
CONTRIBUTION OF INDONESIAN NATIONAL STANDARD (SNI) ON GROSS DOMESTIC PRODUCTS (GDP)

Kontribusi Standar Nasional Indonesia (SNI) terhadap Produk Domestik Bruto (PDB)

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Abstrak

Gross Domestic Product (GDP) is the number of goods and services produced by a country in a certain period as a measuring tool for a country's economic development. GDP comprises many factors, including national household consumption, investment, state consumption, exports, and imports. Standards are inherent in goods and services produced, consumed, and nationally and internationally traded. This study aims to determine the effect of standards on GDP. The method used is econometrics through case studies in Indonesia by considering the independent factors, namely fixed capital, number of workers, patents, and Indonesian National Standard (SNI), while the dependent factor is GDP. The results showed that a 1% percent increase in SNI, patents, fixed capital, and labor could increase Indonesia's GDP by 0.3%, 0.08%, 0.04%, and 0.4 %, with alpha 5% from 1998 to 2017, respectively. With an average SNI growth of 5.43%, the contribution of SNI is 1.63% year to the average GDP growth. In monetary terms, a 1% increase in total SNI in 2017 increased to about 5.9 trillion in GDP.

Keyword: Gross Domestic Product; fixed capital; labor; patent; Indonesian National Standard (SNI); econometrics

Abstract

Produk Domestik Bruto (PDB) adalah jumlah barang dan jasa yang diproduksi oleh suatu negara dalam periode tertentu, sebagai alat ukur perkembangan ekonomi suatu negara. PDB dibangun dari banyak faktor, termasuk konsumsi rumah tangga nasional, investasi, konsumsi negara, ekspor dan impor . Standar adalah elemen yang melekat pada barang dan jasa yang diproduksi, dikonsumsi, dan diperdagangkan secara nasional dan internasional. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh standar terhadap PDB. Metode yang digunakan adalah ekonometrika melalui studi kasus di Indonesia dengan mempertimbangkan faktor independen yaitu modal tetap, jumlah tenaga kerja, paten, dan Standar Nasional Indonesia (SNI), sedangkan faktor dependen adalah PDB. Hasil penelitian menunjukkan bahwa 1% persen peningkatan jumlah SNI, paten, modal tetap, dan tenaga kerja dapat meningkatkan PDB Indonesia sebesar 0,3%, 0,08%, 0,04%, dan 0,4%, dengan alpha 5% pada periode 1998 hingga 2017, masing-masing. Dengan rata-rata pertumbuhan SNI sebesar 5,43%, SNI memberikan kontribusi sebesar 1,63% per tahun terhadap rata-rata pertumbuhan PDB. Secara moneter, kenaikan 1% total SNI pada tahun 2017 menghasilkan peningkatan PDB sekitar 5,9 triliun.

Kata kunci: Produk domestik bruto; modal tetap; tenaga kerja; paten; Standar Nasional Indonesia (SNI); ekonometrika

1. INTRODUCTION

The development of the economy aims to improve people's welfare. Economic growth is an indicator of successful development. The purpose of the action is to improve people's welfare. Economic growth can be calculated from various aspects, both from the real and financial sectors and in production, consumption, and investment. An increase in investment or investment is required to create positive economic growth. It is because

investment is a significant need in development which impacts the growth rate. Government policy is needed to encourage investment because capital is the driving force in the economy. A considerable investment in a country will increase economic growth, while a minor investment will show sluggish economic growth (Rosyidi, 2004). The success of the development is also determined by the distribution of investments under the location and conditions of the community (Makmun and Yasin, 2003). It can be

achieved by applying modern investment management, including implementing organizational asset management standards like ISO 55001.

Another factor affecting economic growth is the labour used in the production process. The conditions of the population and workforce strongly influence employment. The workforce's high number and growth rate demand implications for the need to expand and provide employment. The problem of employment opportunities is closely related to the problem of economic growth. Overall, the national development policy seeks to keep the economy in line with efforts to expand job opportunities (Amelia, 2017). Rustiono (2008) states that rapid population growth encourages underdevelopment problems and furthers development prospects.

Furthermore, it is said that the rising problem in population is not because of the large number of family members but because they are concentrated in urban areas as the result of the fast rate of migration from rural to urban areas. However, a sufficient population with a high education and skill level will be able to drive the economic growth rate. Meanwhile, increased worker productivity can be achieved by protecting occupational safety and health. All of this can be achieved by applying modern workforce management, including the application of ISO management of occupational safety and health, like ISO 45001.

Economic growth is also influenced by technological developments, inventions, and product innovations related to standards and patents. According to Park (2008), patent protection has been strengthened in many countries. Patent policy is an essential tool policymakers use to stimulate innovation and economic growth. Meanwhile, the extent to which standards can impact the economy depends on the industrial sector's application of standards. Firms with many trading partners and intensive intra-firm trade enormously gain profit from internationally harmonized standards as their benefits increase in line with the number of countries involved. If formal standards are referred to in national regulation, this will enhance product compliance with standards and provide the benefit of increased legal domestic safety and the foreign country (Schroder, 2011). Technical specifications of the standard may be a means to improve a firm's competitive advantage (Swann, 2000).

