



Examining the Effects of Minimum Wage Levels, Human Development, and Population Growth on the Open Unemployment Rate in Banten

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Abstract: This research was conducted to examine how minimum wage levels, the Human Development Index (HDI), and population growth contribute to changes in the open unemployment rate in Banten Province during 2010–2024. A quantitative framework was applied by utilizing secondary time-series data sourced from the Central Statistics Agency (BPS). The study employed multiple linear regression analysis supported by classical assumption tests, along with hypothesis evaluation through t-tests, F-tests, and the coefficient of determination (R^2). The findings reveal that, individually, minimum wage does not demonstrate a statistically significant relationship with open unemployment. In contrast, HDI shows a significant inverse relationship, while population growth is proven to significantly increase unemployment levels. When assessed collectively, all independent variables significantly influence the open unemployment rate. The model's R-Squared value of 0.751215 suggests that 75.12% of fluctuations in unemployment are accounted for by the variables included in the model, whereas the remaining proportion is associated with external factors beyond this research scope. These results emphasize that labor quality improvement and population dynamics are key elements affecting unemployment, highlighting the importance of policy strategies that extend beyond wage regulation toward strengthening workforce capacity and expanding employment opportunities.

Keywords: Open Unemployment, Minimum Wage, HDI, Population Growth, Banten

Introduction

Indonesia as a developing country faces complex development challenges, one of which is the problem of unemployment. Despite having a large population and abundant natural resource potential, these conditions have not been fully able to encourage optimal labor absorption ([Zenika et al., 2022](#)). The high unemployment rate not only has an impact on the economic aspect, but also triggers various social problems such as poverty, crime, and social inequality. At the regional level, Indonesia continues to record an open unemployment level that remains higher than that of a number of other Asian countries,

positioning this issue as an important concern within the national development agenda (Diandra, 2025).

Unemployment represents a macroeconomic issue arising from disparities between labor availability and employment demand. This situation is shaped by multiple connected economic and social determinants, including minimum wage regulations, human resource quality as indicated by the Human Development Index (HDI), as well as population growth patterns (Zuliasari & Rachmawati, 2021). Such mismatches may lead to reduced workforce productivity and can ultimately weaken overall societal welfare.

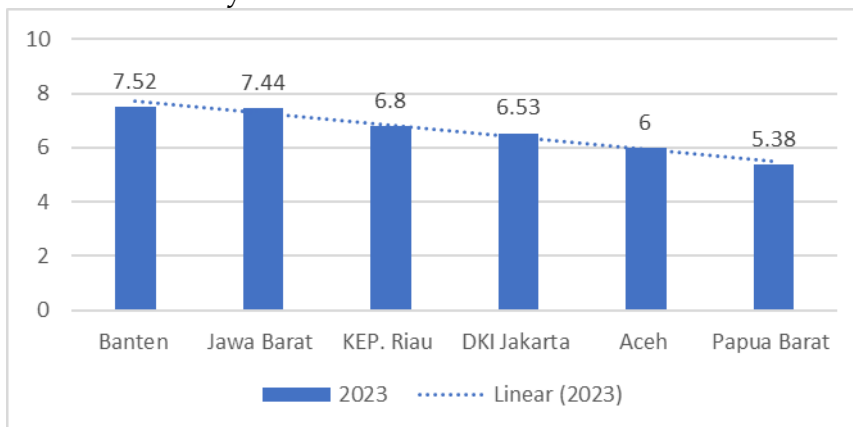


Figure 1. Provincial Open Unemployment Rate Percentage

Unemployment issues are likewise evident in regional areas, including Banten Province. Based on statistics published by the Central Statistics Agency (BPS), Banten registered the highest level of open unemployment in Indonesia in 2023, which was 7.52 percent. Although in the period 2020-2024 the unemployment rate in this region tends to decrease, the figure is still above the national average. This shows that employment problems in Banten Province are still persistent and require more comprehensive attention, especially in the reduction of policies oriented towards expanding employment opportunities.

