The Effect of Education, Health, Minimum Wage, Foreign Investment on Labor Productivity in 33 Provinces of Indonesia

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ABSTRACT

The competitiveness of labor is a key factor to encourage the competitiveness of a country's economy. Indonesia has low labor competitiveness due to uncompetitive labor productivity. In addition, Indonesia has a trend of declining labor productivity growth, so more serious attention is needed to make labor productivity better. This study aims to analyze the effect of education, health, minimum wage, and foreign investment on labor productivity using panel data from 33 provinces of Indonesia in 2010-2019. This research used a multiple linear regression FEM with cross-section weight and coefficient covariance method cross-section SUR (PSCE). The result proved partially, health and minimum wage have a significant positive effect, while education and foreign investment have an insignificant positive effect on labor productivity. The most dominant independent variable is health. Simultaneously, the four independent variables have a significant effect on labor productivity in 33 provinces of Indonesia.

Introduction

Globalization in the economic dimension integrates the economic activities of countries in the world. The expansion of the economic openness system triggers competition between countries. The International Institute for Management Development (IMD, 2019) defines competitiveness as a holistic concept to assess a country's capacity to create long-term value through some factors, such as economic performance, government efficiency, business efficiency, and infrastructure. The economic performance cannot be separated from the role of human resources. According to Adam (2016), labor competitiveness is a key factor to encourage and accelerate economic competitiveness.

Based on IMD's research (2018), the ranking of competitiveness Indonesia's labor is

above 40 out of 63 countries in the world. Arham (2019) argued that the low competitiveness of the labor comes from uncompetitive labor productivity. It can be seen in Figure 1, the growth of Indonesia's labor productivity fluctuates and tends to decrease with an average growth rate 3.43%. Thus, Indonesia's ambition and strategic moves are needed to create greater labor productivity.
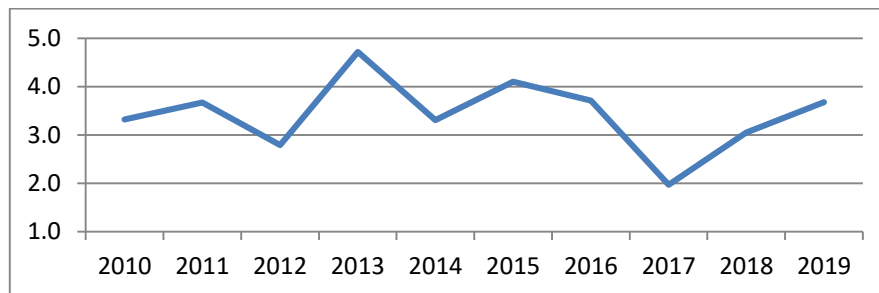
Source : ILO, 2019

Figure 1 : Labor Productivity Growth of Indonesia in 2010-2019 (%)

According to the findings of the Asian Productivity Organization (APO, 2020), the main source of Indonesia's labor productivity growth is the quality of labor. Qualified labor is more capable to produce the high economic value output. Any activity that improves the quality of labor is considered a human capital investment (McConnell et al, 2017).

Based on the theory Todaro and Smith (2011), human capital is a productive investment in knowledge, skills, and health. Furthermore, they explained that education encourages the ability of human resources to absorb technology and develop the capacity for sustainable growth and development. In the concept of schooling model (Borjas, 2016), education lead to higher labor productivity. The signaling hypothesis by McConnell et al (2017) explained that educational achievement can be used as screening to indicate the quality of labor, including their productivity.

Everyone has different intellectual abilities caused by differences in innate abilities such as knowledge, skills, and experience. Based on Statistics Indonesia (BPS) data from 2015-2019 there are 15% of uneducated workers (no/never been to school and not/not yet graduated from elementary school), and 44% of workers are less educated (elementary and junior high school graduates). In addition, educational achievement is measured by the mean year school (MYS). The average value for Indonesia's MYS during 2010-2019 is 7.8 years (BPS, 2020). This achievement is still relatively low considering that the 9-year compulsory education program has been running for quite a long time, even in 2015 it was renewed with a 12-year compulsory education program. The low level of education has an impact on the low bargaining power of the labor because labor cannot be recruited for more professional jobs. Sakernas BPS (2019) shows that 55.72% of Indonesia's labor work in the

informal sector with relatively low productivity. Therefore, considering the importance of the education variable in theory as a driver of productivity and with the condition of low educational attainment in Indonesia, this study would like to reveal more about the effect of education on labor productivity in Indonesia.

