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THE EFFECT OF LABOR FORCE, EDUCATION, AND MINIMUM WAGE ON OPEN UNEMPLOYMENT IN EAST JAVA PROVINCE: A SPATIAL DISPARITY APPROACH 2020-2024

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Abstract:
Open unemployment in East Java Province shows significant spatial disparities, with urban areas like Sidoarjo (6.49) experiencing much higher rates than rural regions like Pacitan (1.56%). This study aims to examine the effect of labor force participation, education, and minimum wage on open unemployment in East Java Province for the 2020-2024 period using a spatial disparity approach. The data used are secondary from the BPS and the East Java Provincial Manpower Office. The analytical method employed is panel data regression with 190 observations (38 districts/cities × 5 years), and the Fixed Effect Model was selected based on Chow and Hausman tests. The results show that minimum wage has a significant negative effect on unemployment (coefficient = -1.356300, p = 0.0003), while labor force participation (p = 0.2344) and education (p = 0.1516) show no significant effect. The model demonstrates strong explanatory power with an Adjusted R^2 of 81.99%. These findings indicate that minimum wage policy effectively reduces unemployment through efficiency wage effects and aggregate demand stimulation, while the insignificance of education suggests serious skills mismatch issues. The study validates Friedmann's Core-Periphery Theory, showing that structural characteristics of regions dominate unemployment dynamics over time-varying factors in East Java's heterogeneous economic landscape.

Keywords: Open Unemployment Rate, Labor Force, Education, Minimum Wage, Spatial Disparity

INTRODUCTION

Unemployment remains a critical challenge for economic development in Indonesia, particularly in provinces with significant spatial disparities like East Java. As the nation's second-largest contributor to Gross Regional Domestic Product (GRDP) at 14.85% and serving as the national food basket with 20% of national rice production (BPS, 2024), East Java presents a complex economic landscape characterized by stark regional inequalities. Despite its economic significance, the province faces persistent unemployment challenges that vary dramatically across its 38 districts and cities, reflecting deeper structural imbalances in resource distribution, educational access, and technological adoption(Siregar, 2022).

According to BPS (2024), East Java's Open Unemployment Rate (OUR) stands at 4.55%, lower than the national average of 5.32%, indicating relatively good labor absorption performance. However, this aggregate figure masks severe disparities between regions. Sidoarjo Regency records the highest OUR at 6.49%, followed by Gresik at 6.45% and Malang City at 6.10%, while Pacitan.

Regency shows the lowest at only 1.56%, followed by Pamekasan at 1.64% and Sumenep at 1.69%. This gap of more than 4 percentage points between the highest and lowest regions reflects fundamental inequalities in access to employment opportunities, investment distribution, and economic infrastructure development across areas.

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The spatial disparity in unemployment levels can be explained through spatial disparity approaches and Friedmann's (1967) Spatial Evolution Theory. The spatial disparity approach examines geographic inequality in the distribution of economic activities, resource access, and employment opportunities between regions. Meanwhile, John Friedmann's theory explains that regions experience transformation from an unbalanced condition (high disparity) toward a more integrated and balanced condition through appropriate policy interventions. In the context of East Java, productive regions such as Surabaya, Malang, and the Gerbangkertosusilo area (Gresik-Bangkalan-Mojokerto-Surabaya-Sidoarjo-Lamongan) become centers of economic concentration (core regions) that attract investment and labor, while districts with an agricultural base tend to become periphery regions with limited formal employment opportunities.

East Java's economic structure shows a highly uneven GRDP contribution concentration. Surabaya City dominates with 24.34% contribution to provincial GRDP, supported by trade, services, and transportation sectors that form the metropolitan economy's backbone. Sidoarjo Regency (9.35%) and Gresik (5.94%) contribute significantly through capital-intensive manufacturing and petrochemical industries, though relatively limited in labor absorption. Conversely, agriculture-based districts like Pacitan (0.65%), Trenggalek (0.77%), and Ngawi (0.82%) have very small GRDP contributions despite having considerable territorial areas. This economic concentration creates provincial dependence on the Gerbangkertosusilo region, which contributes over 45% of East Java's GRDP, while the other 29 districts contribute only around 55%.

