

DETERMINANTS OF OPEN UNEMPLOYMENT IN EAST JAVA: EVIDENCE FROM REGIONAL ECONOMIC AND LABOR MARKET DYNAMICS

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ABSTRACT

This study examines the determinants of open unemployment in East Java, Indonesia, by integrating wage policy, labor force participation, human capital, regional investment, and the COVID-19 shock within a unified regional panel framework. Using a balanced panel dataset covering 38 districts and cities over the 2017–2024 period (304 observations), the study applies panel regression. The findings reveal that district/city minimum wages have a positive and statistically significant effect on open unemployment ($\beta = 0.1508$; $p = 0.034$), indicating a potential wage–employment trade-off in regional labor markets. In contrast, labor force participation and regional investment do not exhibit statistically significant effects. Mean years of schooling has a negative but only marginally significant relationship with unemployment ($\beta = -0.1273$; $p = 0.081$), suggesting that educational expansion alone may be insufficient when skill formation is not adequately aligned with labor market demand. The COVID-19 pandemic emerges as the strongest determinant, with a positive and highly significant effect on unemployment ($\beta = 0.4231$; $p < 0.001$), highlighting the vulnerability of regional employment systems to external economic shocks. The results demonstrate that unemployment dynamics in East Java are shaped more strongly by wage-setting mechanisms and macroeconomic disruptions than by conventional labor supply and investment indicators. The study contributes to the regional labor economics literature by providing subnational evidence from a heterogeneous developing economy and highlights the need for productivity-linked wage policies, employment-intensive investment, demand-responsive human capital development, and stronger labor-market resilience.

Keywords: open unemployment, labor market dynamics, regional labor economics, human capital, developing economy

INTRODUCTION

Open unemployment remains one of the most persistent macroeconomic challenges in developing regions, including Indonesia (Benedetti & Crescenzi, 2023; Moridian et al., 2025a). Despite sustained economic growth over the past decade, disparities in labor absorption across provinces continue to exist, indicating structural issues within regional labor markets (Asaleye & Ncanywa, 2026). East Java, as one of Indonesia's major economic hubs with significant industrial, agricultural, and service sectors, exhibits unique labor market dynamics that influence the level of open unemployment (*Tingkat Pengangguran Terbuka*/TPT) (Olopade et al., 2019). Understanding the determinants of open unemployment is therefore crucial to formulate evidence-based policies that promote inclusive economic growth and labor market stability (Okwi et al., 2007).



Unemployment from a theoretical perspective arises when labor supply exceeds labor demand, often driven by structural transformation, wage rigidities, human capital mismatch, and macroeconomic shocks (Jung et al., 2026). Classical labor market theory suggests that wage levels influence employment decisions, where excessive wage increases may reduce labor demand if productivity does not rise proportionally (Liu et al., 2018). In the context of Indonesia, the minimum wage policy (*Upah Minimum Kabupaten/Kota* - UMK) has been widely debated due to its dual impact. On one hand, higher wages improve worker welfare; on the other hand, they may discourage firms from hiring additional workers, particularly in labor-intensive industries (Dean et al., 2025). Empirical studies in developing economies show mixed results, suggesting that the impact of minimum wages depends on regional productivity and industrial structure (Moridian et al., 2025b).

Another important determinant of unemployment is labor force participation rate (*Tingkat Partisipasi Angkatan Kerja/TPAK*), which reflects the proportion of the working-age population actively participating in the labor market (Elhorst & Zeilstra, 2007). An increase in labor force participation without proportional job creation may lead to higher unemployment rates (Kuldasheva & Ahmad, 2025). In rapidly urbanizing regions such as East Java, demographic transitions and increased female labor participation contribute to rising labor supply, potentially creating pressure on employment opportunities (World Bank, 2020). Previous studies indicate that regional variations in labor participation significantly explain differences in unemployment across provinces in Indonesia (Feng & Gao, 2026).

Human capital often proxied by average years of schooling (*Rata-rata Lama Sekolah/RLS*), also plays a crucial role in shaping labor market outcomes. According to human capital theory, higher educational attainment enhances worker productivity and employability, thereby reducing unemployment risk (Becker, 1964). However, in developing regions, the mismatch between educational output and labor market needs may generate educated unemployment, where graduates struggle to find suitable jobs (Psacharopoulos & Patrinos, 2018). Studies in Indonesia highlight that improvements in educational attainment do not always translate into immediate employment gains due to structural constraints and skill mismatches (Meyer & Allen, 1991).

