

Research article

Determinants of Unemployment Rate in Indonesia: A Dynamic Panel Data Approach

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*Corresponding author email: rizkiyatuloke@gmail.com**ABSTRACT**

Unemployment is a common problem faced by developing countries such as Indonesia. As one of the indicators of economic development, unemployment has a complex nature and has an impact on various aspects. This study was conducted to determine the conditions and variables that affect the unemployment rate in Indonesia from 2014-2023. The data analysis used is a dynamic panel data econometric model using Generalized Method Moments (GMM). This model was developed by Arellano Bond that meets the criteria of unbiased, valid, and consistent. The results of the analysis show that the variables of economic growth, human development index, average years of schooling, total population, foreign direct investment, domestic investment, and number of poor people have a significant effect on the unemployment rate. In addition, the unemployment rate in the previous period also had a significant effect on the unemployment rate in the period when the study was conducted. The findings in the study provide information on strategies to stabilize labor demand and supply, increase investment, and implement efficient short-run and long-run policies as an effort to reduce unemployment in Indonesia.

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Indonesia, as a developing country, has a high population growth rate. Quoted from the World Population Review as of 10 November 2024, Indonesia's population increased by around 2 million people from 2023, which was 281 million, then increased to 283,488,000 people in 2024. The high quantity of human resources makes Indonesia the fourth most populous country in the world (Shaturaev, 2021). For developing countries, too high population growth will slow down development (Peterson, 2017). Most developing countries face unemployment as an alarming socioeconomic problem (Abada et al., 2021). Unemployment is one aspect that is an important indicator of economic development (Fung & Nga, 2022). High levels of unemployment can have a negative impact on economic conditions. The problem of unemployment does not support the realization of economic growth (Kukaj, 2018). Unemployment has become a threat to society in all aspects, both economically and socially (Alawad et al., 2020). When there is an increase in unemployment, it means that individuals will lose wages and the country will lose factors of production to produce goods and services (Siddiq, 2021). Economic indicators such as economic growth and the level of capital formation or investment in a country can affect the unemployment rate (Alrayes & Wadi, 2018). Increased investment can expand productive projects and create new jobs, which will lead to expanded employment opportunities for the community (Alrabba, 2017).

In a study by Alawad et al. (2020) analyzed the relationship between educational indicators and unemployment rates, and it is stated that a person who does not have formal qualifications and academic achievements will find it difficult to get a job. The human development index as an

indicator of human capital formation can increase opportunities for individuals to gain access to better jobs (Benedict, 2019). Social indicators can also affect the level of unemployment, a study conducted by Muhammad & David (2019) shows that the variables of poverty and unemployment have a relationship that indicates the possibility of causality. The condition of high population can also be a problem and the rise in population not only increases unemployment but also accumulates unemployment (Siddiq, 2021).

Figure 1 illustrates the condition of the open unemployment rate in Indonesia, which fluctuated from 2014-2023. Based on the data, the open unemployment rate in Indonesia fluctuates and tends to decrease from 2016 to 2019. After previously experiencing an increase in 2015 which increased by 0.24% compared to the open unemployment rate in 2014, the open unemployment rate began to increase and reached its peak in 2020 at 7.07%, this is the impact of COVID-19 pandemic. In the following year the open unemployment rate in Indonesia began to decline even though it was still relatively high.

