Analysis of Labour Productivity in Micro and Small Industries in Java

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Abstract. Micro and small industries are very important in a country's economy. In the case of developing countries or regions, one of the important issues in micro and small industries is labor productivity. This study aims to analyze labor productivity which is influenced by education level, age, and wage level in several provinces in Java. To get the appropriate analysis results, the method used in this study is panel data regression analysis. The results of the analysis in this study found several findings, namely education level, age, and wage level have a significant positive effect on labor productivity in micro and small industries in Java.

Keywords: labor productivity, micro and small industry, education, age, wages.

1   Introduction

The sector that has an important role in accelerating the country's economic growth is the industrial sector. One that is included in the industrial sector is the processing industry which has the largest contribution among other business fields. The processing industry consists of large industry, medium industry, small industry, and micro industry. The micro and small industries are an important sub-sector for the sustainability of the country's economic situation. This is because micro and small industries can survive the shocks of global economic instability [1]. In the processing industry, micro and small industrial enterprises dominate. The labor productivity of the manufacturing industry in Java tends to increase, this is proven by research [2], [3], where the labor productivity of DKI Jakarta is higher. In published data, micro and small industrial businesses totaled 4,209,817 units in 2020, while large and medium industries totaled 29,363 units. In Indonesia, the largest number of micro and small industrial enterprises are in Java, namely 63.11% of the total. Of all the provinces on Java Island, the largest number of micro and small industrial businesses are in Central Java Province.

Table 1. Number of Micro and Small Industrial Enterprises in the Provinces of Java Island in 2020.

Provinces	Number of Micro and Small Industrial Enterprises
D.K.I Jakarta	59.017
West Java	625.943
Central Java	898.162

Provinces	Number of Micro and Small Industrial Enterprises
D.I Yogyakarta	137.499
East Java	828.482
Banten	107.677
Total	**2.656.780**

Source: Central Bureau of Statistics Indonesia, 2020.

One of the previous studies discussed the total factor productivity in micro and small industries. The researcher found that the total factor productivity in the micro industry is greater than that in the small industry [4]–[6]. The discussion regarding the productivity of micro and small industries can be narrowed down, one of which is labor productivity. Productivity is an important part of economic growth and people's welfare [7]. Labor productivity is always associated with human resources that can increase production [1].
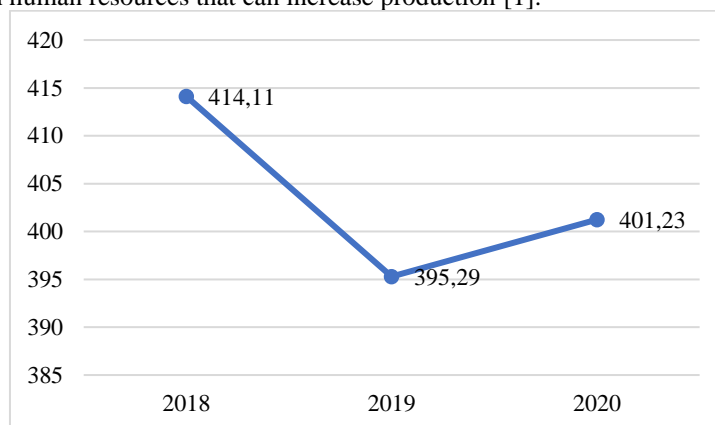

Fig. 1. Labour Productivity Micro and Small Industry in Java Island in 2018-2020 (Million rupiah/labour/year).
Source: Central Bureau of Statistics Indonesia, 2018-2020 (Processed)

The following is the labor productivity of micro and small industries in Java for the last 3 years. Labor productivity is always associated with human resources that can increase production [1]. Low labor productivity is a problem that can lead to low production results [8]. One of the human development index indicators is education. The existence of a qualified workforce can increase labor productivity. The level of education taken is considered to be able to make the workforce more qualified compared to someone who has a low level of education [8].