Regional investment, both domestic and foreign, stimulates economic activity, expands production capacity, and generates new employment opportunities (Matusche, 2025). Empirical evidence suggests that investment inflows significantly reduce unemployment by increasing labor demand, particularly in manufacturing and infrastructure sectors (Wu et al., 2025). In the context of East Java, investment has played a vital role in industrial development, yet its distribution remains uneven across districts, potentially contributing to spatial disparities in unemployment rates (De Mooij et al., 2003; He & Yoo, 2024; Nupehewa et al., 2022).

The COVID-19 pandemic introduced unprecedented disruptions to labor markets worldwide, including Indonesia. Government restrictions, declining economic activity, and reduced business operations led to widespread layoffs and reduced working hours (International Labour Organization [ILO], 2021). In Indonesia, the pandemic significantly increased unemployment rates, particularly among informal and low-skilled workers (BPS, 2021). The inclusion of a COVID-19 dummy variable in unemployment analysis is essential to capture the structural break caused by this global shock. Recent

studies confirm that the pandemic altered labor market dynamics by accelerating digital transformation while simultaneously widening employment inequalities (OECD, 2021; IMF, 2022).

Although numerous studies have examined unemployment determinants at the national level, empirical analyses focusing specifically on East Java remain limited. Existing research often emphasizes macroeconomic indicators without integrating labor market participation, education, investment, and pandemic shocks within a unified regional framework. This study addresses this gap by examining how UMK, TPAK, RLS, investment, and COVID-19 collectively influence open unemployment in East Java. By adopting a regional economic perspective, this research contributes to the growing literature on subnational labor market analysis in developing economies.

Furthermore, East Java represents an interesting case study due to its economic diversity and spatial heterogeneity. The province includes industrialized urban centers such as Surabaya alongside agricultural and rural districts with distinct employment structures. Such heterogeneity implies that labor market responses to wage policies, education improvements, and investment flows may vary significantly across regions. Therefore, analyzing these determinants provides valuable insights into regional policy design aimed at reducing unemployment sustainably.

In conclusion, open unemployment in East Java is influenced by complex interactions between labor supply factors, wage policies, human capital development, investment dynamics, and external shocks such as the COVID-19 pandemic. Understanding these relationships is essential for designing effective labor market interventions that balance worker welfare and employment creation. This study seeks to provide empirical evidence on the determinants of open unemployment in East Java by incorporating key regional economic and labor market variables, thereby offering policy implications for promoting inclusive and resilient economic development.

METHODS

Operational Definition of Variables

Clear operationalization of variables is essential to ensure empirical consistency, measurement validity, and replicability in panel data regression analysis (Baltagi, 2021; Wooldridge, 2019). This study employs one dependent variable and five main independent variables, along with one dummy variable, grounded in regional labor economics and macroeconomic theory.

Dependent Variable

Open Unemployment Rate (TPT – Tingkat Pengangguran Terbuka)

The dependent variable in this study is the Open Unemployment Rate (OUR), defined as the percentage of the labor force actively seeking employment but currently unemployed. This indicator reflects regional labor market performance and macroeconomic stability, capturing both structural and cyclical unemployment dynamics (Blanchard & Johnson, 2017). Measurement:

$$TPT = \frac{\text{Number of Unemployed}}{\text{Labor Force}} \times 100$$

Unit: Percentage (%)

Source: National Labor Force Survey (Sakernas), Statistics Indonesia (BPS)

The unemployment rate is widely applied in labor economics to evaluate regional employment conditions and policy effectiveness (ILO, 2022).

Independent Variables

(1) District/City Minimum Wage (UMK)

The District/City Minimum Wage (UMK) represents the legally mandated annual wage floor determined by local government regulations. According to neoclassical labor market theory, higher minimum wages may reduce labor demand if wage levels exceed worker productivity (Borjas, 2020). However, efficiency wage theory suggests that higher wages may increase productivity and reduce labor turnover.

Unit: Indonesian Rupiah (IDR)

Source: Provincial Labor Office (Disnakertrans East Java)

(2) Labor Force Participation Rate (TPAK)

Labor Force Participation Rate measures the proportion of the working-age population actively participating in the labor market, either employed or seeking employment. An increase in labor participation expands labor supply and may increase unemployment when job creation does not grow proportionally (Todaro & Smith, 2020).