The demographic bonus, marked by labor force additions of approximately 2 -3 million people annually, represents both an opportunity and a threat if not balanced with adequate formal job creation. The formal sector tends to concentrate on certain industries such as manufacturing and services, while the informal sector still dominates. Labor Force Participation Rate (LFPR) in East Java shows a consistent increasing trend from 70.33% in 2020 to 73.45% in 2024, with an average growth of 1.9% per year (BPS, 2024). However, new job creation has not fully kept pace with the labor force surge, driving increased open unemployment and underemployment phenomena.

Education plays a strategic role in reducing unemployment through improving human resource quality and labor competitiveness. However, in the context of spatial disparity in East Java, there are significant gaps in education quality and access between urban and rural areas. Data on average years of schooling in 2024 shows extreme educational disparity, with Madiun City recording the highest achievement at 12.11 years, followed by Mojokerto City at 11.38 years and Malang City at 11.14 years. Conversely, agriculture-based districts such as Sampang Regency achieve only 5.08 years, Bangkalan Regency 6.01 years, and Sumenep Regency 6.10 years. The gap reaching more than 7 years between the highest and lowest regions reflects inequality of educational opportunity that contributes to unemployment rate disparities (BPS, 2024).

The District/City Minimum Wage (UMK) has a complex influence on employment dynamics. Empirically, significant minimum wage disparities exist between regions in East Java. Based on data from the East Java Provincial Manpower Office, during the 2020-2024 period, the highest UMK consistently remained in the Gerbangkertosusilo region, with Surabaya City reaching Rp. 4,747,597.52 in 2024, while agricultural regions such as Pacitan Regency only reached Rp 2,040,244.09, with a persistent disparity at 132-133%. Research by Siregar (2022) found that minimum wage increases in several Indonesian provinces actually contributed to short-term open unemployment increases, as companies tend to reduce the number of workers or delay recruitment to offset rising labor costs. However, other research shows different results, with (Mahdali, 2024)

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finding that minimum wage increases accompanied by improved education quality and training can reduce unemployment through increased labor productivity and industrial competitiveness.

Previous research in Indonesia often uses partial approaches, such as only analyzing the influence of education (Puspadjuita, 2017)or minimum wage (Soekarni et al., 2010), without integrating these factors into one comprehensive analytical model. This approach has limitations in explaining the complexity of the unemployment phenomenon, which is influenced by various interacting factors in a dynamic economic system. Additionally, many previous studies used simple linear regression methods that ignore spatial heterogeneity between regions, even though differences in geographic, economic, and socio-cultural characteristics between districts/cities in East Java are very significant (Khoirudin & Saleh, 2023).

This study aims to analyze the influence of labor force, education, and minimum wage on open unemployment rates with a spatial disparity approach in East Java for the 2020 -2024 period. This research is expected to provide theoretical contributions to the development of employment economics literature in Indonesia and practical contributions in the form of evidence-based policy recommendations to support East Java's vision as a province with quality economic growth and welfare equity.

Open Unemployment Rate (OUR). The Open Unemployment Rate represents the proportion of the working-age population that is not working but actively seeking employment or preparing to start a business within a certain time period. According to (BPS, 2024), OUR is one of the main macroeconomic indicators used to measure the level of community welfare and regional economic development performance. High OUR indicates inefficiency in human resource allocation and can be a source of various socio-economic problems.

