



THE EFFECT OF WAGE LEVELS, INVESTMENT, AND THE COVID-19 PANDEMIC AS DUMMY VARIABLES ON COAL INDUSTRY EMPLOYMENT IN INDONESIA 2014-2023

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Abstract

This study analyzes the effect of wage levels, investment, and the COVID-19 pandemic as dummy variables on employment in the Indonesian coal industry during the 2014-2023 period. Using a quantitative approach with multiple linear regression analysis on panel data, the results show that the three independent variables simultaneously have a significant effect on employment. Partially, the wage level is found to have a significant negative effect on employment, consistent with classical economic theory which states that an increase in wages can increase production costs and encourage companies to reduce labor demand or substitute capital. Investment has a significant positive effect on labor absorption, supporting the neoclassical investment theory which explains that an increase in capital will boost productivity and labor demand through a multiplier effect. The COVID-19 pandemic (as a dummy variable) also shows a significant negative effect on employment, confirming the adverse impact of this external shock on the coal industry labor market. The coefficient of determination (R-squared) of 98.95% indicates that variations in wage rates, investment, and the COVID-19 pandemic are able to explain almost all variations in employment, while the rest is explained by other variables outside the model. This study provides important implications for the government in formulating effective employment and investment policies, as well as for companies in optimizing operational and employment strategies amid market dynamics.

Keywords:

Labor Absorption, Wage Rate, Investment, COVID-19 Pandemic, Coal Industry

BACKGROUND

Indonesia is one of the world's largest coal producers with reserves reaching 39.89 billion tons by 2022. The coal mining sector contributes around 3.2% to Indonesia's Gross Domestic Product (GDP). Labor absorption in this sector has experienced complex fluctuations, with a significant decline due to the COVID-19 pandemic.

Data shows that the number of workers in the sector fluctuated from 244,836 in 2014 to 234,567 in 2021. An increase in wages has the potential to influence the company's decision



in determining the amount of labor absorbed, especially in the context of optimizing production costs (Nugraha et al., 2020).

Investment will increase the capital stock, which in turn will increase the marginal productivity of labor and encourage an increase in labor demand (Solow, 2018). Most existing studies examine employment in the mining sector in general, but there are limited studies that focus specifically on the coal industry. This study includes a dummy variable (COVID-19 pandemic) which is still limited in previous studies that are more general.

THEORETICAL FRAMEWORK

1. LABOR DEMAND THEORY

The main theory underlying labor demand is the Value of Marginal Product (VMP) theory. This theory states that firms will continue to employ labor up to the point where the value of the marginal product of labor (VMPL) equals the marginal cost of labor, which in a competitive labor market is the wage rate (W), (Hertomo, 2020). The company will maximize profits when $VMPL = W$. If $VMPL > W$, the company can increase profits by increasing labor. If $VMPL < W$, the company can increase profits by reducing labor.

2. THEORY OF LABOR ABSORPTION

Labor absorption is the amount of labor that is absorbed or absorbed to work in a particular business unit (Bellante & Jackson, 2019). According to (Simanjuntak, 2019), labor absorption is a certain amount of labor used in a certain business unit or in other words, labor absorption is the number of workers who work in a business unit. In the context of the coal industry, labor absorption is an important indicator in measuring the sector's contribution to the national economy (Rakhmawati & Boedirocminarni, 2018).

3. THEORY OF WAGES

Classical economic theory explains that when wages increase, the company's production costs will increase, so companies tend to reduce the use of labor to maintain operational efficiency (Marshall, 2018). According to (McConnell et al., 2019), labor demand is a derived demand that depends on the firm's output demand. When wages increase, the



company's production costs will increase, so companies tend to reduce the use of labor to maintain operational efficiency.

