certification is an activity of validation by a third party or certification body that will provide a certificate to state that a product, process, system, or personnel has met certain requirements. Certification bodies must also meet all accreditation requirements contained in international standards. The use of existing international standards in conformity assessment activities is carried out to facilitate recognition as an institution and the acceptance of certification issued is recognized nationally and internationally. Through Multilateral Recognition Agreements (MLA) or Mutual Recognition Arrangements (MRA) which are agreements to mutually recognize certification results so that SNI can also be accepted in countries other than Indonesia (BSN, 2014; BSN, 2016).

C. METHODOLOGY

The implementation of SNI certification encourages changes in the way of working, innovation, ease of knowledge transfer (technological progress), and can produce better technical efficiency. In order to analyze the effect of certification on the productivity of the manufacturing industry, this study uses a two-stage estimation method, namely by using a production function estimation model to estimate the Total Factor Productivity (TFP) value used as a productivity variable and for the next stage, namely regression using the productivity variable obtained in the first stage as a dependent variable and the certification variable as an independent variable in estimating the effect of certification on productivity.

In the first stage, using the Cobb Douglas production function to estimate TFP as done by Beveren (2012) in the following image.

$$y_{jt} = A_{jt}K_{jt}^{\beta k}L_{jt}^{\beta i}M_{jt}^{\beta m}$$

"Where Yjt represents the output of industry j in period t; Ajt represents the TFP of industry j in period t; Kjt represents the capital of industry j in period t; Ljt represents the labor force of industry j in period t; Mjt represents the material input of industry j in period t; and βk, βl, βm represent the output elasticities with respect to capital, labor, and input.

From this equation, it can be observed that Ajt, as the TFP variable, is something that cannot be directly observed (unobservable). Therefore, the production function must first be calculated using a natural logarithmic transformation with the following model

$$\ln Y_{jt} = \beta_o + \beta_k \ln K_{jt} + \beta_k \ln L_{jt} + \beta_m \ln M_{jt} + \varepsilon_{jt}$$

"Where the natural logarithm of TFP (ln Ajt) is $\beta 0$ + εit. To calculate TFP, the estimation model for TFP can be determined using the following model."

$$TFP_{jt} = \ln Y_{jt} - \beta_k \ln K_{jt} - \beta_i \ln L_{jt} - \beta_m \ln M_{jt}$$

"Where TFP represents the value of TFP growth; ln Yjt, ln Kjt, ln Ljt, ln Mjt are the natural logarithms of output, capital, labor, and material input of industry j in period t; βk, βl, βm represent the coefficient values of output elasticities with respect to capital, labor, and input. The TFP value is obtained by incorporating the coefficient values (βk, βl, βm) derived from the estimation of the production function using the fixed-effect method."

After obtaining the TFP calculation results, an estimate is then made to be able to analyze the influence of certification on manufacturing industry productivity, namely by using the following empirical model specifications.

$$TFP_{jt} = \beta_o + \beta_1 ser_{jt} + \beta_2 DTek_{jt} + \beta_3 HHI_{jt} + \beta_4 PMA_{jt} + \varepsilon$$

Where,

TFP = Total factor productivity industri;

Ser = Percentage of SNI certification ownership in industry;

Dtek = Technology dummy (low: ISIC 10-19, 25 and 31, medium: ISIC 22-24, 32-33, high-medium: ISIC 20-21, 26-30);

HHI = Herfindahl Hirschman index (market concentration) in industry;

PMA = Percentage of foreign capital ownership status in industry;

ε = error;

jt = Industrial sector j in period t.

The data source used in this study is company-level panel data grouped into industries in the manufacturing industry from the Large and Medium Industry Data (IBS) obtained from the results of the Annual Survey of Manufacturing Industry Companies in 2017, 2018 and 2019 questionnaires sourced from the Central Statistics Agency. The available industrial sector data is based on the Indonesian Standard Classification of Business Fields (KBLI) with 2 digits.

