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The Effects of Manufacturing and Trade Sector Performance, Investment, and Minimum Wages on Open Unemployment in Indonesia

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Abstract

This study is motivated by the persistently high open unemployment rate (TPT) in Indonesia, which remains a significant labor market challenge despite continuous economic growth. This study examines how sectoral economic performance, investment, minimum wage policies, and demographic factors influence unemployment dynamics across Indonesian provinces. Specifically, this study aims to analyze the effects of Gross Regional Domestic Product (GRDP) and realized investment in the manufacturing and trade sectors, Provincial Minimum Wage (UMP), and population size on the Open Unemployment Rate in Indonesia. This study employs a quantitative approach using secondary panel data covering 34 provinces in Indonesia during the period 2010–2024. The analytical method applied is panel data regression, with the Fixed Effects Model (FEM) selected as the most appropriate estimation model based on model specification tests. The results indicate that all independent variables jointly have a significant effect on the Open Unemployment Rate, with the model explaining 66% of the variation in unemployment levels. Individually, manufacturing sector Gross Regional Domestic Product (GRDP) has a positive and significant effect on the Open Unemployment Rate, whereas realized investment in the manufacturing sector and the Provincial Minimum Wage have negative and significant effects. Meanwhile, trade sector GRDP, realized investment in the trade sector, and population size do not exhibit statistically significant effects. These findings suggest that manufacturing sector performance, manufacturing investment, and minimum wage policies play important roles in shaping unemployment dynamics, although their effects differ in direction. Therefore, employment policies should prioritize labor-absorbing investment, enhance productivity in the manufacturing sector, and ensure that economic growth is accompanied by the creation of quality employment opportunities while maintaining an appropriate balance between wage policies and labor market conditions.

Introduction

Indonesia, with the largest economy in Southeast Asia and a population of over 287 million, faces significant challenges and opportunities in managing its workforce. The demographic bonus currently enjoyed, with a dominant proportion of the productive-age population (15-64 years old), is a potential engine of economic growth. However, this engine will only be meaningful if the large workforce can be optimally absorbed by the labor market [1]. The demographic bonus phenomenon presents both opportunities and challenges for the economy, particularly in the context of employment. [2] explain that an increase in the proportion of the productive-age population will only have a positive impact on economic growth if accompanied by the economy's ability to optimally absorb the workforce. Their findings indicate that although Banda Aceh City has entered the demographic bonus period since 2010, the level of readiness of the employment sector is still inadequate, as reflected in the high level of open poverty, especially among the younger age group.

Although Indonesia has experienced relatively stable economic growth over the past decade, this growth has not always been accompanied by proportional improvements in labor market performance [3,4]. According to Okun's Law, economic expansion is generally expected to reduce unemployment through increased labor demand [5]. However, the strength of this relationship depends on the structure and quality of economic growth. Growth concentrated in capital-intensive sectors may generate substantial output without creating sufficient employment opportunities [6], whereas labor-intensive sectors tend to contribute more directly to employment creation [7]. Consequently, examining aggregate economic growth alone may obscure important sectoral differences in labor absorption, making it necessary to investigate the contribution of specific sectors to unemployment dynamics.

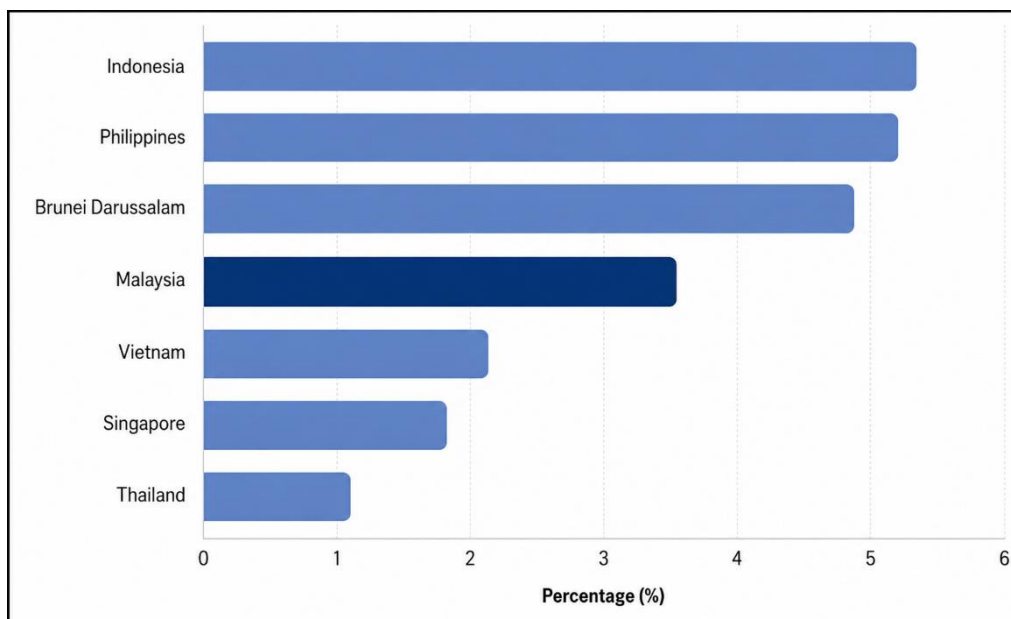


Figure 1. Open unemployment rate in ASEAN countries.