Unit: Percentage (%)

Source: National Labor Force Survey (Sakernas), BPS

(3) Mean Years of Schooling (RLS)

Mean Years of Schooling (RLS) represents the average number of years of formal education completed by individuals aged 15 years and above. Human capital theory argues that higher educational attainment enhances worker productivity and employability, thereby reducing structural unemployment (Becker, 1993; Hanushek & Woessmann, 2020).

Unit: Years

Source: Statistics Indonesia (BPS)

(4) Regional Investment (INV)

Investment is measured as the total realization of domestic investment (PMDN) and foreign direct investment (PMA) at the district/city level. Investment contributes to capital accumulation, industrial expansion, and job creation, which potentially reduces unemployment (Solow, 1956; Barro & Sala-i-Martin, 2004).

Unit: Billion Indonesian Rupiah (IDR)

Source: Investment Coordinating Board (BKPM East Java)

(5) COVID-19 Dummy Variable (D_COVID)

The COVID-19 dummy variable captures the economic shock caused by the pandemic period.

The variable is coded as:

1 = Pandemic period (2020–2021)

0 = Other years

The pandemic significantly disrupted labor markets through mobility restrictions, declining economic activity, and employment losses (ILO, 2021; IMF, 2022).

Unit: Binary (0/1)

Source: BPS and WHO reports=

Table 1. Operational Definition of Variables

Variable	Type	Definition	Unit	Data Source
TPT	Dependent	Open unemployment rate	%	Sakernas, BPS
UMK	Independent	District/city minimum wage	IDR	Disnakertrans
TPAK	Independent	Labor force participation rate	%	Sakernas, BPS
RLS	Independent	Mean years of schooling	Years	BPS
INV	Independent	Regional investment realization	Billion IDR	BKPM
D_COVID	Dummy	Pandemic period indicator	Binary	BPS, WHO

Data Type and Sources

This study employs secondary quantitative data using a panel data structure that combines cross-sectional and time-series dimensions. Observation period 2017–2024 (8 years) Cross-sections 38 districts/cities in East Java Province Total observations 304 panel data points

Panel data analysis enables control of unobserved heterogeneity across regions and over time, improving estimator efficiency and reducing omitted variable bias (Baltagi, 2021). Data were collected from official and reliable government institutions, including:

- Statistics Indonesia (BPS)
- National Labor Force Survey (Sakernas)
- Provincial Labor Office (Disnakertrans East Java)
- Investment Coordinating Board (BKPM East Java)

The use of official administrative and survey data enhances data reliability and minimizes measurement errors.

Econometric Model Specification

The empirical panel regression model is specified as follows:

$$TPT_{it} = \beta_0 + \beta_1 UMK_{it} + \beta_2 TPAK_{it} + \beta_3 RLS_{it} + \beta_4 INV_{it} + \beta_5 D_COVID_{it} + \varepsilon_{it}$$

Where:

- i = district/city
- t = year
- β_0 = constant term
- $\beta_1 - \beta_5$ = regression coefficients
- ε_{it} = error term

Data Analysis Technique

Panel regression estimation is conducted using Stata software following standard econometric procedures (Wooldridge, 2019). Descriptive statistics are used to summarize data distribution, including mean, standard deviation, minimum, and maximum values. Variance Inflation Factor (VIF) is applied to detect potential multicollinearity among explanatory variables (Gujarati & Porter, 2009). Three estimation models are compared (1) Pooled Least Squares (PLS) (2) Fixed Effect Model (FEM) (3) Random Effect Model (REM). Model selection procedures include (1) Chow Test: PLS vs FEM (2) Hausman Test: FEM vs REM

The Hausman test determines whether individual effects correlate with explanatory variables (Hausman, 1978). To ensure model validity, diagnostic tests include (1) Heteroskedasticity Test (Breusch–Pagan) (2) Autocorrelation Test (Wooldridge test for panel data). Robust standard errors are applied when violations are detected to maintain BLUE estimator properties. t-test: Partial significance of variables, F-test: Joint significance, R^2 : Goodness-of-fit measure

Research Hypotheses

- H1 : Minimum wage significantly affects unemployment in East Java (expected positive sign).
- H2 : Labor force participation significantly affects unemployment (expected positive sign).
- H3 : Mean years of schooling significantly affects unemployment (expected negative sign).
- H4 : Regional investment significantly affects unemployment (expected negative sign).
- H5 : COVID-19 pandemic period significantly increases unemployment (expected positive sign).

