

Manufacturing Growth, Minimum Wages, Investment, and Gender Development as Determinants of Unemployment

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ABSTRACT

Purpose – This study examines the effects of manufacturing GRDP, minimum wages, domestic investment, and the Gender Development Index on the Open Unemployment Rate.

Design/methodology/approach - This study employs a quantitative approach using panel data from eight districts and cities in Banten Province during 2017–2024. Secondary data were obtained from official statistical publications and analyzed using panel data regression.

Findings/Results - The results show that manufacturing GRDP and the Gender Development Index have negative and significant effects on the Open Unemployment Rate, while minimum wages have a positive and significant effect. Domestic investment has no significant effect, suggesting that investment activities have not generated sufficient employment, particularly when concentrated in relatively capital-intensive sectors.

Originality/Value - This study highlights the different roles of industrial growth, wage policy, investment, and gender development in explaining regional unemployment. The findings indicate that investment expansion alone is insufficient to reduce unemployment without stronger labor absorption. Policies should therefore encourage labor-intensive industrial development, balanced wage setting, and improved access to employment opportunities across gender groups.

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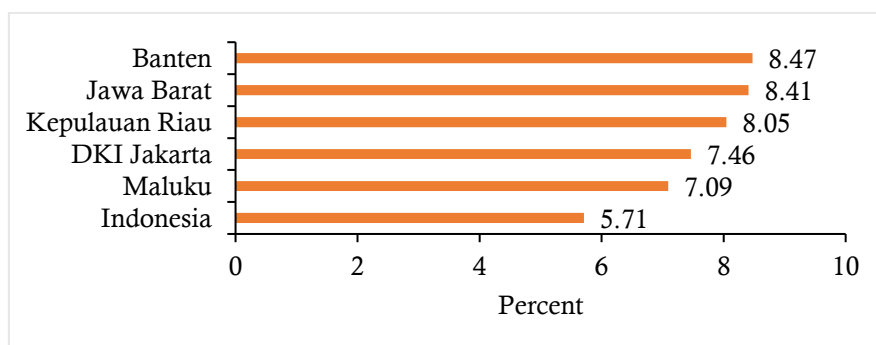
1. Introduction

Economic development encompasses not only increases in income and economic growth but also broader social and economic dimensions. Each country faces its own challenges in implementing the development process, including Indonesia. The implementation of economic development cannot be separated from inclusive and sustainable national development. National development covers all dimensions of the life of society, the nation, and the state. Its primary objectives are to improve economic performance, create employment opportunities, provide a decent standard of living for all citizens, and ultimately achieve national welfare. One of the major challenges in national development is unemployment. According to Sukirno (2002), unemployment is defined as a condition in which an individual who belongs to the labor force and is willing to work has not yet succeeded in obtaining employment.

Economic development involves income growth, structural transformation, productivity improvement, and employment creation. Development is considered meaningful when it improves welfare and creates sufficient job opportunities, rather than merely increasing economic output. Inclusive growth ensures that development benefits wider society, while structural transformation shifts labor toward more productive sectors. However, limited labor absorption and skill mismatches may increase the open unemployment rate and contribute to multidimensional poverty (Sabri *et al.*, 2026).

The Open Unemployment Rate is a key indicator for assessing unemployment conditions at both the national and regional levels. Over the past eight years, Indonesia has shown positive progress in reducing the Open Unemployment Rate from 2017 to 2024. Nevertheless, conditions in several provinces indicate that the regional Open Unemployment Rate remains above the national level. This suggests that efforts to reduce unemployment have not been evenly distributed across regions. The five provinces with the highest average Open Unemployment Rate during the eight-year period from 2017 to 2024 are presented in Figure 1.

Figure 1. Five Provinces with the Highest Average Open Unemployment Rate, 2017–2024 (Percent)



Source: Badan Pusat Statistik (2025)

Based on Figure 1, it can be observed that the five provinces recorded average Open Unemployment Rate levels above the national average. Banten Province is identified as the region with the highest average Open Unemployment Rate in Indonesia, at 8.47 percent, which is above the national average of 5.71 percent. This condition indicates that efforts to reduce unemployment have not been evenly distributed across regions, highlighting the need for regional development to support the achievement of national development goals.

