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Panel Data Analysis With Mediating Variables In The Production Performance Model In Malang City Industry

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ABSTRACT

The development of the industrial sector is able to provide a strategic role in the economy. One of the efforts made to improve industrial performance is to find out the factors that influence production performance in industry. This research has a purpose to determine the effect of number of workers and production quantity on production performance as seen from production value in Malang City Industry, where production quantity is a mediating variable. This research is quantitative research. This data source is secondary data from Malang City Industrial data. The samples in this research were small and medium industries in Malang City for several years. Based on the panel data analysis result with mediating variables, show the number of workers has a significant effect on the amount of production. The number of workers does not have a significant effect on production performance. The amount of production has a significant effect on production performance. The number of workers has a significant effect on production performance through the amount of production. Therefore, it is hoped that industrial leaders need to increase the number of workers so that production increases, and the increased production will increase the performance of industrial production in Malang City.

INTRODUCTION

Sectoral economic growth and development is undergoing transformation. The agricultural sector, which originally made a major contribution to the Indonesian economy, has begun to shift to the industrial sector in line with technological developments and the entry of foreign capital into Indonesia. Moreover, industrial products are always profitable with high exchange rates and can produce greater added value than other industries. This industry has a variety of products that can offer great benefits to its users.

The economy of Malang City is predicted to experience impressive growth in 2022, reaching 6.32%. This value also exceeds pre-pandemic growth and is the highest record in the

last 10 years. Malang City's Gross Regional Domestic Product (GRDP) is ranked fifth highest in East Java with a contribution of 4.3% to Gross Domestic Product, and Malang City contributes to the economy of East Java. Mayor of Malan, Dr.H. Sutiaji (2022) stated that the commercial sector was the largest source of economic growth at 2.1%. Followed by the industrial sector and the education sector which are the main economic sectors of Malang City.The development of the industrial sector is able to provide a strategic role in the economy. One of the efforts made to improve industrial performance is to know the factors that influence industrial performance. Industry needs to consider whether industrial products are optimal in their production processes and production activities. Production activities are the process of creating more value through a combination of input factors, workers, and production factors, output, and as input increases, the production value also increases proportionally, and vice versa. In this case, entrepreneurs regulate the use of production factors in the production process in order to maximize products and maximize profits, because efficient production activities will create optimal production value (Sukirno, 2010). In an effort to improve the performance of industrial production in Malang City, the author tries to carry out an analysis of the factors that influence industrial production performance as seen from the production value or industrial income in Malang City.

Factors that are thought to influence production performance are the number of workers and the amount of production as mediating variables. This factor was chosen because it is considered dominant in the production process and has an impact on the ups and downs of production performance. Previous research that is relevant to this research is research by Andriyani & Susanti (2019) that worker costs influence production value. The more workers there are, the company will incur a lot of worker costs, and this affects the production value of the Furniture Industry in Jeumpa District, Bireun Regency. Apart from that, Hidayat's research (2018) shows that the variable number of workers has a significant effect on the production value of large and medium industries in Malang Regency in 2015. Research by Dangin & Marhaeni (2019) states that worker and production numbers have a positive and significant effect on industrial performance. seen from the income of craftsmen in the leather craft industry in Badung Regency.

LITERATURE REVIEW

Workers

Mulyadi (2014) defines the worker force as the working age population aged between 15 and 64 years, or the number of citizens who can produce goods and services when there is a request for worker and a willingness to carry out these work. Meanwhile, according to Murti & Suprihanto (2014), workers are people who provide skills and abilities to produce goods and services for a company to obtain profits, and are responsible for wages and can receive salaries or wages that are appropriate to their skills. Therefore, companies need to maximize their human resources and create products and services that can meet the needs of more people.

Sukirno (2010) said that worker is an important factor that influences the amount of production. There are several things that need to be considered regarding the workforce, namely the availability of human resources, the quality of the workforce, determining the profession of temporary or seasonal workers, whether the wages of male and female workers are different or not. If a large number of workers are employed, it will increase the amount of production produced.