In addition to education pursued by the workforce, the government's role in education policy in the country also affects labor productivity. If access to finance to continue higher education is facilitated through many channels, then the expansion of education (university) will increase, thus encouraging people to continue their education to a higher level. A highly educated workforce has superior skills to complement existing technological availability [9]. In Indonesia, Indonesian government spending is used for free education programs (free education). This program aims to facilitate access to education for all people to create quality human resources [10].

Workers of productive age are superior in increasing productivity. At productive age, the workforce is physically superior compared to non-productive age workers or those who have passed their productive period [8]. Retirement age is also something that needs to be observed in a company's labor productivity. Some companies still use human resources who are at retirement age, many factors cause companies to still use retired (non-productive) age workers, one of which is the investment in the knowledge and skills of these workers who have been doing their jobs for a long time. However, labor productivity increases, and other influences affect retirement age on productivity such as company policies due to reductions in the pension budget [11].

Micro and small industries have a very large number of businesses, and this causes competition between businesses to be very tight. Appropriate wages are needed to be able to attract workers. The wages received by workers will describe their productivity at work, this is because the wages that workers get are used to make ends meet [12]. If firms pay low wages, they tend to employ more unskilled workers because wages are low [13].

The increase in the minimum wage that occurs due to a spillover effect causes the minimum wage to continue to rise every year and is followed by an increase in wages in the manufacturing industry which consists of large, medium, small, and micro industries. This statement is contained in research [14] and researchers mention possible factors, namely companies deliberately increasing the wages of some workers above the minimum wage to maintain differences in wages.

Based on research that discusses labor productivity, including [15], with the robust regression analysis research method, shows that the education variable affects labor productivity. Research [8] used an explanatory research method to examine the effect of age on labor productivity, and the results showed that there was an influential relationship between age and labor productivity. Research [12] conducted research on the effect of wages on the productivity of carving craft employees with an explanatory survey method, and it was found that wages affected labor productivity.

From these problems, this study aims to determine labor productivity on the island of Java, as well as to analyze the factors of education, age, and wages on labor productivity on the island of Java, especially in micro and small industries.

2 Literature Review

Work or labor productivity is the most appropriate ratio of production results obtained with the amount of labor used according to Nawawi and Martini [16]. Comparison of the total output produced with the number of workers in a business [17]. Productivity is a reflection of the work ethic of a workforce which consists of one of them is a good mental attitude. So productivity can be interpreted from another point of view, namely as the ratio between the output as measured by the physical unit and the input value of labor [12]. Several factors can cause high or low labor productivity such as factors related to labor or factors related to the work environment and the government in setting work policies [18].

A micro-industry is a business that has a workforce of 1-4 people, while a small industry is a business that has a workforce of 5-19 people. Micro and small industries have an industry classification called the International Standard Industrial Classification of All Economic Activities (ISIC) revision 4. Indonesia adapted ISIC to KBLI with the 2-digit KBLI code. There are 23 sub-sectors in micro and small industries. The existence of micro and small

industries helps the government in creating new jobs so that employment will be greater and reduce unemployment [19]. The number of micro and small industrial enterprises in Indonesia is quite large, so if the number of micro and small industrial enterprises increases, the country's economic growth tends to increase [20].

Research conducted by [15]in the Province of Bali revealed several factors that could affect high or low labor productivity. Research in China by [9] provides evidence that educational policies from the government can also affect labor productivity. Research [12] found that labor productivity can be affected by wages and work experience. Research [14] tested the wage variable on labor productivity and had the result that there was an influence relationship between wages and labor productivity.

Capital, innovation, and learning by doing are factors that can affect labor productivity, this finding was found in research [1]. The workforce is of course very closely related to the age of the workforce, research by [8] found that age can affect labor productivity. Age does not always increase labor productivity, research [21] stated that age has a negative influence on labor productivity. Several previous studies are related and become references for this research.

Table 2 Summary of the Relationship between Education, Age and Wages on Labour Productivity.