RESULTS AND DISCUSSION

Result

Table 2. Fixed Effects Regression Results (Cluster-Robust Standard Errors)

Dependent Variable: $\ln_TPT$

Variable	Coefficient	Robust Std. Error	t-Statistic	Prob.	Interpretation
$\ln_UMK$	0.1508	0.0684	2.21	0.034	Significant (+)
$\ln_TPAK$	0.0187	0.0401	0.47	0.644	Not Significant
$\ln_RLS$	-0.1273	0.0710	-1.79	0.081	Marginal (10%)
$\ln_INV$	0.0317	0.0409	0.77	0.443	Not Significant
D_COVID	0.4231	0.1021	4.14	0.000	Significant (+)
Constant	3.8345	0.3646	10.52	0.000	-

Model Statistics:

Within R ²	= 0.1808
F(5,37)	= 11.76
Prob > F	= 0.0000
Number of observations	= 304
Number of groups	= 38
Rho	= 0.5891

Table 3. Comparison of OLS, Fixed Effects, and Random Effects Models

Dependent Variable: ln_TPT

Variable	OLS Coef.	FE Coef.	RE Coef.
ln_UMK	0.2592***	0.1508**	0.1735***
ln_TPAK	-0.1652***	0.0187	-0.0190
ln_RLS	-0.1405**	-0.1273	-0.1579**
ln_INV	0.0205	0.0317	0.0278
D_COVID	0.3999***	0.4231***	0.4199***
Constant	4.3405***	3.8345***	3.9863***
R ² (within)	—	0.1808	0.1786

Notes: *** p<0.01; ** p<0.05; * p<0.10

Hausman Test: Prob > chi² = 0.1949

F-test for individual effects: Prob > F = 0.0000

The fixed effects estimation with cluster-robust standard errors indicates that the minimum wage (UMK) and the COVID-19 dummy variable significantly influence open unemployment in East Java. The model is statistically significant as indicated by the F-test (Prob > F = 0.0000), meaning that the independent variables jointly affect the unemployment rate. The within R² value of 0.1808 suggests that approximately 18.08% of the variation in unemployment within districts over time can be explained by the model.

The minimum wage variable (ln_UMK) has a positive and statistically significant coefficient at the 5% level ($\beta = 0.1508$). Because the model uses logarithmic transformation, this coefficient can be interpreted as elasticity. A 1% increase in the district/city minimum wage is associated with a 0.15% increase in the open unemployment rate, ceteris paribus. This finding supports neoclassical labor market theory, which argues that wage floors above marginal productivity may reduce labor demand. In East Java, where labor-intensive sectors still dominate several districts, rising minimum wages may increase production costs and discourage employment expansion.

The labor force participation rate (ln_TPAK) shows a positive but statistically insignificant coefficient. This suggests that increases in labor supply do not significantly influence unemployment variations during the observation period. The result may indicate that labor absorption mechanisms,

including informal sector employment, partially offset increases in labor force participation. Therefore, unemployment in East Java appears to be more demand-driven rather than purely supply-driven.

The mean years of schooling ($\ln_RLS$) variable exhibits a negative coefficient and is marginally significant at the 10% level. This indicates that higher educational attainment tends to reduce unemployment, consistent with human capital theory. However, the relatively weak significance suggests that education alone may not be sufficient to substantially lower unemployment without structural transformation and alignment between education output and labor market demand. The presence of skill mismatch may explain why the effect is not strongly significant at the 5% level.

Regional investment ($\ln_INV$) does not show a statistically significant effect on unemployment. Although investment theoretically stimulates job creation, the insignificant result may imply that investment inflows in East Java are concentrated in capital-intensive sectors that generate limited employment. Additionally, spatial concentration of investment in urban growth centers may reduce its broader labor absorption impact across districts.

The COVID-19 dummy variable shows a strong positive and highly significant effect on unemployment ($\beta = 0.4231$; $p < 0.01$). This indicates that during the pandemic period (2020–2021), unemployment significantly increased compared to non-pandemic years. In semi-log interpretation, the pandemic raised unemployment by approximately 42%. This result confirms that external macroeconomic shocks play a substantial role in shaping regional labor market outcomes. The magnitude of the coefficient highlights the vulnerability of East Java's labor market to economic disruptions.

Overall, the results suggest that wage policy and external shocks are more dominant determinants of unemployment in East Java than structural variables such as education and investment. Policy interventions should therefore focus on balancing wage regulation with productivity growth, encouraging labor-intensive investment, and strengthening labor market resilience to external shocks.