Germany has researched the effect of Standards on Gross Domestic Product (GDP) using the Cobb-Douglas production function equation method. The step of calculating the

impact of standards on GDP is to correlate the functions of all business sector variables such as labor, the number of patents, permits, capital (assets), and standard amount using the Cobb Douglas production function (Blind et al., 2011). The same calculation method has also been adopted by other countries such as France, Canada, Germany, Australia, the Nordic, and the United Kingdom (UK) (Menon, 2018).

The research results related to the Economic Benefit of Standardization that has been carried out in each country show that the effect of standardization (estimated standard stock elasticity) differs for each country. The estimation of standard stock elasticity shows the highest value in Canada and the lowest value in the Nordic countries. For Canada, every 1% change in the standard stock is positively associated with a 0.36% change in labor productivity. This value is higher than other countries, possibly because the patent variable is not controlled for in the calculation. A study by the Centre for Economics and Business Research (CEBR) found that patent rights conform to standards, so there is no need to add patents. Data available for technology licenses are available only from 1964 onwards. CEBR establishes a model whose standard is the only determinant of the Total Productivity Factor (TFP) so that it has the lowest standardization effect value.

The motivation for this research is that Indonesia's national policy has forced standards to become the second language of transactions after money, which plays a vital role in global trade and must be mastered (Setiadi, 2010). In addition, the Parliament of the Republic of Indonesia at the Hearing Meeting (RDP) constantly questions how much standardization and conformity assessment contribute to GDP (BSN, 2008). It encourages researchers to calculate and find Indonesia's position against several other countries regarding the Indonesia National Standard (SNI) contribution as the basis for Government policy. On the other hand, at the beginning of President Jokowi's leadership, the President also provided strong support and commitment to standards. Jokowi stated, "Indonesia must be able to change massively by improving the quality of goods, design, packaging, branding, service, and price competitiveness to meet global export market standards" (Musyaffa, 2020). Other government policies emphasize that "standardization must be a stimulus for micro and small enterprises to be able to improve the performance and quality of their products and not the other way around." The author argues that this research can answer the above challenges, especially regarding the contribution of SNI to GDP. This study aims to

Contribution of Indonesian National Standard (SNI) on Gross Domestic Products (GDP)

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calculate the contribution of SNI development to GDP.

2. LITERATURE REVIEW

The research was carried out on the premise that standards can affect GDP directly or indirectly. Applying reasonable standards, such as management standards, product standards, and measurements, directly affect productivity (Delmas and Pekovic, 2013). Good productivity on the employee or labour side can increase labour output (Waluyo, 2011). Regarding capital, implementing standards can increase investment attractiveness through high trust in the applicant of standards, specifically environmental management standards (Dean, 2013). From the trade side, standards trigger and encourage

export and import trade. Export trade tends to increase when national standards are in harmony with the regulations of the destination country or International (SI) standards (Baller, 2007; Blind, 2001; Clougherry and Grajek, 2008; Kim and Reinert, 2009; Moenius, 2006). Meanwhile, import trade trends increase if national standards are harmonized with international standards (SI) only because of the standard's similarity of quality parameters and procedures (Blind, 2001; Blind and Jungmittag, 2001; Grajek, 2004; Moenius, 2004). Regarding patents, standards can increase innovation and encourage more patents (Basaran, 2016). Finally, standards directly affect GDP, a function of labor, capital, SNI, and patents.

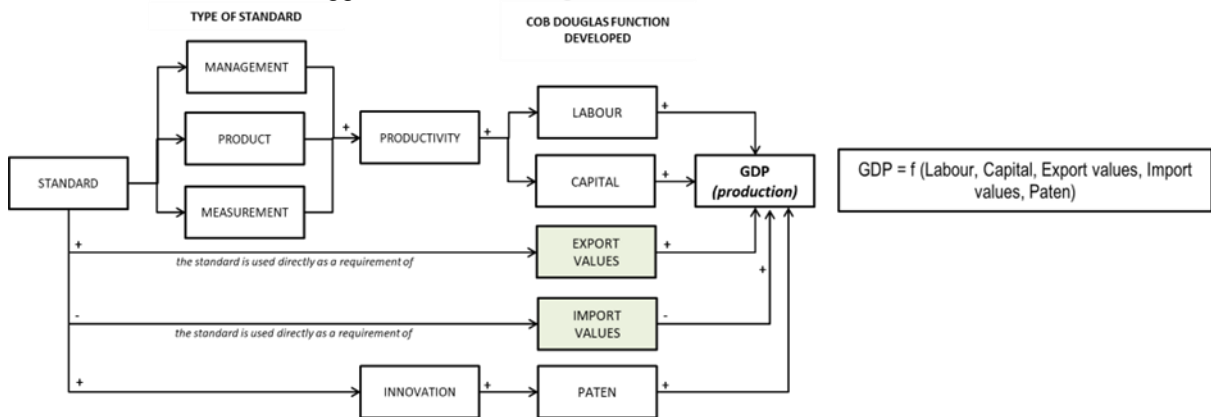


Figure 1 Research approach.

