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THE EFFECT OF ENERGY CONSUMPTION, FIXED CAPITAL AND LABOR COST ON MANUFACTURING OUTPUT IN INDONESIA

Triyana Iftasari[1]
[1]Faculty of Economics, Jakarta State University
Email: triyanasarifta@gmail.com

Abstract

This study aims to determine the effect of energy consumption, fixed capital and labor cost on manufacturing output in Indonesia in 2017-2019. This research is associative research and the method used is a quantitative approach. The data used in this study is panel data collected through documentation techniques. To analyze the data in this study using regression analysis and assistance in the form of an application *Econometric Views* (Eviews 12). The test results show that energy consumption has a positive effect on manufacturing output, fixed capital has a positive effect on manufacturing output and labor costs have a positive effect on manufacturing output. In addition, simultaneously, energy consumption, fixed capital and labor costs have a positive effect on manufacturing output. Coefficient determination test of the independent variable in this study shows the effect of 81.16% on manufacturing output. Meanwhile, another 18.84% is influenced by factors outside this research.

Keywords: Manufacturing Output, Energy Consumption, Fixed Capital, Labor Cost

INTRODUCTION

The stretching of the domestic economy that occurs is caused by various economic activities, one of which is carried out by industry. Most of the daily needs are produced by various types of industries ranging from small to large scale. On the other hand, the existence of industry also creates a large amount of labor absorption (Muhtamil, 2017). With the presence and development of the industry, it is hoped that it can support people's lives, especially in improving social and economic conditions as well as other positive impacts to help the lives of the surrounding community (Nuraeni, 2018). This shows that industry has an important role in stimulating economic activity, especially for the surrounding area to keep moving. So, it is not foreign if the industry is said to be one of the drivers of the economy, especially for the region and the closest community around it.

Currently in Indonesia itself it can be said that the manufacturing industry is one of the important sectors that support human life in general (Winardi et al., 2017). Starting from the fulfillment of basic needs which include clothing (textiles and apparel), food (food and beverages), boards (housing) to providing jobs with high capacity or labor intensive. The development of the manufacturing industry, especially in Indonesia, is marked by the number of manufacturing companies that exist in almost every region in Indonesia, with a total number of more than 30,000 companies according to data released by the Central Statistics Agency (BPS) which consists of various processing or manufacturing sub-sector companies.

In addition to the large number of companies and employees the manufacturing industry is a mainstay in Indonesia because of its high contribution to GDP and non-oil exports (Surjaningsih & Permono, 2014)compared to other sectors. In recent years, the performance of the

manufacturing industry sector is seen from several indicators such as the contribution to GDP (Carolina, 2017), industrial growth and employment which experienced fluctuating numbers (Winardi et al., 2019). In 2017-2019 the increased contribution made was accompanied by an increase in national GDP. The manufacturing industry sector in Indonesia is one of the industrial sectors that contributes greatly to GDP with a significant number reaching 19-20% annually. With a high contribution, it confirms that the manufacturing industry is the mainstay and the main industrial sector in Indonesia.

The ups and downs of the manufacturing industry in Indonesia show that the development of the manufacturing industry itself is not always faced with prime conditions. The global manufacturing industry, for example, experienced a slowdown in growth in 2012 with only 0.2% growth compared to the previous period according to research conducted by the United National Industrial Development Organization (UNIDO). This slowdown occurred as a domino effect from the recession that occurred in several European countries and the weakening of economic growth in North America, East Asia, as well as the slowing rate of economic growth in several developing countries as the main market destination (Lestari & Isnina, 2017). In Indonesia itself, according to news from the official website of the Ministry of Industry of the Republic of Indonesia, in the third quarter of 2012 there was a slowdown in the performance of the manufacturing industry sector. This indicates a sharp decline in manufacturing growth which is reinforced by statistical data that several manufacturing sectors recorded negative growth. The reason is none other than the impact of the global economy which is still not recovering due to the impact of the economic crisis in Europe. The recession that has an impact on slowing growth needs to be watched out for, because it can have a direct impact on becoming a more serious problem for various industries in Indonesia, especially the export-oriented manufacturing industry or in the scope of international trade.

The main impact experienced by the manufacturing industry in Indonesia according to Lestari and Isnina (2017) is a slowdown in growth associated with a possible decline in productivity. The growth of the manufacturing industry in Indonesia according to BPS (Central Statistics Agency) shows a slowdown. The growth of the manufacturing industry which was originally at 4.29% in 2017 decreased to 0.49% with growth at the end of 2019 of 3.80%. This slowdown in growth always occurred in the 2017-2019 period. Although the number of slowdowns in each year is not large, this slowdown shows that the manufacturing industry sector is negatively affected by economic instability and allows this to affect the output produced by the industry.