Author	Variable	Sample	Method	Empirical Findings
Wicaksana K, Kurniawan R (2020).	Labour productivity, high school graduate workforce, male workforce, innovation (dummy), raw materials.	1770 MSI business units (1636 micro businesses, 134 small businesses).	Robust regression with the MM-estimation method.	High school graduate workforce + Labor productivity.
Ukkas I (2017).	Labour productivity, education level, age, work experience, gender.	100 workers in small industries in Palopo City.	Multiple linear regression method.	Education level, age + Labour productivity.
Sulaeman A (2014).	Labour productivity, wages, work experience.	134 people from 20 woodcarving companies in the Subang Regency area.	Parametric analysis with path analysis.	Wages + Labour productivity.
Susilowati L, Ananda C, Ashar K, Susilo S (2019).	Labour productivity, Capital, labour, innovation, learning by doing, training, high school education level.	220 leather craftsmen from Magetan Village, Selosari Village, and Mojopurno Village.	Panel data regression.	High school education + Labor productivity.
Jemila Rahmi & Riyanto (2022).	Labour productivity, minimum wages.	Central Bureau of Statistics survey data for large and	Panel data regression.	Wages + Labour productivity.

Author	Variable	Sample	Method	Empirical Findings
		medium industries in 2010-2015.		
Axel Borsch-Supan, Christian Hunkler, Matthias Weiss (2021).	Labour productivity, age.	Data on non-management employee teams in Germany 2010-2012.	OLS fixed effect.	Age – Labour Productivity.
Yao Yao (2018).	Labour Productivity, education policy.	Private sector companies (PE) and state-owned sector companies (BUMN) in China.	Overlapping Generations Model (OLG).	Education policy + Labour Productivity.
Kazushige Matsuda (2021).	Labour productivity, labor retirement age.	Average earnings at age 60 in one year (2010).	Overlapping Generations Model (OLG).	Retirement age + Labour productivity.
Baharin R, Syah Aji R, Yussof I, Saukani N (2019).	Labour productivity, educational level, health status of the workforce.	Human capital for variable proxies 1981-2014.	ARDL Method.	Primary and secondary education + Labour productivity. Higher education – Labour productivity.

3 Method

This study aims to determine labor productivity and the factors that influence it, especially in Java. This study uses research boundaries, namely the island of Java which consists of provinces on the island of Java there is DKI Jakarta, West Java, Central Java, D.I Yogyakarta, East Java, and Banten. The research period to be examined starts from 2013-2020. The data to be used in this study were obtained from micro and small industry publications from the Central Bureau of Statistics. The method used is descriptive analysis method and multiple linear regression analysis with panel data. The processing of research data was assisted by Eviews 10 software. The use of panel data was carried out due to the combination of cross sections on research boundaries and time series in the study period. The model used is:

$$PROD_{it} = \beta_0 + \beta_1 EDU_{it} + \beta_2 AGE_{it} + \beta_2 WAGE_{it} + \varepsilon_{it} \tag{1}$$

Table 3. Variable Operational Definitions

Variable Type	Variable Name	Variable Operational Definitions	Unit
Dependent	Labour Productivity (PROD)	The total output value or output divided by the number of workers in the micro and small industrial sector.	Million rupiah/labour/year
Independent	Education (EDU)	Percentage of the number of workers based on education level (≥ High	Percent/year

		School) in the micro and small industrial sector.	
Independent	Age (AGE)	Percentage of the number of workers belonging to the productive age category (15-64 years) in the micro and small industrial sector.	Percent/year
Independet	Wages (WAGE)	Total wages divided by the number of paid workers in the micro and small industrial sector.	Million rupiah/person/year

In panel data regression, several steps must be carried out to be able to carry out data processing to find out the results of the research objectives. It consists of model estimation tests, classical assumption tests, and statistical tests [22].