Gross Domestic Product (GDP)

Economic growth is the goal of all countries to keep a government in good condition (Dang and Pheng, 2014). Specifically, economic growth is an intensive action of accumulated capital, investment activities, and technological development due to innovation (Slepov et al., 2017). Economic growth can be seen from the value of the Gross Domestic Indicator (Dang and Pheng, 2014). GDP is a macroeconomic indicator used to calculate the relative importance of a country's productivity (Soubotina, 2004) and describes a country's state and economic growth (Anghelache and Anghel, 2015).

Contribution of Indonesian National Standards (SNI)

Standards are essential in achieving international trade liberalization by establishing a framework, defining a common vocabulary, setting the crucial characteristics of a product and service, and detecting best practices in the ecosystem that will

ensure beneficial results (Shin et al., 2015). Standards are strategic tools and guidelines to help companies overcome the most demanding challenges in modern business. They help ensure business operations are as efficient as possible, increase productivity, and allow the company to access new markets (ISO, 2015). The standard also benefits Small and Medium Enterprises (SMEs) (Susanto et al., 2018). Furthermore, standards are expected to be one of the critical tools for national economic growth and conventional business strategies (Shin et al., 2015). The international standards organization (ISO, 2015) states that the benefits of standards for business activities include cost savings, increased customer satisfaction, access to new markets, increased market share, and environmental benefits. Implementing standards can help optimize operations and increase the bottom line to achieve production cost savings.

Contribution of patent

Patents are intellectual property granted by the state to inventors for the results of their inventions in the technology field, which have a strategic role in supporting national development and advancing public welfare (Setneg, 2016). A patent license is an initial step towards a nation's technological independence and is a must for a country or government to regulate and monitor it. Patent licenses are needed to reduce the possibility of a monopoly on technology by certain parties, which can harm a nation's economy (Utama, 2012). Patents are part of intellectual property rights, divided into two types: normal and simple. Normal patents have gone through in-depth research or development with multiple claims. Simple patents do not require in-depth research or development and contain only one claim (Ramli and Putri, 2018). The patent system can protect innovative inventions from developed countries, but on the other hand, the patent system cannot safeguard inventions in developing countries (Utami et al., 2014).

Contribution of labour

In a particular area, the presence of labor becomes one factor determining the development's success. The rapid growth of an area is influenced by the number of workers, especially if there are many workers with more expertise. Mulyadi (2003) in Sayifullah and Emmalian (2018) states that human resources are a working-age population between 15-64 years old or the total population in a country that can produce goods and services where there is a demand for labor. There is the participation of the population in the activity of making goods in a country.

Contribution of Fixed Capital (Investment)

Fixed capital is an essential factor in economic growth. Fixed capital is needed for production activities as well as investment in the form of construction, machines, types of equipment, etc. Sources of investment are divided into an investment from within the country called Domestic Investment (PMDN) and investment from abroad called Foreign Investment (PMA). The role of PMDN and PMA investment in the economy can increase income and provide employment and raw materials for infrastructure development (Suharto and Nugroho, 2016; Wihda and Poerwono, 2016). As the policy maker, the government needs to make policies to support investment development to achieve economic improvement in a region.

Previous studies

The study conducted in Germany also shows that economic growth depends on various factors,

including capital. The study results show fluctuations in capital contribution to economic growth from 1961 to 2006 (Blind et al., 2011). Calculating GDP by statistical data or using labour and capital functions modeling showed insignificant differences in outcomes. The study conducted by Dunaev (2004) concluded that the calculation results of Ukraine's GDP for 1997–2001 as a function of labour and capital compared to statistical data calculations results showed a relative error of not more than 1%. It makes it possible to determine the gross domestic product for 2002, 2003, and subsequent years. Moreover, Kormendi and Meguire (1985), Barro (1991), and Levine and Renalt (1992) report that the rapid rate of capital formation can also accelerate the level of economic growth because capital formation is a medium for mobilizing and distributing savings to business fields that are considered more productive to increase economic growth.

In general, it can be seen that standardization has a positive impact on labor productivity and economic growth. However, the calculation results obtained reflect the benefits or standard contributions partially sectorally and philosophically do not directly impact the improvement of safety, community welfare, and the economy but rather indirectly impact (See Figure 1).

Hypothesis

This study hypothesizes whether fixed capital, number of workers, patent rights, and national standards contribute to Indonesia's gross domestic product. All independent factors affect national economic growth and international trade transactions. But all these factors are interrelated and support the cumulative way.

3. METHODS

This study uses accompanying variables as part of the production function: capital, labour, and patent variables, with the main target variables, namely the contribution to the SNI (Table 1).

The standard contribution to GDP is calculated using the econometric method, where several factors influence GDP as a production function. This study uses a commonly used function, namely the Cobb-Douglas production function. Empirically the Cobb-Douglas production function describes the relationship between economic output and input factors for capital, labor, and technological progress, in the form of a general equation as follows:

$$Y = AX_1^{\beta_1} X_2^{\beta_2} \dots AX_m^{\beta_m} \quad (1)$$

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Where:

- Y - the value of GDP;
- B - the elasticity value of factor;
- X - (which affects GDP) including SNI (X_1), patents (X_2), fixed capital (X_3), and labour (X_4);
- A - the level of technical progress (Cheng & Han, 2013).