Minimum wage policy is considered one of the important variables that may influence the open unemployment rate. From a theoretical perspective, an increase in minimum wage can enhance workers' living standards; however, it may also raise production expenses for companies. As labor costs become higher, businesses may respond by improving operational efficiency, including limiting labor utilization, which can contribute to rising unemployment when productivity growth does not keep pace. This perspective is consistent with labor demand theory, which explains that higher wage levels generally lead employers to reduce the quantity of labor they hire (Vallendzo et al., 2020).

Furthermore, workforce capability measured by the Human Development Index (HDI) has a close connection with unemployment conditions. Higher HDI values generally indicate better achievements in schooling, public health, and overall living quality. Even so, better labor competence does not automatically guarantee sufficient employment opportunities. This mismatch may trigger a rise in joblessness, particularly among individuals with higher educational backgrounds. Meanwhile, demographic expansion

significantly influences labor market structure. A rapid increase in population contributes to a larger labor supply, yet without balanced job creation, this situation may intensify unemployment pressures. Conversely, when demographic increases are supported by stronger investment flows and broader employment expansion, a growing workforce can become an important driver of economic development (Septiana & Asmara, 2024).

A number of earlier studies have produced varying conclusions about how these factors are associated with unemployment levels. Research by Silvia & Malangkas (2022) indicates that minimum wage is positively and significantly related to unemployment. In contrast, Lestari & Nilasari (2025) explain that the Human Development Index (HDI) is inversely associated with unemployment, suggesting that better human capital development may help lower joblessness. Meanwhile, Agnesia et al. (2023) reported that population growth was linked to lower unemployment, particularly when supported by sufficient job availability.

Variations in findings from earlier research indicate that unemployment cannot be explained through a single perspective, as it emerges from multiple interconnected economic and social determinants. Moreover, comprehensive studies that jointly evaluate minimum wage, HDI, and population growth remain relatively scarce, particularly within Banten Province. This condition highlights the existence of unresolved academic gaps that require deeper investigation.

Considering these circumstances, the present research focuses on examining how minimum wage levels, human development conditions, and demographic growth are associated with open unemployment in Banten Province from 2010 to 2024. This study is intended to provide evidence-based insights regarding the main drivers of unemployment while also offering practical references for designing more targeted and efficient employment strategies within regional policy frameworks.

Research Method

This research applies a quantitative design to explore the relationship between minimum wage, Human Development Index (HDI), and population growth in relation to open unemployment conditions in Banten Province. The investigation relies on secondary statistical information arranged as annual time-series data spanning 2010–2024, sourced from the Banten Provincial Central Statistics Agency (BPS). In this framework, open unemployment serves as the outcome variable expressed as a percentage, while minimum wage (Rupiah), HDI, and population growth function as explanatory variables based on their respective measurement units.

To examine these relationships, the study employs multiple linear regression supported by EViews 12 for data processing. Prior to regression estimation, several prerequisite diagnostic procedures were conducted, including distribution normality, inter-variable correlation, variance consistency, and serial correlation assessments to confirm model suitability under BLUE standards. Subsequent statistical evaluation involved simultaneous significance assessment through the F-test and individual parameter

examination through the t-test at a 5% significance threshold. In addition, the coefficient of determination (R^2) was utilized to assess how far the explanatory variables account for changes in unemployment levels.

The analytical framework applied in this research can be expressed through the following equation:

$$Y = \alpha + \beta^1 X^1 + \beta^2 X^2 + \beta^3 X^3 + \varepsilon$$

Where:

Y = Open Unemployment Rate

X_1 = Minimum Wage Variable

X_2 = Human Development Index (HDI) Variable

X_3 = Population Growth Variable

α = Intercept or constant term

$\beta_1, \beta_2, \beta_3$: Parameter coefficients for each explanatory variable

ε : Disturbance term or residual error

Results and Discussion

Data Processing Outcomes

Classical Assumption Evaluation

Normality Assessment

Normality assessment was conducted to determine whether the research data and model residuals demonstrate a pattern that approximates normal distribution standards, allowing the statistical model to satisfy required analytical prerequisites (Sahir, 2022).