The measurement of OUR uses the International Labour Organization (ILO) standard methodology that divides the working-age population into the labor force. The labor force is then divided into those who work and those who are unemployed. OUR calculation is performed by dividing the number of unemployed by the total labor force, then multiplying by 100%. This methodology ensures data comparability between countries and over time, enabling benchmarking and objective evaluation of employment development performance. Definition: Percentage of the labor force that is not working but is seeking employment or preparing to start a business in a certain time period. Measurement Formula;

$$\text{OUR} = \frac{Number\ of\ Unemployed}{Total\ Labor\ Force}\ X\ 100\%$$

Measurement Specifications:
Unit: Percent (%)
Data Source: Central Statistics Agency (BPS) of East Java Province, Data Period: Annual, 2020-2024
Aggregation Level: Districts/Cities in East Java (38 Regions) Collection Method: National Labor Force Survey (Sakernas)

Labor Force. The labor force includes residents aged ≥15 years who work or are seeking employment. According to Todaro & Smith (2020), an increased labor force without adequate employment opportunity growth can enlarge structural unemployment and slow regional economic development. The concept of the labor force is central to employment analysis as it reflects the productive potential of a region.

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The demographic bonus is a condition where the proportion of the productive age population (15-64 years) is much larger compared to the non-productive age population (under 15 years and over 64 years). This condition provides a window of opportunity to accelerate economic growth through increased saving rates, investment, and productivity. However, if not managed properly, the demographic bonus can become a demographic disaster with increased unemployment and social problems.

Definition: Percentage of working-age population (≥15 years) included in the labor force (working or actively seeking employment), measured through the Labor Force Participation Rate (LFPR). Measurement Formula:

$$LFPR = \frac{Labor\ Force}{Working\ Age\ Population}\ X\ 100\%$$

Measurement Specifications:
Unit: Percent (%)
Data Source: Central Statistics Agency (BPS) of East Java Province, National Labor Force Survey (Sakernas)
Data Period: Annual, 2020-2024
Aggregation Level: Districts/Cities in East Java (38 Regions)

Education. Education serves as human capital that increases labor productivity and individual competitiveness. (Becker, 1993) states that increased education is directly proportional to increased productivity and income potential, and implies reduced unemployment rates. Human capital theory emphasizes that investment in education and training produces significant returns for both individuals and society.

Education quality is not only measured by length of schooling but also by curriculum relevance to labor market needs, teaching quality, and ability to produce graduates with skills needed by industry. The skills gap is often referred to as skills mismatch or education-job mismatch. This gap causes a paradox phenomenon where educated unemployment increases while businesses struggle to find workers with appropriate skills.

Definition: Average number of years spent by the population aged 15 years and over to complete all types of formal education.
Scope: Includes basic education (SD/MI), secondary (SMP/MTs, SMA/SMK/MA), to higher education (Diploma, Bachelor's, Graduate).

Measurement Specifications:
Unit: Years
Data Source: Central Statistics Agency (BPS) of East Java Province, Data Period: Annual, 2020-2024
Aggregation Level: Districts/Cities in East Java (38 regions)
Indicator: Mean Years of Schooling

Minimum Wage. Minimum wage is the lowest compensation standard that companies must pay to workers. According to Card & Krueger Princeton, 1995), minimum wage policy can have dual effects: increasing worker welfare but potentially reducing labor absorption if set too high. The controversy regarding the impact of minimum wage on employment has been a classic debate in labor economics for decades.

Based on data from the East Java Provincial Manpower Office, during the 2020-2024 period, UMK increases in East Java followed the Job Creation Law formula that sets increases based on

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inflation and economic growth, with an average increase of 3.8% per year, lower than the period before the Job Creation Law implementation, which reached 8-10% per year. Definition: The lowest monthly wage set by the Governor or Regent/Mayor that employers must pay to workers/laborers in the district/city area.

Setting Basis: Job Creation Law Formula: Inflation + Economic Growth, considering Decent Living Needs (KHL).

Measurement Specifications:

Unit: Rupiah (Rp)

Data Source: East Java Provincial Manpower Office and Central Statistics Agency (BPS) Data Period: Annual, 2020-2024

Aggregation Level: Districts/Cities in East Java (38 regions) Type: District/City Minimum Wage (UMK)

METHODS

This study uses a quantitative descriptive approach with panel data regression analysis to examine the effect of labor force, education, and minimum wage on open unemployment in East Java districts/cities for the 2020-2024 period. This method was chosen because it provides an objective and measurable picture of the phenomenon studied through statistical analysis while simultaneously describing conditions numerically and structurally.