Production

Production is what a company produces in the form of goods and services within a certain period of time and is calculated as added value for the company. In reality, the form of production results according to the categories of goods and services varies depending on the

category of business activities of the company concerned. Production can be defined both narrowly and broadly. In a narrow sense, production changes the form of an item into a new item, thus creating a use for that form. In a broad sense, production is an effort that generates profits based on time, space and effort (Fahmi, 2012). According to Machfudz (2007), production results are the final result of a production process whose input is made into output or product. The creation of production results cannot be separated from the existence of production factors. Production factors are things that are sacrificed to produce a product. Therefore, output is the amount of output produced by an industry in a certain period of time.

Production Performance

Performance is the extent to which an individual or company achieves results by carrying out certain tasks (Mangkuprawira & Hubeis, 2007). Performance evaluation at the production site also needs to be carried out. Evaluation of production performance can be used as a reference for decision making to maximize production of products and services and increase profitability. Output value can be seen through productivity and income indicators. Hasir (2013) states that the value of output produced in a year is expressed in rupiah and the number of workers affects the production value. According to Sudarsono (2007), output value is the final result of an entity's production process and is the level of production or the total number of goods sold before they reach consumers in large and small industrial sectors, depending on the business field.

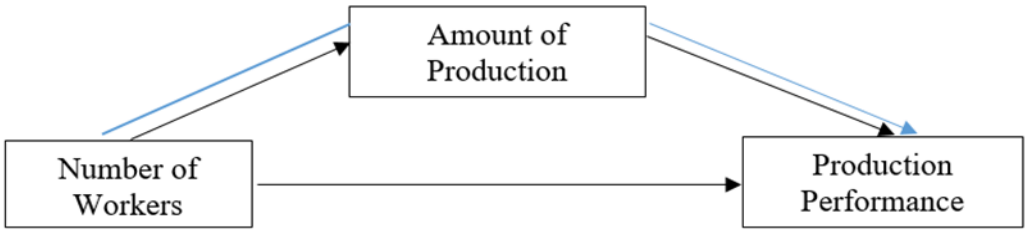
Industry

According to Industrial Law Number 5 of 1984, industry is an economic activity that processes raw materials, raw materials, semi-finished goods and finished goods to produce products that have higher use value, and also includes industrial design and engineering activities. According to Sukirno (2010), this industry is a business that operates in the field of economic activities and is classified as a secondary industry. These activities include textile factories, assembly or car factories, and soft drink factories. The role of industry in local community economic activities includes providing goods and services, absorbing worker, equalizing income, adding value to local products, and improving living standards.

Research Conceptual Framework And Hypothesis

The research conceptual framework which is presented in the following picture.

Figure 1 Research Conceptual Framework



The alternative hypothesis given in this research is as follows:

1. H1 : The number of workers has a significant effect on the amount of production in Malang City Industry
2. H2 : The number of workers has a significant effect on production performance in Malang City Industry
3. H3 : The amount of production has a significant effect on production performance in Malang City Industry

4. H4 : The number of workers has a significant effect on production performance through the amount of production in Malang City Industry

METHODS

The type of research in this research is quantitative, is research designed to study a certain population or sample, the sampling procedure is generally carried out randomly, and data collection is carried out using research tools, data analysis is quantitative or statistical in nature and achieves the following objectives (Sugiyono, 2019). The data source for this research is secondary data from Malang City Industrial data. The population in this research is all data from small and medium industries in Malang City. The sample in this research is small and medium industries in Malang City in 2021 and 2022. The data collected is quantitative and uses the documentation method, namely collecting data related to the problem. The data is data on the number of workers, total production and production value in small and medium industries in Malang City. The research variables used in this research are variables that are thought to influence industrial production performance, namely the number of workers and the amount of production as mediating variables. Production performance is seen from production value or industrial income as the dependent variable (Y). Number of workers as independent variable (X). Amount of production as a mediating variable (Z). This research uses a combination of panel data analysis and path analysis. Panel data analysis combines cross section and time series data (Nachrowi & Usman, 2006). When estimating regression model parameters using panel data, several approaches are often used, including pooling least squares (common effect), fixed effects and random effects (Gujarati & Porter, 2015). In addition, this research combines panel data analysis with path analysis because there are mediating variables in the model (Astutik, et al, 2018).

The analysis steps for this research are as follows.

1. Conduct descriptive statistical analysis
2. Carry out tests to choose a panel regression approach or method between pooling least squares (common effect), fixed effects and random effects by carrying out the Chow test and carrying out the Hausman test on each substructure according to the path analysis model.
3. Carry out estimates using selected panel data analysis using the step 2 model) for each substructure according to the path analysis model.
4. Carry out a significance test for the panel data path analysis model parameters
5. Interpret the analysis results.