Table 1. Variable Definitions

Variabel	Status	Keterangan	Sumber
TFP	Dependen	*Total factor productivity* industri	Hasil hitung dari estimasi fungsi produksi
Y	Independen	Nilai rata-rata dari pendapatan produksi perusahaan di industri j	SIBS
K	Independen	Nilai rata-rata dari nilai taksiran seluruh barang modal tetap perusahaan di industri j	SIBS
L	Independen	Nilai rata-rata dari jumlah tenaga kerja perusahaan di industri j	SIBS
M	Independen	Nilai rata-rata dari biaya bahan baku perusahaan di industri j	SIBS
Ser	Independen	Persentase perusahaan yang memiliki sertifikasi pada industri j	SIBS
PMA	Kontrol	Persentase perusahaan dengan status modal asing pada industri j	SIBS
HHI	Kontrol	Konsentrasi pasar industri j	SIBS
DTek	Kontrol	Industri teknologi rendah (ISIC 10-19, 25 dan 31), industri teknologi menengah (ISIC 22-24, 32-33), industri dengan teknologi tinggi (ISIC 20-21, 26-30)	UNIDO

D. RESULTS AND DISCUSSION

The data used in this study are Large and Medium Industry data from the Annual Survey of Manufacturing Industry Companies in 2017, 2018 and 2019. In this survey, the data available is in 2 (two) digits of the KBLI for the main industrial sector. This study will measure the effect of SNI certification on manufacturing industry productivity.

Total productivity (TFP) which is the dependent variable is formed from a production function consisting of output (Y), capital (K), labor (L) and raw material input (M). The following table will display descriptive statistics of each variable used in the model to estimate the value of total productivity growth (TFP).

Table 2. Descriptive Statistics of Variables for TFP Estimation

Variabel	Satuan	Obs	Mean	Std. Dev.	Min	Max
Output (Y)	Rupiah	72	17651429	14664744	3116306.3	54939272
Kapital (K)	Rupiah	72	5163710	4206745.2	733608.69	18450776
Tenaga kerja (L)	Orang	72	84.034	29.162	47.172	170.135
Input (M)	Rupiah	72	6792822.8	6047933.3	672250.94	25554220

Sumber : Data Industri Besar dan Sedang di Badan Pusat Statistik

Based on this, it can be seen that the output value (Y) of the manufacturing industry varies between Rp 3,116,306 to Rp 54,939,272. The lowest output value is in the Ready-to-wear Industry (KBLI 14) and the highest output value is produced by the Basic Metal Industry (KBLI 24). In the capital variable (K), the value varies between Rp 733,608 to Rp 18,450,776. The lowest capital value is in the Tobacco Processing Industry (KBLI 12), while the highest capital value is in the Basic Metal Industry (KBLI 24). The number of workers used in the manufacturing industry ranges from 47 to 170 people with an average value of 84 people. This shows that most industries are classified as medium industries, namely based on the number of workers of 20 - 99 people. The least amount of labor usage is in the Printing and Reproduction of Recorded Media Industry (KBLI 18) and the largest amount of labor usage is in the Computer, Electronic and Optical Goods Industry (KBLI 26). In the variable of raw and auxiliary material input usage, the value varies between Rp 672,250 to Rp 25,554,220. The highest input usage is in the Basic Metal Industry (KBLI 24) and the least input usage is in the Non-Metallic Mining Industry (KBLI 23).

TFP calculation estimation uses the fixed effect method to overcome the problem of simultaneity and selection bias due to the assumption that productivity has an unobserved productivity value. Furthermore, the coefficients obtained from the regression of the output variable (Y) against capital (K), the number of workers (L) and auxiliary raw materials (M) are used in calculating TFP. The results of the estimation of the variables forming the TFP of the manufacturing industry in 2017 - 2019 can be seen in Table 3.

Table 3. Manufacturing Industry TFP Estimates 2017 – 2019

Variabel	ln Y
ln K	0.0118
	(0.169)
ln L	0.7070*
	(0.408)
ln M	0.6699***
	(0.094)
_cons	2.7978
	(1.798)
N	72
R^2	0.793
adj. R^2	0.784

The average value of total productivity growth (TFP) and the percentage of SNI certificate ownership based on industry with 2 (two) KBLI digits during the 2017-2019 observation year can be seen in the following Figure.