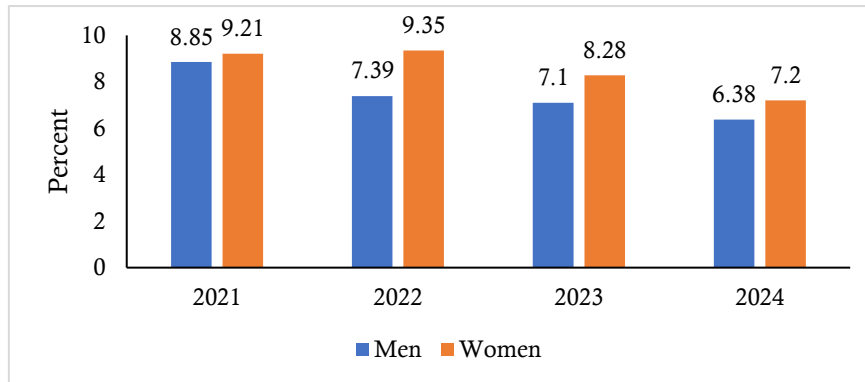
The manufacturing sector is one of the leading sectors relied upon to support economic growth in Banten Province. In 2024, the manufacturing sector recorded the highest contribution to Gross Regional Domestic Product (GRDP) among all sectors, amounting to 30.25 percent. In the same year, the sector also demonstrated significant potential in absorbing labor, accounting for 21.53 percent of the total employed population (BPS Banten Province, 2025a, 2025c). This substantial contribution to GRDP, accompanied by high labor absorption, indicates that the manufacturing sector has the potential to reduce the Open Unemployment Rate. A high GRDP value reflects strong demand for goods and services from consumers. Mankiw (2010) explains that an increase in demand for consumption goods reduces firms' inventories, thereby encouraging higher production and generating additional demand for labor.

However, the dynamics of labor demand do not operate independently. Classical theory explains that when wages increase, firms tend to reduce their demand for labor, while workers increase their labor supply. In reality, market mechanisms do not always function flexibly. One factor that may disrupt this flexibility is the implementation of a minimum wage policy. Mankiw (2010) refers to this condition as wage rigidity, a situation in which wages do not adjust to changes in labor market conditions. As a result, even when output increases, firms do not immediately expand employment due to limited capacity or reluctance to pay wages above the market equilibrium level.

Domestic investment refers to investment activities carried out by domestic investors within Indonesia with the aim of promoting economic growth, expanding employment opportunities, and advancing technological progress (Amar & Arkum, 2023). An increase in Domestic investment reflects a rise in investment activities that potentially stimulate labor demand and reduce unemployment. However, the relationship between domestic investment and labor absorption is not always significant. Several studies indicate that domestic investment does not significantly affect the Open Unemployment Rate, as investment tends to flow into capital-intensive sectors and is constrained by the limited quality of human resources that do not yet match industry requirements.

An interesting phenomenon can be observed in the labor market conditions of Banten Province, where the Open Unemployment Rate for women was recorded higher than that for men from 2021 to 2024. This difference indicates the existence of disparities in access to employment opportunities between the two gender groups in Banten Province. Such conditions suggest that women in Banten face relatively greater challenges in accessing and maintaining employment compared to men. This disparity may be attributed to limited job opportunities that match women's preferences and skills, as well as the presence of discrimination or gender bias in the labor market (Riwanda et al., 2024). This phenomenon is illustrated in Figure 2.

Figure 2. Open Unemployment Rate by Gender in Banten Province, 2021–2024 (Percent)



Source: BPS Provinsi Banten (2025d)

The Gender Development Index (GDI) is an indicator used to measure equality in human development achievements between men and women across the dimensions of health, education, and a decent standard of living (BPS Banten Province, 2025b). A higher GDI value indicates a smaller gender gap in human development. Improvements in the GDI reflect more equitable development outcomes, which have the potential to enhance women's labor force participation and workforce quality, thereby increasing employment opportunities. Therefore, the GDI is an important variable in this study as it provides a gender equality perspective in development analysis and its relationship with unemployment.

Theoretically, regional unemployment can be understood through the interaction of labor demand, labor market institutions, and regional development characteristics (Berg, 2015). Manufacturing GRDP and domestic investment reflect economic activity and the potential demand for labor, although their employment effects depend on sectoral structure, technology, and labor intensity. Minimum wages influence labor market outcomes by affecting both firms' labor costs and workers' incentives, while the Gender Development Index (GDI) reflects broader differences in human development and regional inclusiveness. Therefore, these variables should not be viewed independently but as interconnected factors shaping labor market conditions and differences in the Open Unemployment Rate across districts and cities in Banten Province.

2. Literature Review and Hypothesis Development

2.1. Theoretical Framework

Unemployment at the regional level can be understood as the outcome of interactions between labor demand, labor supply, wage-setting institutions, structural transformation, and the capacity of local economies to generate productive employment. Okun's (1962) framework establishes a broad inverse relationship between output expansion and unemployment, while structural-transformation theory emphasizes that the employment effects of growth depend on the sectors in which output expands and on their capacity to absorb labor. Lewis (1954) argues that development involves the reallocation of labor toward more productive modern activities, whereas more recent work shows that structural change can raise productivity and employment when expanding sectors generate sufficient labor demand (McMillan & Zeufack, 2023). Consequently, changes in regional output do not affect unemployment mechanically;

their effect depends on sectoral labor intensity, technology, firm structure, and the matching of worker skills with available jobs.

