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The Long- and Short-Run Effects of GDP, Labor Force, and Industrial Growth on Unemployment in Indonesia

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ABSTRACT

This study investigates the impact of GDP per capita, labor force participation (LABOR), and manufacturing value added (MVA) on unemployment (UE) in Indonesia using annual data from the World Development Indicators (WDI) for the period 1990–2023. Employing an Error Correction Model (ECM), the analysis distinguishes between short-term dynamics and long-term relationships among the variables. The findings reveal that, in the long run, GDP per capita, LABOR, and MVA significantly influence unemployment. In the short run, however, only GDP per capita and MVA are found to have a statistically significant effect. The estimated Error Correction Term (ECT) of -0.505068 indicates a moderate speed of adjustment towards long-term equilibrium following short-term shocks.

Policy Implications: The results suggest that promoting inclusive economic growth and enhancing the industrial sector's contribution to GDP can play a crucial role in reducing unemployment in Indonesia. Moreover, optimizing labor force participation through targeted employment and education policies could strengthen the long-term resilience of the labor market.

Research Contribution: This study contributes to the existing body of literature by offering a comprehensive long-term and short-term perspective on the macroeconomic determinants of unemployment in a major emerging economy. By using up-to-date data and applying the ECM framework, the research provides valuable insights for policymakers seeking evidence-based strategies to address labor market challenges in developing countries.

Key Word: Unemploymen, ASEAN, ECM, GDP

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Introduction

Unemployment is one of the fundamental issues faced by many developing countries, including Indonesia. Although Indonesia's economic growth has been relatively stable since the 1990s, the challenge of reducing unemployment in a sustainable manner remains an important agenda in national development policy. One of the main reasons is that high economic growth does not always go hand in hand with jobless growth. This condition raises concerns about the effectiveness of economic development strategies in creating inclusive and sustainable employment opportunities.

In the framework of economic development, Gross Domestic Product (GDP) per capita is often used as the main indicator in measuring a country's economic performance (Todaro & Smith, 2009). However, the critical question that needs to be answered is the extent to which GDP growth per capita really has an impact on improving employment conditions in Indonesia. In addition, demographic changes and increased labor force participation also affect labor market dynamics. The increase in the number of

workers that is not accompanied by adequate job creation can push the unemployment rate higher (Mankiw & Taylor, 2020).

On the other hand, the manufacturing industry sector plays a strategic role in economic development and labor absorption, especially in developing countries. Manufacturing Value Added (MVA) is an important indicator that reflects the extent to which the industrial sector contributes to GDP and opens new job opportunities. However, there are challenges in ensuring that the sector's growth impacts improving workforce welfare and reducing the unemployment rate. The mismatch between industrial needs and labor skills, weak innovation, and dependence on commodity-based exports are the main obstacles.

Given the complexity of the relationship between these macroeconomic variables and unemployment, an analytical approach is needed that can capture short-term and long-term dynamics simultaneously. The Error Correction Model (ECM) approach is the right method in this context because it can identify the direct influence (short-run dynamics) and long-run equilibrium effects between variables. Using time series data from 1990 to 2023, this study seeks to provide a deeper understanding of the mechanisms of the relationship between GDPs per capita, labor force, manufacturing value-added, and unemployment in Indonesia.

This study has several main objectives, empirically analysing the influence of GDP per capita, labor force participation, and the added value of the manufacturing sector (MVA) on the unemployment rate in Indonesia in the short and long term.

This research offers several significant new contributions, both theoretically and practically. One of the main novelties of this study is the special attention to the role of the manufacturing sector (MVA) in explaining the dynamics of unemployment. Although the manufacturing sector has long been considered a key driver of job creation, empirical studies examining its impact quantitatively on unemployment in Indonesia are still limited, especially in the context of long-term periods.

The results of this study are expected to provide more focused policy recommendations, especially in terms of how to optimize economic growth and the development of the industrial sector to create wider jobs. These empirical findings are important to support the formulation of inclusive and evidence-based employment policies.