Then the equation is formed as follows:

$$GDP_{it} = A SNI_{it}^{\beta_1} Patent_{it}^{\beta_2} Capital_{it}^{\beta_3} Labour_{it}^{\beta_4} \quad (2)$$

Table 1 Research design.

Output of Research	Target	Type of data	Dependent Variable	Independent variable		Approach	Method
				Main independent variable	Companion independent variable		
THE CONTRIBUTION OF INDONESIAN NATIONAL STANDARDS (SNI) TO GROSS DOMESTIC PRODUCT (GDP)	SNI Contribution to GDP	Secondary data from 1998-2017 (19 years)	GDP	Amount of SNI (5 sectors of production business sector)	Amount of Labour ----- Amount of Capital ----- Amount of Paten	Cob Douglas Production Factor (expenditure approach)	Model Econometric Time Series Data Panel with FEM/REM test [Figure 2] (n=100)

Source: results of research data processing, 2021

The total economic production over a certain period or annually measures technical progress as a function of technological knowledge shown by capital productivity (Capital), and labor (Labor) is calculated to measure the impact of decreasing marginal income from additional resources on the economy. The SNI contribution is reflected in the number of SNI during a specific period (it), and the patent contribution is reflected in the number of patents during a particular period

(it). Then the two parts of the equation take natural logarithms, then the following equation is obtained:

$$\ln GDP = A + \beta_1 \ln SNI + \beta_2 \ln Patent + \beta_3 \ln Capital + \beta_4 \ln Labour \quad (3)$$

The econometric model is tested by going through the following stages (Figure 2)

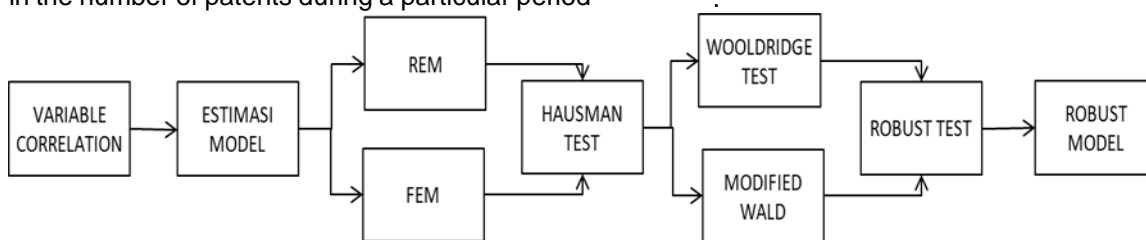


Figure 2 The stages of testing the regression model.

Data type and locus

The data used in this study are from 1998 to 2017, namely from the source of data on GDP, capital, and labor obtained from the Central Statistics Agency (BPS), the number of SNI from the National Standardization Agency for Indonesia, and the number of patents registered at the Directorate General. Intellectual Property Rights,

Ministry of Law and Human Rights of the Republic of Indonesia. The obtained data were analyzed using the panel regression method using STATA software to get results per the research objectives. This study uses previous research's concordance between NACE Rev.2 / ISIC Rev.4, IPC V8, ICS 6 Ed. and HS 2012 to connect all variables (Tampubolon, 2017).

Table 2 Descriptif statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	100	279988.4	160120.6	65012.1	729171.8
SNI	100	815.93	869.3245	131	3651
Patent	100	8509.06	15644	30	78869
Capital	100	2.64e + 11	7.19e + 11	1.21e + 09	4.00e + 12
Labour	100	945491.4	1525113	50837	545621

Source: results of research data processing, 2021

Table 2 shows that the value of observations or the amount of data to be examined as many as 100 observations, consisting of 5 (five) sectors, namely: 1) service sector, 2) transportation and communication, 3) mining and excavation, 4) agriculture, 5) livestock, forestry, and fisheries, as well as 6) processing industry in time series from 1998 - 2017. Data is processed statistically parametric. Processed data is usually distributed with an alpha value of 5%. The selected sector is a sector that is closely related to SNI as a leverage factor.

For the GDP variable, the mean or average value is 279.9 trillion. The maximum value of GDP was 729.17 trillion in 2017 in the manufacturing

sector and a minimum value of 65.01 trillion in 2000 in the transportation and communication sector. The maximum increase in the average variable GDP was 160.12 trillion, and the maximum decrease was 160.12 trillion, indicated by the standard deviation value. In the SNI variable, the minimum number of national standards issued was 131 in 1998 for Agriculture, Animal Husbandry, Forestry, and Fisheries sectors, and the maximum number was 3651 in 2017 for the Processing Industry sector. Meanwhile, the minimum number of patents registered was 30 in 1998 in the services sector, and the maximum number was 78,869 in 2017 in the manufacturing sector.

Table 3 Correlation between variables.

