Scholars Journal of Economics, Business and Management OPEN ACCESS
Abbreviated Key Title: Sch J Econ Bus Manag
ISSN 2348-8875 (Print) | ISSN 2348-5302 (Online)
Journal homepage: https://saspublishers.com/journal/sjebm/home

Analysis of Total Productivity Factors of Medium Manufacturing Industries for Food and Textile Subsectors in Indonesia

Sugiyono Madelan*

Master Management, Postgraduate, Universitas Mercu Buana, Jl. Meruya Selatan No.1, RT.4/RW.1, Meruya Sel., Kec. Kembangan, Kota Jakarta Barat, Daerah Khusus Ibukota Jakarta 11650, Indonesia

DOI: 10.36347/sjebm.2019.v06i09.001 | **Received:** 13.08.2019 | **Accepted:** 22.08.2019 | **Published:** 22.09.2019

***Corresponding author:** Sugiyono Madelan

Abstract **Original Research Article**

This research aims to analyze the total response of productivity factors in the medium scale manufacturing industry in Indonesia. Pooled secondary data was collected from the Indonesian Central Bureau of Statistics for the period 2011-2014. The model estimated is a multiple regression model. Stationary test, cointegration test, redundant fixed effect test, and Hausman test for random effects were used to estimate the common, fixed, and random models of cross section at national level pooled data in Indonesia for the food industry, textile industry, manufacturing industry and for large and medium scale industries, large industries, and medium industries. The results of the study showed that the total productivity factor for productive labor variable was 0.4961; which informs the position of decreasing return to scale in the food, textile and manufacturing industries as well as the manufacturing industry on large and medium scale industries, large industries, and medium industries. The ability to change production factor variables which are low in explaining changes in the output value variable and decreasing return to scale position makes it clear about the causes of problems outside of the productivity factors that give rise to the ambiguity of improving economic growth in the manufacturing industry in Indonesia.

Keywords: Total Factors Productivity, Medium Scale Manufacturing Industry, Food, Textiles.

Copyright © 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

PRELIMINARY

Economic growth in Indonesia has declined in the past 8 years, then stagnated (Figure-1). Economic growth reached 4.9 percent to 5.17 percent per year in the last 4 years. This economic growth is far below the expected target in the National Medium-Term Development Plan (RPJMN), which is at 7 percent per year. With economic growth of around 5 percent per year, the government's efforts to reduce poverty in Indonesia are becoming increasingly difficult to do. Similarly, efforts to reduce the number of unemployed people, or even to improve the level of socio-economic inequality in Indonesia. Tax revenues are not easily raised in the perspective of government management, as long as economic growth cannot be increased significantly.

To find out about what affects economic growth, among others, can be known from the factor of productivity. Productivity is a comparison between output and input. Productivity is the first and important topic of discussion in Production and Operations Management. Output in the form of products or services while input, including in the form of land, capital labor, facilities, equipment, energy, materials and information. Economic growth that is difficult to increase is related to productivity problems. Economic growth measures changes in output. Output is difficult to increase, if input is not productive.

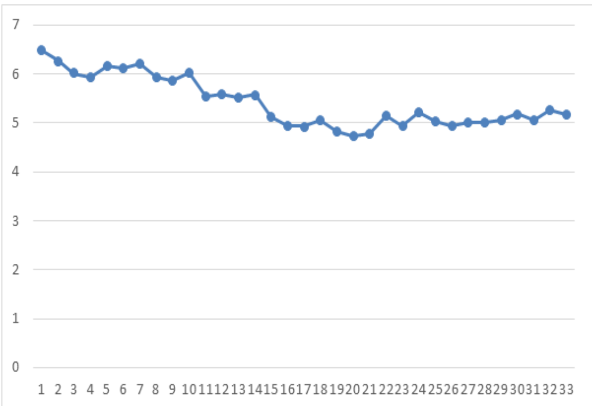

Fig-1: Indonesian Economic Growth Year on Year Quarter I Year 2011-Quarter IV Year 2018
Source: Indonesian Statistics Agency, 2018

To find out which inputs are responsive in increasing output, research on productivity is needed. In this case it is called the total factor of productivity. Any input that is able to increase output more quality can be known from the coefficient value of the total productivity factor from the input.

Based on the Journal of the Ministry of Industry, it is known that the total productivity factor of the medium and large manufacturing industry in Indonesia in the motor vehicle industry sub-sector (ISIC 34) is 0.12. Inelastic total productivity factors like that show that the role of the motor vehicle industry is not as big as what it displays in producing output. The large number of mass-produced motorized vehicles and congestion in big cities is apparently not a large contributor to output.

The number of companies and the highest output in the processing industry in Indonesia is the food industry. Next is textile. The food and textile processing industry play a major role in determining economic growth. The processing industry was chosen, because the role of the processing industry was large in determining economic growth. Medium-scale industries are chosen, because the development of medium industries is not as good as small industries and large industries. Therefore, information on total productivity factors from medium industries is expected to be useful to improve the structure of economic growth in Indonesia. By improving the structure of economic growth, social justice has the potential to be better realized.