Theoretical Framework

The problem of unemployment in the economy cannot be separated from the interaction between various macroeconomic factors such as economic growth, the structure of the industrial sector, and the dynamics of the labor force. The theoretical framework underlying the relationship between these variables is generally based on classical economic theory, Keynesian, and endogenous growth theory.

According to classical economic theory, the labor market will always achieve equilibrium through the price (wage) mechanism, so unemployment is only temporary (Barnett, 2004). However, especially in developing countries, such mechanisms often do not work perfectly. This is where the Keynesian approach comes into play, emphasizing that aggregate demand, including labor demand, is heavily influenced by the level of consumption, investment, and government spending. In this context, Gross Domestic Product (GDP) is an important indicator (Sinaga, et al., 2018; Bryniuk, 2023; Bankapur, et al., 2018) that reflects the strength of aggregate demand and the economy's capacity to absorb labor.

An empirical study by Shuaib, et al (2015) that examined the relationship between GDP and unemployment in Nigeria shows that GDP growth does not always automatically lower unemployment. They found that fast-growing sectors of the economy are not necessarily labor-intensive, so they do not contribute significantly to absorbing the new workforce. This strengthens the argument that economic structure has an important role in determining the effectiveness of growth in job creation (Schubert & Kroll, 2016; Bartolucci, et al., 2018).

In endogenous growth theory, the role of the industrial sector, specially manufacturing, is considered crucial in driving sustainable economic growth and job creation. This sector not only absorbs labor directly but also creates a multiplier effect on other sectors. Szirmai and Verspagen (2015) in their study on the role of industrialization in developing countries stated that the added value of

manufacturing contributes significantly to the reduction of unemployment, especially when the sector can transform technologically and productivity.

In addition, labor force participation is also an important variable within the framework of employment theory (Veracierto, 2008). According to the theory of demographic and labor transition, an increase in the number of labor forces that is not accompanied by a growth in employment opportunities will increase the unemployment rate. Study Oderinde & Adeniyi (2022) in Nigeria found that increased labor force participation must be balanced with investment in training and education so that the available workforce has skills that match market demand.

Thus, the theoretical framework in this study is based on the concept that GDP per capita, the added value of the manufacturing sector, and labor force participation have a significant influence on unemployment. However, the direction and strength of its influence can differ depending on the structural and institutional conditions of a country. Therefore, the empirical approach used in this study aims to examine these relationships in the Indonesian context, considering short-term and long-term dynamics.

Methodology

This study uses a quantitative approach with a time series-based econometric method to analyze the influence of Gross Domestic Product (GDP) per capita, labor force participation (LABOR), and Manufacturing Value Added (MVA) on the unemployment rate (EU) in Indonesia during the period 1990–2023. The goal of this approach is to evaluate both the long-term and short-term relationships between these variables.

Data Sources and Types

The data used in this study is annual secondary data obtained from the World Development Indicators (WDI) published by the World Bank. The variables used include:

EU: Unemployment rate (% of the total labor force),
GDP: Gross Domestic Product per capita (in US dollars),
LABOR: Labor force participation (% of the working-age population),
MVA: Added value of the manufacturing sector (% of GDP).

Stages of Analysis

To explain the dynamics of the relationship between variables in the short and long term, the Error Correction Model (ECM) model is used (Basuki & Prawoto, 2019). This model allows the separation of short-term effects from long-term equilibrium relationships among non-stationary variables that have cointegration relationships.

The analysis steps are carried out as follows:

a. Stationariness Test (Unit Root Test)
   To ensure the absence of spurious regression problems, all variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) test (Herranz, et al., 2017). The variable must be stationary at the first level of differentiation (I (1)) for ECM to be applied.
b. Johansen Cointegration Test
   After confirming that all variables are I (1), a Johansen cointegration test (Granger, 2004) is performed to identify whether there is a long-term relationship between the variables. If at least one cointegration vector is found, then the ECM model is worth using.
c. ECM Model Estimation
   ECM (Gujarati & Porter, 2009) is built on the results of long-term regression, by incorporating an error correction component (ECT) to capture the adjustment process towards long-term equilibrium.