Source: International Monetary Fund [8].

Based on Figure 1, in a regional context, International Monetary Fund (IMF) projection data [8] shows that in 2024, Indonesia recorded the highest unemployment rate among ASEAN countries for which data is available, namely around 5.2 percent, followed by the Philippines at 5.1 percent, and Brunei Darussalam at 4.9 percent. Countries such as Malaysia, Vietnam, Singapore, and Thailand have lower unemployment rates, around 3.5 percent, 2.1 percent, 1.9 percent, and 1.1 percent, respectively. Indonesia's position, which is still at this highest figure, indicates that although the growth of the industrial and trade sectors has contributed to national GDP, its labor absorption has not been optimal to reduce unemployment relatively at the ASEAN level. The Open Unemployment Rate (TPT) is the primary and most critical indicator for measuring the health of Indonesia's labor market. The Central Statistics Agency (BPS) defines the TPT as the percentage of the unemployed relative to the total labor force. Unemployed individuals are those who are not working but are preparing a business, seeking employment, or have accepted a job but have not yet started work. A study by Abrar et al. [9] found that youth unemployment in Aceh Province still dominates the unemployment structure, despite a decline in the aggregate unemployment rate.

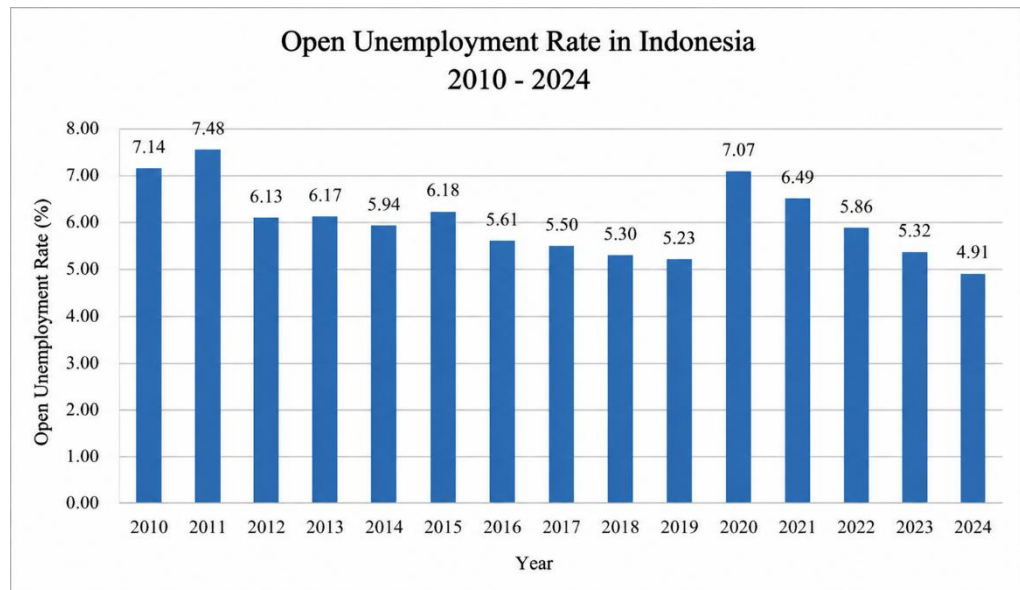


Figure 2. Indonesia's open unemployment rate (TPT), 2010–2024.

Source: Statistics Indonesia [10].

As shown in Figure 2, in August 2010, Statistics Indonesia (BPS) recorded Indonesia's unemployment rate at 7.14 percent. The unemployment rate continued to decline until 2019, when it reached 5.23 percent. Furthermore, in 2020, the world was hit by COVID-19, which also affected global employment conditions. Indonesia also experienced employment impacts. Indonesia's unemployment rate in 2020 rose drastically compared to the previous year, reaching 7.07 percent, equivalent to 7.99 million people. In 2023, Indonesia's unemployment rate returned to 5.32 percent, down from the peak of the COVID-19 pandemic. In nominal terms, this decline is encouraging, but it is still higher than the pre-pandemic period [10]. The growth of the manufacturing and trade sectors in Indonesia is influenced not only by macroeconomic dynamics but also by employment policies such as the Provincial Minimum Wage (UMP). The UMP is the lowest monthly wage that employers are required to pay to workers, applicable at the provincial level, aimed at maintaining purchasing power and employee welfare. The policy of increasing the Provincial Minimum Wage (UMP) has the potential to boost workers' purchasing power, thereby increasing demand for goods and services. However, theoretically, it could also impact unemployment if higher labor costs encourage companies to reduce hiring or even lay off workers, particularly in labor-intensive sectors such as the manufacturing and trade sectors [11,12].