This study aims to: (1) Analyze the role of productive labor input productivity, unpaid labor, and capital in influencing the output of the food and textile sub-sector processing industries, as well as medium (IS), large (IB), and large-scale manufacturing and medium (IBS) in Indonesia for the period 2011-2014; (2) Analyzing the difference in total factor productivity in the sub-sector of the large-scale (IB) and large and medium scale food and textile industries (IB) in Indonesia for the period 2011-2014.

LITERATURE REVIEW

Heizer and Render [1] view productivity as a challenge in producing goods and services, which are needed to transform resources into goods and services in the viewpoint of production and operations management. By increasing efficiency that can be changed, becoming more productive, the value added of goods and services can be improved. Productivity is the ratio of output of goods and services divided by inputs, namely resources, such as labor and capital. The job of the operations manager is to improve the ratio of output to input. Productivity improvements can improve efficiency.

The growth of total factor productivity (TFP) in the manufacturing industry has been tested with parametric and non-parametric approaches. A number of researchers used the econometric approach to estimate TFP levels and TFP growth rates in manufacturing industries. In this approach, the growth rate of TFP is measured as a residual growth in the added value of the manufacturing industry, then the role of growth input on added value is recorded. Translog and Cobb-Douglas production functions are applied to estimate TFP growth.

Productivity measurement in economic theory is carried out by Jan Timbengen [2] and Robert Solow [3]. The study formulates productivity measurements in the context of the production function and relates them to the analysis of economic growth.

$$Y(t) = A(t).\ f[K(t), L(t)]$$

Y (t) aggregate production (or aggregate income), K (t) is capital from capital used when production, L (t) is a number of inputs from labor and A (t) is TFP (total factor productivity).

The rate of growth, labor productivity and capital productivity calculated as productivity will provide an overview of the efficiency of an industry. Total productivity factors are calculated using the following equation [4]:

$$\blacktriangle \log TFP(t) = \blacktriangle \log V(t) - \{[SL(t) + SL(t\text{-}1/2] \ \blacktriangle \log L(t) + [((1\text{-}SL)(t))] + [((1\text{-}SL)(t\text{-}1)) / 2] \ \blacktriangle \log K(t)\}$$

Where V, L, K, TFP and S indicate added value, labor, capital, total factor productivity and the role of labor income on added value.

To identify input total factor productivity, the TFP function is stated as follows:

$$TFP = f(O, TE, F, K / L)$$

Where O, TE, F, K / L indicate the level of output, total compensation / income, number of factories and capital to the ratio of labor. In this case the output is measured from Gross Domestic Product (GDP).

The relationship of productivity growth with all these variables can be represented by an equation in the following forms:

$$Y = f(X1, X2, X3, X4, X5)$$

Where

X1 = output growth
X2 = the amount of additional income / other
X3 = number of factories
X4 = ratio of labor
X5 = capital per factory

Empirical Study

Biatour *et al.*, [5] said that some of the output could not be explained by the number of production factors in the Belgian industry in the period 1988-2007. Comin [6] says that part of the output of TFP cannot also be explained by the use of inputs in production. Lipsey and Carlaw [7] say that TFP cannot simultaneously measure technological change, externalities, and the impact of economies of scale. Even though technological improvements are important, technology does not always succeed in increasing TFP. TFP cannot be used to measure long-term prospects for increasing output.

Ismail, Sulaiman, and Jajri [8] explained that TFP growth played an important role in economic growth in Malaysia. However, the role of TFP growth is still lower than capital and labor. The role of capital is even the biggest for economic growth in Malaysia. According to Kurniawaty [9] the average industrial TFP growth in Indonesia is 2 percent. The cause of changes in TFP growth is technological change.

According to Jajri [10], the TFP growth model is open to foreign companies and the world economy which restructures the economy that shifts resources in Malaysia. Giang *et al*., [11] explained that productivity improvement policies in agricultural companies have a large role in sustainable economic growth in the country. However, Tekleselassie *et al*., [12] explains that the elasticity of capital inputs to output is relatively low, but labor and raw materials play a role in output in Ethiopia. Meanwhile Tripathi [13] explained that agricultural productivity in India stagnated in the late 1990s after two decades of high economic growth.

Uyarer and Volkan [14] state that value added and employment in Istanbul have the largest share in measuring productivity. Regional convergence occurs in the industrial, service and agricultural sectors. Productivity decomposes from these sectoral components. Arsana [15] says that provincial level innovation deteriorates, while innovation plays an important role in improving productivity. Sari [16] said that the output growth of the Indonesian manufacturing industry was driven by input growth, so that the Indonesian manufacturing industry's production techniques were less efficient. Arsana and Wu [15] say that productivity growth in China is driven by high technological advancements among development zones, while productivity growth in Indonesia is dominated by changes in efficiency.