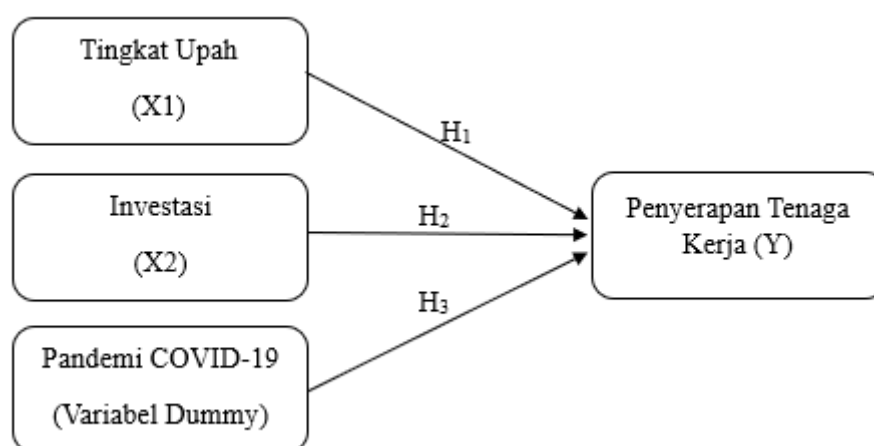
4. THEORY OF INVESTMENT

Neoclassical investment theory explains that investment will increase the capital stock, which in turn will increase the marginal productivity of labor and encourage an increase in labor demand (Solow, 2018). In the context of the coal industry, investment can take the form of building new processing facilities, modernizing technology, or expanding production capacity (Malik, 2013). This investment will create a multiplier effect on labor absorption, both directly through operational needs and indirectly through increased economic activity in the surrounding area (Nuraini, 2017).

5. COVID-19 PANDEMIC

The COVID 19 pandemic has resulted in a decline in global economic demand, logistical disruptions, and the implementation of health protocols that affect company operations (ILO, 2021). This impact is reflected in company policies that adjust the number of workers in an effort to reduce operational costs.

In general, the conceptual model of this research can be described as follows:



Picture 1. Framework

Source: Data processed by researchers, (2025)



Based on the problem formulation and hypothesis framework above, the hypothesis of this study can be formulated as follows:

- Hypothesis 1 (H1): The wage rate has a significant negative effect on coal industry employment in Indonesia.
- Hypothesis 2 (H2): Investment has a significant positive effect on coal industry employment in Indonesia.
- Hypothesis 3 (H3): The COVID-19 pandemic has a significant negative effect on coal industry employment in Indonesia.

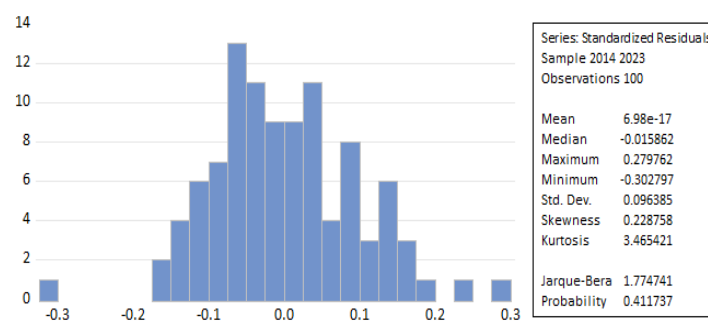
METHOD

In this study, the type of approach that will be used is a quantitative research approach. The quantitative method is a scientific approach that looks at a situation that can be classified between variables. The type of data used uses secondary data and this data is collected in the form of time series, namely data that has been collected sequentially with different times during the period 2014 to 2023 using the covid-19 pandemic as a dummy variable.

The population in this study are all coal industry companies operating in Indonesia from 2014 to 2023. Given that this research uses a secondary data analysis approach with national aggregate data, the sample used is the 10 largest provinces in the coal industry in Indonesia over a 10-year period (2014-2023).

RESULT

1. Normality Test



Source: Eviews 12, data processed by researchers (2025)

Based on the results of the normality test above, it is stated that the resulting probability value is greater than the significance value, namely $0.411737 > 0.05$. So the data in this study is normally distributed.



2. Multicollinearity Test

Variance Inflation Factors			
Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.014133	147.5203	NA
Tingkat Upah	0.008197	233.8951	4.265954
Investasi	0.000244	12.16142	1.968035
COVID-19	0.001132	4.724921	2.834953

Source: Eviews 12, data processed by researchers (2025)

Based on the test table above, the value of Centered VIF is the variable wage rate (X1), investment (X2), COVID-19 (Dummy) <10 , meaning that the value obtained from the processed data is free from multicollinearity symptoms.

3. Autocorrelation Test

Durbin-Watson stat	1.807525
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Source: Eviews 12, data processed by researchers (2025)

In the results of this study, the Durbin-Watson Statistic value is 1.807525, meaning that the value is more than -2 and less than 2 ($-2 < 1.807525 < 2$). This value can also mean that this research data can be free from autocorrelation symptoms.

4. Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.084758	0.067903	1.248228	0.2150
Tingkat Upah	-0.022222	0.051714	-0.429717	0.6684
Investasi	0.018816	0.008913	2.111033	0.2374
COVID-19	-0.023677	0.019214	-1.232253	0.2209

Source: Eviews 12, data processed by researchers (2025)

Based on this test, all probabilities of the wage level variable (X1), investment (X2),



COVID-19 (Dummy) exceed the significance value, which is 0.05. So this research model is free from heteroscedasticity symptoms.

5. Multiple Linear Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.249511	0.118882	10.51048	0.0000
Tingkat Upah	-0.458885	0.090539	-5.068367	0.0000
Investasi	1.155436	0.015605	74.04269	0.0000
COVID-19	-0.134178	0.033640	-3.988625	0.0001

Source: Eviews 12, data processed by researchers (2025)

- The constant value obtained is 1.249511. This can be explained that if the wage rate (X1), investment (X2), and COVID-19 (dummy variable) are 0, then the value of a coal industry employment in Indonesia (Y) is 1.249511.
- The regression coefficient value for the wage level variable (X1) is -0.458885. This means that if the wage level variable (X1) increases by one percent, the coal industry employment variable in Indonesia (Y) decreases by -0.458885, and vice versa. If the variable wage rate variable (X1) decreases by one percent, the coal industry employment variable in Indonesia (Y) will increase by -0.458885.
- The regression coefficient value for the investment variable (X2) is 1.155436. This means that if the investment variable (X2) increases by one percent, the coal industry employment variable in Indonesia (Y) will increase by 1.155436, and vice versa. If the investment variable (X2) decreases by one percent, the coal industry employment variable in Indonesia (Y) will decrease by 1.155436.
- The regression coefficient value for the COVID-19 variable (dummy) is -0.134178. This means that if the COVID-19 (dummy) variable increases by one percent, the coal industry employment variable in Indonesia (Y) decreases by -0.134178, and vice versa. If the COVID-19 (dummy) variable decreases by one percent, the coal



industry employment variable in Indonesia (Y) will increase by -0.236813.

6. T-Test (Partial Test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.249511	0.118882	10.51048	0.0000
Tingkat Upah	-0.458885	0.090539	-5.068367	0.0000
Investasi	1.155436	0.015605	74.04269	0.0000
COVID-19	-0.134178	0.033640	-3.988625	0.0001

Source: Eviews 12, data processed by researchers (2025)

- The results of the t-test on the wage level variable (X1) show that the wage level variable (X1) has a t-statistic of -5.068367, which is smaller than the t-table of 1.9847 with a wage level value (Prob. = 0.0000), because $0.0000 < 0.05$, then the wage level (X1) has a significant negative effect on the employment of the coal industry in Indonesia (Y).
- The results of the t-test on the investment variable (X2) show that the investment variable (X2) has a t-statistic of 74.04269, greater than the t-table of 1.9847 with an investment value (Prob. = 0.0000), because $0.0000 < 0.05$, then investment (X2) has a significant positive effect on the absorption of coal industry labor in Indonesia (Y).
- The results of the t-test on the COVID-19 (dummy) variable show that the COVID-19 (dummy) variable has a t-statistic of -3.988625, smaller than the t-table of 1.9847 with a value of COVID-19 (Prob. = 0.0001), because $0.0001 < 0.05$, then COVID-19 (dummy) has a significant negative effect on the employment of the coal industry in Indonesia (Y).

7. F-Test (Simultaneous Test)

F-statistic	3140.436
Prob(F-statistic)	0.000000

Source: Eviews 12, data processed by researchers (2025)



Using a significance level of $\alpha = 0.05$, $df1 = 3$, and $df2 = 96$, the F-table value is 2.70. If the F-count value $> F_{table}$, then the overall regression model is significant. In this case, $F_{count} = 3140.436 > F_{table} = 2.70$. The conclusion from the p-value is that this regression model is significant overall, which means that the independent variables of wage level (X1), investment (X2), COVID-19 pandemic (dummy) simultaneously (simultaneously) on the dependent variable of coal industry employment in Indonesia (Y).