In addressing these employment challenges, the role of the real sector, particularly the Manufacturing and Trade sectors, cannot be ignored. These two sectors are twin pillars that not only drive economic growth but also serve as the main support for labor absorption in Indonesia [13]. In the Manufacturing Sector, this paradox is particularly evident. The growth of added value in this sector is increasingly driven by capital-intensive and high-tech industries, such as the automotive and electronics industries, which have high productivity but relatively low labor absorption [14]. On the other hand, the Wholesale and Retail Trade Sector demonstrates a different but equally important role. This sector is the most resilient national employment buffer. In the fourth quarter of 2022, its contribution to national GDP was 13.70 percent, ranking second only to the manufacturing industry [15]. The population aged 15 years and over is a crucial indicator in employment analysis because this group is categorized as the working-age population with the potential to engage in economic activities, either as part of the labor force or as non-labor force. The working-age population includes individuals who are employed, unemployed, and economically inactive, such as students and housewives [16]. Therefore,

population growth in this age group directly influences labor market dynamics, including the open unemployment rate.

From a theoretical perspective, the relationship between the selected explanatory variables and unemployment can be explained through several complementary economic theories. Kaldor's Growth Laws suggest that manufacturing serves as the engine of economic growth because productivity improvements in this sector stimulate broader economic expansion and employment creation [17]. Meanwhile, investment theory argues that capital accumulation increases production capacity and creates additional labor demand, although the employment effect depends on whether investment is directed toward labor-intensive or capital-intensive activities [18]. In the labor market, minimum wage theory presents competing perspectives. The competitive labor market model predicts that higher minimum wages may reduce employment by increasing labor costs, whereas efficiency wage theory argues that higher wages can improve worker productivity, reduce turnover, and potentially offset higher labor costs [19]. Furthermore, David Ricardo developed a wage theory that emphasized that wages tend to approach the minimum level necessary for the reproduction of labor. Ricardo also discussed how the structure of income distribution between wages, profits, and rent is influenced by relative productivity and capital accumulation, which are closely related to the development of economic sectors. In the context of the division of labor, Ricardo observed that increased productivity can lower production costs and affect real wage levels, but the long-term distribution of profits depends on technical development and resource constraints [20].

Despite the growing body of literature, several research gaps remain. First, previous studies in Indonesia have predominantly examined aggregate economic growth or total investment [21–23], while relatively limited attention has been given to distinguishing the roles of manufacturing and trade sector performance and their realized investments in influencing unemployment. Second, empirical findings regarding the effects of sectoral output, investment, minimum wages, and population remain inconsistent, indicating that these relationships require further examination using more recent and comprehensive data.

Therefore, this study aims to analyze the effects of manufacturing and trade sector Gross Regional Domestic Product (GRDP), realized investment in both sectors, Provincial Minimum Wage (UMP), and population size on Indonesia's Open Unemployment Rate using panel data from 34 provinces over the 2010–2024 period. The findings are expected to enrich the empirical literature on regional labor markets and provide evidence-based recommendations for designing employment policies that better align sectoral economic growth with job creation.

Materials and Methods

Data

This study employs a quantitative approach using secondary data analysis. Secondary data are utilized because the study does not collect information directly from respondents. Instead, it relies on publicly available data obtained from official institutions, including Statistics Indonesia (BPS) [24] and the Ministry of Investment and Downstreaming (BKPM) [25]. The study applies panel data analysis, which combines time-series and cross-sectional dimensions to examine variations across provinces over time. The time-series dimension consists of annual observations covering the period 2010–2024, while the cross-sectional dimension comprises 34 provinces in Indonesia. The dataset is an unbalanced panel comprising 34 provincial units observed over 15 years, resulting in a total of 487 observations. This panel data structure enables the study to capture both temporal changes and regional heterogeneity in explaining variations in Indonesia's Open Unemployment Rate.

The Open Unemployment Rate is measured as a percentage. The Gross Regional Domestic Product (GRDP) of the manufacturing and trade sectors is measured in index. Realized

investment in the manufacturing and trade sectors is measured in trillion Rupiah. The Provincial Minimum Wage (UMP) is measured in Million Rupiah, while the population variable represents the number of persons aged 15 years and over. The variables and their operational definitions are presented in Table 1.