Health is also a prerequisite for increasing productivity. Good health conditions affect increasing longevity so that labor can contribute productively for longer because they have more experiences (McConnell et al, 2017). The degree of health is represented by life expectancy at birth (LEB). Indonesia's LEB has increased every year, which in 2019 reached 71.34 years (BPS, 2020). The increase in LEB reflects the improvement in the health status of the population supported by technological advances in the health sector, health facilities and infrastructure, and public awareness of a healthy lifestyle. Based on the study by Putri and Kusreni (2017), LEB has a positive effect on the productivity. Meanwhile, Arham (2019) proves that LEB has no effect on increasing productivity. Djirimu's research (2019), LEB has a negative effect on productivity. The difference in the results in previous studies makes this study want to re-examine how health affects labor productivity in Indonesia.

Wages as work incentives also affect labor productivity. Borjas (2016) explained that the total product curve brings the idea that labor productivity and work effort depend on wages. Although high wages will increase labor costs for the company, labor can produce higher levels of output. In the efficiency wage model (McConnell et al, 2017), higher wages can reduce worker negligence (shirking model), improving health (nutritional model), and increasing the proportion of experienced workers compared to new workers (labor turnover model).

Indonesia uses a provincial minimum wage system that sets from estimation the need for a decent living and provides incentives to boost productivity. Firmansyah (2015) revealed that wages have a significant positive effect on productivity, even having the largest contribution compared to other independent variables in his research. Meanwhile, in Putri and Kusreni's research (2017) wages have no significant positive effect on productivity. The difference in the results of previous studies makes this study want to re-examine how the influence of wages on labor productivity in Indonesia.

Foreign investment (FDI) is also useful in providing breakthroughs in labor productivity (Derado and Darko, 2019). In line with Asada (2020), FDI contributes to increasing labor productivity through technology transfer, the introduction of production processes, and better management skills. Moreover, multinational companies usually have access to the latest and most advanced technology that is expected to enter and spread to local companies to increase the productivity of the host country.

FDI is important to be included in research on labor productivity. Based on the report from the Indonesia's Investment Coordinating Board (BKPM 2019), the realization of foreign invesment has a larger proportion than domestic investment. This means that FDI has a dominant role to support the economy of Indonesia. Based on BPS (2020), Indonesia's FDI fluctuated during 2010-2019, with an average value of 26,539.77 million US$ per year. To increase the value of FDI in the long term, Indonesia needs to create an investment-friendly environment, improve economic factors (economic growth, infrastructure, and fiscal incentives), and maintain non-economic factors (regulation and socio-political stability). In addition, there are not many studies in Indonesia that examine the effect of foreign investment on labor productivity. Choudhry (2009) found that FDI had a significant positive effect except in low-middle income countries. Tintin (2012) revealed that FDI triggers productivity in developed and developing countries. FDI also increases productivity in Pakistan (Serfraz, 2018).

Labor productivity is very important for Indonesia to catch up with competitiveness in the globalization era. Therefore, the role of factors that affect labor productivity is needed to boost productivity growth. In this case, this study will analyze the effect of education, health, minimum wage, and foreign investment on labor productivity in 33 provinces of Indonesia.