8. Coefficient of Determination (R-square)

R-squared	0.989913
Adjusted R-squared	0.989598

Source: Eviews 12, data processed by researchers (2025)

In the coefficient of determination or R² test, it is obtained that the adjusted r-squared value is 0.989598 or it can be said that this value is equal to 98.95%. This means that the amount of variation in the variable wage level (X1), investment (X2), and COVID-19 (dummy) is able to explain the absorption of coal industry labor in Indonesia (Y) by 98.95%, while the remaining 1.05% can be explained by other variables outside this research model.

DISCUSSION

1. Effect of Wage Level (X1) on Labor Absorption in the Coal Industry in Indonesia (Y)

In the wage level variable (X1), it can be concluded that the research results obtained have a significant negative effect on the employment variable in Indonesia (Y). The resulting coefficient value of -0.458885 can be interpreted that a value if there is an increase of 1%, there will be a decrease in employment in Indonesia of -0.458885%. However, the probability value of the wage level variable (X1) has a value of $0.0000 < 0.05$ (alpha), it can be concluded that the wage level variable (X1) has a significant negative effect on the employment of the coal industry in Indonesia (Y).

In the interpretation of the results in accordance with the research, it can also be concluded that these results are in accordance with classical economic theory, which explains that there is a negative relationship between the level of wages and the amount of labor demanded by the company (Marshall, 2018). According to (McConnell et al., 2019), labor



demand is a derived demand that depends on the firm's output demand. When wages increase, the company's production costs will increase, so companies tend to reduce the use of labor to maintain operational efficiency.

2. The Effect of Investment (X2) on Labor Absorption in the Coal Industry in Indonesia (Y)

In the investment variable (X2), it can be concluded that the research results obtained have a significant positive effect on the coal industry employment variable in Indonesia (Y). The resulting coefficient value of 1.155436 can be interpreted that a value if there is an increase of 1%, there will be a decrease in employment in Indonesia by 1.155436%. However, the probability value of the investment variable (X2) has a value of 0.0000 < 0.05 (alpha), it can be concluded that the investment variable (X2) has a significant positive effect on the employment of the coal industry in Indonesia (Y).

In the interpretation of the results in accordance with the research, it can also be concluded that these results are in accordance with the neoclassical investment theory explaining that investment will increase the capital stock, which in turn will increase the marginal productivity of labor and encourage an increase in labor demand (Solow, 2018). In the context of the coal industry, investment can be in the form of building new processing facilities, modernizing technology, or expanding production capacity (Malik, 2013).

3. Effect of COVID-19 Pandemic (Dummy) on Labor Absorption in the Coal Industry in Indonesia (Y)

In the COVID-19 pandemic variable (dummy), it can be concluded that the research results obtained have a significant and negative effect on the coal industry employment variable in Indonesia (Y). The resulting coefficient value of -0.134178 means that if there is an increase of 1%, there will be a decrease in employment in Indonesia of -0.134178%. However, the probability value of the COVID-19 pandemic variable has a value of 0.0001 < 0.05, it can be concluded that this variable has a significant and negative effect on the absorption of coal industry employment in Indonesia.

The COVID-19 pandemic created a perfect economic storm, hitting demand and supply simultaneously, limiting mobility and increasing uncertainty. These collectively forced companies to scale back operations and, consequently, drastically reduced employment across all sectors of the Indonesian economy (Fauzi Rahman & Suharto, 2021).



CONCLUSION

Based on the results of the analysis of research data regarding the effect of wage levels, investment and the COVID-19 pandemic on employment in Indonesia, it can be concluded that:

1. The wage rate, investment, and COVID-19 pandemic have a significant effect on coal industry employment in Indonesia. This suggests that the three factors are collectively important in explaining fluctuations in employment.
2. The results show that the wage rate has a significant negative effect on coal industry employment in Indonesia. This indicates that to increase the level of wages on labor absorption is always supported by an increase in labor productivity, capital investment, and production technology.
3. The results show that investment has a significant positive effect on labor absorption in the coal industry in Indonesia. This shows that increasing investment is crucial in creating jobs and absorbing labor.
4. The results show that the COVID-19 pandemic has a significant negative effect on coal industry employment in Indonesia. This confirms that the COVID-19 pandemic has a real adverse impact on the labor market.
5. In the coefficient of determination or R² test, the adjusted r-squared value is 98.95%. This means that the amount of variation in the level of wages, investment, and the COVID-19 pandemic is able to explain the absorption of coal industry labor in Indonesia by 98.95%, while the remaining 1.05% can be explained by other variables outside this research model.

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