4   Result

Descriptives Analysis

Labor productivity in micro and small industries in every province on Java Island varies greatly. Likewise, every year there are fluctuations or there is an increase or decrease in energy productivity.
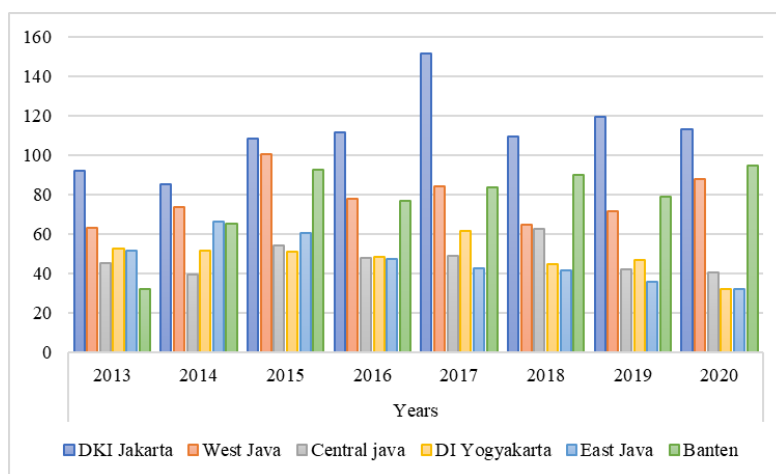

Fig. 2. Labour Productivity in the Provinces of Java Island in 2013-2020
Source: Central Bureau of Statistics, 2013-2020 (processed data)

Figure 2 shows that the highest labor productivity in Java Island from 2013-2020 was in DKI Jakarta Province. In 2017, DKI Jakarta reached 151.80 million rupiah/labor/year. The lowest labor productivity changes every year, this is due to fluctuations in labor productivity so that the position of provinces with low labor productivity always changes. East Java Province

from 2018-2020 has experienced a continuous decline, In 2020 East Java Province had a labor productivity of 32.03 million rupiah/labor/year.

Regression Analysis

Model estimation test is used to have the best research model. The model consists of Common Effect Model, Fixed Effect Model, and Random Effect Model. This study uses the Chow test to test the model estimation. Following are the results of the Chow Test:

Table 4. Result of the Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.885683	(5,39)	0.1191
Cross-section Chi-square	10.393204	5	0.0648

Table 4 shows the probability value generated in the Chow Test of 0.0648, meaning that the probability value is greater than 0.05 or 0.0648 > 0.05. Then the best model used is the Common Effect Model. So the model equation obtained is:

Table 5 Panel Regression Result Using Common Effect Model

Variable	Coefficient	t-Statistic	Prob.
C	-210.5784	-2.615118	0.0122
EDU	0.494833**	2.441856	0.0187
AGE	2.281258**	2.582564	0.0132
WAGE	2.743853***	7.341602	0.0000
R-Squared		0.766556	
F-Statistic		48.16070	
Prob F		0.000000	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The R-squared value of the model is 0.766556 or 76.65 percent. This means that the independent variable can explain the diversity of the dependent variable by 76.65 percent and the remaining 23.35 percent is ceteris paribus. Based on the results obtained, the coefficient of labor with education above high school has a significant positive effect on labor productivity. The labor productivity coefficient of productive age has a significant positive effect on labor productivity. The wage coefficient has a significant positive effect on labor productivity. Taken together the independent variables (education, age, wages) influence labor productivity seen from the F-statistics.

Multicollinearity Check

The multicollinearity test is used to test whether or not there is a correlation between independent variables in the regression model. The following are the results of the Multicollinearity Test:

Table 6. Result of the Multicollinearity Test.

	EDU	AGE	WAGE
EDU	1.000000	-0.006695	0.315506

AGE	-0.006695	1.000000	0.509272
WAGE	0.315506	0.509272	1.000000

Based on Table 4, the results obtained from the Multicollinearity Test are that no correlation coefficient between independent variables is greater than 0.8 so multicollinearity does not occur in the regression model.

Heteroscedasticity Check

The heteroscedasticity test is used to test whether there is an inequality of residual variables for all observations of the regression model. Following are the results of the Heteroscedasticity Test:

Table 7. Results of the Heteroscedasticity Test (Harvey Test).

F-statistic	1.759786	Prob. F(3,44)	0.1688
Obs*R-squared	5.142299	**Prob. Chi-Square(3)**	**0.1617**
Scaled explained SS	7.095780	Prob. Chi-Square(3)	0.0689

Based on Table 5, the results obtained from the Heteroscedasticity Test show that the Prob. Chi-Square is 0.1617 meaning it is greater than 0.05 so there is no heteroscedasticity.