	Ln GDP	Ln SNI	Ln patent	Ln capital	Ln labour
Ln GDP	1.0000				
Ln SNI	0,7529	1.0000			
Lnpatent	0.7292	0.8470	1.0000		
Ln capital	0.7407	0.8791	0.8108	1.0000	
Ln labour	0.7736	0.8691	0.7275	0.8483	1.0000

Source: results of research data processing, 2021

Table 2 above contains descriptive statistics and variance factor information for the five variables used in the specification of this model. Table 3 above also shows that the relationship between the research variables is unidirectional and positive. The relationship between the independent variable and the

dependent variable is quite strong. The correlation value is more than 0.5. From these data, it can be calculated that the average GDP growth is 4.39 percent, SNI growth (sni) is 5.43 percent, patent growth (patents) is 39.29 percent, fixed capital growth (capital) is 30.69 percent, and labor growth. (labor) is 2.89 percent.

4. RESULT AND DISCUSSION

4.1 Result

Estimation of Fixed Model

Table 4 shows the analysis results to obtain the efficient and unbiased β parameter using the Least Square Dummy Variable (LSDV). The approach in LSDV is often done by including dummy variables to allow for differences in the

value of different parameters in each unit. The number of dummy variables must correspond to the number of objects or individuals.

Based on STATA software, the FEM model panel regression data for this case are as follows:

$$\begin{aligned} \text{Ln GDP}_{it} = & 2,6673 + 0,3001 \text{Ln SNI}_{it} + \\ & 0,0818 \text{Ln Patent}_{it} + 0,043 \text{Ln Capital}_{it} \\ & + 0,4866 \text{Labour}_{it} \end{aligned} \quad (4)$$

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Table 4 Output of fixed effect model estimation.

Ln GDP	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]	
Ln SNI	.3000788	.0763776	3.93	0,000	.1483641	.4517936
Lnpatent	.0818035	.0210655	3.88	0,000	.0399596	0,1236475
Lncapital	.0434417	.0204918	2.12	0.037	0,0027372	.0841462
Ln labour	0,4866210	.0770296	6.32	0,000	.3336111	0,6396309
_cons	2.667326	.9335974	2.86	0,005	.8128498	4.521803
sigma_u	.81297766					
sigma_e	.13806975					
rho	0,97196563 (fraction of variance due to u_i)					
F test that all u_i = 0: F (4, 91) = 111,87						

Source: results of research data processing, 2021

In this model, it is found that the effect of the four independent variables on the gross domestic product variable is simultaneously using the F test value (probability value of 0.00000 α 0.05). The partial test found that the variables of fixed capital, labor, standards, and patents had a positive and significant effect on GDP with an alpha level (0.05). The diversity of this GDP model by the four independent variables is quite reasonable based on the R-squared value, which can be explained by 83 percent.

Estimation of Random Effect Model

Given the above Fixed Effect Model (FEM) model using dummy variables causes a decrease in the efficiency of the estimated parameters and has a

consequence (trade-off) to reduce the number of degrees of freedom. Meanwhile, in the panel data model, there is a correlation between error terms due to changes in time. Differences in observation can be overcome using the error component or random-effects model approach. With that assumption, individual errors are not correlated, so the errors are as a whole. Based on the output with STATA software, the panel data for the Random Effects Model (REM) model for this case are as follows:

$$\ln GDP_{it} = 8.7435 + 0.0018 \ln SNI_{it} + 0.0959 \ln patent_{it} + 0.225 \ln capital_{it} + 0.1861 \ln labour_{it} \quad (5)$$

Table 5 Output of random effect model estimation.

Ln GDP	Coef.	Std. Err.	Z	P> t	[95% Conf. Interval]	
Ln SNI	.0018046	.1059124	0,02	0,986	-.2057799	.2093892
Ln patent	.0959756	0,0354313	2.71	0,007	0,0265315	.1654198
Ln capital	.0225679	.0401475	0,56	0,574	-.0561197	.1012555
Ln Labour	0,1861550	0,0517514	3.60	0,000	.0847241	0,2875859
_cons	8.7435740	.5472013	15.98	0,000	7.671079	9.816069
sigma_u	0					
sigma_e	.13806975					
rho	0 (fraction of variance due to u_i)					

Source: results of research data processing, 2021

This model also finds the effect of the four independent variables on gross domestic product variables simultaneously using the Chi-square value (probability value of 0.00000 α 0.05). The partial test found that the variables of fixed capital, labour, standards, and patents had a positive and significant effect on GDP with an alpha level (0.05). In the partial test, only patent and labor variables positively and significantly affect GDP. While the SNI and capital variables still have a positive but insignificant effect. The diversity of this GDP model by all independent

variables can only be explained by 65 percent by this model based on the R-squared value.

Model Selection

As shown above, two estimation models have been formed, and it is necessary to carry out further tests to select the best model for the panel data regression model using a test. In the Hausman test, a more suitable REM is chosen using the null hypothesis as the Random Effect Model and the alternative hypothesis as the Fixed Effects Model.

Table 6 Output of Hausman Test.