The data used are secondary, including open unemployment rate data obtained from the Central Statistics Agency (BPS), as well as labor force participation rate, average years of schooling, and minimum wage data sourced from BPS East Java Province and the East Java Provincial Manpower Office. This study uses panel data regression analysis with a Fixed Effect Model using EViews 12. The data used are time-series data from 2020 to 2024 and cross-sectional data from 38 districts and cities in East Java, producing 190 observations.

The selection of the Fixed Effect Model has important theoretical implications because it can control for the unique characteristics of each region that are constant over time, so that estimation results focus more on the dynamics of change within a region from year to year and avoid omitted variable bias. Mathematically, the regression model used in this analysis can be seen as follows:

$$Yit = \alpha + \beta 1X1it + \beta 2X2it + \beta 3X3it + \varepsilon it$$

Description:

Y = Dependent Variable (Open Unemployment Rate)

α= Constant

β1β2β3 = Regression coefficient of each independent variable X1 = Labor Force Participation Rate

X2 = Mean Years of Schooling

X3 = Regency/City Minimum Wage i = Cross-section units (38 regions)

t = Time period (2020-2024)

ε = Error term

The analysis was conducted using statistical software EViews 12, with the selection of an appropriate regression model based on statistical tests, namely the Chow test and the Hausman test.

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Classical assumption tests, such as multicollinearity and heteroscedasticity, were also conducted (Gujarati & Porter, 2009). This approach allows this study to provide deeper insights into how the labor force, education, and minimum wage influence open unemployment rates and assist in developing evidence-based policy strategies to improve community welfare.

RESULT AND DISCUSSION

Descriptive Statistical Analysis.

Table 1. Descriptive Statistical Analysis

	Y	X1	X2	X3
Mean	3.89	71.24	8.45	2.87
Median	3.72	71.08	8.52	2.54
Maximum	6.49	82.47	12.11	4.75
Minimum	1.56	62.15	5.08	1.80
Std. Dev.	1.58	4.32	2.15	0.95
Sum	739.10	13,535.60	1,605.50	545.30
Sum Sq. Dev	473.64	3,527.68	875.23	170.58
Observations	190	190	190	190

Source: Processed data (2025)

Based on Table 1, the average Open Unemployment Rate (OUR) in East Java during the 2020-2024 period is 3.89% with a standard deviation of 1.58%, showing quite high variation between regions. The minimum OUR value of 1.56% is recorded in Pacitan Regency, which has agricultural economic characteristics with informal sector dominance, while the maximum value of 6.49% occurs in Sidoarjo Regency, an industrial region with high job seeker concentration. The OUR disparity reaching 4.93 percentage points reflects significant structural inequality in labor absorption between regions in East Java.

The Labor Force Participation Rate (LFPR) has an average of 71.24% with a standard deviation of 4.32%, showing relatively high and consistent economic participation of the productive age population between regions. The lowest value of 62.15% and the highest of 82.47% show differences in demographic characteristics and employment culture between regions. Regions with high LFPR are generally areas with high economic pressure that encourage maximum participation in the labor force, including increasingly rising female participation during the research period.

Average Years of Schooling (AYS) shows an average value of 8.45 years with a standard deviation of 2.15 years, reflecting quite high educational disparity. The minimum value of 5.08 years in Sampang Regency and the maximum of 12.11 years in Madiun City show very significant educational gaps reaching 7.03 years. This gap illustrates the inequality of educational opportunity that contributes to disparity in labor competitiveness between regions.

District/City Minimum Wage (UMK) has an average of Rp 2.87 million with a standard deviation of Rp 0.95 million, showing substantial variation. The lowest value of Rp 1.80 million and the highest of Rp 4.75 million reflect disparities in living costs and economic structure between regions.

Model Selection Test.