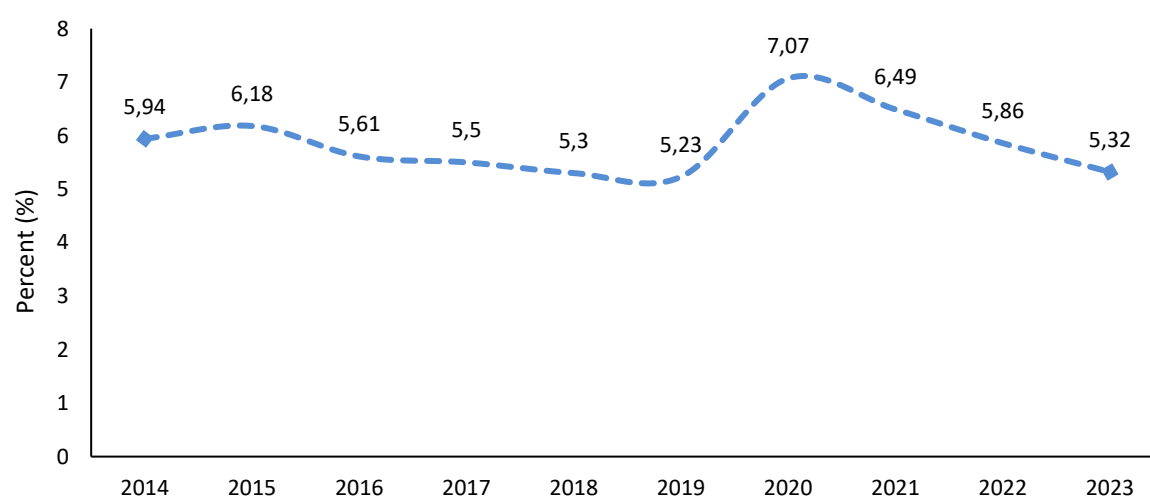


Figure 1: Open Unemployment Rate in Indonesia 2014-2023

Source: BPS Indonesia (2024)

Previous study conducted by Madito & Khumalo (2014) on unemployment in South Africa for the period 1967 to 2013 found that there is a negative relationship between economic growth and the unemployment rate. Economic growth and unemployment have a negative relationship, where an increase in economic growth will result in a reduction in the unemployment rate (Adelowokan et al., 2019). Economic growth occurs when GDP increases. The increase in gross domestic product is driven by an ever-increasing aggregate demand that affects production factors and lowers the unemployment rate (Mohamed, 2024). Study conducted by Pasara & Garidzirai (2020) states that capital formation with investment can have a positive impact on reducing the unemployment rate. This can show how economic indicators impact the unemployment rate. Investment and economic growth not only increase demand but can also expand production capacity. An increase in demand and production capacity will have a positive impact on increasing the availability of employment (Jonsson et al., 2021). Investments can increase net equity as well as expand available jobs in currently growing industries (Durguti et al., 2021).

Human resource development is an important aspect to increase individual productivity, provision of work skills is needed to create work-ready human resources (Anifowose & Chummun, 2025). Human capital affects productivity and efficiency, which can affect an individual's chances of getting a job (Kukaj, 2018). The risk of high unemployment rates is the result of individuals with little or no education (Blinova et al., 2015). However, the high level of education possessed by individuals cannot reduce unemployment without the quality of education that is relevant to the needs of the labor market (Anas & Musah, 2023). Additionally, the increasing population will certainly affect the amount of supply or available labor force. However, if it is not matched by the demand for labor from the business world, this has the potential to increase unemployment (Dosi et al., 2018). Panel

data studies conducted (Imtiaz et al., 2020) state that population and unemployment have a positive relationship and high population can have an impact on unbalanced labor demand and supply. This means that it is important to maintain stability between the size of the labor force and available jobs. The inconsistency in the findings of previous study on the determinants of unemployment is shown by Chand et al. (2018) who found that economic growth has a significant negative effect on the unemployment rate. Meanwhile, a study by Kumar (2024) explored economic growth without being followed by an increase in employment (jobless growth). Study by Agustina et al. (2023) stated that the human development index has a positive impact on the unemployment rate. In contrast to the study of Jeguirim (2021) which states that the human development index has a negative effect on unemployment, and education has a positive impact on the unemployment rate (Hjazeen et al., 2021). Meanwhile, a study by Şerifoğlu (2023) states that the level of education is able to reduce unemployment by increasing labor absorption.

The study by Maijama'a et al. (2019) states that population growth does not have a significant influence on the unemployment rate. Meanwhile, the study by Mohamud et al. (2023) states that population growth has a positive impact on increasing unemployment. Foreign investment has a negative impact on the unemployment rate (Johnny et al., 2018). However, the study of Olabiya et al. (2024) states that foreign investment has a positive impact on unemployment. Domestic investment has a significant influence on unemployment (Dhanoon et al., 2020). The study of Saka & Moyanga (2024) found that investment growth in a particular sector does not have a significant impact on unemployment.