	---- Coefisien ----			
	(b)	(B)	(b-B)	sqrt (diag (V_b-V_B))
	FEM	REM	Difference	SE
Ln SNI	.3000788	.0018046	.2982742	.
Ln patent	.0818035	.0959756	-.0141721	.
Ln capital	.0434417	.0225679	.0208738	.
Ln labour	.486621	0,186155	0,300466	0,0570557

Source: results of research data processing, 2021

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

In the Hausman test, if the Hausman statistical value is greater than the critical value, then H0 is rejected, and the correct model is the Fixed Effects model and vice versa (Gujarati and Porter, 2012). The output value above shows that the prob> chi² or p-value 0.0004 is less than the 5 percent actual level, then H₀ is rejected, and it is stated that the Fixed Effects model is suitable.

Robustness Checks

There is a concern that the residual variance (error) of the data is not constant in all the observed data, which can lead to inaccurate test results. The variance that is not constant will result in a standard error, which is also not consistent, so the confidence interval can be overestimated or underestimated. Hence the conclusions drawn from the resulting regression equation can be misleading. Therefore, the heteroscedasticity test or residual diversity test was carried out. And to determine whether there is a correlation between residuals of residuals that are not independent of one observation to another with a time lag, it is necessary to perform an autocorrelation test (Kuncoro, 2011). These residuals can also lead to inaccurate conclusions. In multiple linear regressions with the OLS method (Ordinary Least Square), the model parameters must be BLUE

(Best Linear Un] Estimator), and it is expected that the B (beta) coefficient must be consistent, unbiased, and efficient.

From the heteroscedasticity test output using the Modified Wald Test, the p-value (0.0000) is less than the 5 percent real level, so H0 rejects, or there is a heteroscedasticity problem in the estimated fixed-effect model. In the panel data in STATA, the autocorrelation test uses the Wooldridge test. The output shows that the p-value (0.0089) is less than the 5 percent real level, so H0 rejects, or there is an autocorrelation problem in the estimated fixed-effects model.

Estimasi Model Robust Fem

When the implication occurs in the autocorrelation and heteroscedasticity in the panel data of the Fixed Effect model, corrective action is taken with the FEM ROBUST model. This robust method was introduced by Andrews (1972) and is a regression method used when the error distribution is not normal and/or several outliers affect the model (Ryan, 1997). Robust procedures are aimed at accommodating data oddities, eliminating the identification of outlier data, and being automatic in overcoming outlier data (Aunuddin, 1989).

Table 7 Output model FEM Robust.

Ln GDP	Kuat					
	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]	
Ln SNI	.3000788	.0415550	7.22	0,002	.1847036	0,4154541
Lnpatent	.0818035	.0214605	3.81	0,019	.0222196	.1413874
Lncapital	.0434417	.0137263	3.16	0,034	.0053314	.0815519
Ln labour	0,4866210	.0814964	5.97	0,004	.2603508	.7128912
_cons	2.6673260	.9833614	2.71	0,053	-.0629226	5.3975750
sigma_u	.81297766					

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Ln GDP	Kuat Coef.	Std. Err.	T	P> t	[95% Conf. Interval]
sigma_e	.13806975				
rho	0,97196563 (fraction of variance due to u_i)				

Source: results of research data processing, 2021

Based on the output above, the FEM ROBUST Model is the best model in this study to explain the effect of capital, labour, SNI standards, and a patent on GDP.

$$\text{Ln GDP}_{it} = 2.6673 + 0.30007 \text{ Ln SNI}_{it} + 0.08180 \text{ Ln Patent}_{it} + 0.04344 \text{ Ln Capital}_{it} + 0.4866 \text{ Ln Labour}_{it} \quad (6)$$

4.2 Discussion

Based on the modeling results, it shows that the most outstanding elasticity to GDP of Cob Douglas production variables based on the above calculations are: 1) labor factor (0.4%), 2) SNI factor (0.3%), 3) patent factor (0.08%) and 4) capital factors (0.04%) that occurred in 5 sectors studied, namely: agriculture-livestock-forestry-fisheries sector, mining-excavation sector, manufacturing industry sector, transportation-communication sector and service sector.

The growth in the development of the number of SNI for 19 years from 1998 to 2017 (in 5 sectors) has or at least has contributed to GDP growth of 0.3% or the second number after the labor contribution in the Cob-Douglas equation tested. Why? In developing countries, the factors that most influence economic growth (GDP) are the investment factor (capital investment) and the labor factor (Sulaksono, 2015). However, if technology, standards, innovation, or patents are the most significant influencing factors, then they will characterize the transition process of a country to a competitive country (Sener et al., 2011). However, in general, labor absorption still contributes significantly because all business fields are difficult to separate from the function of labor, especially the most significant contributor to GDP after foreign investment in the manufacturing sector (Agrawal and Khan, 2011).

Table 8 Average % share of 5 sectors to GDP studied (random 1998,2003,2008,2013 and 2017).