5 Discussion

From the results of the analysis that has been presented, it appears that there is a relationship between the independent variables and the dependent variable in the context of labor productivity. Further economic analysis can provide additional insights regarding the impact and implications of these findings from an economic perspective.

Based on the regression results, the education coefficient is 0.494833. This means that if education increases by 1%, labor productivity will increase by 0.494833 million rupiah/labor/year assuming other variables are held constant. The most investment made by the community is education, this is because education can develop knowledge and skills which, if optimized, will affect the increase in labor productivity [15]. Economically, this shows that investment in education has a significant positive impact on productivity. An increase in education will help develop the skills, knowledge, and employability of the workforce, which in turn will increase their contribution to production and economic growth. In economic research, the positive relationship between education and labor productivity has been well-studied. Several studies, such as those conducted by [21], show that education plays an important role in enhancing the capabilities and skills required by the modern workforce. Another example is research by [23] who found that the quality of education has a significant positive impact on national productivity. So it can be concluded that the higher the level of education the workforce takes, the productivity of the labor expended will increase.

In the age variable, the regression results are obtained, namely a coefficient of 2.281258. This means that if productive age increases by 1%, labor productivity will increase by 2.281258 million rupiahs/labor/year assuming other variables are held constant. According to [8], the effect of age on labor productivity is very high because age is related to the physical abilities of the workforce. If the workforce is at a productive age, the workforce has higher

physical and creative abilities so labor productivity will certainly increase. Research in labor economics has underscored the importance of the age variable in influencing productivity. The study by [24] investigates how age influences productivity and argues that differences in skills and experience between specific age groups can affect labor output. Research by [25] demonstrated that higher wages can be an incentive for individuals to increase their productivity in response to greater rewards. Also, research by [26] analyzes how the age factor affects productivity in various economic sectors. The result it can be concluded that workers of productive age (15-64 years) can increase labor productivity.

The wage variable coefficient based on the regression results is 2.743853. This means that if wages increase by 1 million rupiah/person, labor productivity will increase by 2.743853 million rupiah/labor/year assuming other variables are held constant. Wages can be used as a benchmark for the level of welfare of workers, if the wages received by workers are higher, it can be said that the welfare of workers is very good. According to [12], wages greatly affect labor productivity. Wages are needed to repay labor services for their contribution to a business which is given in the form of money. Economically, this indicates a positive relationship between wage levels and productivity. This can also encourage increased motivation and dedication, which in turn will increase production yields and economic performance. Recent research by [27] has delved deeper into these dynamics in the context of the modern labor market. Then, it can be concluded that the higher the wages given to labor, the productivity of the labor expended will increase.

6 Conclusion

Based on the results and discussion, conclusions can be obtained in this research. The conclusion is that the provinces on Java Island are very varied and always experience fluctuations every year. DKI Jakarta is the province with the highest productivity in Java Island in the 2013-2020 period. The labor with an education level above higher education in the micro and small industries is quite high. Likewise, more labor is in the productive age compared to the non-productive age, this applies to most business fields in Indonesia. Paying wages in each province is very diverse, this is because the minimum wage for each region is different, causing a variety of wages given.

In this study, the calculation of labor productivity uses the output per worker formula. Based on the results of the study using panel data regression, it was found that the education variable, the age variable, and the wage variable affected the labor productivity of micro and small industries simultaneously. In the education variable which is the proxy for SMA and above (high school level and above), the age variable is proxied using the productive age of the workforce, as well as the wage variable where the three independent variables have a partially significant positive effect on labor productivity. Wages have the highest influence on labor productivity, so every micro and small industrial business needs to pay attention to wages or remuneration provided to workers to create a business environment with high labor productivity.

Suggestions that can be given by researchers are the need for increased performance from the Trade and Industry Department to deal with problems in micro and small industrial businesses. As well as coaching activities for micro and small industrial workers, as well as the duties and functions of the Department of Labor in gathering available manpower in micro and small industries.

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