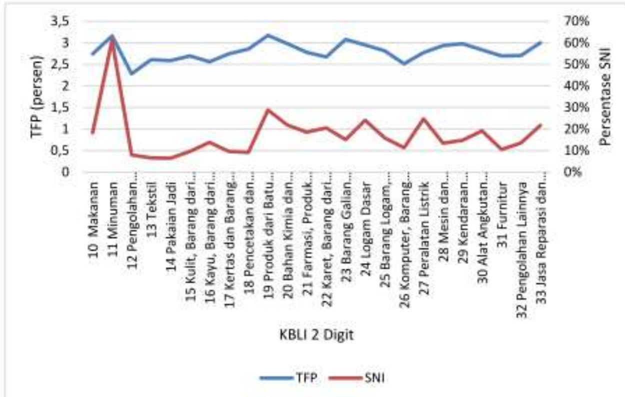

Figure 3. Average Value of TFP and SNI Manufacturing Industry 2017-2019

Based on the technology classification, the average TFP growth value obtained between low-tech industries, medium-tech industries and high-tech industries is almost the same. However, when compared to the average TFP of the entire industry, which is 2.79%, it can be said that high-tech industries also have high TFP on average. In the high-tech industry, 4 out of 7 industries are above the average TFP of the industry as a whole or 57% of the industry, while in the low-tech industry, only 4 out of 12 industries have TFP above the average or 33% of the industry. The highest percentage of SNI is in the beverage industry at 61% and the lowest percentage of SNI at 6% is in the ready-to-wear industry. The percentage of SNI ownership may be influenced by the difference between mandatory and voluntary SNI implementation. the average SNI of the entire industry is 17%, so high-tech industries have more SNI than low-tech industries. In high-tech industries, 4 out of 7 industries have an SNI percentage above the average or 57%, while in low-tech industries, only 3 out of 12 industries have an SNI percentage above the average or 25%.

Table 4. Average TFP Growth Value and SNI Percentage in Observation Years 2017-2019

Klasifikasi Industri	KBLI	Jenis Industri	Rata-rata △ TFP	Rata-rata SNI
Industri Teknologi Rendah	10	Makanan	2,74%	18%
	11	Minuman	3,16%	61%
	12	Pengolahan Tembakau	2,28%	8%
	13	Tekstil	2,61%	7%
	14	Pakaian Jadi	2,59%	6%
	15	Kulit, Barang dari Kulit dan Alas Kaki	2,69%	10%
	16	Kayu, Barang dari Kayu dan Gabus	2,56%	14%
	17	Kertas dan Barang dari Kertas	2,75%	10%

	18	Pencetakan dan Reproduksi Media Rekaman	2,85%	9%
	19	Produk dari Batu Bara dan Pengilangan Minyak Bumi	3,17%	29%
	25	Barang Logam, Bukan Mesin dan Peralatannya	2,82%	16%
	31	Furnitur	2,69%	10%
Industri Teknologi Menengah	22	Karet, Barang dari Karet dan Plastik	2,67%	21%
	23	Barang Galian Bukan Logam	3,08%	15%
	24	Logam Dasar	2,95%	24%
	32	Pengolahan Lainnya	2,71%	14%
	33	Jasa Reparasi dan Pemasangan Mesin dan Peralatan	3,00%	22%
Industri Teknologi Tinggi	20	Bahan Kimia dan Barang dari Bahan Kimia	2,98%	22%
	21	Farmasi, Produk Obat Kimia dan Obat Tradisional	2,78%	18%
	26	Komputer, Barang Elektronik dan Optik	2,51%	11%
	27	Peralatan Listrik	2,77%	25%
	28	Mesin dan Perlengkapan ytdl	2,94%	13%
	29	Kendaraan Bermotor, Trailer dan Semi Trailer	2,98%	15%
	30	Alat Angkutan Lainnya	2,84%	19%
Rata-rata dari total			2,79%	17%

On average, industries that have a high percentage of SNI are also followed by having high TFP growth. Furthermore, the following Figure illustrates the relationship between the percentage of SNI and the value of TFP growth, sufficiently illustrating the pattern of the relationship between SNI certification and the value of TFP growth, that there is a trend or pattern where the percentage of ownership of SNI certification that is getting higher also illustrates high TFP growth.