No	GDP Sector	1998	2003	2008	2013	2017	Average Share
1	Processing industry	19,0%	40,9%	40,6%	39,4%	35,3%	35,03%
2	Transport-Communication	53,7%	7,9%	12,1%	16,3%	15,3%	21,05%
3	Agriculture-Livestock-Forest-Fish	12,7%	22,3%	20,7%	18,9%	21,1%	19,13%
4	Services	7,3%	13,4%	14,1%	14,4%	15,3%	12,88%
5	Mining-excavation	7,5%	15,5%	12,6%	10,9%	13,1%	11,90%

Source: results of research data processing, 2021

If we look at the main components of GDP from 1998 to 2017 randomly, the manufacturing sector (average = 35.03%) (See Figure 3) is the most significant contributor to GDP growth starting in 1998, 2003, 2008, 2013, and 2017. Next followed are the transportation and communication sector (average = 21.05%), then the agriculture-livestock-forest-fishery sector (average = 19.13%), the services sector (average = 12.88%), and finally, the mining sector. And excavation (11.90%). The critical question is how much does standardization play in these sectors?

Support for SNI and certification in the processing industry sector is approximately 97%

of the 11291 SNIs in effect as of March 2021. Almost all SNIs support the processing industry process (BSN, 2021) (statistic sni). If you look at some types of standards or SNI trends that are applied in the industry, only a few, but at least this standard certification is a requirement for the smooth running of the processing industry sector business processes even to gain the trust of international clients (ISO-IAF-UNIDO, 2011). These standards include SNI / ISO 9001, SNI 31001, SNI / ISO 14001, SNI / ISO 45001, SNI / ISO 22000, SNI / ISO 50001, SNI / ISO 22301 and others. In 2011, 2603 industries implemented ISO

9001, or only 6.13% of Indonesia's 42,468 large-scale processing industries.

Transport-communication sector. The author argues that at the end of this decade, there have been many developments in the information technology and communication industry sector that absorb a lot of informal workers (Maryanti et al., 2015). Maryanti stated that the most absorbing labor of the six business sectors were the transportation-communications and the services sectors. The most straightforward example is the development of online motorcycle taxi transportation services, which absorb a lot of labor (Alfian, 2019). Many industries that absorb a lot of labor are also transforming digitizing information (Bogner et al., 2016). The existence of the communication industry sector that continues to grow is inseparable from the role and support of standardization in it (Satria et al., 2009) (Permenkominfo No. 6, 2014). If we trace its relationship to the development of national communication standards, SNI/IEC 27001: 2013 has been widely implemented in Indonesia, including in all internet-based service or service industries, such as Regional Drinking Water Company (PDAM) (Lenawati et al., 2017), Educational Institutions (February et al., 2019), Financial Service Institutions (Habibi et al. 2011) (Syarif et al., 2016). On the other hand, the communication sector also applies SNI / ISO 9001 a lot. Statistical data for 2011 shows that 126 industries involve SNI/ISO 9001 from 2603 companies (5%) (ISO-IAF-UNIDO, 2011). The figure is quite prominent. The standard supports the transportation-communication sector. There are at least 1094 SNIs related to this sector.

The next sector is agriculture-livestock-forest-fishery. The contribution of SNI related to this sector is as many as 2329 SNIs as of March 2021 (21% of the total applicable SNI) (BSN, 2021) (statistics SNI 2021). SNI and certification that are very prominent in this sector are applying standards for palm oil, shrimp, coffee, rubber, cocoa, cashew nuts, copra, pepper, tea, and honey. United Nations Industrial Development

Organization (UNIDO) statistical data shows that 308 industries in the agriculture-livestock-forest-fishery sector applied SNI / ISO 9001 in 2011, or only 6.13% of all large-scale processing industries. A minimal number compared to the total number of processing industries. But of course, not only is SNI's contribution to this sector, but on the trend of SVLK certification (Gultom, 2014), organic agriculture certification SNI 6729: 2013 (Djazuli, 2014), Bali beef benih certification (PPY et al., 2019), honey certification (Pratama et al., 2020; Rahmatang, 2019), and certification of milkfish seeds (SNI 01-6149-1999). The contribution of SNI related to this sector is as many as 2345 SNIs as of March 2021 (21% of the 11,219 applicable SNIs) (BSN, 2021) (statistics sni 2021). SNI and certification that are very prominent in this sector is the application of management system standards, and there are at least 44 SNIs related to this standard. (sispk.bsn.go.id, 2021). UNIDO statistical data shows that 796 service sector industries implemented SNI / ISO 9001 in 2011, or around only 1.9% of all large-scale processing industries totaling 42,468. This figure has not been added to the application of other SNI / ISO management such as SNI 31000 (Kuntoro, 2017), SNI / ISO 14001 (BPS, 2017), SNI / ISO 45001 (Suzie, 2018), SNI / ISO 22000 (Mulyono et al., 2013), SNI / ISO 50001 (Apriyanti, 2019; Nasir et al., 2018), SNI / ISO 22301 and others.

Then why is the patent the 3rd contributing factor after the standard or SNI to GDP? It is because patents cannot directly add value to the production process. Patents must go through a stage called patent commercialization. Patent commercialization includes stages such as: selling technology, licenses/royalties, joint ventures, production, and market. If the patent stops at one of the steps, the patent cannot produce added value in production. The most important thing to note is that the number of patents in Indonesia that are encouraged or encourage commercialization is still relatively small.