Table 1. Operational variable definitions

Variable Role	Variable Name	Variable Symbol	Operational Definition	Scale	Data Source
Dependent Variable	Open Unemployment Rate	TPT	Percentage of the workforce that is unemployed but looking for work	Percentage (%)	BPS
Independent Variable	Manufacturing Industry GDP	lnIND	Gross Value Added in the Manufacturing Industry sub-sector	Natural Logarithm (ln)	BPS
	Trade GDP	lnDAG	Gross Value Added in the Trade sub-sector	Natural Logarithm (ln)	BPS
	Realization of Investment in the Processing Industry	lnINV_IND	Total Domestic and Foreign Investment in the Manufacturing Industry Sub-sector	Natural Logarithm (ln)	BKPM
	Trade Investment Realization	lnINV_DAG	Total Domestic and Foreign Investment in the Trade sub-sector	Natural Logarithm (ln)	BKPM
	Provincial Minimum Wage	lnUMP	UMP Amount for Each Province	Natural Logarithm (ln)	BPS
	Population aged 15 years and over	lnJP	Number of Population Aged 15 Years and Over in Each Province	Natural Logarithm (ln)	BPS

Conceptual Framework

The conceptual framework illustrates in Figure 3 shows the relationship between sectoral economic performance, investment, labor market policy, demographic factors, and the Open Unemployment Rate (TPT) in Indonesia. This study assumes that unemployment dynamics are influenced by both demand-side and supply-side factors within the regional labor market. The Gross Regional Domestic Product (GRDP) of the manufacturing and trade sectors represents sectoral economic performance, where higher output is expected to influence labor demand through production expansion, although the employment effects may differ depending on sectoral characteristics and capital intensity. Similarly, realized investment in the manufacturing and trade sectors is expected to affect unemployment by increasing production capacity and creating employment opportunities, while the magnitude of its impact depends on whether investment is directed toward labor-intensive or capital-intensive activities. The Provincial Minimum Wage (UMP) represents labor market policy that may influence unemployment through its effects on labor costs, worker welfare, and firm-level employment decisions. Meanwhile, the population aged 15 years and over represents labor supply conditions, where population growth may either become an economic advantage through greater workforce availability or increase unemployment pressure when employment opportunities are insufficient. Based on these theoretical relationships, this framework proposes that GRDP, sectoral investment, minimum wage policies, and population size jointly influence variations in Indonesia's Open Unemployment Rate across provinces.

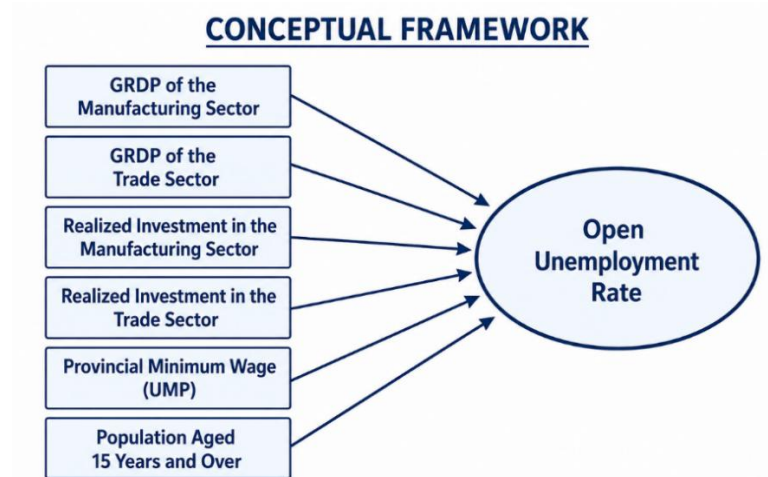


Figure 3. Conceptual framework of the study

Method

Based on the conceptual framework, the panel data econometric model estimated in this study is specified in Equation 1 as follows:

$$TPT_{it} = \beta_0 + \beta_1 \ln IND_{it} + \beta_2 \ln DAG_{it} + \beta_3 \ln INV_IND_{it} + \beta_4 \ln INV_DAG_{it} + \beta_5 \ln UMP_{it} + \beta_6 \ln P_{it} + \varepsilon_{it} \quad (1)$$

Where TPT_{it} represents the Open Unemployment Rate in province i during year t ; β_0 is the constant (intercept); β_1 to β_6 are the regression coefficients measuring the effects of the independent variables on the Open Unemployment Rate; $\ln IND_{it}$ denotes the natural logarithm of the Gross Regional Domestic Product (GRDP) of the manufacturing sector in province i during year t ; $\ln DAG_{it}$ represents the natural logarithm of the Gross Regional Domestic Product (GRDP) of the trade sector in province i during year t ; $\ln INV_IND_{it}$ denotes the natural logarithm of realized investment in the manufacturing sector in province i during year t ; $\ln INV_DAG_{it}$ represents the natural logarithm of realized investment in the trade sector in province i during year t ; $\ln UMP_{it}$ denotes the natural logarithm of the Provincial Minimum Wage (UMP) in province i during year t ; $\ln P_{it}$ represents the natural logarithm of the population aged 15 years and over in province i during year t ; ε_{it} is the error term capturing the effects of other factors not included in the model; while i denotes the cross-sectional units (34 provinces in Indonesia) and t denotes the annual observation period from 2010 to 2024.