Erken [17] says that entrepreneurship has a long-term impact on total productivity factors. Saputra [18] said that the largest TFP growth in the food, beverage and tobacco industry was the other food industry, which amounted to 2.95 percent. Hermawan [19] said that the sugar industry in Indonesia experienced a decline in productivity due to a breakdown in technology adoption. Surjaningsih and Permono [20] said that during the period 2005-2009 technical changes played an important role in TFP in large and medium industries in Indonesia, but their role declined.

Eskani [21] said that the TFP of medium and large industries in Indonesia in the period 2001-2005 was the largest in the motor vehicle industry subsector, which amounted to 4.9 percent. Overall TFP of medium and large industries is 1.39 percent. Eng [22] said that TFP in Indonesia grew by 1.7 percent per year and explained 33 percent of the growth of Gross Domestic Product (GDP) during 2000-2007. Javorcik, Fitriani, and Lacovone [23] say that productivity in Indonesia experienced dynamic evolution during 1990-2009. Modjo [24] said that TFP manufacturing industry after liberalization and the economic crisis in 1997 showed a decline.

Fadejeva and Melihovs [25] used the Solow model in measuring TFP in Latvia on a sectoral basis. The result is low TFP in the manufacturing, electricity, gas and water supply, trade and retail sectors including hotels and restaurants, while higher TFP is found in the transportation, warehousing and communication sectors. Ark [26] says that productivity growth in addition to paying attention to technology and innovation, also needs to pay attention to external forces such as market and institutional structures, such as the digital market.

Felipe [27] said that TFP growth in East Asia has declined over the past 30 years. According to Hulten [28] TFP private economic business ventures in the United States declined during the period 1948-1996 from 64 percent to 52 percent. According to Erken, Donselaar, and Thurik [17, 29] forgotten entrepreneurship was used to measure TFP in developing countries during the period 1971-2002.

Levenko, Oja, and Staehr [30] say that the role of TFP is weak in Europe and Eastern Europe, especially after the global financial crisis. Miao and Wang [31] said that TFP fell after the financial bubble erupted which caused an economic recession as happened in the financial crisis in East Asia, Mexico and Argentina. Yin and Yean [32] said that TFP growth in the Malaysian manufacturing sector was 4.67 percent.

Fadiran and Akanbi [33] say that in the long term there is a consistent relationship between institutions and TFP in SubSahara Africa. Araujo, Feitosa, and Silva [34] say that some variables explain the technical inefficiencies of some countries in the form of public expenditure and inflation rates in Latin America, such as local prices for purchasing power.

Based on previous research studies, the position of this research is in a position to explain the influence of input factors on output. If previous research examined the large and medium scale manufacturing industries, this study also examined specifically in the middle industry. If previous research examined in aggregate or specifically in the sugar industry, food and beverage industry, and tobacco in Indonesia, this study specifically examined the food and textile subsector, which has the biggest role in the manufacturing industry in Indonesia, especially the industrial revolution 4.0. The limitations of this study are not always referring to the last 5 years of study, due to the limited number of TFP literature for the last 5 years study and the availability of available pooled data.

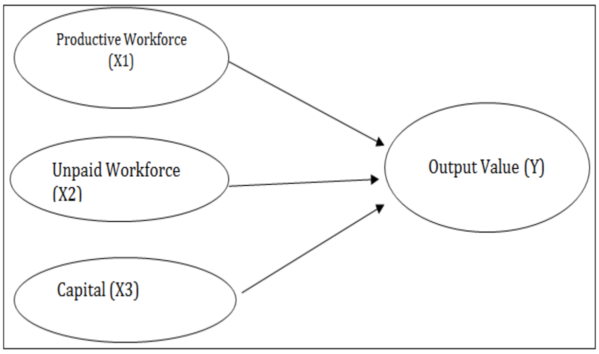

Fig-2: Framework

Framework

The research framework used as a follow-up of the study of theory and empirical studies, in the form of the influence of the independent variable (X) on the dependent variable (Y). The independent variable (X) includes the productive workforce (X1), unpaid labor (X2), and capital (X3), and the dependent variable is the output value (Y). Productive labor, unpaid labor, and capital have a positive effect on output values See Figure-2.

The research hypothesis is as follows:

- H1: Productive Workers have a positive effect on Output Value.
- H2: Unpaid Workforce has a positive effect on Output Value.
- H3: Capital has a positive effect on Output Value.

RESEARCH METHODS

This type of research is quantitative research. According to Sugiyono (2013), quantitative methods can be interpreted as research methods based on positivism philosophy, used to examine certain populations or samples, sampling techniques are generally done randomly, data collection uses research instruments, quantitative / statistical data analysis.

The operational definitions and measurements are presented in Table-1 below. The population in this study was the mid-scale food and textile sub-sector processing industry for the past 4 years, which came from a study of 4,797 companies. The number of samples is the same as the total population, which is 4,797 companies. The sampling technique used is the census, which is all the research population used as the number of samples.

The data used in this study are annual secondary data in the form of time series (time series) during the period (2011-2014), which are presented pooled data using a cross section in the form of industrial business scale and manufacturing industry sector. The data is obtained from statistical information published by the Central Statistics Agency (BPS). The method of data collection is done through a literature review of the Central Statistics Agency. Data is processed using Eviews release 10. Software is done by processing descriptive statistics and inferencing statistical testing. Stationary test, cointegration test, redundant fixed effect test and Hausman test were conducted.