Table 9 Mapping of SNI Sector and Its Contribution to GDP Elasticity.

No	Sector	SNI Availability Facts*	Implementation facts SNI/ISO 9001**	% GDP elasticity
1	Services	2345	796	
2	Transportation&communication	1094	126	
3	Mining&quarrying	-	22	
4	Agriculture-Livestock, forestry & fisheries	2329	308	0,3 %
5	Processing industry	10882	2603	

Source: results of research data processing, 2021

*Estimation results, ** UNIDO survey results-2011

Contribution of Indonesian National Standard (SNI) on Gross Domestic Products (GDP)

(Biatna Dulbert Tampubolon, Febrian Isharyadi, Utari Ayuningtyas, Ary Budi Mulyono, Meilinda Ayundyahrini, Hermawan Febriansyah, Ajun Tri Setyoko, Reza Lukiawan, Putty Anggraeni, Ellia Kristiningrum, Danar Agus Susanto, Endi Hari Purwanto, Teguh Adinugroho dan Novin Aliyah)

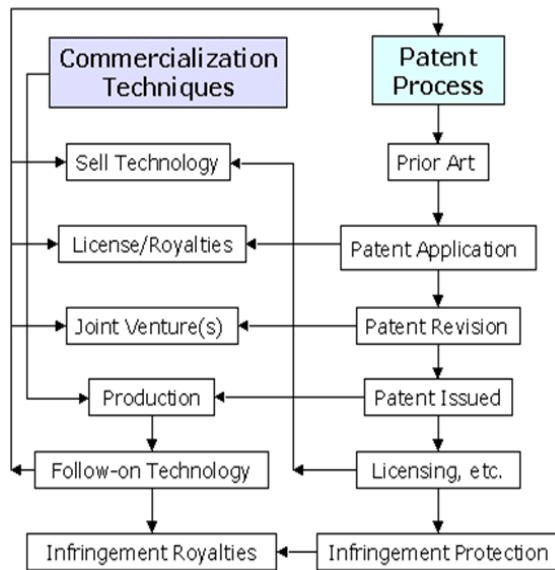


Figure 3 Commercialization Patent Steps (Source: results of research data processing, 2021, adopted from www.ipplan.com, 2021).

In contrast to standards, the authors argue that standards have a position in the production and trade processes in 2 places: 1) Standard as an absolute prerequisite (pull requirement), and 2) standard as an added value enhancing factor (push requirement). The current trade transaction paradigm tends to position the standard as a pull requirement so that if these conditions are not met, it will stop or not work. In addition, several companies voluntarily apply a standard with the motivation to go public or harmonize their export clients, which provides relatively high economic benefits, as the opinion of researchers in literature reviews. The most exciting thing is that when a company applies management standards, it unconsciously tries to increase productivity while contributing to innovation in terms of management and the products it produces (Pitipaldi, 2018).

5. CONCLUSION

There is significant potential for developing national standards for national economic growth, especially in developing countries. This paper empirically investigates the effect of fixed capital, labour, SNI, and patents on Indonesia's GDP. It contributes to the knowledge of factors of national economic growth in developing countries. Until now, the topic of research is little studied and rarely conducted.

The findings based on the FEM ROBUST model confirm that an increase of 1 percent of the total SNI stock, the number of patents, fixed

capital, and labor can increase the gross domestic product for the period 1998 to 2017 with a significant success rate of 0.3 percent, 0.08 percent, 0.04 percent, and 0.4 percent, respectively, Disclosing findings in monetary terms assuming a constant impact estimate over time (2000 prices), where the average annual growth of the SNI is 5.43 percent. The value of GDP elasticity with SNI is 0.3, indicating that the SNI contributes 1.63 percent (around 988.88 billion Rupiah) per year of the average GDP growth. It is in line with the findings in studies conducted by developed countries, such as Germany 1 percent for the period 1961 - 1996 (DIN, 2000), Canada 2, 7 percent for the period 1981-2004, France 3.4 percent for the period 1950-2007, UK 2.4 percent for the period 1921-2013, Nordic 1.8 percent for the period 1976-2016 (Menon, 2018).

The average GDP growth from 1998 to 2017 reached 4.39 percent per year or around 60.66 trillion Rupiah. So the total contribution of SNI for 19 years came to 18.59 trillion Rupiah from the accumulated GDP growth of 1152.59 trillion Rupiah for five sectors. These values are not the whole contribution that can be calculated. Only five industries out of the nine sectors of GDP are available. So the assistance of other sectors has not been included due to limited data on one of the variables. Apart from national standards, patents also contributed 1.86 percent of the GDP growth on average 4.39 percent per year, while fixed capital was 1.23 percent and labor was 1.56 percent. So it is also concluded that an increase of 1 percent of the Indonesian National Standard stock increases GDP by 0.3 percent. In monetary terms, a one percent increase in total SNI in 2017 increased to about 5.9 trillion in GDP.

Our findings have national policy-level implications and sectoral policies. By sector, encouraging ministries and agencies to include standardization and conformity assessment programs in policies to increase business competitiveness in their sectors contributes to economic growth for that sector.

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