The analysis consisted of several stages, namely descriptive statistics, model selection, classical assumption testing, and hypothesis testing. Descriptive statistics were used to summarize the characteristics and distribution of the research variables. Model selection was performed to determine the most appropriate panel data estimation model by comparing the Common Effects Model (CEM), Fixed Effects Model (FEM), and Random Effects Model (REM) through the Chow and Hausman test. Classical assumption testing was subsequently conducted to ensure the validity and reliability of the estimated model. Finally, hypothesis testing was carried out using the F-test to examine the joint significance of the independent variables, the t-test to evaluate the individual effect of each independent variable, and the coefficient of determination (R-squared) to assess the explanatory power of the model.

Results and Discussion

Descriptive Statistics

Descriptive statistics are used to provide a general overview of the characteristics of the research data, including the mean, median, maximum, minimum, and number of observations

for each variable. The variables analyzed in this study include the Open Unemployment Rate (TPT), Gross Regional Domestic Product (GRDP) of the manufacturing sector, GRDP of the trade sector, realized investment in the manufacturing sector, realized investment in the trade sector, Provincial Minimum Wage (UMP), and the working-age population. The dataset consists of 487 observations, covering 34 provinces in Indonesia during the period 2010–2024.

The Open Unemployment Rate (TPT) has an average value of 5.36%, indicating that, on average, approximately 5–6% of Indonesia's labor force was unemployed during the study period. The manufacturing sector GRDP records an average value of Rp72,676.92 billion, with the minimum value of Rp555.18 billion observed in East Nusa Tenggara Province in 2010. Meanwhile, the trade sector GRDP has an average value of Rp42,250.28 billion, with the lowest value of Rp1,473.20 billion recorded in Gorontalo Province in 2010.

The average realized investment in the manufacturing sector amounts to Rp881,151.12 million, with the minimum value of Rp627.11 million recorded in Gorontalo Province in 2010. Realized investment in the trade sector has an average value of Rp66,787.90 million, while the lowest value of Rp69.64 million was recorded in the Special Region of Yogyakarta in 2011. The Provincial Minimum Wage (UMP) has an average value of Rp2,010,422.76 per month, with the minimum wage of Rp630,000 observed in East Java Province in 2010. This reflects the relatively low wage level at the beginning of the observation period compared with subsequent years. In addition, the working-age population has an average of 5,817 thousand people across the provinces included in the sample.

Overall, the descriptive statistics reveal considerable economic disparities among Indonesian provinces. Provinces located on the island of Java, such as West Java, East Java, and DKI Jakarta, generally record the highest values for GRDP, realized investment, minimum wages, and working-age population. In contrast, provinces in Eastern Indonesia, including East Nusa Tenggara, Gorontalo, and West Papua, tend to exhibit the lowest values for these indicators. These differences suggest that economic activity and development remain concentrated in a limited number of regions, which may contribute to variations in unemployment rates across provinces.

Table 2. Descriptive statistics.

Stat.	TPT	IND	DAG	INV_IND	IND_DAG	UMP	JP
Mean	3.17	72,676.92	42,250.28	881,151.12	66,787.90	2,010,422.76	5,817
Median	3.54	14,741.64	13,228.17	363,666.69	22,792.46	1,958,170.00	3,082
Max.	4.94	741,041.4	368,883.4	10,138,914	936,340	5,067,381.00	39,393
Min.	1.40	555.18	1,473.20	627.11	69.64	630,000.00	512
Obs.	487	487.00	487.00	487.00	487.00	487.00	487

Best Model Selection

In panel data analysis, three estimation approaches are commonly employed: the Common Effects Model (CEM), Fixed Effects Model (FEM), and Random Effects Model (REM). To identify the most appropriate model, this study conducted model selection tests using the Chow Test and the Hausman Test.

The Chow Test was first performed to determine whether the CEM or FEM was more suitable. As presented in Table 3, the probability values of both the Cross-section F statistic and the Cross-section Chi-square statistic are 0.0000, which are lower than the 5% significance level (0.05). Therefore, the null hypothesis (H_0), which states that the Common Effects Model is appropriate, is rejected in favor of the alternative hypothesis (H_1). These results indicate that the Fixed Effects Model provides a better specification than the Common Effects Model.