ECM Model Specifications
The ECM model used in this study can be written as follows:

$$\Delta UEt=\alpha 0+\alpha 1\Delta GDPt+\alpha 2\Delta LABORt+\alpha 3\Delta MVAt+\lambda ECTt-1+\varepsilon t$$

Information:

D	expresses the change (first differentiation) of the variable
UEt	Unemployment rate in the t-year,
GDPt	Gross Domestic Product per capita in the year t
LABORt	Labor force participation in the th year
MVAt	Added value of the manufacturing sector in the year t
ECTt−1	Error Correction Term of the previous period long-term relationship
L	ECT coefficients that indicate the speed of adjustment towards long-term equilibrium
ETH	Error term

Results of Analysis and Discussion

Table of the results of the Group Unit Root Test stationary test on the variables: EU, GDPCAP, MVA, LABOR in the period 1990–2023.

Table 1. Stationary Test

Group unit root test: Summary

Series: UE, GDPCAP, MVA, LABOR

Sample: 1990 2023

Method	Statistic	Prob.**	Statistic	Prob.**
Levin, Lin & Chu t*	1.4309	0.9238	-8.0598	0.0000
Im, Pesaran and Shin W-stat	3.7658	0.9999	-7.3709	0.0000
ADF - Fisher Chi-square	1.5357	0.9921	60.9952	0.0000
PP - Fisher Chi-square	3.5993	0.8913	68.1352	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Data processed

This test is performed to determine whether the time series data contains root (non-stationary) units or not. You use four approaches: Levin, Lin & Chu (LLC) t*; Im, Pesaran and Shin (IPS) W-stat; ADF - Fisher Chi-square; and PP - Fisher Chi-square. The test results are divided into two parts: The first column (statistical value and high probability): showing the results for the level (without differentiation), or raw data, and the second column (very low statistical value and probability 0.0000): showing the results for the differentiated data (after the first differentiation is performed).

On the level data stationary test, all probability values are well above 0.05 (even close to 1), which means there is not enough evidence to reject H0 (Hypothesis Zero). That is: all four variables are not stationary at the level. Whereas the stationary test on the first differential data, all probabilities < 0.05 (even = 0.0000), which means subtracting H0. That is: the four variables become stationary after the first differentiation.

Coefficient Interpretation

a. Coefficient = -0.2151, Prob = 0.0000; Meaning: In the long run, every 1% increase in GDP per capita will decrease the unemployment rate by 0.2151%, assuming other variables are constant. Statistically significant (p-value < 0.01). This shows that economic growth has an important role in reducing unemployment in the long run.

b. Coefficient = -0.0803, Prob = 0.0853; Meaning: Every 1% increase in labour force participation will decrease unemployment by 0.0803%, statistically significant at a significance level of 10% (p > 0.05). This could suggest that an increase in the number of workers has the potential to lower unemployment, the results are statistically strong, likely due to labour quality or skills mismatch.
c. Coefficient = 0.1825, Prob = 0.0000; Meaning: Every 1% increase in manufacturing added value increases unemployment by 0.1825% in the long run. Statistically significant (p < 0.01). These results may be counter-intuitive, but they may indicate that the growth of the manufacturing sector in Indonesia is capital-intensive, not labour-intensive, or that there is a technological transformation that replaces human labour (Anyanwu, 2017).