In this study using fixed effect regression analysis based on Solow growth theory with the following equations:

$$Qt = At\ f\ (Kt, Lt)$$

That is

Q: output
K: capital and raw materials
L: labor
A: Solow growth residual also called TFP

At is assumed to be exponential namely Aedt so

$$Qt = Aedt\ K\alpha L t\beta$$

Linear to:

$$Ln\ (Qt) = \ln A + dt + \alpha \ln (Kt) + \beta \ln (Lt) + \ln e$$

The equations are estimated based on the equation as follows:

$$Ln\ (Qt) = \beta 0 + dt + \beta 1 \ln (Kt) + \beta 2 \ln (Lt) + In\ e$$

That is:

Q: value of output produced
K: capital stock and raw materials
L: number of workers
β0, β1, β2: estimated parameters, inverse in (β0 + dt) value TFP value
d: The coefficient over time, shows TFP growth
e: error term

Table-1: Operationalization of Research Variables

Variable	Operational definition	Scale
Productive Workforce	Number of productive workers or employees	Ratio
Capital	Something can be in the form of money or other form of assets needed as a means for production	Ratio
Unpaid Workforce	The number of workers who work is not paid by the company	Ratio
Output Value	Output values generated from industrial activities	Ratio

RESULTS AND DISCUSSION

Stationary data does not experience interference with autocorrelation or distorted data interference. Therefore, the data variable that will be used for multiple regression modeling of the modern econometric approach is stationary testing. Stationary tests are performed using the Levin, Lin and Chu methods, Im, Magnification and Shin W-stat methods, Fuller-Fisher Chi-square Augmented Dick method, and PP-Fisher Chi-square method. If the test results show a significant level of 1% or 5%, the tested variables prove to be stationary.

The output value variable is identified as stationary at the 5% level as shown at the level of all normal asymptotic tests, where the probability value of the test results is less than 5%. Input cost variables are identified as stationary at 1% level as shown in the first difference of all normal asymptotic tests, where the probability value of the test results is smaller than 1%. The labor variable was identified as stationary at a real level of 1% as indicated by the level for all normal asymptotic tests, where the probability value of the test results was smaller than 1%. Stationary productive labor variables at a real level of 1% as shown in first differen for all normal asymptotic tests, where the probability value of the test results is smaller than 1%. Other labor variables are stationary at a real level of 1% as shown in first differen for all normal asymptotic tests, where the probability value of the test results shows a value smaller than 1%. Unpaid labor variables are identified as stationary at 1% level as indicated by first differen for all normal asymptotic tests, where the probability value of the test results is smaller than 1%. Capital variables were identified as stationary at 1% level as indicated by differing seconds for all normal asymptotic tests using the Im, Magnitude and Shin W-stat test, ADF-Fisher Chi-square test, and PP-Fisher Chi-square test for individuals where scores probability of the test results is smaller than 1%. However, the results of the Levin, Lin and Chu t test do not show stationary for common. Because the capital variable is still stationary evidence in differing seconds, the capital variable can be used to estimate the multiple regression model carefully.

Cointegration test to find out whether there is a disruption of autocorrelation in the use of a group of variables used in the multiple regression equation model. If cointegration is identified, a group of variables can be used to estimate multiple regression equation models.

Model 1 which involved the use of output value variables and input costs proved to be cointegrated in the rho-statistical group, PP-statistical group, and ADF-statistical group at a real level of 5%, where the probability value of the test results was smaller than 5%. Model 2 which uses variable output, labor, and capital values cointegration in the rho-statistical group, PP-statistical group, and ADF-statistical group at a real level of 5% as indicated by the probability value that is smaller than 5%. Model 3 experienced cointegration in the ADF-statistical group at a real level of 1%, but did not experience cointegration in the rho-statistic group and PP-statistical group. Because the use of variable output values, productive labor, other labor, unpaid labor, and capital in Model 3 do not always experience cointegration, the use of these variables needs to be carried out more carefully.

Model 1 Multiple Regression

The coefficient of determination is 0.113176 Model 1 None (common). This means that the suitability of the model is low, where each change in the input cost variable is able to explain 11.32 percent changes in the output value variable. The F test is significant at the 1 percent level as indicated by the proability value of the F test which is smaller than 1 percent. Durbin Watson's value is 1.04. This means that the model has a positive autocorrelation disorder.

Single regression equation model output value is influenced positively and significantly on the real level of 1 percent as indicated by the probability value of the variable which is smaller than 1 percent. The effect of variable input costs on the output value of 166200.8 units. The influence number becomes the total value of the productivity factor of the manufacturing industry in Indonesia for the period 2011-2014.