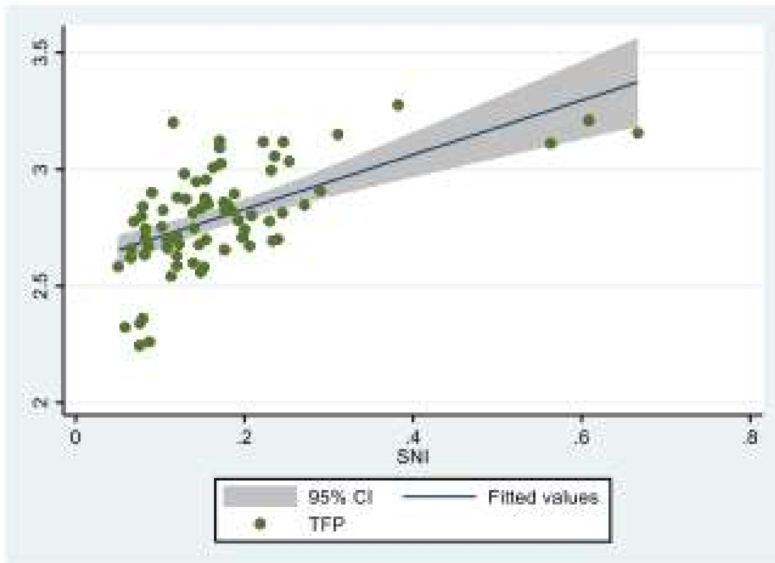

Figure 4. Relationship between SNI Percentage and TFP Growth Value

After the estimation is done to obtain the TFP growth value, the TFP growth value is used to estimate the effect of certification on the total productivity of the manufacturing industry. The following table presents descriptive statistics of each variable used in estimating the effect of certification on the total productivity of the manufacturing industry.

Table 5. Descriptive Statistics of Variables to Estimate the Effect of Certification on Total Productivity of Manufacturing Industry

Variabel	Obs	Mean	Std. Dev.	Min	Max
lnTFP	72	2.798	.223	2.24	3.27
SNI (ser)	72	.174	.114	.051	.667
Teknologi (DTek)	.	.	.	.	.
Rendah	72	.5	.504	0	1
Sedang	72	.208	.409	0	1
Tinggi	72	.292	.458	0	1
HHI	72	.165	.161	.014	.845
PMA	72	.168	.125	.016	.582

The variable describing the productivity (TFP) of the manufacturing industry varies between 2.24% to 3.27% with an average TFP value of 2.79% and a standard deviation of 0.22% indicating that the distribution of TFP growth value data for the manufacturing industry in this study tends to be around its average value. The greater the TFP growth value, the higher the productivity of an industry. Meanwhile, the SNI variable describes the percentage of SNI certificate ownership in a manufacturing industry, the SNI value varies between 5.1% to 66.7% with an average value of 17.4%. The higher the SNI value indicates that companies that have SNI certificates in a particular industrial group (2-digit KBLI) are increasing and can be said to have implemented effective and efficient production activities.

The PMA variable has a value that varies between 1.6% to 58.2% with an average value of 16.8%. This variable describes the percentage of companies that have foreign capital dominance in an industry. The technology dummy variable describes a dummy technology category based on UNIDO, where low-tech industries (ISIC 10-19, 25 and 31), medium-tech industries (ISIC 22-24, 32-33), high-medium technology industries (ISIC 20-21, 26-30). In this study, 50% of industries have low technology, 20.8% industries with medium technology and 29.2% are included in high-tech industries. The HHI variable has a value that varies between 0.014 to 0.845 with an average value of 0.165. The smaller the HHI variable indicates that the level of concentration of output sales is less in the industry.