Poverty can significantly affect the unemployment rate Muhammad & David (2019). A study (Halleröd et al., 2015) that discussed the complexity of the relationship between poverty and unemployment found that poverty does not always have a significant effect on unemployment. This difference concludes that there is some debate regarding the relationship of economic growth, human development index, average years of schooling, foreign direct investment, domestic investment, and number of poor people to the unemployment rate. There are still gaps in the study due to inconsistent data selection. Differences in observation areas in the regression analysis also lead to conflicting findings on unemployment. Many previous studies have not clearly distinguished between the short-run and long-run effects of macroeconomic variables in influencing unemployment. The lack of use of analytical methods that are able to separate these two types of impacts creates a void that still needs to be answered by future study. Previous study has not examined the short- and long-run relationships between economic growth (Niare & Mariko, 2023), human development index (Haji et al., 2024), average years of schooling (Abada et al., 2021), population (Durguti et al., 2021), foreign direct investment (Aderounmu et al., 2021), domestic investment (Saryadi et al., 2024), and number of poor people (Kukaj, 2018). This study seeks to fill the gap by empirically analyzing the dynamic relationship between these variables and their impact on the unemployment rate in both short and long run.

This study was conducted using dynamic panel data regression through the Generalized Method Moment (GMM) model developed by Arellano Bond. In this dynamic panel data model, the lag of the dependent variable is used which is positioned as an explanatory variable to analyze the short-run and long-run effects. This model will produce unbiased, consistent, and efficient estimators. Thus, the purpose of this study is to analyze the short-run and long-run relationship between these variables and the unemployment rate in Indonesia. The findings in this study are expected to be a reference and consideration for the government in making decisions because expanding employment is the focus of a policy. In addition, the results of this study can be used as empirical study that reviews the factors that influence the unemployment rate, extending the existing literature to generalize the relationship between variables to alleviate unemployment. This background explains how economic growth, human development index, average years of schooling, total population, foreign direct investment, domestic investment, and the number of poor people can affect the unemployment rate. In the second section, the methods used in the study are explained. In the third section, the results of the analysis and discussion are presented. It is ended by formulating conclusions and implications of the findings.

2. RESEARCH METHODS

2.1. Data

The type of secondary data used in this study is panel data from 34 provinces in Indonesia, for the period from 2014 to 2023. There are eight variables studied, including the open unemployment rate, economic growth, human development index, average years of schooling, total population, foreign direct investment, domestic investment, and the number of poor people. The data used is sourced from BPS Indonesia. The description of the variables in this study is presented in Table 1 as follows.

Table 1. The Description of Variables

Variables	Description	Source
Open unemployment rate (<i>U</i>)	Percentage of the number of unemployed to the number of the workforce (%)	BPS
Economic growth (<i>EG</i>)	Percentage change in the value of Gross Regional Domestic Product (GRDP) of a region in a certain period compared to the GRDP of the previous period (%)	BPS
Human development index (<i>HDI</i>)	A relative index of human quality of life development measured by composite indicators such as health (life expectancy); education (expected years of schooling and average years of schooling); and decent living standards (per capita expenditure) (index)	BPS
Average years of schooling (<i>AYS</i>)	The number of years spent by people aged 25 years and over in formal education (year)	BPS
Total population (<i>TP</i>)	The total number of individuals inhabiting a particular geographic area during a particular time period (person)	BPS
Foreign direct investment (<i>FDI</i>)	The total value of investment inflows made by foreign investors to establish or acquire control of a company operating in another country (USD million)	BPS
Domestic investment (<i>DI</i>)	The total value of investment made by domestic investors to establish or develop businesses in the country (IDR Billion)	BPS
The number of poor people (<i>NPP</i>)	The number of people whose average per capita expenditure per month is below the poverty line (person)	BPS

2.2. Model Specifications

Data processing was carried out using an econometric application, namely Stata-16 software. The dynamic panel model can be explained in the following equation:

$$y_{i,t} = \delta y_{i,t-1} + x_{i,t}\beta + u_{i,t} \quad (1)$$

where, $y_{i,t}$ is the i -th observation unit in period t . δ is the Coefficient of the explanatory endogenous variable; $x_{i,t}$ is a Vector of observations of the dependent variable; β is a vector of the predictor variables' coefficients; $u_{i,t}$ is the Panel regression error for the i -th observation unit in the t -time period.