Table 2. Long-Term Regression

Dependent Variable: UE

Sample: 1990 2023

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDPCAP)	-0.2151	0.0143	-15.0742	0.0000
LOG(LABOR)	-0.0803	0.0451	-1.7793	0.0853
LOG(MVA)	0.1825	0.0226	8.0870	0.0000
C	-1.1456	0.2262	-5.0647	0.0000
R-squared	0.8851	Mean dependent var		0.0498
Adjusted R-squared	0.8736	S.D. dependent var		0.0158
S.E. of regression	0.0056	Akaike info criterion		-7.4153
Sum squared resid	0.0009	Schwarz criterion		-7.2358
F-statistic	77.0258	Hannan-Quinn criter.		-7.3541
Prob(F-statistic)	0.0000	Durbin-Watson stat		0.7913

Source: Data processed

To find out if there is a long-term relationship (cointegration) between variables in the ECM model, one common method is to test the stationarity of the Error Correction Term (ECT). If ECT is stationary at the level, then there is a long-term relationship between the variables in the model.

Table 3. Cointegration Test

Null Hypothesis: ECT has a unit root			
Exogenous: Constant			
Lag Length: 3 (Automatic - based on SIC, maxlag=8)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.19032	0.03060
Test critical values:	5% level	-2.96397	
*MacKinnon (1996) one-sided p-values.			

Source: Data processed

ECT is stationary, which means that there is cointegration (long-term relationship) between the variables in the ECM model (EU, GDP per capita, LABOR, and MVA). Because ECT is proven to be stationary, the Error Correction Model (ECM) approach used is valid and valid theoretically and statistically. This suggests that despite the short-term dynamics, the system will return to long-term equilibrium, as reflected in the significant and negative ECT in the short-term ECM model.

Table 4. Short-term regression (ECM model)
Dependent Variable: D(UE)
Sample (adjusted): 1991 2023

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(GDPCAP))	-0.138645	0.048097	-2.882595	0.0075
D(LOG(LABOR))	0.046696	0.066856	0.698446	0.4907
D(LOG(MVA))	0.113073	0.043993	2.570244	0.0158
ECT(-1)	-0.505068	0.148336	-3.404887	0.002
C	-0.001601	0.001484	-1.07865	0.2899
R-squared	0.55879	Jarque Bera		2.603612
F-statistic	8.865475	Probability		0.272040
Prob(F-statistic)	0.000093	Heteroskedasticity Test: Breusch-Pagan-Godfrey		
Breusch-Godfrey Serial Correlation LM Test		Obs*R-squared		3.402552
Obs*R-squared	2.686274	Prob. Chi-Square (5)		0.4928
Prob. Chi-Square (2)	0.2610	Durbin-Watson stat		2.113291

Source: Data processed

Based on the table in the bag, there is no problem of multicollinearity (the VIF value is less than 100, Homoscedasticity is met, because the Breusch-Pagan-Godfrey test does not show heteroscedasticity. There is no autocorrelation problems based on the Durbin-Watson and Breusch-Godfrey tests. The term error is quite close to the normal distribution, although a slight deviation from normality exists. Overall, the ECM model used fulfils classical assumptions well, which means the results of the resulting estimates and inferences are reliable.

The Effect of GDP Per Capita on Unemployment in Indonesia

Coefficient = -0.138645, p-value = 0.0075. Interpretation: Any 1% increase in GDP per capita will reduce the unemployment rate by 0.1386% in the short term. Statistically significant (p-value < 0.01), which shows that economic growth has a negative effect on the unemployment rate in the short term. This is in line with economic theory that economic growth tends to create jobs and reduce unemployment (Irpan, et al., 2016).

The increase in GDP per capita generally reflects economic growth that encourages an increase in production, consumption, and investment activities (Sanchez & Liborio, 2012; CM, et al., 2025). As the economy grows, companies experience increased demand for the products and services they produce. To meet this demand, companies tend to increase production capacity by increasing the number of workers, both in the industrial, trade, and service sectors. This directly lowers the unemployment rate in the short term.