RESULTS

Descriptive Analysis

The first step is to analyze all the data to describe a summary of research data such as mean, maximum value, minimum value and standard deviation using descriptive statistics. The results of the descriptive analysis are presented in the following table.

Table 1 Descriptive Analysis Results

	Number of Workers	Amount of Production	Production Performance
Mean	965.72	1266708	81800000000
Median	406	14559	36500000000
Maximum	8878	17108956	562000000000
Minimum	85	70.000	37000000
Standard Deviation	1896.93	3642067	127000000000

Source: Data Analysis Results (2024)

Selection Of Panel Regression Models

General effects models, fixed effects models, and random effects models are three approaches that can be used to estimate model parameters when using panel data (Gujarati, 2015). Next, use the Chow, Hausman, and Lagrange tests to determine which panel data parameter estimates will be used. Panel regression model selection is carried out for each substructure. First, the Chow test is carried out to determine the appropriate model between the Common Effect Model (CEM) and the Fixed Effect Model (FEM). Following are the results of the Chow Test.

Table 2 Panel Regression Model Selection Test Results

Substructure	Statistic Test	p-value	Decision
Substructure I	Chow Test	0.000	Fixed Effect Model (FEM)
	Hausman Test	0.000	Fixed Effect Model (FEM)
Substructure II	Chow Test	0.000	Fixed Effect Model (FEM)
	Hausman Test	0.000	Fixed Effect Model (FEM)

Source: Data Analysis Results (2024)

Based on Table 2 above, the Chow substructure I and II tests obtained p-value (0.000) < 0.05, so the estimation model that is suitable to be applied to estimate parameters is the Fixed Effect Model (FEM). Next, the Hausman Test is carried out which aims to determine a suitable model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). From the results of the Hausman test substructure I and II tests in the table above, a p-value was obtained 0.000 < 0.05, so the estimation model used is the Fixed Effect Model.

Hypothesis Testing

Hypothesis testing includes simultaneous testing (F test) and partial testing (t test). The test was carried out on substructure I and substructure II. Based on the selection of estimation models that have been made, the appropriate estimate is the Fixed Effect Model. The following is the substructure.

Figure 2 Substructure I

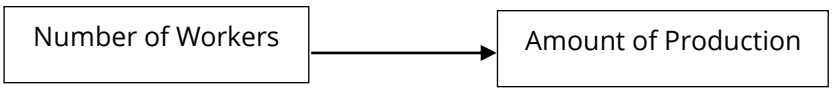
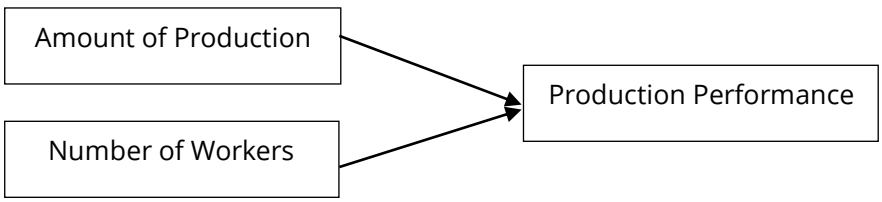


Figure 3 Substructure II



Simultaneous Test

Simultaneous Testing (F Test) Substructure I and Substructure II are intended to test the influence of the independent variable on the dependent variable together or simultaneously. Simultaneous test results are presented in the following table.

Table 3 Simultaneous Test Results

Substructure	p-value	Decision
Substructure I	0.000	Have a significant effect
Substructure II	0.000	Have a significant effect

Source: Data Analysis Results (2024)

Based on Table 3, in substructure I, namely the number of workers have a significant simultaneous effect on the amount of production, as evidenced by the p-value (0.000) < 0.05. In substructure II, the number of workers and the amount of production have a significant simultaneous effect on production performance as seen from the production value, which is proven by the p-value (0.000) < α (0.05).

Direct Effect Test (Partial Test)

Partial Test (t-test) or direct influence test to test the independent variable individually or partially has an effect on the dependent variable. Partial test or direct effect test results are as follows.