Model specification of open unemployment rate (*U*) using independent variables of economic growth (*EG*), human development index (*HDI*), average years of schooling (*AYS*), total population (*TP*), foreign direct investment (*FDI*), domestic investment (*DI*) and number of poor people (*NPP*) can be explained in the following Equation (2):

$$U_{i,t} = \delta U_{i,t-1} + a_1 EG_{i,t} + a_2 HDI_{i,t} + a_3 AYS_{i,t} + a_4 TP_{i,t} + a_5 FDI_{i,t} + a_6 DI_{i,t} + a_7 NPP_{i,t} + u_{i,t} \quad (2)$$

where, δ is a scalar, x_{it} is a row vector of size K and β is a column vector of size K . In other words x_{it} represents a matrix of size $1 \times k$ and β represents a matrix of size $k \times 1$, with K indicating the number of independent variables in the model. With the expectation that $u_{i,t}$ is a one-way error component. It is assumed that independently and identically normally distributed (independent and identically distributed/IID) with average 0 and variance σ_u^2 that is $\mu_i \sim N(0, \sigma_u^2)$, and $v_{i,t} \sim N(0, \sigma_v^2)$.

The coefficient in the dynamic model equation is the short-run effect of $X_{it} \cdot \beta$ which is known as the short-run multiplier. Meanwhile, $(\beta/1 - \beta)$ is the long-run impact of changes in X_{it} which is then known as the long-run multiplier. In a simple dynamic panel regression model, where the dependent lag variable is the only independent variable, it can be explained in the following equation:

$$y_{i,t} = \delta y_{i,t-1} + u_{i,t} \quad (3)$$

In the dynamic panel data regression estimation model, there are two approaches, namely First Different GMM (FDGMM) and System GMM (SYSGMM). The FDGMM approach was developed by Arellano-Bond. The use of this method aims to determine the dynamic panel data model with the best GMM estimation that meets the criteria of unbiased, valid, and consistent. The FDGMM approach can be explained in the following equation:

$$y_{i,t} - y_{i,t-1} = \delta(y_{i,t} - y_{i,t-2}) + (x_{i,t} - x_{i,t-1}) \quad (4)$$

Parameter estimation based on the Arellano-Bond method uses the GMM principle to obtain consistent predictions. The GMM estimator for δ is obtained by minimizing the quadratic function, so the following equation is obtained:

$$\hat{\delta} = \left[(N^{-1} \sum_{i=1}^N Z_i \Delta y'_{i,t-1}) \hat{w} (N^{-1} \sum_{i=1}^N Z_i \Delta y'_{i,t-1}) \right]^{-1} \left[(N^{-1} \sum_{i=1}^N Z_i \Delta y'_{i,t-1}) \hat{w} (N^{-1} \sum_{i=1}^N (Z'_i \Delta y_i)) \right] \quad (5)$$

In order to obtain a consistent estimate for δ that is an efficient estimator, two 103steps are taken by substituting the weights \hat{w} into $\hat{\lambda}^{-1}$. Thus the GMM Arellano Bond estimation can be explained in the following equation:

$$\hat{\delta} = \left[(N^{-1} \sum_{i=1}^N (\Delta y_{i,t-1} Z_{diff})) \hat{\lambda}^{-1} (N^{-1} \sum_{i=1}^N (\Delta y_{i,t-1} Z_{diff})) \right]^{-1} \left[(N^{-1} \sum_{i=1}^N (\Delta y_{i,t-1} Z_{diff})) \hat{\lambda}^{-1} (N^{-1} \sum_{i=1}^N (Z'_{diff} \Delta y_i)) \right] \quad (6)$$

This equation provides an unbiased, consistent, and efficient Arellano-Bond GMM estimate. The SYSGMM method (System Generalized Moment Method) aims to estimate the system equation by integrating the moments of the first different condition and the moments of the level condition. The one-step system estimator based on the equation can be explained as follows:

$$\hat{\delta} = \left[(N^{-1} \sum_{i=1}^N \varphi_{i,-1} Z_{sys}) \widehat{W} (N^{-1} \sum_{i=1}^N Z'_{sys} \varphi_i) \right]^{-1} \left[(N^{-1} \sum_{i=1}^N \varphi_{i,-1} Z_{sys}) \widehat{W} (N^{-1} \sum_{i=1}^N Z'_{sys} \varphi_i) \right] \quad (7)$$

The estimator $\hat{\delta}$ is a consistent estimator and does not depend on the magnitude of the weights \widehat{W} . Blundell-Bond adapted the $\hat{\delta}$ obtained through the estimator by replacing $\widehat{W} = \varphi^{-1}$ by:

$$\hat{\varphi}^2 = N^{-1} \sum_{i=1}^N Z'_{sys} \hat{q}_i \hat{q}'_i Z_{sys} \quad (8)$$

An efficient two-step Blundell-Bond system estimator is produced, as described in the following equation:

$$\hat{\delta} = \left[(N^{-1} \sum_{i=1}^N \varphi'_{i,-1} Z_{sys}) \hat{\varphi}^{-1} (N^{-1} \sum_{i=1}^N Z'_{sys} \varphi_{i,-1}) \right]^{-1} \left[(N^{-1} \sum_{i=1}^N \varphi'_{i,-1} Z_{sys}) \hat{\varphi}^{-1} (N^{-1} \sum_{i=1}^N Z'_{sys} q_i) \right] \quad (9)$$

The Blundell-Bond two-step efficient system estimator produces greater effectiveness when compared to the one-step efficient system estimator.