The important role of manufacturing output is as the main result of a productivity. Manufacturing output is an important indicator to increase economic growth. In the short run, manufacturing output is not everything. However, from a long-term point of view, manufacturing output is important because it is the only way to increase sustainable economic growth (Krugman, 1994). So, it can be concluded that the slowdown in the growth of the manufacturing industry will affect the decline in manufacturing output and in the long term will affect the growth of the national economy.

LITERATURE REVIEW

Manufacturing Output

The main purpose of activities in the manufacturing industry is to produce output in the form of goods or services that have added value and higher use value. According to Samuelson and Nordhaus (2004) output is defined as a number of goods or services produced in a certain period of time for direct use or reprocessing. Output is also defined as an item resulting from the production process by Elly and Umboh (2020).

Energy Consumption

Basically, the development of the manufacturing industry sector requires adequate inputs such as labor, capital, land and technology. However, apart from these factors, there are other factors that can support industrial development, one of which is the level of energy consumption related to environmental sustainability (Muryani & Leny, 2019) . The word energy itself comes from the Greek, namely *En* which means inside and *Ergon* which means work, so energy is defined as the ability to do work or an effort (Khasanah, 2017) . Meanwhile, according to Law no. 30 of 2001 concerning energy, energy is the ability to do work in the form of heat, light, mechanics, chemistry and electromagnetics.

Fixed Capital

Capital as a factor of production is defined as short-term investment and current assets, for example, such as cash, receivables and securities (Kasmir, 2012) . Complementing the concept of capital, capital can simply be divided into *fixed capital* and *working capital*. Capital whose condition and amount are not easy to change is the definition of fixed capital. As for working capital, it is different from fixed capital, because working capital in terms of circumstances and amounts can change in a short time, namely days. This is reinforced by Soeprihanto (1997) that what is meant by fixed capital is funds embedded in fixed assets aimed at generating long-term profits. Fixed capital as part of capital is also defined as fixed assets or assets used to carry out daily activities which include production and other activities (Indriyo & Reksohadiprodjo, 1992).

Labor Costs

The continuity of an activity in an industry cannot be separated from the presence of labor. To obtain a number of workers required labor costs. According to the International Labor Organization (ILO) labor costs are costs incurred by employers or business owners to employ workers. These costs consist of remuneration for work performed, bonuses, food, drink and other payments, social security expenditures, welfare services and other items, such as worker transportation, work clothes and recruitment, along with taxes that are considered as labor costs. This is confirmed by Antos (1983) that labor costs are all costs borne by the company to employ labor as a factor of production. Meanwhile , Purwaji (2016) defines labor costs as the entire fee for services provided for the use of human resources.

METHOD

The objects in this study are manufacturing output, energy consumption, fixed capital and labor costs. The scope of this research ranges from 2017-2019. This research is associative research and the method used is a quantitative approach. As for the nature, the type of data in this study includes quantitative data. Meanwhile, based on time, the type of data in this study includes panel data. The data was obtained from a third party, namely BPS (Central Statistics Agency) with documentation techniques. To analyze the data in this study using regression analysis and assistance in the form of an application, namely *Econometric Views* (Eviews 12).

Regression analysis is a statistical analysis model used to determine whether or not there is an influence of an independent variable on the dependent variable (Wahyudi, 2020) . In this study, the panel data regression equation mathematically was obtained as follows:

$$\boldsymbol{Y_{it} = \alpha + \beta_1 (X_1)_{it} + \beta_2 (X_2)_{it} + \beta_3 (X_3)_{it} + \varepsilon}$$

Y = Manufacturing output variable

X_1 = Energy consumption variable
X_2 = Fixed capital variable
X_3 = Variable labor cost

RESULTS AND DISCUSSION

This study was conducted to answer the questions and doubts that the researcher had determined. In this study, the data that has been obtained are carried out several tests to answer predetermined questions. The results obtained from the test produce the following regression equation:

$$\boldsymbol{Y = 3,080138 + 0,243382\, X_1 + 0,095183\, X_2 + 0,763030\, X_3}$$

1. The coefficient value for the constant shows that the dependent variable of manufacturing output will be worth 3.080138 if the independent variable is considered constant or constant;
2. The coefficient for the energy consumption variable (X_1) shows that if energy consumption increases by 1 (unit) and other variables are considered constant or constant, then manufacturing output will increase by 0.243382. The positive energy consumption coefficient means that if the value of energy consumption increases, the value of manufacturing output will also increase;
3. The coefficient for fixed capital variable (X_2) shows that if fixed capital increases by 1 (unit) and other variables are considered constant or constant, then manufacturing output will increase by 0.095183. The coefficient of fixed capital which has a positive value means that if the value of fixed capital increases, the value of manufacturing output will also increase;
4. The coefficient for the labor cost variable (X_3) shows that if the labor cost increases by 1 (unit) and other variables are considered constant or constant, then the manufacturing output will increase by 0.763030. The positive coefficient of labor costs means that if the value of labor costs increases, the value of manufacturing output will also increase.