Fixed effect is a condition of an object that has a fixed coefficient with a time difference. The corrected determination coefficient of the model is 0.087. This means that the model compatibility is relatively low. Changes in input cost variables can explain 8.68 percent of changes in the output value variable. The F test is significant at the real level of 1 percent, which means that the input cost variable affects the output value variable where the influence from the industrial scale is constant. Durbin Watson's value of 1.038 indicates that the regression equation model has a positive autocorrelation disorder. Based on the information value of the Akaike criteria, Schwarz criteria, and Hannan-Quin criteria that are of greater value than the previous none equation model, then the 1 fixed effect model equation is stated to be poor in explaining the variable influence of input costs on output values on industrial scale differences.

Table-2: Multiple Regression Model 1 Fixed Effect

Dependent Variable: NILAI_OUTPUT				
Method: Pooled Least Squares				
Date: 07/04/19 Time: 07:11				
Sample (adjusted): 2 36				
Included observations: 35 after adjustments				
Cross-sections included: 3				
Total pool (balanced) observations: 105				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.98E+11	8.20E+10	7.284502	0.0000
D(BIAYA_INPUT)	166200.8	46292.86	3.590204	0.0005
Fixed Effects (Cross)				
IBS—C	6.98E-05			
IB—C	6.98E-05			
IS—C	6.98E-05			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.113176	Mean dependent var		6.15E+11
Adjusted R-squared	0.086835	S.D. dependent var		8.78E+11
S.E. of regression	8.39E+11	Akaike info criterion		57.78620
Sum squared resid	7.11E+25	Schwarz criterion		57.88731
Log likelihood	-3029.776	Hannan-Quinn criter.		57.82717
F-statistic	4.296523	Durbin-Watson stat		1.037683
Prob(F-statistic)	0.006759			

Input cost variables affect positively and significantly on the output value variable at the real level of 1 percent. The influence of the variable cost of input costs is 166200.8 units as a total factor of productivity for the calculation of growth in the manufacturing industry in Indonesia. Meanwhile the manufacturing industry on a large scale of industry, medium industry, and large scale and medium scale industries in fixed effects showed very little effect of 6.98E-05 units. The redundant fixed effect test results show that Chi-square Cross-section is significant at the level of 1 percent as indicated by the probability value that is smaller than 1 percent. This means that there is a fixed effect of the use of constant objects in the form of a manufacturing industry scale.

The random effect model does not show a significant influence as the effect shown by zeros. Thus, random effects need to be tested using the Hausman test to find out about the potential for random effects. The Hausman test results below show that random effects do not affect the output value variable as indicated by the probability value of a random cross-section which is not significantly greater than 5 percent. The Hausman test does not prove the existence of random effects.

Model 2 Multiple Regression

The coefficient of determination corrected in Model 2 None is equal to 0.067720. The coefficient of determination is smaller than the regression model 1, so that the 2 none model is not selected. The fixed effect table below shows that the fixed effect size is still smaller compared to the effect of the fixed effect in the model Table-1 above. Besides the coefficient of determination is corrected also smaller than the Model 1. Therefore, the estimation results of the Model of 2 fixed effects are less chosen than the Model 1. The redundant fixed effect test results below indicate that the multiple regression equation Model 2 fixed effect is significant at the real level of 1 percent as indicated by the probability of the Chi-square cross-section whose value is smaller than 1 percent. Thus, there is a constant effect of the effect on the scale of the manufacturing industry in Indonesia. The Hausman test results show that the random effect is not a significant influence on the 5 percent real level in the estimation Model 2 random effect regression equation as indicated by the probability value of a random cross section that has greater than 5 percent. Therefore, the estimation results of this random effect Model 2 are less selected.

Model 3 Multiple Regression

Model 3 None multiple regression estimation results have a corrected coefficient of determination whose numbers are greater than Model 1 and Model 2. As a result, there is hope to choose Model 3 as the best estimation of multiple regression equations based on differences in manufacturing industry scale.

Table-3: Multiple Regression Model 2 Fixed Effect

Dependent Variable: NILAI_OUTPUT				
Method: Pooled Least Squares				
Date: 07/04/19 Time: 07:22				
Sample (adjusted): 3 36				
Included observations: 34 after adjustments				
Cross-sections included: 3				
Total pool (balanced) observations: 102				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.83E+11	8.83E+10	6.604717	0.0000
TK	26401.57	9965.115	2.649399	0.0094
D(MODAL,2)	2.44E+10	1.32E+11	0.184806	0.8538
Fixed Effects (Cross)				
IBS—C	0.000172			
IB—C	0.000172			
IS—C	0.000172			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.067720	Mean dependent var		6.12E+11
Adjusted R-squared	0.029276	S.D. dependent var		8.91E+11
S.E. of regression	8.78E+11	Akaike info criterion		57.88662
Sum squared resid	7.47E+25	Schwarz criterion		58.01529
Log likelihood	-2947.217	Hannan-Quinn criter.		57.93872
F-statistic	1.761504	Durbin-Watson stat		1.231073
Prob(F-statistic)	0.142852			

Table-3 as a model regression multiple equation has a correction coefficient of correction greater than model 1 and model 2, which is equal to 0.389922. That is, the suitability of the model is low but higher than the equation Model 1 and Model 2. The ability to change the independent variable of productive workforce, unpaid labor, capital, and lag of output value can explain 38.99 percent changes in the dependent variable output value.