2.2. Manufacturing GRDP, Structural Transformation, and Unemployment

Manufacturing is particularly relevant to structural transformation because it can connect productivity growth with large-scale labor absorption through production, processing, logistics, maintenance, and related services. Historically, industrialization has supported the movement of workers from lower-productivity activities toward more productive employment. However, the employment intensity of manufacturing varies substantially across subsectors. McMillan and Zeufack (2023) show that manufacturing can contribute to productivity and employment growth, but employment gains may be weaker when production is concentrated in capital-intensive activities. The International Labour Organization (2026) likewise stresses that slower structural transformation constrains the creation of sustained, higher-productivity employment. In a province such as Banten, where manufacturing is an important component of regional economic activity, higher manufacturing GRDP may therefore be associated with lower unemployment when output expansion reflects stronger production and demand for workers. Nevertheless, the magnitude of this relationship depends on whether growth occurs in labor-intensive or capital-intensive industries.

2.3. Minimum Wages, Labor Costs, and Unemployment

The relationship between minimum wages and unemployment is theoretically ambiguous. In a competitive labor-demand framework, a binding wage floor that rises above the market-clearing wage increases the cost of labor and may reduce hiring, working hours, or the number of positions offered by firms. Firms may also respond through substitution toward capital, productivity improvements, price adjustments, or movement toward informal employment. Evidence reviewed by Del Carpio and Pabon (2017) shows that the employment consequences of minimum-wage increases in emerging economies depend on the magnitude of the increase, compliance, firm size, worker skill, and the degree of informality. Thus, wage rigidity can increase unemployment when firms cannot absorb higher labor costs, but modest wage increases need not always generate substantial job losses if productivity, demand, and adjustment margins compensate for the higher wage floor. For this reason, the expected relationship in Banten should be interpreted as an empirical question conditioned by local labor-market structure.

2.4. Domestic Investment, Investment Composition, and Unemployment

Domestic investment can expand productive capacity, stimulate aggregate demand, and generate employment during both the construction and operational phases of a project. Its effect on unemployment, however, depends crucially on investment composition. Investment directed toward labor-intensive manufacturing, construction, trade-related logistics, and small or medium-sized enterprises may create substantial employment, whereas investment concentrated in capital-intensive production, automation, real estate, or projects with weak local supply-chain linkages may generate fewer jobs relative to the value of investment. Evidence on structural change also shows that the employment effect of capital formation depends on whether capital complements labor or substitutes for it and on the sector in which

investment occurs (McMillan & Zeufack, 2023). Evidence from the Organisation for Economic Co-operation and Development (OECD) indicates that the composition of investment and the types of assets acquired can have different effects on productive capacity and productivity growth (OECD, 2023). Therefore, higher domestic investment is expected to be associated with lower unemployment when it expands labor-absorbing activities, although the strength of the relationship may be limited when investment is highly capital intensive.

2.5. Gender Development, Human Capital, and Unemployment

The Gender Development Index measures gender gaps in achievements in health, education, and income and therefore captures an important dimension of the quality and inclusiveness of human development (United Nations Development Programme, 2025). Improvements in gender development can be associated with stronger labor-market outcomes through several mechanisms. More equal access to education and health can improve the quality and effective supply of human capital, while narrower gender disparities can broaden the pool of workers able to participate productively in economic activity. Gender equality can also reduce barriers that prevent women from entering, remaining in, or progressing within the labor market. Global evidence continues to document substantial gender gaps in labor-force participation and access to quality employment (International Labour Organization, 2026). However, because the dependent variable in this study is the total Open Unemployment Rate rather than female unemployment, the GDI coefficient should not be interpreted as identifying a women-specific causal channel. Instead, GDI may reflect broader differences in regional human development, access to services, labor-market inclusion, and economic opportunity that are associated with aggregate unemployment.

2.6. Hypothesis Development

H1: Manufacturing GRDP is negatively associated with the Open Unemployment Rate in Banten Province.

H2: District/city minimum wages are positively associated with the Open Unemployment Rate in Banten Province.

H3: Domestic investment is negatively associated with the Open Unemployment Rate in Banten Province.

H4: The Gender Development Index is negatively associated with the Open Unemployment Rate in Banten Province.

3. Methodology

This study employs a quantitative approach. The type of data used in this research is panel data, which combine time-series data from 2017 to 2024 and cross-sectional data from eight districts/cities in Banten Province. The data were obtained from official publications and statistical reports issued by the Central Bureau of Statistics (BPS) of Banten Province. The variables collected include the Open Unemployment Rate, the manufacturing Gross Regional Domestic Product (GRDP), district/city minimum wages (DCMW), domestic investment, and the Gender Development Index (GDI) for the eight districts/cities in Banten Province during the 2017-2024 period.