Table 4 Partial Test Results

Substructure	Variable	Coefficient	p-value	Decision
Substructure I	Intercept	-2420599	0.1008	
	Workers	3818.175	0.0000	Have a significant effect
Substructure II	Intercept	4.04 x 10^{10}	0.0104	
	Workers	5771742	0.7788	Have not a significant effect
	Amount of Production	28257.52	0.0000	Have a significant effect

Source: Data Analysis Results (2024)

Based on the results of the analysis in substructure I, it can be seen that the p-value of the variable number of workers (0.000) < α (0.05). So the decision H0 is rejected, which means that the variable number of workers have a significant direct effect on the amount of production. The effect of the variable number of workers on the variable number of production is positive because the coefficient is positive.

This can be interpreted that if the number of workers is high, the amount of production will be higher, and vice versa. From the results of the t test analysis in table 4, the substructure I equation is as follows. Amount of Production = -2420599 + 3818.175 Workers.The fixed effect model in panel data assumes that the slope coefficient of each variable is constant but the intercept varies for each cross section unit. In substructure I, the following intercepts are different for each industry.

Tabel 5 Intercept Fixed Effect Model Substructure I

No	Industry	Intercept
1	Small Foof Processing Industry	-14614128
2	Small Textile Industry	-8968938
3	Small Leather Goods Industry	603258
⋮	⋮	⋮
18	Medium Non-Metal Excavating Industry	1380513
19	Medium Metal Processing Industry	1828235
20	Medium Equipment Industry	1784731

Source: Data Analysis Results (2024)

Based on the results of the analysis in substructure II, it can be seen that the p-value of the variable number of workers (0.778) > α (0.05). So the decision H0 is accepted, which means that the variable number of workers does not have a significant direct effect on production performance as seen from the production value. Meanwhile, the production quantity variable has a p-value (0.000) < α (0.05). So the decision H0 is rejected, which means that the production quantity variable has a significant direct effect on production performance as seen from the production value. The effect of the production quantity variable on the production performance variable is positive because the coefficient is positive. This can be interpreted that if the production quantity is high, the production performance will be higher, and vice versa. From the results of the t test analysis in table 4, the substructure II equation is as follows. Production Performance = 4.04 x 10^10+ 5771742 Worker + 28257.52 Amount of Production The fixed effect model in panel data assumes that the slope coefficient of each variable is constant but the intercept varies for each cross section unit. In substructure II, the following intercepts are different for each industry.

Tabel 6 Intercept Fixed Effect Model Substructure II

No	Industry	Intercept
1	Small Foof Processing Industry	-3.32×10^{11}
2	Small Textile Industry	4.95×10^{11}
3	Small Leather Goods Industry	-1.5×10^{9}
⋮	⋮	
18	Medium Non-Metal Excavating Industry	-2.87×10^{10}
19	Medium Metal Processing Industry	1.43×10^{10}
20	Medium Equipment Industry	4.27×10^{10}

Source: Data Analysis Results (2024)

Indirect Effect Test

The indirect effect test have a purpose to determine the indirect effect of an independent variable on the dependent variable through the mediating variable, or to find out whether the relationship is significant through the mediating variable (Ghozali, 2015). The mediating or intervening variable in this research is the amount of production. Test the indirect effect using the Sobel Test which is presented in the following table.

Table 7 Sobel Test Results

	p-value	Decision
Number of workers → Amount of production → Production Performance	0.000	Have a significant effect

Source: Data Analysis Results (2024)

From the results of the Sobel test using the Sobel calculator, it was obtained that p-value (0.000) < α (0.05). So it can be concluded that the number of workers has a significant effect on production performance through the amount of production.

Coefficient Of Determination

The coefficient of determination is used to assess the ability of the independent variable to explain the dependent variable. The coefficient of determination of the substructure I dan substructure II is presented in the following table.

Table 8 Coefficient Of Determination

Substructure	
Substructure I	0.997
Substructure II	0.998

Source: Data Analysis Results (2024)

To calculate the total coefficient of determination, the path analysis model uses the R2 value with the following formula.

$$P_{e1} = \sqrt{1 - R_1^2} = \sqrt{1 - 0.997} = 0.055$$

$$P_{e2} = \sqrt{1 - R_2^2} = \sqrt{1 - 0.998} = 0.045$$

Total coefficient of determination

$$R_m^2 = 1 - P_{e1}^2 P_{e2}^2$$

$$R_m^2 = 1 - (0.055^2)(0.045^2) = 0.999$$

So the total coefficient of determination from path analysis is 0.999. So the contribution of the variable influence of the number of workers, the number of production on production performance where the number of production as a mediating variable is 99.9%, while the remaining 0.1% is influenced by other variables outside the model or not included in the research.