3. RESULTS AND DISCUSSION

3.1. Result

Before conducting the estimation analysis, the initial stage is to present descriptive statistics to provide an overview of the characteristics of the data used. This presentation is important to understand the condition and variation of panel data during the observation period. All variables in this study have the same number of observations, reflecting balanced panel data. There is considerable variation in some variables, such as population and domestic investment, as reflected by the maximum value and high standard deviation (Table 2). This indicates that there are significant differences in conditions between regions or over time in the sample. In contrast, the open unemployment rate, economic growth, and average years of schooling show a relatively stable distribution of data, with minimum and maximum values that are not far apart and a fairly low standard deviation. This indicates that the differences between entities tend to be smaller than the other variables.

Table 2. The Result of Descriptive Statistics

Variables	Mean	Min	Max	Std. Dev.	N
<i>U</i>	5.212	1.400	10.950	1.843	340
<i>EG</i>	4.628	-15.74	22.940	3.587	340
<i>HDI</i>	70.157	0.470	82.460	5.634	340
<i>AYS</i>	8.438	5.760	11.450	0.988	340
<i>TP</i>	7,802.24	618.2	50,345.20	11,007.8	340
<i>FDI</i>	910.83	2.000	8,283.70	1,412.99	340
<i>DI</i>	10,632.73	0.000	95,202.1	15,808.45	340
<i>NPP</i>	793.44	0.000	4,836.45	1,126.72	340

The next step is to conduct a unit root test on each variable to determine the nature of data stationarity in Table 3. This test is important because most panel data estimation methods assume that the variables are stationary, so that the estimation results are not biased. The test results show that the open unemployment rate, economic growth, average years of schooling, population, foreign investment, and poverty headcount are stationary at the level as indicated by a p-value below the 5% significance level (0.05). The only variable that is not stationary at level is domestic investment, but it becomes stationary after the first differentiation.

Table 3. The Result of Unit Root Test

Variables	<i>p</i> -value	
	Level	First Different
$\Delta(U)$	0.000	0.000
$\Delta(EG)$	0.000	0.000
$\Delta(HDI)$	0.008	0.000
$\Delta(AYS)$	0.000	0.000
$\Delta(TP)$	0.000	0.000
$\Delta(FDI)$	0.000	0.000
$\Delta(DI)$	0.811	0.000
$\Delta(NPP)$	0.000	0.000

Table 4 reports the heterogeneity test is conducted to determine whether there are differences in characteristics across individuals (cross-section) in the panel data used. Heterogeneity is important to consider so that the model used can describe structural differences between observation units, so that the estimation results become more accurate. Based on the results of the CD Pesaran test displayed in Table 4, the CD statistic value is 17.710 with a p-value of 0.000 smaller than the 5% significance value (0.05). It can be concluded that there is cross-unit dependence in the model. This condition indicates that ordinary estimation methods, such as fixed effect or random

effect panel regression, may not be sufficient. Therefore, the use of the generalized method of moments is appropriate because it can overcome the problem of cross-unit dependence.

Table 4. Results of Panel Data Regression Analysis with SYS-GMM

Dependent variable = U				
Variables	Coefficient	Std. Error	Z-test	p-value
U_{t-1}	0.4544	0.0218	20.8400	0.0000
EG	-0.1331	0.0057	-23.2400	0.0000
HDI	0.0083	0.0004	19.3700	0.0000
AYS	0.1790	0.0632	2.8300	0.0050
TP	0.0000	0.0000	2.2900	0.0220
FDI	-0.0001	0.0000	-3.2500	0.0010
DI	-0.0000	0.0000	-3.0200	0.0030
NPP	0.0003	0.0001	2.5700	0.0100
Diagnostic test	Stat	p-value		
CD-test	17.710	0.000		
Sargan test	28.402	0.957		
Arellano Bond	1.804	0.071		