This research applies panel data regression analysis using EViews software. The panel regression analysis is conducted to examine the effect of the independent variables

(manufacturing GRDP, district/city minimum wages, domestic investment, and GDI) on the dependent variable (Open Unemployment Rate) across the districts/cities in Banten Province from 2017 to 2024. Accordingly, the panel data regression model employed in this study can be formulated in the following equation:

$$\text{OUR}_{it} = \alpha + \beta_1 \text{GRDP}_{it} + \beta_2 \text{DCMW}_{it} + \beta_3 \text{DI}_{it} + \beta_4 \text{GDI}_{it} + e_{it} \quad (1)$$

Where: **OUR** is the Open Unemployment Rate; **GRDP** represents the manufacturing Gross Regional Domestic Product; **DCMW** denotes the district/city minimum wages; **DI** refers to domestic investment; **GDI** is the Gender Development Index; α is the constant term; β_1 , β_2 , β_3 , and β_4 are the regression coefficients of each independent variable; e is the error term; subscript i indicates the districts/cities in Banten Province; and subscript t denotes the time period from 2017 to 2024.

4. Result and Discussion

4.1 Model Selection Tests

There are three model approaches used in panel data regression analysis, namely the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). To determine the most appropriate estimation model among these three approaches, a series of model selection tests is required, as described below.

Chow Test

The Chow test is used to determine whether the Fixed Effect Model (FEM) or the Common Effect Model (CEM) is more appropriate (Gujarati & Porter, 2009). If the probability value is greater than 0.05, the Common Effect is considered the preferred model. Conversely, if the probability value is less than or equal to 0.05, the Fixed Effect is more appropriate. The results of the Chow test in this study are presented in Table 1. The test results show that the probability value of the Cross-section Chi-square is 0.00. This indicates that the Fixed Effect is more appropriate than the Common Effect.

Table 1. *Chow Test*

Effects Test	Statistic	Prob.
Cross-section Chi-square	85.06	0.00

Source: Processed data, 2026

Hausman Test

The Hausman test is used to determine whether the Fixed Effect Model (FEM) or the Random Effect Model (REM) is more appropriate (Gujarati & Porter, 2009). If the probability value is greater than 0.05, the Random Effect is considered the preferred model. Conversely, if the probability value is less than or equal to 0.05, the Fixed Effect is more appropriate. The results of the Hausman test in this study are presented in Table 2. The test results show that the probability value of the Cross-section random is 0.00. This indicates that the Fixed Effect is more appropriate than the Random Effect.

Table 1. *Hausman Test*

Test Summary	Chi-Sq. Statistic	Prob.
Cross-section random	46.74	0.00

Source: Processed data, 2026

Based on the results of the Chow test and the Hausman test, the most appropriate model to be used in this study is the Fixed Effect Model (FEM). Therefore, the Lagrange Multiplier test is not conducted. The results of the panel data regression estimation using the FEM approach are presented in Table 3, which yield the following equation.

$$\text{OUR}_{it} = 72.95 - 0.000000\text{GRDP}_{it} + 0.000001\text{DCMW}_{it} - 0.00004\text{DI}_{it} - 0.66\text{GDI}_{it} \quad (2)$$

Table 3. Fixed Effect Model (FEM) Estimation Results

Variable	Coefficient	t-statistic	Prob.
Constant	72.95	2.81	0.006
GRDP	-0.0000004	-5.69	0.00
DCMW	0.000001	2.23	0.02
DI	-0.00004	-0.77	0.44
GDI	-0.66	-2.14	0.03
Adjusted R ²			0.73
F-statistic			16.57
Prob.(F-statistic)			0.00

Source: Processed data, 2026

In this study, the one-way fixed effects model is selected because the main focus of the study is structural heterogeneity across regions. This model controls for time-invariant characteristics of the eight regencies and cities in Banten Province, including economic structure, urbanization, industrial location, fiscal capacity, infrastructure quality, and local labor market conditions. These regional differences are considered the primary sources of heterogeneity associated with the open unemployment rate.

The use of one-way fixed effects is also appropriate given the relatively small sample of 64 observations covering eight regions over eight years. Moreover, annual macroeconomic changes are partly reflected in the explanatory variables, such as manufacturing GRDP, minimum wages, domestic investment, and the Gender Development Index. Since the study aims to examine the relationship between regional economic variables and unemployment rather than estimate separate effects for each year, regional fixed effects are considered sufficient for the baseline model.

4.2 Normality Test

The normality test aims to determine whether the disturbance variable (residual) in the regression model is normally distributed (Gujarati & Porter, 2009). In this study, the Jarque-Bera (JB) test is employed. If the JB probability value is greater than or equal to 0.05, it indicates that the data are normally distributed. The results of the normality test, presented in Table 4, show that the JB probability value is 0.68, which is greater than 0.05. Since this value meets the ≥ 0.05 criterion, it can be concluded that the residuals of the panel data regression equation estimated using the Fixed Effect Model (FEM) are normally distributed.