DISCUSSION

The Effect Of The Number Of Workers On The Amount Of Production

Based on the first hypothesis, it shows that the number of workers influence the amount of production in Malang City Industry with a p-value of 0.000 < 0.05, this shows that the first hypothesis is proven. These results can show that having a large workforce will increase the amount of production in Malang City Industry.

The results of this research are supported by research from Virnayanti & Darsana (2018) which states that worker has a positive and significant effect on the production volume of Wooden Sculpture Craftsmen. Likewise, research from Fachrizal (2016) shows that worker has a significant influence on the amount of production in the leather craft industry in Merauke Regency. These findings are in accordance with the research by Cirillo & Ricci (2020) and Panshin et al. (2019) show that the number of workers have an effect on amount of production.

The Effect Of Number Of Workers On Production Performance

Based on the second hypothesis, it shows that the number of workers does not have a significant effect on production performance as seen from the production value or production income in Malang City Industry with a p-value of 0.778 > 0.05, this shows that the second hypothesis is not proven.

The results of this research are not in line with Hidayat's (2018) research that the number of workers has a significant effect on the production value of large and medium industries in Malang Regency and is also not in accordance with Dangin & Marhaeni's (2019) research which states that worker has a positive and significant effect on performance. industry as seen from the income of craftsmen in the leather craft industry in Badung Regency. However, this research's results are in line with research by Sudirman, et al (2023) which shows that the number of workers does not have a significant direct effect on the performance of micro, small and medium enterprises.

The Effect Amount Of Production On Production Performance

Based on the third hypothesis, it shows that there is an effect of the amount of production on production performance as seen from the production value or production income in Malang City Industry with a p-value of 0.000 < 0.05, this shows that the third hypothesis is proven. These results can show that by producing a large amount of production it will increase production performance as seen from the production value or production income in the Malang City Industry.

The result of this research is in accordance with the research from Dangin & Marhaeni (2019) which show the amount of production has a positive and significant effect on industrial performance as seen from the income of craftsmen in the leather craft industry in Badung Regency. These results are also in accordance with research by Rahman, et al (2020) that the amount of production has a positive and significant effect on the income of the small batik industry in the West Feedandangan village, Sumenep district.

The research results of Prastio & Thoín (2021) and Pradnyawati & Cipta (2021) also state that there is a positive and significant influence between the amount of production and industrial income.

The Effect Of The Number Of Workers On Production Performance Through The Amount Of Production

Based on the fourth hypothesis, it shows that there is an influence of the number of workers on production performance as seen from the production value or production income through the amount of production in Malang City Industry with a p-value of 0.000 < 0.05, this shows that the fourth hypothesis is proven. These results can show that having a large workforce will increase the amount of production, with an increased amount of production it will also increase production performance as seen from the production value or production income in the Malang City Industry.

The result of this research is in accordance with research from Virnayanti & Darsana (2018) which show that the number of workers has a positive and significant effect on the amount of production. The amount of production has a positive and significant effect on industry performance as seen from revenue.

This result is in accordance with research by Dangin & Marhaeni (2019), Rahman, et al (2020), Prastio & Thoín (2021) and Pradnyawati & Cipta (2021). The variable number of production can mediate the influence of the variable number of workers on production performance as seen from production value or income.

CONCLUSION

Based on the panel data analysis result with mediating variables that have been done, the following are the conclusions of this research:

1. The number of workers has a significant effect on the amount of production in Malang City Industry
2. The number of workers does not have a significant effect on production performance in Malang City Industry
3. The amount of production has a significant effect on production performance in Malang City Industry
4. The number of workers has a significant effect on production performance through the amount of production in Malang City Industry

Therefore, it is hoped that industrial leaders need to increase the number of workers so that production increases, and the increased production will increase the performance of industrial production in Malang City.

SUGGESTION

This research is not free from several limitations and weaknesses but analysis can still be carried out. The first limitation is the research data, namely the research period used in this research is still limited because it was only carried out for two years, namely 2021-2022 because that is the only data available. Apart from that, this research also only took samples from small industries and medium industries, because data for large industries was not available.

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