Method

This study used panel data from 33 provinces of Indonesia in 2010-2019. The data were collected through a literature study from publications of the Statistics Indonesia (BPS) and provincial government documents. The data used include:

1. Labor Productivity (Y) calculated from the ratio between Gross Regional Domestic Product (2010 base year) at constant prices and the number of labor.
2. Education (X1) is proxied by mean year of school (MYS). This study used MYS which is calculated from the population of 25 years and over. In general, people at that age are no longer in school, so that is a good indicator to measure the education stock of an area.
3. Health (X2) is proxied by life expectancy at birth (LEB) as the number of years a person is expected to live.
4. Provincial Minimum Wage (X3) is the lowest monthly wage set by the governor.
5. Foreign Investment (X4) is the realization of investment by foreign countries in the provinces of Indonesia.

This study used multiple linear regression analysis of panel data processed using the

Eviews 10 program. The regression model used in this study refers to Puspasari and Handayani (2020), formulated as follows:

$$Y_{it} = \alpha_0 + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \beta_4 X4_{it} + \varepsilon_{it} \qquad 1$$

Where, Y: Labor productivity (million Rupiah); i: cross-section data of 33 provinces; t: time-series data of 2010-2019; α:constant; β1, β2, β3, β4: the output elasticity of the used input; X1: MYS (year); X2:LEB (year); X3: minimum wage (Rupiah); X4: foreign investment (million US$). These variables have different units. Therefore, it is necessary to do data transformation in the form of natural logarithms (Ln). The multiple linear regression equation for this study becomes:

$$LnY_{it} = \alpha_0 + \beta_1 LnX1_{it} + \beta_2 LnX2_{it} + \beta_3 LnX3_{it} + \beta_4 LnX4_{it} + \varepsilon_{it} \qquad 2$$

Bawono and Arya (2018) mentioned 3 approaches to estimate parameters in the panel data regression model, such as common effect model (CEM), fixed effect model (FEM), and random effect model (REM). Furthermore, specification tests (Chow, Hausman, and Lagrange Multiplier) to find which approach was appropriate. If the selected model is CEM or FEM, then proceed with the selection of an estimator. Based on the residual variance-covariance matrix structure, there are 3 estimation methods (Greene, 2012):

1. Ordinary Least Square (OLS)/Least Square Dummy Variables (LSDV), if there are no heteroscedasticity and cross-sectional correlation problems.
2. General Least Square (GLS)/Weight Least Square (WLS), if there is a heteroscedasticity problem, but there is no cross-sectional correlation problem.
3. Seemingly Unrelated Regression (SUR)/Feasible Generalized Least Square (FGLS), if there are problems with heteroscedasticity and cross-sectional correlation.

OLS is used to estimate the parameters of one or more regression equations, by not allowing the relationship between the error of one equation and the error of another equation. Regression equations that are combined into one system are often related to each other. If the errors in different equations are correlated, OLS becomes inefficient, so the Seemingly Unrelated Regression (SUR) model by Arnold Zellner (1962) is used.

Yahya, et al (2008) explained that for a large sample size (n ≥100) SURE will still be efficient if there is a correlation between exogenous variables in the SUR model. The use of SUR leads to improved tests of hypotheses regarding regression coefficients and other parameter values, taking account the correlation of error terms across the equation leads to better prediction of future values of the dependent variables (Batalgi, 2011). In the research of Widyaningsih, et al (2014), the SUR model produces a smaller error than OLS. Pusakasari (2015) applied weighted SUR to overcome assumption violations so that the results are unbiased, have the smallest variance, produce a larger coefficient of

determination, and the results are in accordance with the theory. In addition, the use of SUR by Anisa (2016) provides better regression analysis results and significance than OLS.

If the estimation method is OLS, it must pass the detection of the classical assumptions of normality, heteroscedasticity, multicollinearity, and autocorrelation. If it is GLS or FGLS, then it only needs to pass normality and multicollinearity because the two methods have robustness from heteroscedasticity and autocorrelation problems in the model (Gujarati and Porter, 2009). After getting the best estimation model that passed the classical assumption, the next thing to do is statistical tests.

Results and Discussion

Table 1 presents the results of the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) approaches. This study has also selected the best model through the Chow test and the Hausman test. Based on those two tests, the FEM model is an appropriate model for this research.