Table 2. Normality Test

Jarque-Bera	0.75
Probability	0.68

Source: Processed data, 2026

4.3 Classical Assumption Tests

According to Gujarati and Porter (2009), a regression model must undergo a series of diagnostic tests to ensure that it produces the Best Linear Unbiased Estimator (BLUE). In panel data regression analysis, the classical assumption tests commonly applied include the multicollinearity test and the heteroskedasticity test.

Multicollinearity Test

The multicollinearity test aims to determine whether there is a linear relationship among the independent variables (Gujarati & Porter, 2009). In this study, multicollinearity is detected by examining the Variance Inflation Factor (VIF) values. If the VIF value is less than or equal to 10, it indicates the absence of multicollinearity. The results of the VIF multicollinearity test presented in Table 5 show that all independent variables have VIF values below 10. Therefore, it can be concluded that this study does not suffer from multicollinearity problems.

Table 3. *Multicollinearity Test*

Variable	Centered VIF
GRDP	1.87
DCMW	3.28
DI	1.58
GDI	2.12

Source: Processed data, 2026

Heteroskedasticity Test

The heteroskedasticity test aims to determine whether the variance of the residuals in the regression model is constant across observations (Gujarati & Porter, 2009). In this study, the White test is employed to detect heteroskedasticity. If the probability value of Obs*R-squared is greater than 0.05, the data are indicated to be free from heteroskedasticity. The results of the White test presented in Table 6 show that the probability value of Chi-Square Obs*R-squared is 0.15, which is greater than 0.05. Therefore, it can be concluded that this study does not suffer from heteroskedasticity problems.

Table 4. *Heteroskedasticity Test*

<i>Heteroskedasticity Test: White</i>			
Obs*R-squared	19.20	Prob. Chi-Square	0.15

Source: Processed data, 2026

4.4 Statistical Tests

Coefficient of Determination

According to Gujarati and Porter (2009), R^2 is known as the coefficient of determination, which measures the extent to which the independent variables explain the variation in the dependent variable within a model. R^2 is used in simple linear regression involving only one independent variable, whereas Adjusted R^2 is applied when the model includes more than one independent variable. Based on the estimation results of the panel data regression using the Fixed Effect Model (FEM) presented in Table 3, the Adjusted R^2 value is 0.73. This value indicates that the manufacturing GRDP, district/city minimum wages, domestic investment, and GDI explain 73 percent of the variation in the Open Unemployment Rate. Meanwhile, the remaining 27 percent is explained by other variables not included in this research model.

F-Test

The F-test is used to determine whether the independent variables (manufacturing GRDP, district/city minimum wages, domestic investment, and GDI) jointly affect the dependent

variable (Open Unemployment Rate). Based on Table 3, the F-statistic value is 16.57, while the probability of the F-statistic is 0.00. The critical F-value (F-table) obtained is 2.52. A comparison between the F-statistic and the F-table shows that $16.57 > 2.52$, and the probability of the F-statistic (0.00) is less than 0.05. These results confirm that, collectively, the manufacturing GRDP, district/city minimum wages, domestic investment, and GDI have a significant effect on the Open Unemployment Rate.

t-Test

The t-test is used to determine the partial effect of each independent variable on the dependent variable. The critical t-value (t-table) obtained is 2.0009. Based on Table 3, the partial effects of each independent variable (manufacturing GRDP, district/city minimum wages, domestic investment, and GDI) on the dependent variable (Open Unemployment Rate) can be interpreted as follows:

- a. The manufacturing GRDP variable has a t-statistic value of $|-5.69| > 2.0009$ (t-table) and a p-value of $0.00 < 0.05$. This finding indicates that manufacturing GRDP has a negative and significant effect on Open Unemployment Rate.
- b. The district/city minimum wages variable has a t-statistic value of $|2.23| > 2.0009$ (t-table) and a p-value of $0.02 < 0.05$. This finding indicates that district/city minimum wages has a positive and significant effect on Open Unemployment Rate.
- c. The domestic investment variable has a t-statistic value of $|-0.77| < 2.0009$ (t-table) and a p-value of $0.44 > 0.05$. This finding indicates that DI has no significant effect on Open Unemployment Rate.
- d. The GDI variable has a t-statistic value of $|-2.14| > 2.0009$ (t-table) and a p-value of $0.03 < 0.05$. This finding indicates that GDI has a negative and significant effect on Open Unemployment Rate.

The Effect of Manufacturing GRDP on the Open Unemployment Rate in Banten Province

The results indicate that manufacturing GRDP is negatively and significantly associated with the Open Unemployment Rate in Banten Province during the 2017-2024 period. This finding suggests that districts and cities with higher manufacturing output tended to have lower unemployment rates after controlling for the included explanatory variables and time-invariant regional characteristics.