The test results show that the energy consumption variable has a probability value of 0.0018 which is smaller than 0.05 or 5%. The positive effect resulting from the statistical t value of 3.206224 shows a positive effect on manufacturing output. So, it can be concluded that there is a positive and significant effect of energy consumption on manufacturing output. These results are in accordance with the theory of energy consumption contained in the research of Vosooghzadeh (2020) that energy consumption will affect the resulting output. Similar results were obtained in the research conducted by Muryani (2019) and Tira (2012) . The more energy consumed in the industry; the more manufacturing output is generated. This result is reinforced by a statement submitted by the Ministry of Energy and Mineral Resources (2016) , that the progress of the times makes the use or level of energy consumption increase, one of which is in the manufacturing industry sector.

The test results show that the fixed capital variable has a probability value of 0.0079 which is smaller than 0.05 or 5%. The positive effect resulting from the t-statistical value of 2.712408 shows a positive effect on manufacturing output. These results are consistent with the theory put forward by Woods (1983) that fixed capital has a role and influence on the resulting output. The assumption in this theory is that having a high fixed capital allows maximum productivity. So that the output generated from the industry is high and increases income. The positive effect of fixed capital on manufacturing output is supported by previous research conducted by Putri et al. (2020), Putra & Yasa (2019) and Das & Sudiana (2019) provide similar results on the effect of fixed capital on output. This influence arises because of the linkage of the availability of fixed capital to support ongoing production activities.

The test results show that the labor cost variable has a probability value of 0.0000 which is smaller than 0.05 or 5%. The positive effect resulting from the t-statistic value of 7.610300 shows a positive effect on manufacturing output. So, it can be concluded that there is a positive and significant effect of labor costs on manufacturing output. These results are in accordance with the exchange rate theory proposed by Smith (1776) in Peach (2009) . The theory refers to the factor of labor in which labor is exchanged for a given wage. The greater the cost of labor sacrificed, the higher the expected level of output. The research that is in line with the results of this study has been carried out by Putra and Yasa (2019), Wulandari et al. (2017) and Budiman et al. (2015). There is an inseparable relationship between labor costs and the resulting manufacturing output. The relationship results from the influence caused. Even though it already has a substitution factor to replace labor, the role of labor cannot be eliminated.

The test results show that the F- *statistic* value is 140.7406 and the F- *statistic probability value is* 0.000000 which is smaller than 0.05 or 5%. So, it can be concluded that there is a positive and significant effect of energy consumption variables, fixed capital and labor costs on manufacturing output simultaneously. These results are in accordance with the growth theory expressed by several previous experts. Based on the *neoclassical growth theory* proposed by Solow (1956) output is a function of capital and labor. With an increase in fixed capital, the resulting output will increase. As with the increase in labor costs, the resulting output will increase. Conversely, with a decrease in fixed capital or labor costs, the resulting output will decrease. But along with the development of science and technology, the use of technology in everyday life began to be adapted. One of them is the use of technology in the industrial sector, including the manufacturing sector. According to the theory of endogenous growth (*endogenous growth theory*) proposed by Romer (1986) technological variables affect productivity. Technological developments over time will produce output growth over time as well so that an increase in energy consumption causes higher output. The development of growth theory considers the role of technology. The existence of energy consumption is a form of using technology in an industry, the goal is to increase the product produced.

Another test carried out is the coefficient of determination (R^2) to measure the ability of the independent variable to influence the dependent variable (Ghozali & Ratmono, 2017) . The greater the value of R2, the better the ability of the independent variable to influence the dependent variable. Based on the test results obtained R^2 value of 0.811619. This figure shows that the variables of energy consumption, fixed capital and labor costs in this study affect manufacturing output by 0.811619 or the independent variable in this study is able to explain the effect of 81.16% on manufacturing output. Meanwhile, another 18.84% is influenced by factors outside this research.

CONCLUSION

This study was conducted with the aim of testing and knowing the effect of energy consumption, fixed capital and labor costs on manufacturing output in Indonesia in 2017-2019. The results of hypothesis testing can be concluded that energy consumption has a positive effect on manufacturing output, fixed capital has a positive effect on manufacturing output and labor costs have a positive effect on manufacturing output. In addition, simultaneously, energy consumption, fixed capital and labor costs have a positive effect on manufacturing output. Testing the coefficient of determination of the independent variable in this study shows the effect of 81.16% on manufacturing output. Meanwhile, another 18.84% is influenced by factors outside this research.

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