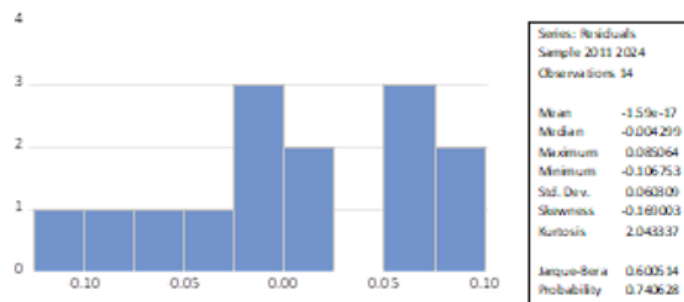


Figure 2. Normality Test

According to the statistical output, the Jarque-Bera significance score of 0.740628 exceeds the threshold value of 0.05, indicating that the error terms follow an acceptable normal distribution pattern. Therefore, the distribution requirement is fulfilled, and further statistical procedures can be continued.

Multicollinearity Test

This procedure was performed to identify the presence or absence of strong correlations among the explanatory variables within the regression framework. Ideally, such correlations should be minimal because excessive association among predictor variables may distort parameter estimation, reduce analytical precision, and complicate the interpretation of each variable's individual contribution to the model (Ghozali, 2021).

Table 1.
Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0,004073	12,05944	OR
Minimum Wage (X1)	0,078607	2,005752	1,098217
Human Development Index (X2)	57,04212	9,365424	1,121404
Population Growth (X3)	0,008417	1,128229	1,031091

Referring to the multicollinearity evaluation output, the centered VIF scores for Minimum Wage, Human Development Index, and Population Growth are 1.098217, 1.121404, and 1.031091, respectively. Even though the uncentered VIF values appear comparatively higher, the primary benchmark in this assessment remains the centered VIF measurement. Because all centered VIF figures remain far below the tolerance threshold of 10, the regression structure indicates an absence of problematic multicollinearity. This demonstrates that the predictor variables are not excessively correlated, allowing the regression framework to remain appropriate for subsequent analytical procedures.

Heteroscedasticity Test

This examination was conducted to identify whether the error variance differs across observational data points within the regression equation. In an appropriate regression structure, variance stability is expected across all observations to maintain consistency, precision, and neutrality in parameter estimation (Scott, 2012).

Table 2.
Heteroscedasticity Test

F-statistic	1,353252	Prob. F (3.10)	0,3123
Obs*R-Squared	4,042502	Prob. Chi-Square (3)	0,2569
Scaled explained SS	2,409773	Prob. Chi-Square (3)	0,4918

Statistical output indicates that the Obs*R-Squared significance value reaches 4.042502, exceeding the 0.05 benchmark. This outcome indicates the absence of variance inconsistency problems, meaning the variance stability requirement has been satisfied. Therefore, the regression framework remains appropriate for continued statistical evaluation.

Autocorrelation Test

This procedure was carried out to detect whether regression errors across different

time intervals are interconnected. Such evaluation is essential because the dataset consists of annual time-series information from 2010 to 2024. An appropriate regression specification is expected to avoid serial correlation so that parameter estimates remain reliable and statistically acceptable (Sahir, 2022).

Table 3.
Autocorrelation Test

R-squared	0,175086	Mean dependent var	-1.59E-17
Adjusted R-squared	-0,340485	S.D. dependent var	0,060309
S.E. of regression	0,069825	Akaike info criterion	-2,188129
Sum squared resid	0,039004	Schwarz criterion	-1,914247
Log likelihood	21,31690	Hannan-Quinn crister.	-2,213481
F-statistic	0,339597	Durbin-Watson stat	1,649221
Prob (F-statistic)	0,875279		

According to the regression diagnostic statistics, the Durbin–Watson score recorded was 1.649221. When evaluated using the applicable Durbin–Watson decision standard, this figure falls within the accepted interval between d_U and $4-d_U$, indicating the absence of serial correlation issues. Therefore, the regression framework satisfies autocorrelation requirements under classical assumption standards and remains appropriate for subsequent analytical interpretation.