Table 1. Result of Panel Data

	CEM		FEM		REM	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-10.4381	0.0011	-18.6782	0.0002	-16.8053	0.0000
LnX1	1.2787	0.0000	-0.1171	0.5762	0.0518	0.7884
LnX2	1.4965	0.0420	4.8186	0.0001	4.3234	0.0000
LnX3	0.3571	0.0000	0.1888	0.0000	0.1795	0.0000
LnX4	0.1033	0.0000	0.0043	0.2678	0.0054	0.1561
Diagnostic Tools						
R2	0.4577		0.9924		0.7403	
F-stat	68.5706		1062.4250		231.5798	
Chow Test		0.0000				
Hausman Test				0.0000		

Source: Eviews10 data processing results

Next, it needs to detect the classical assumption of heteroscedasticity and cross-sectional correlation on the FEM. From the calculation on the residual covariance matrix, the statistical value of the LM test is $165.330 > X^2_{0.05;32} = 46.194$. This means that there is a heteroscedasticity problem. From the calculation on the residual correlation matrix, the statistical value of the test λLM $1259.350 > X^2_{0.05;528} = 582.564$. This means that there is a cross-sectional correlation in the model. Thus, the best model used is FEM with cross-section weight to accommodate heteroscedasticity problems and coefficient covariance method cross-section SUR (PSCE) to accommodate cross-sectional correlation problems.

The above model is robust from heteroscedasticity and autocorrelation problems, so only normality and multicollinearity detection need to be checked. Based on the results of normality detection (Table 2), the probability value of Jarque Bera (JB) is 0.123678 > (0.05).

It means the residuals in the estimation model are normally distributed. The result of the pairwise correlation coefficient between the two regressors (Table 2) does not exceed the rule of thumb (0.8), so there is no multicollinearity problem in the model.

Table 2. FEM with *cross section weight* and *coefficient covariance method cross section SUR* (PSCE)

Variable	Coefficient	t-Statistic	Prob.	Conclusion
C	-13.2566	-2.9818	0.0031	
LnX1	0.1722	0.7370	0.4617	Insignificant
LnX2	3.3970	3.0413	0.0026	Significant
LnX3	0.1889	6.5544	0.0000	Significant
LnX4	0.0038	1.3976	0.1633	Insignificant
Diagnostic Tools				
R2				0.9931
F-stat				1164.5780
Normality Test				0.1237
Multicolinearity Test	Free from Multicolinearity based on Pairwise Correlation Test			

Source: Eviews10 data processing results

Based on the results of data processing presented in Table 4, the estimation model of the labor productivity equation (Y):

$$LnY_{it} = -13.2566 + 0.1722LnX1_{it} + 3.3970LnX2_{it} + 0.1889LnX3_{it} \qquad 3$$
$$+ 0.0038LnX4_{it}$$

The education (X1) coefficient is positive 0.1722, which means for every 1% increase in education, labor productivity will increase by 0.1722% with the assumption that the health, minimum wage, and foreign investment variables are constant. The health (X2) coefficient is positive 3.3970, which means for every 1% increase in health, labor productivity will increase by 3.3970% with the assumption that the variables of education, minimum wage, and foreign investment are constant. Health is also the most dominant variable affecting labor productivity because it has the highest coefficient value among other independent variables in this research.

The minimum wage (X3) coefficient is positive 0.1889, which means for every 1% increase in the minimum wage, labor productivity will increase by 0.1889% with the assumption that the variables of education, health, and foreign investment are constant. The foreign investment (X4) coefficient is positive 0.0038, which means every 1% increase in foreign investment, labor productivity will increase by 0.0038% with the assumption that the variables of education, health, and minimum wage are constant.

The statistical value F 0.000000<0.05 means that the variables of education (X1), health (X2), minimum wage (X3), and foreign investment (X4) simultaneously have a significant

effect on labor productivity variables in 33 provinces of Indonesia (Y). The R^2 value is 0.993 means the variation of the labor productivity variable in 33 provinces of Indonesia (Y) 99.3% can be explained by the variation of the education (X1), health (X2), minimum wage (X3), foreign investment (X4) and 0.7% is explained by other variables outside this regression model.