At this stage, the panel data regression model was estimated using the two-step system GMM (SYS-GMM) approach. This model was chosen because it provides a valid instrument. Table 4 presents the intercept and slope values for each exogenous variable based on the SYS-GMM approach model. Table 3 shows the intercept and slope values for each independent variable using the SYS-GMM approach. The intercept value is the ratio of changes in one variable to changes in other variables. This refers to the change in the independent variable for each unit change in the dependent variable. The model specification tests used in the GMM method are the Arellano and Bond tests (consistency test) and the Sargan test (instrument validity test). The Sargan test is conducted to identify the overall validity of instrument variables whose number exceeds the number of estimated parameters (overidentifying conditions), with the null hypothesis that the instrument is valid. The expected result in this Sargan test is not to reject the null hypothesis with a significance of 5% if the p-value is less than the significance level (0.05), then the null hypothesis will be rejected. Based on Table 4, it is known that the criteria for the perfection of the dynamic model in the SYS-GMM model are 28.402. The results of the Sargan test are not significant, with a probability value of 0.957 greater than the 5% significance level (0.05). This shows that H_0 is accepted, meaning that there is no correlation between errors, thus the requirements for a valid instrument are met. The Arellano bond test is used to ensure that the error term does not correlate serially on AR(2) so that the estimate obtained is consistent with the null hypothesis that there is no autocorrelation. The estimation is said to be consistent if in the second-order first difference there is no autocorrelation between residuals and endogenous variables. Based on the Arellano Bond test results in Table 4, it shows that the use of the dynamic panel data method with the generalized Arellano Bond method of moment analysis approach meets the criteria of the statistically best model. The Arellano Bond test results are not significant at the 5% or 0.05 significance level at a p-value of 0.071, so it can be concluded that the test meets the criteria for estimator consistency.

Table 5 reports the test results of the pooled least squares estimator are biased upwards, and the fixed effects estimator is biased downwards. The estimator of the SYS-GMM method falls between the two. This result fulfills the criteria of the unbiasedness test.

Table 5. Parameter Estimation of Unbiasedness

Variable	FEM	SYS-GMM	PLS
U_{t-1}	0.3617	0.4544	0.7737

Table 6 report the result of dynamic panel regression method that can be used to determine the effect of endogenous variables in the short and long-run. In a dynamic panel regression model,

the coefficient β is the short-run effect of changes in x_i . β is then called the short run multiplier while $(1-\delta)$ is the long run effect of changes in x_i . Table 6 reports the long-run parameter test, it is known that the economic growth has a significant negative effect on the unemployment rate partially. The short-run elasticity coefficient value of 0.1331 and the p-value is 0.0000 which is smaller than the significance value of 5% (0.05). Meanwhile, the value of the long-run elasticity coefficient is -0.2440 and the p-value is 0.0000 which is smaller than the significance value of 5% (0.05). The existence of a negative relationship between economic growth and the unemployment rate indicates that every 1% increase in economic growth will reduce unemployment.

Table 6. The Estimation Results of Short and Long-run Effects

Dependent variable = U				
Variables	Short-run Elasticity	p-value	Long-run Elasticity	p-value
EG	-0.1331	0.000	-0.2440	0.000
HDI	0.0083	0.000	0.0152	0.000
AYS	0.1790	0.005	0.3282	0.003
TP	0.0000	0.022	0.0000	0.022
FDI	-0.0001	0.001	-0.0003	0.002
DI	-0.0000	0.003	-0.0000	0.002
NPP	0.0003	0.010	0.0006	0.006

The short-run elasticity coefficient of the human development index variable is 0.0083 with a p-value of 0.000 smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is 0.015 with a p-value of 0.000 which is smaller than the significance value of 5% (0.05). These results indicate a significant positive effect of the human development index on the unemployment rate, where every 1% increase in the human development index will have an impact on increasing unemployment both in the short and long-run. The average years of schooling indicator shows a significant positive influence on the unemployment rate. The short-run elasticity coefficient value is 0.179 with a p-value of 0.0050 which is smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is 0.328 with a p-value of 0.0030 which is smaller than the significance value of 5% (0.05). This means that every increase in the average length of schooling by 1% will have an impact on increasing unemployment.