GDP growth also causes multiplier effects in various economic sectors (Gašperová, et al., 2017). For example, an increase in people's income will increase household consumption, which in turn will drive the growth of MSMEs and the informal sector. These sectors are the largest employers of labour in Indonesia. With the increase in economic activity, more jobs are created in a relatively short time, thereby reducing unemployment (Moh'd AL & Jaradat, 2019).

When the economy shows growth, investors and business actors tend to be more optimistic and confident to expand their businesses. In the short term, this will trigger the opening of new businesses or the expansion of business capacity, which of course requires additional manpower.

GDP growth is also often driven by government spending and private investment. Labor-intensive programs, infrastructure development, and other economic stimuli carried out by the government will create direct jobs in the short term, while reducing the unemployment rate.

Thus, it can be concluded that in the short term, the increase in GDP per capita has a strong influence on the decline in the unemployment rate in Indonesia. Economic growth encourages job creation directly or indirectly through increased production, consumption, and investment activities. However, for this influence to be sustainable, economic growth also needs to be inclusive and target labour-intensive sectors.

The Effect of Labor Force Participation on Unemployment in Indonesia

Coefficient = 0.046696, p-value = 0.4907. Interpretation: Any 1% increase in labour force participation would increase unemployment by 0.0467%, but it was not statistically significant (p-value > 0.05). Implications: Although there are positive effects, the effect is not significant, which may indicate that the increase in labour force participation in Indonesia does not directly lead to significant changes in the unemployment rate in the short term. This can be caused by factors such as the quality of the workforce or skills mismatches in the job market.

In the short term, the labour force does not have a significant influence on the unemployment rate in Indonesia due to several structural factors and labour market dynamics that are complex and indirect. Based on the regression results that show the variable coefficient D(LOG(LABOR)) of 0.046696 with a p-value of 0.4907, it can be concluded that the increase in the number of labour force has not had a significant impact on the change in the unemployment rate in the short term (Klinger & Rothe, 2010).

One of the main causes of this phenomenon is the delay in the absorption of labour by the labour market. The growth of the labour force, for example from new graduates or internal migration to big cities, takes time before it can be truly absorbed into the world of work. The recruitment process, adaptation to the world of work, and the readiness of the industry to absorb new workers do not happen instantly. In other words, there is a time lag between the increase in the labour force and the decrease in the unemployment rate.

In addition, the quality of the workforce is also an important factor. Many formal education graduates in Indonesia do not have the skills or competencies that are in line with the needs of the industry, so even though the number of workers is increasing, they are not able to fill the available positions immediately. This is known as skill mismatch. In the short term, employers tend to be selective in hiring workers due to high training costs and the need for operational efficiency.

On the other hand, Indonesia's vast informal sector also acts as a buffer, where most of the new workforce is not directly openly unemployed, but enters informal jobs with low productivity. This condition causes unemployment data not to always reflect the full reality of the increase in the labour force.

Research by Lee & Parasnis (2014) supports these findings, where they state that in the short term, the number of labour force does not significantly affect the unemployment rate due to structural factors and slow labour market adaptation.

Thus, it can be concluded that the growth of the labour force in the short term does not directly cause changes in the unemployment rate, because it is hampered by limited employment, skills mismatches, and suboptimal connectivity between providers and job seekers. To overcome this, long-term policies such as improving the quality of education and vocational training that are in line with market needs are needed.

The Influence of the Manufacturing Sector on Unemployment in Indonesia

Coefficient = 0.113073, p-value = 0.0158. Interpretation: Any 1% increase in the added value of the manufacturing sector will increase unemployment by 0.1131% in the short term. Statistically significant (p-value < 0.05), although there is an increase in the manufacturing sector, but here the manufacturing sector contributes to the increase in unemployment in the short term. This could show that the manufacturing sector in Indonesia is more capital-intensive than labour-intensive, so it does not create enough jobs for the workforce.