The F test results are significant at the 1 percent level. the values of Akaike, Schwarz, and Hannan-Quin outweighed the regression model 1 and model 2, but the suitability of the model was still better. The Durbin Watson test value of 1.66 shows that it is close to number 2, so the possibility of the model does not experience interference with autocorrelation.

Only productive labor variable and output value lag are positively and significantly influencing the output value variable at a real level of 1% as indicated by the probability value that is smaller than 1%. Its influence is 1569477 units and 0.590407 units respectively. So the total productivity factor of the output value of the manufacturing industry in Indonesia is 1569477.59 units. Variable labor is not paid and capital variables do not affect the output value variable. Fixed effect of manufacturing industry scale of 0,000172 units.

Table-4: Multiple Regression Model 3 Fixed Effect

Dependent Variable: NILAI_OUTPUT				
Method: Pooled Least Squares				
Date: 07/04/19 Time: 19:20				
Sample (adjusted): 3 36				
Included observations: 34 after adjustments				
Cross-sections included: 3				
Total pool (balanced) observations: 102				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.40E+11	8.75E+10	2.740726	0.0073
D(TKP)	1569477.	310094.5	5.061287	0.0000
D(TKTD)	0.001419	0.002014	0.704301	0.4830
D(MODAL,2)	3.49E+10	1.06E+11	0.328733	0.7431
NILAI_OUTPUT(-1)	0.590407	0.086887	6.795120	0.0000
Fixed Effects (Cross)				
IBS—C	0.000172			
IB—C	0.000172			
IS—C	0.000172			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.414083	Mean dependent var		6.12E+11
Adjusted R-squared	0.377078	S.D. dependent var		8.91E+11
S.E. of regression	7.03E+11	Akaike info criterion		57.46138
Sum squared resid	4.70E+25	Schwarz criterion		57.64152
Log likelihood	-2923.530	Hannan-Quinn criter.		57.53432
F-statistic	11.18984	Durbin-Watson stat		1.663858
Prob(F-statistic)	0.000000			

The results of the redundeant fixed effect test show that there is a fixed effect of the difference in manufacturing industry scale that is significant at the real level of 1% as indicated by the probability value of the Chi-square cross-section which is smaller than 1%. This condition proves that pooled data using industrial scale cross section is a constant object. Furthermore, no random effects data processing and Hausman test were carried out on Model 3 multiple regression due to the presence of singular and singular near problems.

Cointegration Test by Industry Type

The cointegration test is conducted to determine the potential for interference with autocorrelation if a variable is used to estimate multiple regression. The cointegration test results show that cointegration occurs in the PP-statistical group and the ADF-statistical group as indicated on the probability is smaller than 1%. However, there is no cointegration using the rho-statistical group method. Therefore, modeling uses variable values of output, productive labor, unpaid labor, capital, and lag of output values need to be estimated carefully.

Pooled Data Analysis by Industry Type

The corrected coefficient of determination is worth 0.389922. This means that the model compatibility is relatively low. The ability to multiply productive labor variables, unpaid labor, capital, and lag output values can explain 38.99 percent changes in output value variables. So, there are as many as 100% - 38.99% = 61.01% which cannot explain changes in the output value variable. This condition explains that the declining economic growth of the manufacturing industry in Indonesia still requires a more satisfying explanation of the use of outside input of production factors.

Based on Table-5, it can be seen that productive labor variables and output value lags influence positively and significantly on changes in output values as indicated by the probability value that is smaller than 1%. Meanwhile the labor variable is not paid and capital does not affect the output value variable.

Table-5 explains that the types of food, textile and manufacturing industries do not have a large difference in the effect of changes in the output value variable. The fixed model determination coefficient is slightly smaller than model none. There is also no change in the influence of the input variable on the output value variable.

Table-5: Multiple Regression Model 4 Fixed Effect

Dependent Variable: NILAI_OUTPUT				
Method: Pooled Least Squares				
Date: 07/04/19 Time: 19:48				
Sample (adjusted): 3 36				
Included observations: 34 after adjustments				
Cross-sections included: 3				
Total pool (balanced) observations: 102				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.40E+11	8.75E+10	2.740726	0.0073
D(TKP)	1569477.	310094.5	5.061287	0.0000
D(TKTD)	0.001419	0.002014	0.704301	0.4830
D(MODAL,2)	3.49E+10	1.06E+11	0.328733	0.7431
NILAI_OUTPUT(-1)	0.590407	0.086887	6.795120	0.0000
Fixed Effects (Cross)				
MAKANAN—C	0.000172			
TEKSTIL—C	0.000172			
MANUFAKTUR—C	0.000172			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.414083	Mean dependent var		6.12E+11
Adjusted R-squared	0.377078	S.D. dependent var		8.91E+11
S.E. of regression	7.03E+11	Akaike info criterion		57.46138
Sum squared resid	4.70E+25	Schwarz criterion		57.64152
Log likelihood	-2923.530	Hannan-Quinn criter.		57.53432
F-statistic	11.18984	Durbin-Watson stat		1.663858
Prob(F-statistic)	0.000000			

The redundant fixed effect test results show that the Model 4 fixed effect is significant at the real level of 1% as indicated by the probability value of the Chi-square cross-section which is smaller than 1 percent. The corrected coefficient of determination is greater than the Model 4 none, so that the fixed effect Model 4 can be selected as the best model to estimate the total productivity factor. The total value of the productivity factor starts from the calculation of the number of significant coefficients which were originally equal to = 2.40E + 11 + 1.569.477 + 0.590407 = 240.001.569.477, 590407.