The negative association is broadly consistent with the structural role of manufacturing in Banten's economy. In 2024, the manufacturing sector contributed 30.35 percent of provincial GRDP and absorbed 21.53 percent of the workforce (BPS Provinsi Banten, 2025a, 2025c). Manufacturing activities are concentrated in major industrial areas, particularly Tangerang Regency and Tangerang City, which host textile, footwear, food, and beverage industries. Some of these subsectors are relatively labor-intensive and may generate substantial demand for production, processing, logistics, and supporting workers. This sectoral structure provides a plausible explanation for the observed negative relationship between manufacturing output and the Open Unemployment Rate.

Nevertheless, the empirical model uses total manufacturing GRDP and does not distinguish between labor-intensive and capital-intensive subsectors. Therefore, the results do not directly demonstrate that growth in textiles, footwear, or food processing was responsible for the decline in unemployment. Manufacturing expansion may reduce unemployment when output growth occurs in industries with high labor requirements and when local workers possess the

skills demanded by firms. In contrast, growth driven by highly automated, capital-intensive, or technology-intensive industries may increase output and productivity without producing a proportional increase in employment.

The employment effect of manufacturing growth may also depend on workforce quality and labor-market matching. Manufacturing firms may require specific technical, vocational, managerial, or digital skills that are not fully available among local job seekers. Under these conditions, firms may recruit workers from outside the region or adopt labor-saving technologies, limiting the effect of manufacturing expansion on local unemployment. Thus, a higher manufacturing GRDP does not necessarily imply that all groups of local workers benefit equally from industrial development.

This interpretation is consistent with Shiferaw and Hailu (2016), who found that manufacturing output growth was associated with employment creation, and Felipe et al. (2019), who emphasized the role of manufacturing in supporting employment and economic development. However, the present model cannot determine whether higher manufacturing output increases labor demand, whether regions with lower unemployment provide more favorable conditions for manufacturing growth, or whether both outcomes are driven by other factors. These factors may include infrastructure quality, investment conditions, urbanization, education, labor-force participation, technological adoption, sectoral productivity, and economic growth outside manufacturing.

This study examines the Open Unemployment Rate rather than the absolute number of unemployed persons. The rate is affected by both employment creation and changes in labor-force participation. Manufacturing expansion may increase the number of employed persons, but the Open Unemployment Rate may decline only slightly or remain unchanged if the number of individuals entering the labor force also increases. Conversely, the rate may decline partly because individuals stop seeking work and leave the labor force, rather than because manufacturing employment increases. Therefore, the negative coefficient should be understood as evidence of a structural relationship between manufacturing output and the Open Unemployment Rate, rather than definitive proof that manufacturing growth directly reduces unemployment.

The Effect of District/City Minimum Wage on the Open Unemployment Rate in Banten Province

The results indicate that district/city minimum wages are positively and significantly associated with the Open Unemployment Rate in Banten Province during the 2017-2024 period. This finding implies that, within the sample, regions and periods characterized by higher minimum wages also tend to exhibit higher unemployment rates.

As suggested by standard competitive labor-market theory, when a statutory minimum wage increases labor costs beyond the productivity of some workers, particularly relatively low-skilled or inexperienced workers, firms may respond by reducing recruitment, adjusting working hours, substituting capital for labor, or becoming more selective in hiring. Such adjustments may contribute to higher unemployment among groups whose productivity is close to or below the mandated wage level. Nevertheless, the present empirical model does not directly identify this mechanism, and the estimated coefficient should therefore not be interpreted exclusively through this theoretical perspective.

Importantly, minimum wages are not randomly determined across districts and cities. Regional minimum-wage levels may reflect differences in labor productivity, living costs, industrial structure, historical wage levels, union bargaining, economic growth, and broader local labor-market conditions. This issue is particularly relevant in Banten Province, where highly industrialized districts and cities differ systematically from less industrialized regions in terms of firm composition, worker characteristics, productivity, and labor-market dynamics. Consequently, part of the observed positive relationship may capture the structural characteristics of industrial regions in which both wages and unemployment are relatively high rather than a direct employment effect of minimum-wage policy.

Alternative labor-market theories also suggest that higher minimum wages do not necessarily reduce employment. Under monopsonistic or imperfectly competitive labor markets, employers may possess wage-setting power and pay workers below their marginal productivity. In such circumstances, a moderate increase in the minimum wage may raise wages without reducing employment and, under certain conditions, may even increase employment by reducing employers' monopsony power, improving worker retention, or encouraging labor-force participation. Thus, the employment consequences of minimum-wage policies depend on the structure and competitiveness of the labor market, the magnitude of the wage increase, worker productivity, and firms' capacity to absorb higher labor costs.