In the short term, the Manufacturing Value Added (MVA) or the added value of the manufacturing sector has a significant influence on unemployment in Indonesia because this sector plays a strategic role as a provider of employment and a driver of economic growth. Based on the regression data, the positive and significant coefficient of D(LOG(MVA)) to D(EU) shows that when the added value of the

manufacturing sector increases, paradoxically the unemployment rate also increases in the short term. This phenomenon can be explained through several structural and dynamic mechanisms within the manufacturing industry sector itself.

First, the growth of MVA in the short term is often driven by increased productivity through automation or the use of new technologies that reduce the need for labour. Manufacturing companies tend to make efficiency in the production process, including by reducing the number of workers and replacing them with more modern machines or systems. This can result in "jobless growth", which is economic growth or certain sectors that are not accompanied by job creation.

Second, the labour structure of Indonesia's manufacturing sector is still dominated by unskilled workers, while industrial transformation towards industry 4.0 requires a high-skilled workforce. In the short term, there is a mismatch between labour demand and supply, where industries need workers with certain skills that are not available in sufficient numbers in the labour market.

Third, there are adjustments in industrial restructuring. When the manufacturing sector expands or invests in new ones, in the early stages, there is often a downsizing of labour or a change of production locations that cause temporary unemployment, before new jobs are created in the medium to long term.

Research from BPS (2022) and the ILO report also show that the impact of the manufacturing sector on labour absorption is time-lagged, meaning that it will only be felt after some time due to the process of technological adaptation and restructuring.

Thus, even though the MVA is increasing, in the short term it can lead to an increase in unemployment due to labour efficiency, skills gaps, and industrial restructuring that cannot be immediately offset by the readiness of the national workforce (Samuda, 2023). For this reason, a training and skill improvement policy (reskilling) that is right on target is needed.

ECT coefficient = -0.505068, p-value = 0.0020. Interpretation: Negative and significant ECT values indicate that the system will adjust 50.5% of long-term imbalances to changes in unemployment rates in a single period. Statistically significant (p-value < 0.01), which indicates that there is a process of readjustment towards long-term equilibrium after a disturbance in the labour market. This suggests that despite short-term fluctuations in unemployment, the system will return to a significant long-term equilibrium state.

Conclusion

In the short term, the increase in GDP per capita has a **negative and significant** effect on the unemployment rate in Indonesia. This indicates that economic growth can help reduce unemployment, in line with the theory that higher economic growth tends to create more jobs. In the long run, this influence remains **negative and significant**, which confirms that sustainable economic growth is one of the key factors to reduce unemployment in the Indonesian economy.

In the short term, **no significant influence was found** between changes in the labor force and the unemployment rate. This shows that although the number of labor force is increasing, it is not directly related to the increase or decrease in unemployment in Indonesia. Perhaps other factors, such as skills and job suitability, play a greater role in influencing the unemployment rate.

In the short term, the added value of the manufacturing sector has a positive and significant influence on the unemployment rate. This suggests that although the manufacturing sector is growing, it is more capital-intensive than labor-intensive, which may not have a direct impact on labour absorption. Instead, more sophisticated or modern manufacturing sectors can replace human labor with technology, leading to a decrease in the number of jobs in the sector.

A significant negative ECT value (-0.505068) indicates that Indonesia's labor market system will readjust to long-term equilibrium in a relatively short time after the disruption. Any imbalance in unemployment will be corrected at an adjustment rate of about 50.5% per period.

Although labor force participation in Indonesia is quite high, policies that focus on workforce skill development are indispensable to ensure that the workforce has skills that suit market needs. Training and education programs based on industry needs will reduce the mismatch between the number of workers and the types of jobs available.

The government needs to encourage the development of a labor-intensive manufacturing sector or a more inclusive one for local workers. This includes supporting MSMEs in the manufacturing sector and providing incentives for companies that create new jobs in the sector. In addition, technology and automation in manufacturing need to be considered with policies that facilitate the transition of labor to other sectors that require more human labor.

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