The total number of productivity factors that have a positive value shows the position of return to scale. The total productivity factor of productive labor in the form of the value of the coefficient of productive labor multiplied by the average of the productive workforce then the result is divided by the average value of output. The elasticity of the productive workforce is 0.4961. This means that there is a decreasing return to scale position on productive labor which is related to the value of manufacturing industrial output for the period of 2011-2014.

Furthermore, the estimation of random effect models and random effect tests were not carried out due to near singular problems. Thus, the best model of the total factor productivity for the food, textile and manufacturing sectors is a fixed effect Model 4, while for the best model the total factor productivity for medium and large industries, large industries, and medium industries is a Model of 3 fixed effects.

DISCUSSION

The total factor productivity for the food, textile, and manufacturing manufacturing industries as well as for large and medium scale industries, large industries, and medium industries is the elasticity of the productive workforce of 0.4961. This means that there is a decreasing return to scale position on productive labor which is related to the value of manufacturing industrial output for the period of 2011-2014.

Biatour *et al.*, [5] said that some of the output could not be explained by the number of production factors in the Belgian industry in the period 1988-2007. What was stated by Biatour *et al.*, [5] was also found in this study, where the value of output cannot be explained by unpaid labor and capital. Comin [6] also said that part of the output of TFP cannot be explained by the use of inputs in production, where the findings of Comin [6] also occur in this study. Lipsey and Carlaw [7] say that TFP cannot be used to measure long-term prospects for increased output, but in this study which it was found that lags in output value affect the value of output so that TFP can potentially be measured using short and the long-term periods.

Uyarer and Volkan [14] state that added value and employment in Istanbul have the largest share in productivity measurement, but in this study indicate that productive labor affects the value of output. Saputra [18] said that the largest TFP growth in the food, beverage and tobacco industry was the other food industry, which amounted to 2.95 percent. In this study TFP of the food, textile and manufacturing industries have the same magnitude.

Hermawan [35] said that the sugar industry in Indonesia experienced a decline in productivity due to a breakdown in technology adoption, while in this study also showed a decreasing return to scale condition. Surjaningsih and Permono [20] said that during the period 2005-2009 technical changes played an important role in TFP in large and medium industries in Indonesia, but their role declined as the findings of this study. Overall TFP of medium and large industries is 1.39 percent, while in this study shows a smaller role than number 1.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results and discussion, conclusions are drawn as follows:

- Variable productive labor input and output value lag have a positive and significant effect on output values in large and medium scale, large scale, and medium scale manufacturing industries as well as on the food, textile and manufacturing industries subsectors. The variable labor input is not paid and the capital input variable does not affect the value of the food, textile, and manufacturing, as well as medium and large, medium and large (medium) manufacturing sectors in Indonesia for the period 2011-2014.
- There is no difference in the total factor of productivity in the food industry, textile industry, and manufacturing industries as well as the medium and large scale and medium and large of scale manufacturing industries in Indonesia in the 2011-2014 period in this study.

Based on the conclusions mentioned above, the recommendations are as follows:

- It is necessary to increase the knowledge and skills of productive workforce in the form of improving labor productivity through training activities and increasing education levels.
- Research is needed that details the type of capital, such as land, buildings, raw materials, and so on so that it can better explain the effect of capital on output values. This is because the ability of input variables in explaining changes in the output value variable is still relatively low.