The positive association found in this study is broadly consistent with evidence reported by Gorjón et al. (2024), who found that Spain's 2019 minimum-wage increase was associated with a higher probability of affected workers becoming unemployed and a reduction in work intensity. Vitaliano (2023) similarly reported an association between minimum-wage increases and a higher estimated natural rate of unemployment in New York. However, the broader empirical literature provides mixed findings, with other studies showing relatively small, statistically insignificant, or even positive employment effects under particular labor-market conditions. These differences reinforce the importance of avoiding a uniform interpretation of minimum-wage effects across institutional and regional settings.

The Effect of Domestic Investment on the Open Unemployment Rate in Banten Province

The results indicate that domestic investment did not have a statistically significant effect on the Open Unemployment Rate in Banten Province during 2017-2024. The domestic investment variable used in this study represents aggregate annual investment realization and therefore combines projects that differ substantially in sector, scale, labor intensity, implementation period, technological requirements, and geographic location.

Several mechanisms may explain the non-significant coefficient. First, domestic investment in Banten is not evenly distributed across sectors. Based on data from Kementerian Investasi dan Hilirisasi/BKPM (2025), the three KBLI categories receiving the largest cumulative domestic investment realization during 2017-2024 were real estate, amounting to IDR 53.961 trillion; warehousing and transportation support activities, amounting to IDR 29.689 trillion; and the food industry, amounting to IDR 23.818 trillion. These sectors may generate substantially different employment effects. For example, some real-estate, logistics, infrastructure, and technology-related projects can involve large capital expenditures relative to the number of permanent workers employed, whereas certain manufacturing activities may have greater potential for direct labor absorption.

Second, the employment effects of investment may differ between the construction and operational stages of a project. Large investment projects can generate considerable temporary employment during construction but require substantially fewer permanent workers once operations begin. Aggregate annual investment realization does not distinguish between these stages. As a result, the relationship between investment expenditure and the Open Unemployment Rate may be weakened when temporary and permanent employment effects are combined within the same measure.

Third, the geographic concentration of investment may also affect the results. Investment realization can be concentrated in particular industrial districts or cities, while unemployment conditions differ considerably across regions. A large investment project located in one district may therefore have only a limited effect on the unemployment rate of other districts and cities included in the provincial sample. Moreover, workers employed by new investment projects may come from outside the host district or require skills that are not readily available among the local unemployed population.

The non-significant coefficient should also be understood in relation to the dependent variable used in this study. The Open Unemployment Rate measures the proportion of the labor force that is unemployed rather than the absolute number of jobs created. Investment may increase employment without necessarily reducing the unemployment rate if the labor force or the number of individuals seeking employment increases simultaneously. Therefore, an insignificant relationship with the Open Unemployment Rate does not imply that investment generates no additional employment.

Previous studies also indicate that the employment consequences of investment depend on sectoral composition, technology, workforce requirements, and the timing of investment realization (Aulya et al., 2025; Liu et al., 2024; Benfratello et al., 2025). Accordingly, the present result is more appropriately interpreted as showing that aggregate contemporaneous domestic investment realization was not significantly associated with variations in the Open Unemployment Rate in Banten during the study period.

From a policy perspective, the findings do not imply that increasing investment is ineffective for labor-market improvement. Rather, they indicate that the total monetary value of investment alone may be insufficient for predicting changes in regional unemployment. Investment policy should therefore consider sectoral composition, geographic distribution, project implementation stages, employment intensity, and the compatibility between investor skill requirements and the characteristics of the local workforce. Policies that combine investment promotion with workforce development and encourage projects capable of generating sustainable local employment may produce stronger labor-market outcomes.

The Effect of the Gender Development Index on the Open Unemployment Rate in Banten Province

The results indicate that the Gender Development Index (GDI) is negatively and significantly associated with the Open Unemployment Rate in Banten Province during the 2017-2024 period. This finding is interpreted as evidence that districts and cities with more balanced gender-development outcomes tend to exhibit lower aggregate unemployment rates. However, because the dependent variable is the total Open Unemployment Rate rather than female unemployment, female labor-force participation, or the gender unemployment gap, the estimated coefficient cannot be interpreted as direct evidence that improvements in gender development specifically reduce female unemployment.

The negative coefficient may instead reflect a broader relationship between balanced human-development outcomes and regional labor-market conditions. Regions with smaller gender disparities in education, health, and income may also possess stronger human capital, better access to public services, higher household welfare, and more diversified economic opportunities.

This interpretation is consistent with the human-capital perspective emphasized by Todaro and Smith (2020), in which disparities in education and health can reduce the productive capacity of the population and limit broader economic development. More balanced achievements between women and men may strengthen the overall quality of regional human capital and expand the pool of individuals capable of participating productively in economic activities. Nevertheless, improvements in these dimensions do not necessarily imply equal access to jobs or equal labor-market outcomes. Gender equality in human development and gender equality in employment should therefore be treated as related but conceptually distinct phenomena.