The short-run elasticity coefficient of the total population variable is 0.000 with a p-value of 0.022 which is smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is 0.000 with a p-value of 0.022, which is smaller than the significance value of 5% (0.05). This result shows that population has a significant positive effect on the unemployment rate. This means that in the short and long run, every 1% increase in population will have an impact on increasing unemployment. The foreign investment variable has a significant negative effect on the unemployment rate. The short-run elasticity coefficient value is -0.000 with a p-value of 0.001 which is smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is -0.000 with a p-value of 0.002 which is smaller than the significance value of 5% (0.05). Any increase in foreign investment by 1% will have an impact on decreasing the unemployment rate in the short and long-run.

The test result of the domestic investment indicator shows a significant negative effect on the unemployment rate in Indonesia. The short-run elasticity coefficient value of -0.000 with a p-value of 0.0030 is smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is -0.000 with a p value of 0.002 which is smaller than the significance value of 5% (0.05). In the short and long-run, any increase in domestic investment by 1% will result in a decrease in the unemployment rate. The number of poor people variable has a significant positive effect on the unemployment rate. The short-run elasticity coefficient value is 0.000 with a p-value of 0.0100 which is smaller than the significance value of 5% (0.05). Meanwhile, in the long run, the coefficient value is 0.000 with a p-value of 0.0060 which is smaller than the significance value of 5% (0.05). This means that every 1% increase in the number of poor people will have an impact on the increase in the unemployment rate.

3.2. Discussion

The findings of this study show that economic growth has a significant negative effect on the level of unemployment, both in the short and long-run. This result is, of course, in line with Okun's law, which states that the relationship between unemployment and economic growth is negative or inversely proportional. Increasing economic growth will have an impact on reducing the unemployment rate. Economic growth is highly dependent on the factors of production produced by a country (Susilo et al., 2020). Economic growth will support the availability of jobs that can be utilized by the labor force. An increase in economic growth can certainly reduce the unemployment rate. This result is supported study by Hjazeen et al. (2021) which states that economic growth can reduce unemployment in Jordan, where economic growth can support people in getting employment opportunities. Economic growth has a positive impact on job creation to reduce the unemployment rate (Conteh, 2021). These findings provide implications in the form of theoretical information to reduce unemployment through increased economic growth. Efforts to reduce unemployment can be done by optimizing strategic sectors that have the potential to absorb more labor. Supporting innovation and entrepreneurship to expand employment opportunities to reduce unemployment levels sustainably.

The results show that in the short-run, the human development index has a significant positive effect on the unemployment rate, as well as in the long-run. The human development index standard, which is still in the medium category, is the cause of the increasing unemployment rate. The high quality of human resources has an impact on the high competition to get a job, while the availability of employment does not experience significant growth. Human capital is an important component because qualified human resources can be the basis for economic growth in a region (Akinyele et al., 2023). In accordance with the argument of endogenous growth theory, the human development index is one of the indicators that affect economic growth (Leiwakabessy & Amaluddin, 2020). This result is supported by study conducted Agustina et al. (2023) which states that the human development index has a significant positive effect on the unemployment rate in Indonesia. The findings conclude that in order to reduce the unemployment rate, it can be done by optimizing the human development index which is then followed by the creation of a more flexible labor market so that the labor market structure can absorb a larger number of workers.

Average years of schooling have a significant positive effect on the unemployment rate in Indonesia, both in the short and long-run. Education is an important factor in improving the quality of life and income of the community; the higher the education, the higher the wages earned. However, this makes people more selective in finding work. One of the factors for the increase in unemployment is the prestige among the educated community for employment status (Marjit et al., 2022). The level of wages that are deemed inappropriate, so not a few choose to be temporarily unemployed until they get a more decent job.

As competition in the world of work gets tougher, education alone is not enough to be considered. Other factors, such as networking, knowledge, skills, or even specific expertise, are needed. The results of this study are supported by Niare & Mariko (2023) where individuals with high levels of education worsen unemployment conditions in the West African Economic and Monetary Union (WAEMU). The findings conclude that, as an effort to reduce the unemployment rate, it is important to formulate strategic policies that focus on the adjustment between the quality of prospective workers and the needs of demand in the labor market. Developing a curriculum that is more adaptive to industry needs can be one of the efforts to achieve a match between the skills of prospective workers and the skills needed by the labor market.