Discussion

The empirical results reveal that wage policy and external economic shocks play a more dominant role in explaining unemployment dynamics in East Java compared to structural variables such as education, labor participation, and investment. The positive relationship between minimum wage and unemployment supports neoclassical labor market theory, which argues that wage floors exceeding marginal productivity may reduce labor demand and increase unemployment (Dean et al., 2025; Feng & Gao, 2026; Kuldasheva & Ahmad, 2025). This finding is also consistent with previous studies in developing economies showing that minimum wage increases may generate adjustment pressures for firms, particularly in regions with heterogeneous productivity levels (Barbier, 1987a, 1987b; Krugman, 1995). Therefore, wage-setting policies should consider regional productivity differences to avoid unintended labor market distortions. Uniform wage adjustments across districts with varying economic structures may disproportionately affect less productive regions, leading firms to reduce hiring or delay labor expansion (Kuldasheva & Ahmad, 2025; Moridian et al., 2025b).

The insignificant effect of labor force participation indicates that unemployment in East Java is more strongly driven by labor demand constraints rather than labor supply expansion. Although higher labor force participation theoretically increases labor supply and may elevate unemployment when job creation lags behind, the empirical findings suggest that labor absorption mechanisms, including informal

employment, may partially offset this effect. This result aligns with previous evidence showing that developing regional labor markets often adjust through informal sector expansion rather than open unemployment changes (Elhorst & Zeilstra, 2007; Moridian et al., 2025b; Wu et al., 2025).

Similarly, the weak influence of education, represented by mean years of schooling, suggests that improving educational attainment alone may not be sufficient to reduce unemployment without stronger alignment between education systems and industry needs. While human capital theory emphasizes that higher education enhances employability and productivity, the insignificant or marginal effect observed in this study may indicate the presence of skill mismatch between graduates and labor market demand. This finding supports prior research indicating that educational expansion in developing countries does not automatically translate into employment gains when structural transformation is (Amin et al., 2025; Asaleye & Ncanywa, 2026; Di Gennaro et al., 2025).

The insignificant impact of regional investment further emphasizes the importance of investment quality rather than quantity. Although economic growth theory predicts that investment stimulates employment creation through capital accumulation and production expansion (Solow, 1956; Barro & Sala-i-Martin, 2004), the results suggest that investment inflows in East Java may be concentrated in capital-intensive sectors or geographically concentrated in urban areas, thereby limiting their capacity to generate widespread employment opportunities. Consequently, employment-oriented investment strategies that prioritize labor-intensive sectors may be more effective in reducing unemployment.

Finally, the strong positive impact of the COVID-19 pandemic confirms that macroeconomic shocks can substantially alter labor market dynamics. The significant coefficient of the COVID dummy variable indicates that unemployment increased sharply during the pandemic period, reflecting disruptions caused by mobility restrictions, declining economic activity, and business closures. This finding is consistent with global labor market evidence showing that the pandemic generated unprecedented employment losses, particularly in developing economies with large informal sectors (ILO, 2021; IMF, 2022; OECD, 2021). The pandemic effect demonstrates the vulnerability of regional employment structures to external crises, highlighting the need for adaptive labor market policies and economic resilience strategies.

Overall, these findings imply that reducing unemployment in East Java requires integrated policy approaches combining wage policy reform, employment-oriented investment strategies, and stronger alignment between human capital development and labor market demand. Policies aimed at enhancing regional productivity, promoting labor-intensive investment, and improving workforce skills relevance are essential to ensure sustainable employment growth and resilience against future economic shocks.

CONCLUSION

This study analyzes the determinants of open unemployment in East Java using panel data from 38 districts/cities during 2017–2024. The empirical results indicate that minimum wage policy and external economic shocks play a more dominant role in influencing unemployment compared to structural variables such as labor force participation, education, and investment.

The minimum wage shows a positive and significant effect on unemployment, suggesting that wage increases may create labor demand adjustments when not accompanied by productivity

improvements. Meanwhile, labor force participation, education, and investment exhibit weak or insignificant effects, indicating that structural factors alone are insufficient to reduce unemployment without stronger alignment between labor market demand, human capital quality, and investment structure.

The COVID-19 pandemic emerges as the strongest determinant, significantly increasing unemployment and demonstrating the vulnerability of regional labor markets to external shocks. Overall, the findings imply that unemployment reduction in East Java requires integrated policies that balance wage regulation, promote labor-intensive investment, strengthen human capital relevance, and improve labor market resilience against future economic disruptions.

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