REFERENCES

1. Heizer J, Render B. *Operations Management*. International Edition. Seventh Edition. Pearson Education International, New Jersey. 2005.
2. Tinbergen J. Professor Douglas' production function. Revue de l'institut international de statistique. 1942 Jan 1:37-48.
3. Solow RM. Technical change and the aggregate production function. The review of Economics and Statistics. 1957 Aug 1:312-20.
4. Kowlgi NG, Chhabra L. D-lactic acidosis: an underrecognized complication of short bowel syndrome. Gastroenterology research and practice. 2015;2015.
5. Biatour B, Dumont M, Kegels C. The determinants of industry-level total factor productivity in Belgium. 2011.
6. Comin D. Total factor productivity. New York University and NBER. 2006.
7. Lipsey RG, Carlaw K. What does total factor productivity measure?. International Productivity Monitor. 2000;1:31-40.
8. Rahmah I, Sulaiman N, Jajri I. Total Factor Productivity and Its Contribution to Malaysia's Economic Growth. Research Journal of Applied Sciences, Engineering and Technology. 2014;7(23):4999-5005.
9. Kurniawaty H. Total Factor Productivity (TFP) Industri Tekstil dan Produk Tekstil (TPT) di Indonesia Tahun 2005-2009. Jurnal Ilmu Ekonomi Terapan. 2016 Jun 25;1(1):42-56.
10. Jajri I. Determinants of total factor productivity growth in Malaysia. Journal of economic Cooperation. 2007;28(3):41-58.
11. Giang MH, Xuan TD, Trung BH, Que MT. Total Factor Productivity of Agricultural Firms in Vietnam and Its Relevant Determinants. Economies. 2019 Mar;7(1):4.
12. Tekleselassie TG, Berhe K, Getahun TD, Abebe G, Ageba G. Productivity Determinants in the Manufacturing Sector in Ethiopia: Evidence from the Textile and Garment Industries. Ethiopian Development Research Institute (EDRI). 2017.
13. Tripathi A. Total factor productivity growth in Indian agriculture. Journal of Global Economy (ISSN 0975-3931). 2010 Jul;6(4).
14. Uyarer B, Volkan E. Regional And Sectoral Labor Productivity Convergence In Turkey. Applied Econometrics and International Development. 2016;16(1):77-92.
15. Arsana WW, Wu Y. Comparing Regional Productivity Growth and Its Determinants in Indonesia and China. In42nd Australian Conference of Economists 2013 May 7 (p. 30pp). Murdoch University.
16. Sari DW. The Source of Growth of Indonesia's Manufacturing Industry. InThe 29th FAEA Annual Conference 2004 Dec (pp. 1-19).
17. Erken H, Donselaar P, Thurik R. Total factor productivity and the role of entrepreneurship. Erasmus School of Economics: 2014, December.
18. Saputra AW. Analisis Pertumbuhan Total Faktor Produktivitas dan Sumber Pertumbuhannya Pada Industri Makanan, Minuman, dan Tembakau di

Indonesia. Skripsi. Fakultas Ekonomi dan Bisnis Universitas Airlangga, Departemen Penddikan Nasional, Surabaya. 2015.
19. Hermawan PJM. Determinan Pertumbuhan Faktor Produktivitas Total (TFP) Industri Gula di Indonesia 1993-2011. 2012. http://lib.ui.ac.id/ detail?id= 20387643 &lokasi=lokal.
20. Surjaningsih N, Permono BP. Dinamika *Total Factor Productivity* Industri Besar dan Sedang Indonesia. DKM Bank Indonesia. 2010.
21. Eskani IN. Total Factor Productivity (TFP) Industri Menengah dan Besar di Indonesia. Dinamika Kerajinan dan Batik: Majalah Ilmiah. 2016 Apr 26;28(1):17-24.
22. Eng PVD. Total factor productivity and economic growth in Indonesia. The Australian National University. 2009. Working papers in trade and development no.2009/01.
23. Javorcik B, Fitriani F, Lacovone L. Policy Note 5: Productivity Performance in Indonesia's Manufacturing Sector. Trade and Investment Climate, Kingdom of the Netherland, and USAID. 2000.
24. Ikhsan-Modjo M. Total factor productivity in Indonesian manufacturing: a stochastic frontier approach. Monash University (ABERU discussion paper 28). 2006.
25. Fadejeva L, Melihovs A. Measuring Total Factor Productivity and Variable Factor Utilization: Sector Approach, the Case of Latvia. Eastern European Economics. 2010 Sep 1;48(5):63-101.
26. Ark BV. Total Factor Productivity: Lesson from the Past and Directions for the Future. Working Paper research. National Bank of Belgium: October 2014, 271.
27. Felipe J. Total factor productivity growth in East Asia: A critical survey. The Journal of Development Studies. 1999 Apr 1;35(4):1-41.
28. Hulten CR, Dean ER, Harper M. New Development in Productivity Analysis. National Bureau of Economic Research: 2001 January, 1-54.
29. Erken H, Donselaar P, Thurik R. Total factor productivity and the role of entrepreneurship. 2008.
30. Levenko N, Oja K, Staehr K. Total factor productivity growth in Central and Eastern Europe before, during and after the global financial crisis. Post-Communist Economies. 2019 Mar 4;31(2):137-60.
31. Miao J, Wang P. Bubbles and total factor productivity. American Economic Review. 2012 May;102(3):82-7.
32. Pee-Yin C, Siew-Yean T. Total factor productivity in the Malaysian manufacturing sector: Some preliminary results. Jurnal Ekonomi Malaysia. 1995;29:9-35.
33. Fadiran D, Akanbi OA. Institutions and Other Determinants of Total Factor Productivity in Sub-Saharan Africa. 2017 Oct 4.
34. Araujo JA, Feitosa DG, Silva AB. Latin America: Total factor productivity and its components. CEPAL Review. 2014.
35. Bintoro BP, Simatupang TM, Putro US, Hermawan P. Actors' interaction in the ERP implementation literature. Business Process Management Journal. 2015 Apr 7;21(2):222-49.