The results of the study show that population size has a significant positive effect on the unemployment rate., both in the short and long-run. The increasing population can be a challenge in the field of population, especially in employment. A high population can be a problem if it is not matched by an increase in the number of employment opportunities. A high population can result in a larger labor supply than demand, leading to increased unemployment (Anifowose & Chummun, 2025). This result is consistent with Malthus' theory, where higher population growth will also increase the number of workers. When there are limited jobs available, competition will be fierce,

and those who are left out will become unemployed. Study conducted by Haji et al. (2024) states that population growth has a positive effect on the unemployment rate in Zanzibar for the period 1990-2020. This result is consistent with Malthus' theory, where higher population growth will also increase the number of workers. When there are limited jobs available, competition will be fierce, and those who are left out will become unemployed.

In the short-run, foreign direct investment has a significant negative effect on the unemployment rate, as well as in the long-run. This result is based on Harrod-Domar's theory, which states that investment will increase the economy's ability to produce. An increase in aggregate foreign investment will affect job creation (Folawewo & Adeboje, 2017). Foreign investment is expected to have a positive impact on employment by expanding job creation (Durguti et al., 2021). Study conducted by Johnny et al. (2018) states that foreign investment has a negative impact on the unemployment rate in Nigeria for the period 1980-2015. The findings of this study provide implications in the form of theoretical information regarding efforts to reduce unemployment through increased foreign investment. Simpler administrative licensing can improve a conducive investment climate. The government must be able to ensure political, legal, and economic stability to increase foreign investors' confidence.

Domestic investment has a significant negative effect on the unemployment rate in Indonesia, both in the short and long run. Investment is an important factor responsible for economic development and growth in a region. Domestic investment has a positive impact on the economic conditions of a country, as it supports the availability of infrastructure that can improve the welfare of the community (Widarni & Wilantari, 2021). The existence of domestic investment can create jobs and increase income for the community (Febriyanti et al., 2024). This result is in line with study by Alrabba (2017), where investment has a significant negative effect on the unemployment rate in Jordan in 1992-2015. Study conducted by Dhanoon et al. (2020) also states that domestic investment can reduce the unemployment rate in Middle Eastern and North African countries for the period 2003-2018. This study concludes that domestic investment is important to reduce unemployment. The government needs to reduce bureaucratic barriers that can hinder the investment process and domestic business development. Make it easier for investors to access the capital market to create a positive investment climate.

Based on the study results, it is known that in the short-run and long-run, the number of poor people has a significant positive effect on the unemployment rate in Indonesia. Poverty and unemployment variables have a relationship that shows the possibility of cause and effect (Muhammad & David, 2019). Poverty and unemployment have an interrelated relationship; when the community is classified as poor, it will be difficult for them to fulfill their educational needs at a higher level. This condition will make it difficult for them to adapt to all technological advances, which in turn will make it difficult for them to get a job with a more decent wage. Study conducted by Aderounmu et al. (2021) also states that poverty has a significant positive effect on the unemployment rate in Nigeria. The findings conclude that it is important to increase access to education and health for the poor to encourage the improvement of human resources. Social assistance of a social nature also needs to be provided to encourage the economic independence of the poor.

4. CONCLUSIONS

Based on the results of data analysis and discussion, it is known that the level of economic growth has a significant negative effect on the level of unemployment. This is because increased economic growth supports the creation of more jobs and has an impact on the absorption of labor. The human development index variable has a significant positive effect on the unemployment rate. Indonesia's HDI, which is classified as a medium category, has an impact on hampering efforts to alleviate unemployment. The average years of schooling has a significant positive effect on the unemployment rate. The high average years of schooling make people very selective in determining their jobs, and they prefer to delay working. The total population has a significant positive effect on the unemployment rate. Higher population growth has an impact on the increasing number of labor force and tighter job competition. Foreign direct investment and domestic investment have a

significant negative effect on the unemployment rate. High investment supports increased production to produce goods and services. The number of poor people has a significant positive effect on the unemployment rate in Indonesia. The condition of poverty in Indonesia does not support the fulfillment of education and the competence of the community to get a more decent job. The main finding in this study shows the existence of a dynamic relationship, where the value of a variable can be influenced by other variables. Unemployment is a complex social problem that can affect various aspects. Based on these findings, implicit policies are needed that can reduce the unemployment rate in Indonesia. Short and long-run policies are needed to continue to reduce the unemployment rate every year. Increasing investment, diversifying the economic sector, and improving the quality of the human development index can be pursued to minimize unemployment in Indonesia. This study is limited to 34 provinces in the last 10 years, with a limited selection of variables on economic, educational, and social indicators. For future study, we suggest expanding the scope of observational data and conducting a comparative analysis to provide further insights into this issue.

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