Regression Coefficient Evaluation Multiple Linear Regression Assessment

The statistical approach applied in this section employed multiple linear regression to examine how Minimum Wage (X_1), Human Development Index (X_2), and Population Growth (X_3) are associated with Open Unemployment Rate (Y) as the outcome indicator. Data computation and parameter estimation were processed through EViews software. Referring to the calculation output, the estimated mathematical model is presented below:

$$Y = 0.092128 + 0.184325X_1 - 24.91781X_2 - 0.308316X_3$$

Interpretation of the regression equation can be explained as follows:

a) The intercept of 0.092128 represents the predicted level of open unemployment when

Minimum Wage, Human Development Index, and Population Growth are assumed to remain unchanged. Under these circumstances, the estimated unemployment figure is 0.092128 percent.

- b) The coefficient attached to the Minimum Wage variable indicates a direct association with unemployment. This means that for every one-unit rise in minimum wage, the open unemployment rate is projected to increase by 0.184325 percent, provided that all other explanatory factors remain constant.
- c) The coefficient for the Human Development Index (HDI) demonstrates an inverse association with open unemployment. In practical terms, each one-unit increase in HDI is estimated to reduce unemployment by 24.91781 percent, assuming the remaining explanatory variables are held constant.
- d) The Population Growth coefficient also reflects an opposite directional connection with unemployment. This indicates that a 1 percent rise in population growth is estimated to lower the unemployment level by 0.308316 percent when all other determinants remain unchanged.

F Test (Simultaneous)

Table 4.
Test F

F-Statistic	Prob
10,06512	0,002296

Referring to the simultaneous significance evaluation, the calculated F-statistic reached 10.06512 with a significance probability of 0.002296, which is lower than the 0.05 threshold. This outcome demonstrates that Minimum Wage, Human Development Index, and Population Growth collectively contribute meaningfully to variations in the Open Unemployment Rate. Therefore, the regression framework is considered statistically appropriate for explaining the combined association between explanatory factors and the response variable.

T Test (Partial)

Table 5.
T Test

Variable	Coefficient	t-statistic	Prob
C	0,092128	1,443583	0,1794
Minimum Wage (X1)	0,184325	0,657440	0,5257
Human Development Index (X2)	-24.91781	-3,299225	0,0080
Population Growth (X3)	-0.308316	-3,360590	0,0072

Referring to the partial significance evaluation, each explanatory factor demonstrates different statistical outcomes. Minimum Wage (X1) records a significance score of 0.5257, exceeding the 0.05 benchmark, which indicates that this variable does not meaningfully affect the Open Unemployment Rate. In contrast, the Human Development Index (X2) produces a significance score of 0.0080, falling below 0.05, which confirms an inverse and meaningful association with unemployment. Population Growth (X3) also demonstrates statistical relevance with a significance score of 0.0072, indicating a meaningful positive association. These findings suggest that individual predictors contribute differently when assessed separately; however, when evaluated collectively, all explanatory components remain relevant in explaining unemployment dynamics within the estimated framework.

Coefficient of Determination Test (R²)

Table 6.
R Test Results

R-Squared	0,751215
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According to the coefficient of determination evaluation, the model produces an R-Squared score of 0.751215. This figure indicates that 75.12% of changes in the Open Unemployment Rate are accounted for by Minimum Wage, Human Development Index, and Population Growth within the analytical framework. Meanwhile, the remaining 24.88% is associated with additional determinants outside the variables included in this research scope.

Discussion

Minimum Wage and Open Unemployment Dynamics

Referring to the partial statistical examination, the significance score for Minimum Wage reached 0.5257, which is above the 0.05 threshold. This outcome indicates that Minimum Wage does not demonstrate meaningful statistical relevance to Open Unemployment in Banten Province. Accordingly, wage policy does not appear to be the primary determinant in explaining unemployment fluctuations within the region. One possible explanation lies in labor market characteristics that remain heavily concentrated in informal employment, where wage regulations may not be fully implemented. In addition, business responses to wage adjustments are often directed toward operational restructuring, including efficiency strategies or reductions in working hours, rather than direct workforce expansion or reduction.