The effect of certification on manufacturing industry productivity, the results of the TFP growth calculation are then used as the dependent variable and regressed with the SNI certificate variable and other control variables. In this estimation, there is the use of a technology dummy variable that tends to remain constant over time (time invariant), so that the possible method used is the selection between Pooled Least Square (LS) or Random Effect (RE). Through the Breusch and Pagan Lagrangian Multiplier test, the results show that the best model used in this estimation is the random effect. The results of the estimation of the effect of certification on manufacturing industry productivity in 2017-2019 can be seen in the following table.

Table 6. Estimation Results of the Impact of Certification on Total Productivity of the Manufacturing Industry in 2017-2019

Variabel	(1) lnTFP	(2) lnTFP	(3) lnTFP	(4) lnTFP
SNI (ser)	1.0403***	1.0182***	0.8464***	0.8412***
	(0.206)	(0.186)	(0.193)	(0.187)
DTek				
1.Teknologi Sedang		0.1131	0.1112	0.1293
		(0.090)	(0.085)	(0.083)
2.Teknologi Tinggi		0.0739	0.0623	0.1335*
		(0.075)	(0.079)	(0.072)
HHI			0.0610***	0.0687***
			(0.022)	(0.023)
PMA				-0.3731
				(0.248)
_cons	2.6172***	2.5759***	2.6095***	2.6486***
	(0.057)	(0.062)	(0.065)	(0.082)
N	72	72	72	72
R^2	0.3565	0.3988	0.4343	0.4446
Prob > chi2	0.0000	0.0000	0.0000	0.0000

The regression results show that the SNI certificate variable has a significant positive effect on the total productivity (TFP) of the manufacturing industry. From the regression results, a coefficient value of 0.8412 is obtained, which indicates that if the percentage of SNI certificate ownership in a particular type of industry increases by 1 percent, assuming all other variables remain constant (ceteris paribus), then the TFP growth value in that industry will experience an increase of 0.8412 percent. These results are in line with the study of Ghoedhuys and Sleuwaegen

(2013) which found that international certification applied to companies in 59 countries has a positive and significant effect on increasing TFP. The coefficient value of the high-tech industry shows a coefficient value of 0.1335. The coefficient value indicates that industries that use high technology (ISIC 20-21, 26-30) have an impact on increasing the growth of total industrial productivity by 0.1335 percent higher compared to low-tech industries. It can be concluded that the higher the technology used, the higher the TFP growth produced. This is in line with Kwon and Stoneman (1995) who found that higher technology adoption will reduce production costs and increase company income. The reduction in production costs has an impact on increasing productivity.

The HHI control variable that describes market concentration in the industry significantly has a positive effect on the total productivity of the manufacturing industry. The HHI coefficient value obtained is 0.0687, which indicates that if the concentration of an industry increases by 1 percent, the TFP growth value in that industry increases by 0.0687 percent. These results are in line with Karentina's (2019) research which found that a higher HHI value has an impact on greater productivity.

E. CONCLUSION

This study aims to analyze the effect of certification on the productivity of the manufacturing industry in Indonesia. Based on the results of the estimation model of the effect of certification on productivity, it was found that the implementation of certification, especially SNI certificates in companies in the manufacturing industry, has a significant positive effect on total productivity growth (TFP). An increase in certification by 1 percent will have an impact on increasing the TFP growth value by 0.8412 percent.

Another thing that also affects TFP is the level of technology in the industry. In industries with higher technology (KBLI industry 20-21, 26-30), the TFP growth value is 0.1335 percent higher than low-tech industries. This indicates that in industries with increasingly high technology will have a significant positive impact on total productivity. In line with the descriptive analysis where the number of high-tech industries that have above-average TFP growth values is greater than the number of low-tech industries (57 percent and 33 percent respectively).

Another factor that also affects TFP is market concentration (HHI). Market concentration in the industry (HHI) in the industry has a positive effect on the total productivity of the manufacturing industry. The market concentration of an industry increases by 1 percent, then the TFP growth value in the industry increases by 0.0687 percent.

So it can be concluded that overall the estimation results of the model show the influence of SNI on the total productivity of the manufacturing industry. In addition to SNI, other factors that have a joint influence are market concentration in the industry (HHI) and the level of technology in the industry.

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