Table 3. Chow test results.

Fixed Tests	Stat.	d.f.	Prob.
Cross-section F	17.0060	(32,448)	0.0000
Cross-section Chi-square	387.2244	32	0.0000

Subsequently, the Hausman Test was conducted to determine the most appropriate model between the Fixed Effects Model and the Random Effects Model. The null hypothesis (H_0) states that the Random Effects Model is the preferred specification, while the alternative hypothesis (H_1) favors the Fixed Effects Model. Based on the Hausman Test results presented in Table 3, the probability value is less than the 5% significance level ($p < 0.05$). Accordingly, the null hypothesis is rejected, indicating that the Fixed Effects Model is more appropriate than the Random Effects Model.

Tabel 4. Hausman test results.

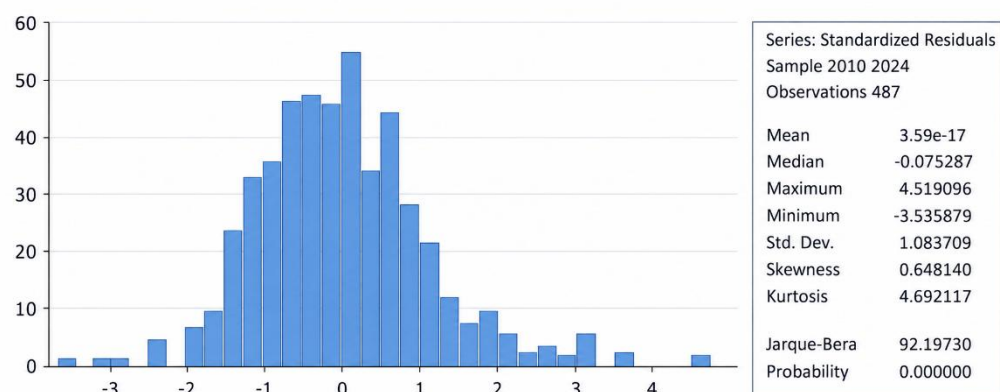
Test Summary	Chi-Sq. Stat.	Chi-Sq. d.f.	Prob.
Cross-section random	21.194	6	0.0017

Based on the results of both the Chow Test and the Hausman Test, the Fixed Effects Model (FEM) was selected as the most appropriate estimation model for this study. Therefore, all subsequent analyses and hypothesis testing were conducted using the Fixed Effects Model.

Classical Model Assumption Test Results

The classical assumption tests were conducted to ensure that the estimated regression model satisfies the assumptions required for reliable statistical inference. The tests performed in this study include the normality test, heteroskedasticity test, and multicollinearity test. An autocorrelation test was not performed because it is not a standard classical assumption test for static panel data regression models, particularly when the Fixed Effects Model (FEM) is employed.

The normality test was conducted using the Jarque–Bera test to examine whether the regression residuals follow a normal distribution. Based on the results presented in Figure 4, the Jarque–Bera statistic is 92.19730 with a probability value of 0.0000. This result indicates that the residuals are not normally distributed at the 5% significance level. However, given the relatively large sample size (487 observations), the violation of the normality assumption is not considered a serious issue because the estimators remain consistent and asymptotically normal under the Central Limit Theorem.

**Figure 4.** Normality test results.

The heteroskedasticity test was conducted to determine whether the variance of the residuals is constant across observations. The results, presented in Table 5, indicate that the probability values for LNDAG (0.1078), LNINV_IND (0.7888), LNINV_DAG (0.7538), and LNJP (0.0953) are

greater than the 5% significance level, whereas only those for LNIND (0.0005) and LNUMP (0.0062) are below the 5% significance level. Overall, the null hypothesis of homoskedasticity cannot be rejected, suggesting that the regression model is unlikely to suffer from heteroskedasticity.

Tabel 5. Heteroscedasticity test results.

Variable	Coef.	Std. Er.	t-Stat.	Prob.
LNIND	0.3553	0.1007	3.5277	0.0005
LNDAG	-0.5417	0.3362	-1.6112	0.1078
LNINV_IND	0.0244	0.0912	0.2679	0.7888
LNINV_DAG	-0.0304	0.0968	-0.3139	0.7538
LNUMP	-0.4106	0.1493	-2.7501	0.0062
LNJP	0.6693	0.4004	1.6715	0.0953
C	3.5564	2.3508	1.5128	0.1310

The multicollinearity test was performed using the correlation matrix of the independent variables to examine the presence of strong linear relationships among the explanatory variables. As presented in Table 6, most pairwise correlation coefficients are below the commonly accepted threshold of 0.90, indicating that there is no serious multicollinearity among the independent variables. Therefore, the regression coefficients can be estimated reliably without substantial distortion arising from multicollinearity.

Tabel 6. Multicollinearity test results.