This study found that education, which is proxied by mean year school has an insignificant positive effect on labor productivity in 33 provinces of Indonesia. The positive sign of the coefficient is in line with the human capital theory (Todaro and Smith, 2011) and the idea of the schooling model (Borjas, 2016). The insignificant effect indicates that the increase in education is not sufficient to increase productivity without being followed by job training. This reason is supported by the research of Yanti (2016) and Putri together with Kusreni (2017), which explained that labor skills are the most important factor for increasing labor productivity. With training, labor productivity can be increased according to the needs of the job.

Health which is proxied by the life expectancy of birth has a significant positive effect on labor productivity in 33 provinces of Indonesia. In line with Todaro and Smith (2011), health is a prerequisite for increasing productivity. Health can also increase longevity, so labor can contribute productively for longer (McConnell et al, 2017). The result of this study is similar to Arshad and Malik's research (2015), that health has a significant positive effect on the labor productivity of Malaysia. They stated that better health conditions can extend life expectancy, and healthier labor has higher productivity because their mental and physical health makes them less to take medical absence. In addition, the findings of Fitri et al (2016) explained that good health will support labor enthusiasm to work, which will increase productivity.

This study proved that minimum wage has a significant positive effect on labor productivity in 33 provinces of Indonesia. In line with Borjas's (2016) that labor productivity and work effort depend on wages, also in line with the efficiency wage model (McConnell et al, 2017). Previously, research by Amelia et al (2019) found that wages had a significant positive effect on labor productivity in the provinces of Indonesia and explained when labor feels that earned wages are sufficient to fulfill their needs, their productivity at work will increase. In addition, according to a study by Puspasari and Handayani (2020), productivity depends on the level of earned wages because wages are the motivation to work.

The result of this study found that foreign investment has an insignificant positive effect on labor productivity in 33 provinces of Indonesia. The positive sign of the coefficient is in

line with Derado and Darko (2019) and Asada (2020), who explained that foreign investment provides breakthroughs to increasing labor productivity. According to the findings of Boghean and State (2015), foreign investment has a significant positive relationship with labor productivity in 20 European countries. Those countries have been able to provide a business-friendly environment for investors and policy to attract foreign investment. Meanwhile, based on OECD (2019) survey, Indonesia was in the top 5 positions out of 84 countries as the most restrictive country with regulations on foreign investment with an index value 0.347. Extreme protectionism can reduce the entry of foreign capital into Indonesia also reduce the adoption of new technologies that often come from foreign industries which have the effect of weakening productivity.

Conclusion

Partially, health and minimum wage have a significant positive effect, while education and foreign investment have an insignificant positive effect on labor productivity in 33 provinces of Indonesia. Simultaneously, education, health, minimum wage, and foreign investment have a significant effect on labor productivity in 33 provinces of Indonesia. The most dominant independent variable affecting the productivity of the labor in 33 provinces of Indonesia is health.

If there is no improvement in education, Indonesia's economic performance will be difficult to develop rapidly. Therefore, it is necessary to continuously improve education especially to increase the bargaining power of the labor, so Indonesia's labor can be welcomed in more professional jobs and have the opportunity to create higher productivity. Next, the government may prioritize the health sector in human capital development to realize high labor productivity through controlling funds and improving health services. The government also needs to improve the running of health programs, such as Nusantara Sehat, Employment Social Security, Occupational Health Business Post, and the Productive Healthy Female Workers Movement.

Next, the government needs to improve the quality of components of the minimum wage formulation and optimize the role of related institutions also open for discussion among tripartite, encourage companies to make structures and scales of wage, and strengthen rule enforcement. For the last, increasing the value of foreign investment can certainly support Indonesia's economic performance. So, the government of Indonesia needs to reduce the protectionism of foreign investment and maintain the conduciveness of the country's economic and non-economic factors. Hopefully, foreign investors will be interested to invest their capital in Indonesia which in turn will help the labor to increase production output.

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