The findings of Revilia and Afriani (2025), which indicate that GDI is associated with women's income and participation in professional employment, suggest that improvements in gender development may be related to women's economic outcomes. However, such evidence cannot establish that the negative GDI coefficient obtained in the present study operates through the same channel. The current model does not identify whether the relationship arises through women's employment, men's employment, changes in labor-force participation, educational attainment, occupational structure, income conditions, or other regional characteristics associated with human development.

5. Conclusion

The results of this study indicate that manufacturing GRDP and the Gender Development Index (GDI) are negatively and significantly associated with the Open Unemployment Rate in Banten Province during the 2017-2024 period, while district/city minimum wages are positively and significantly associated with the Open Unemployment Rate. Domestic investment, in contrast, does not show a statistically detectable contemporaneous relationship with the Open Unemployment Rate in the estimated model. These findings should be interpreted as within-sample associations after controlling for time-invariant regional characteristics rather than as definitive evidence of causal effects.

The negative association between manufacturing GRDP and the Open Unemployment Rate suggests that districts and cities with stronger manufacturing-sector performance tend to experience lower unemployment rates. This relationship is consistent with the possibility that manufacturing expansion, particularly in activities with relatively high labor absorption, may support employment creation. However, the present model does not directly identify labor absorption as the causal mechanism, and the estimated coefficient may also reflect differences in industrial structure, productivity, and other regional economic conditions.

The positive association between district/city minimum wages and the Open Unemployment Rate indicates that regions with higher minimum wages tend to record higher unemployment rates within the study period. Although this pattern is consistent with theoretical arguments that higher labor costs may influence firms' recruitment and employment decisions, the result should not be interpreted as evidence that minimum-wage increases themselves cause higher

unemployment. Minimum wages may also reflect regional differences in productivity, cost of living, industrialization, previous wage structures, and local labor-market conditions.

Domestic investment does not exhibit a statistically significant contemporaneous association with the Open Unemployment Rate. This finding does not establish that investment has no employment effect or that capital intensity is the reason for the absence of a significant coefficient. Several explanations remain possible, including delayed employment effects, geographic concentration of investment, differences in labor intensity across sectors and projects, temporary employment during construction stages, and measurement characteristics of aggregate investment realization. The result should therefore be interpreted as indicating that aggregate domestic investment realization was not significantly associated with changes in the Open Unemployment Rate within the specification used in this study.

The negative association between GDI and the Open Unemployment Rate indicates that districts and cities with more balanced gender-development outcomes tend to exhibit lower aggregate unemployment rates. However, because GDI captures disparities between women and men in health, education, and income outcomes rather than direct labor-market equality, and because the dependent variable is total unemployment, the finding cannot be interpreted as evidence that improvements in GDI specifically reduce female unemployment. Instead, it may reflect a broader relationship between balanced human development, regional human-capital conditions, and aggregate labor-market performance.

Based on these findings, several policy implications may be considered. First, policies that support sustainable manufacturing-sector development, particularly activities with strong employment potential and linkages to the local economy, are consistent with the observed negative relationship between manufacturing GRDP and unemployment. Such policies may include improvements in industrial infrastructure, business facilitation, workforce skills, and the development of manufacturing subsectors with relatively high labor absorption.

Second, minimum-wage policy should continue to balance worker protection with regional productivity, business conditions, labor-market characteristics, and firms' capacity to sustain employment. The positive association identified in this study suggests the importance of monitoring employment outcomes alongside wage adjustments, but it does not provide sufficient evidence to conclude that higher minimum wages directly increase unemployment. Third, investment policy should not be evaluated solely on the basis of total realized investment value. Greater attention can be given to the sectoral composition, geographic distribution, implementation stage, and employment intensity of investment projects. Policies that encourage investment with stronger local employment linkages and improve the alignment between workforce skills and investor requirements are consistent with the possibility that the employment effects of investment depend on project characteristics rather than aggregate investment value alone.

Fourth, policies aimed at reducing disparities in education, health, and economic achievement between women and men remain relevant as part of broader human-development and labor-market strategies. However, gender-specific employment policies should ideally be supported by additional evidence using gender-disaggregated labor-market indicators, such as female unemployment, female labor-force participation, or the gender unemployment gap. The

present findings support broader improvements in balanced human-development outcomes, but they do not establish that gender-focused employment interventions are the specific mechanism through which aggregate unemployment can be reduced.

6. Limitations and Future Research

This study is limited by the use of secondary aggregate data and a restricted number of explanatory variables. Therefore, the results may not fully capture individual characteristics, labor-market dynamics, skill mismatches, regional differences, and possible endogeneity among the variables. Future research should include broader economic, demographic, and institutional variables, as well as micro-level data. The use of dynamic panel, spatial econometric, or qualitative approaches is also recommended to provide a more comprehensive understanding of the determinants of the open unemployment rate in Banten Province.

Declaration of AI and AI-assisted technologies in the writing process (if author[s] utilize AI)

During the preparation of this work, the author(s) used **ChatGPT** in order to **paraphrase sentences**. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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