Variable	LNIND	LNDAG	LNINV_IND	LNINV_DAG	LNUMP	LNJP
LNIND	1					
LNDAG	0.8672	1				
LNINV_IND	0.6969	0.7145	1			
LNINV_DAG	0.6939	0.7137	0.9704	1		
LNUMP	0.0759	0.0979	0.3960	0.4470	1	
LNJP	0.7666	0.9249	0.5957	0.5912	-0.1050	1

Panel Data Regression

Panel data regression analysis was conducted using the Fixed Effects Model (FEM), which was selected as the most appropriate estimation model based on the Chow and Hausman tests. The model examines the effects of manufacturing sector Gross Regional Domestic Product (IND), trade sector Gross Regional Domestic Product (DAG), realized investment in the manufacturing sector (INV_IND), realized investment in the trade sector (INV_DAG), Provincial Minimum Wage (UMP), and population (JP) on the Open Unemployment Rate (TPT). The regression results are presented in Table 7.

The F-test indicates that the regression model is statistically significant at the 5% level (Prob. F-statistic < 0.05), suggesting that the independent variables jointly influence the Open Unemployment Rate. Furthermore, the coefficient of determination (Adjusted R-squared) is 0.66, indicating that approximately 66% of the variation in the Open Unemployment Rate across provinces and over time can be explained by the variables included in the model, while the remaining 34% is explained by other factors outside the model.

The partial regression results indicate that the manufacturing sector Gross Regional Domestic Product (LNIND) has a positive and statistically significant effect on the Open Unemployment Rate ($\beta = 0.7248$, $p < 0.001$). This implies that, ceteris paribus, a 1% increase in the manufacturing sector GRDP is associated with an increase of approximately 0.7248 units in the Open Unemployment Rate. Similarly, realized investment in the manufacturing sector (LNINV_IND) has a negative and statistically significant effect on the Open Unemployment Rate ($\beta = -0.4835$, $p < 0.001$), indicating that higher manufacturing investment contributes to reducing unemployment. Specifically, a 1% increase in realized investment in the manufacturing

sector is associated with a decrease of approximately 0.4835 units in the Open Unemployment Rate, holding other variables constant. Furthermore, the Provincial Minimum Wage (LNUMP) also exhibits a negative and statistically significant effect on the Open Unemployment Rate ($\beta = -0.8160$, $p < 0.001$), suggesting that increases in the minimum wage are associated with lower unemployment during the study period.

In contrast, the Gross Regional Domestic Product of the trade sector (LNDAG) does not have a statistically significant effect on the Open Unemployment Rate ($\beta = 0.0611$, $p = 0.8973$). Likewise, realized investment in the trade sector (LNINV_DAG) has a positive but statistically insignificant coefficient ($\beta = 0.0945$, $p = 0.4882$), indicating that variations in trade sector investment do not significantly explain changes in unemployment. Similarly, the population aged 15 years and over (LNJP) has a positive coefficient ($\beta = 1.0980$) but does not reach statistical significance at the 5% level ($p = 0.0519$). Therefore, these three variables cannot be concluded to have a significant influence on the Open Unemployment Rate.

Tabel 7. Results of panel data regression.

Variable	Coef.	Std. Er.	t-Stat.	Prob.
C	5.6253	3.3079	1.7006	0.0897
LNIND	0.7248***	0.1417	5.1152	0.0000
LNDAG	0.0611	0.4731	0.1292	0.8973
LNINV_IND	-0.4835***	0.1283	-3.7692	0.0002
LNINV_DAG	0.0945	0.1362	0.6938	0.4882
LNUMP	-0.8160***	0.2101	-3.8839	0.0001
LNJP	1.0980	0.5634	1.9489	0.0519
R-squared = 0.6869				
Adj. R-squared = 0.6604				
F-stat. = 25.867				
Prob.(F-stat.) = 0.0000				

Note: *** indicates significance at the 1% level.

Discussion

The results indicate that the Gross Regional Domestic Product (GRDP) of the manufacturing sector has a positive and statistically significant effect on the Open Unemployment Rate. This finding suggests that growth in manufacturing output during the study period was not necessarily accompanied by proportional employment creation. One possible explanation is that the manufacturing sector in Indonesia has increasingly adopted capital-intensive production processes and advanced technologies, enabling firms to increase output through automation and productivity improvements rather than expanding their workforce [26]. Consequently, higher manufacturing output does not automatically translate into greater labor absorption. This finding partially contrasts with Kaldor's Growth Laws, which emphasize the manufacturing sector as the engine of economic growth and employment generation [27]. Instead, the results imply that the employment effects of manufacturing growth depend not only on the magnitude of output expansion but also on the production technology and industrial structure. This finding is also consistent with the studies of Jiang et al. [26] and Eder et al. [28] which reported that industrial growth driven by technological upgrading and automation tends to weaken the sector's capacity to absorb labor.