From a theoretical standpoint, this pattern aligns with Keynesian thought, which emphasizes insufficient aggregate demand as a more central driver of unemployment than wage levels alone. Furthermore, the traditional perspective regarding wage flexibility may not function optimally due to institutional limitations and structural barriers. Therefore, these findings strengthen earlier evidence ([Setiawan et al., 2023](#)) suggesting that

unemployment conditions are shaped more strongly by broader macroeconomic circumstances and labor absorption capacity than by wage policy alone.

The Role of Human Development Index in Open Unemployment

According to the partial hypothesis examination, the Human Development Index (HDI) records a significance score of 0.0080, which is lower than the 0.05 benchmark. This statistical evidence indicates that HDI demonstrates meaningful relevance to Open Unemployment in Banten Province with an inverse pattern. In other words, improvements in HDI are associated with lower unemployment levels. This pattern suggests that stronger human capital capacity can support workforce participation through better educational attainment, improved public health, and stronger socioeconomic welfare, all of which may enhance labor productivity and competitiveness. Nevertheless, these improvements do not automatically translate into lower unemployment because workforce advancement must also be supported by sufficient employment opportunities to produce optimal outcomes.

From a Keynesian perspective, labor market absorption remains closely connected to aggregate demand conditions. Therefore, improvements in human development must be supported by an economic environment capable of generating broader employment capacity. These findings are consistent with prior studies by Salsabila et al. (2025) and Rahmawati et al. (2024), which emphasize that HDI serves as an important determinant in suppressing unemployment, although its effectiveness remains interconnected with wider macroeconomic circumstances.

The Impact of Population Growth on Open Unemployment

Referring to the partial statistical assessment, Population Growth records a significance score of 0.0072, which is lower than the 0.05 threshold. This result indicates that demographic growth demonstrates meaningful statistical relevance to Open Unemployment in Banten Province and moves in the same direction. In practical terms, larger population expansion tends to coincide with higher unemployment levels. This pattern suggests that rapid demographic increases may intensify labor market pressure when employment expansion does not progress proportionally.

One possible explanation is that population expansion increases the volume of individuals entering the workforce, while employment capacity may not expand at an equivalent pace. This mismatch can create disequilibrium between labor availability and employment absorption, which may contribute to rising unemployment pressure. Although demographic growth may offer opportunities through a demographic dividend, inadequate human capital quality and limited employment expansion may instead transform this opportunity into a structural challenge for the labor market.

Within Keynesian analysis, labor force expansion must be supported by stronger aggregate demand to ensure productive workforce absorption. Therefore, these findings reinforce prior studies by Setyaputri et al. (2025) and Agnesia et al. (2023), which highlight that demographic expansion is strongly associated with unemployment conditions, particularly when economic growth is not matched by sufficient job generation.

Conclusion

Referring to the overall statistical findings and interpretative discussion, several main conclusions emerge from this research. First, Minimum Wage (X1) does not demonstrate meaningful statistical relevance to Open Unemployment in Banten Province during 2010–2024. This indicates that wage regulation alone is not the dominant driver of unemployment fluctuations, particularly due to labor market structures that remain strongly characterized by informal sector dominance as well as company adaptation through operational rather than employment-based adjustments.

Second, Human Development Index (X2) demonstrates an inverse and statistically meaningful association with unemployment conditions. This suggests that stronger human capital development—through better education, health, and welfare capacity—may contribute to lower unemployment levels. However, the effectiveness of this contribution remains closely connected to labor market capacity in providing sufficient employment opportunities.

Third, Population Growth (X3) demonstrates a direct and statistically meaningful association with unemployment. This indicates that demographic expansion, when not supported by proportional employment generation, may intensify unemployment pressures due to increasing labor market competition.

Finally, when evaluated collectively, Minimum Wage, Human Development Index, and Population Growth jointly provide meaningful explanatory power regarding unemployment conditions in Banten Province. These findings indicate that unemployment is shaped by the interaction of multiple economic and demographic determinants rather than a single causal factor.

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