In contrast, realized investment in the manufacturing sector has a negative and statistically significant effect on the Open Unemployment Rate, indicating that increased investment contributes to reducing unemployment. This finding supports investment theory, which argues that capital accumulation expands production capacity and stimulates labor demand [18,29]. The result suggests that manufacturing investment in Indonesia continues to create employment opportunities through business expansion, factory development, and increased production activities [30]. Therefore, although manufacturing output growth alone does not necessarily generate employment, investment directed toward the manufacturing sector

appears to remain an effective instrument for reducing unemployment. This finding is in line with previous empirical studies of Matsuura & Saito [31] and Buchheim & Watzinger [32] which demonstrated that productive investment in labor-intensive industries promotes job creation and strengthens regional labor market performance.

The Provincial Minimum Wage (UMP) is also found to have a negative and statistically significant effect on the Open Unemployment Rate. This finding does not support the traditional competitive labor market model, which predicts that higher minimum wages increase labor costs and reduce employment opportunities [19]. Instead, the result is more consistent with efficiency wage theory, which argues that higher wages can improve worker productivity, increase job satisfaction, reduce employee turnover, and stimulate aggregate demand through higher household purchasing power [33]. In the Indonesian context, the study by Agusalam et al. [34] stated that periodic adjustments to the Provincial Minimum Wage may have enhanced workers' welfare without significantly discouraging firms from maintaining or expanding employment, particularly during the post-pandemic economic recovery.

Meanwhile, the GRDP of the trade sector and realized investment in the trade sector do not exhibit statistically significant effects on the Open Unemployment Rate. These findings suggest that economic performance and investment in the trade sector alone are insufficient to explain regional differences in unemployment. The trade sector is highly heterogeneous, encompassing both formal and informal business activities with varying levels of productivity and labor intensity [35]. Consequently, increases in trade sector output or investment may not consistently translate into additional employment opportunities across provinces. Similarly, the population aged 15 years and over does not significantly influence unemployment, indicating that labor supply alone is not the primary determinant of unemployment. The ability of the economy to generate sufficient employment opportunities appears to be more important than the size of the working-age population itself [36]. This finding supports demographic dividend theory, which argues that a growing working-age population contributes to economic development only when accompanied by adequate job creation and effective labor market policies [37].

Finally, the regression model is statistically significant overall, with an R-squared value of 0.66, indicating that the selected explanatory variables account for approximately 66% of the variation in the Open Unemployment Rate across Indonesian provinces during the 2010–2024 period. This relatively high explanatory power suggests that sectoral economic performance, manufacturing investment, minimum wage policies, and demographic factors collectively provide a meaningful explanation of regional unemployment dynamics. However, approximately 34% of the variation remains unexplained, implying that other factors, such as educational attainment, labor force participation, technological change, industrial diversification, infrastructure quality, and macroeconomic conditions, may also play important roles and should be considered in future research.

Conclusions

The regression results indicate that manufacturing sector GRDP has a positive and significant effect on the Open Unemployment Rate, while realized investment in the manufacturing sector and the Provincial Minimum Wage have negative and significant effects. The positive relationship between manufacturing GRDP and unemployment suggests that economic growth in the manufacturing sector during the study period did not necessarily translate into greater labor absorption. This finding may reflect the increasing adoption of capital-intensive production technologies and automation, which enhance output without proportionally increasing employment. In contrast, realized investment in the manufacturing sector significantly reduces unemployment, indicating that investment expansion remains an important mechanism for creating employment opportunities and stimulating labor demand. Likewise, the negative effect of the Provincial Minimum Wage suggests that higher wage levels may improve worker

productivity, purchasing power, and aggregate demand, thereby supporting employment creation rather than increasing unemployment. Meanwhile, the insignificant effects of trade sector GRDP, trade sector investment, and population size imply that variations in these variables are insufficient to explain differences in unemployment across Indonesian provinces during the study period. Overall, the findings highlight that the quality and composition of economic growth, rather than growth alone, are more important determinants of employment generation in Indonesia.

Based on these findings, the government should prioritize policies that encourage labor-absorbing investment in the manufacturing sector through fiscal incentives, simplified investment procedures, and support for industries with high employment potential. In addition, industrial development strategies should emphasize labor-intensive manufacturing alongside technological upgrading to ensure that productivity gains are accompanied by job creation. The results also suggest that minimum wage policies should continue to balance worker welfare with business competitiveness by considering regional economic conditions and productivity growth. Finally, greater policy attention should be directed toward improving workforce skills through vocational education and industry-oriented training programs so that labor supply is better aligned with the evolving needs of the manufacturing sector, thereby maximizing the employment benefits of economic growth.

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