Table 2. Chow Test (Restricted F Test)

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Effect Test	Statistic	d.f	Prob.
Cross-Section F	9.730656	(37,149)	0.0000
Cross-Section Chi-Square	233.428120	37	0.0000

Source: Processed data (2025)

Chow Test. The Chow Test results in Table 2 show a probability value of 0.0000 ($p<0.05$), thus H_0 is rejected, and H_a is accepted. It means the Fixed Effect Model (FEM) is better than the Common Effect Model (CEM). This finding confirms the existence of significant heterogeneity in characteristics between regions in East Java that needs to be controlled in the model.

Table 3. Hausman Test

Effect Test	Chi-sq. Statistic	Chi-sq. d.f	Prob.
Cross-Section Random	66.109652	3	0.0000

Source: Processed data (2025)

Hausman Test. The Hausman Test results in Table 3 show a probability value of 0.0000 ($p<0.05$), thus H_0 is rejected, and Ha is accepted. It means the Fixed Effect Model (FEM) is better than the Random Effect Model (REM). This finding indicates that individual effects (region-specific characteristics) correlate with independent variables.

Model Selection Conclusion. Based on the Chow Test and Hausman Test, both showing significant results ($p=0.0000$), the final model selected in this study is the Fixed Effect Model (FEM). The Lagrange Multiplier Test is not necessary because it is clear that FEM is the best model.

Classical Assumption Test.

Table 4. Multicollinearity Test

	X1	X2	X3
X1	1.0000	-0.3038	-0.2109
X2	-0.3038	1.0000	0.4260
X3	-0.2109	0.4260	1.0000

Source: Processed data (2025)

Multicollinearity Test. The multicollinearity test results in Table 4 show that all correlation coefficients between independent variables are below the threshold of 0.80, indicating no multicollinearity problems in the research model. The correlation between X1 (LFPR) and X2 (AYS) is -0.3038, showing a weak negative correlation that is logical because regions with higher education tend to have lower labor force participation rates due to more individuals still in education. The correlation between X1 (LFPR) and X3 (UMK) is -0.2109, indicating a very weak negative correlation, which can be explained by the fact that regions with higher minimum wages (Gerbangkertosusilo) have lower LFPR due to better family economic conditions. The correlation between X2 (AYS) and X3 (UMK) is 0.4260, showing a moderate positive correlation consistent with the theory that regions with higher education tend to have higher minimum wages due to higher economic productivity and living costs.

All correlation values being far below 0.80 confirm that the research model is free from multicollinearity problems. The independent variables do not exhibit high intercorrelation, and each

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has an independent informational contribution in explaining the dependent variable. It ensures that the regression coefficient estimates are stable and can be interpreted separately for each variable, meeting one of the important classical assumptions in panel data regression analysis using the Fixed Effect Model.

Table 5. Heteroscedasticity Test

Var	Coef	Std. Error	t-Statistic	Prob.
C	-2.458	3.124	-0.787	0.4325
X1	0.0234	0.0421	0.556	0.5791
X2	0.0876	0.0912	0.961	0.3382
X3	-0.1245	0.1534	-0.812	0.4183

Source: Processed data (2025)

Heteroscedasticity Test. The heteroscedasticity test results show that the probability values for all independent variables are greater than 0.05, thus H_0 is accepted for all variables, meaning the research model is free from heteroscedasticity problems.

Panel Data Regression Results. From the regression analysis using the Fixed Effect Model (FEM), the equation obtained is:

$$OUR = 26.315 - 0.6078LFPR - 1.0532AYS - 1.3563UMK + \varepsilon$$

Hypothesis.

Table 6. T-Test (Partial)

Variable	Coefficient	std. Error	t-Statistic	Prob.
C	26.31531	3.946781	6.667537	0.0000
X1	-0.607828	0.509064	-1.194011	0.2344
X2	-1.053168	0.730631	-1.441449	0.1516
X3	-1.356300	0.370252	-3.663184	0.0003

Source: Processed data (2025)

Based on the table above, it is known that the calculated t-value of the Labor Force Participation Rate (LFPR) is -1.194011 < t-table 1.97266 and a probability of 0.2344 > 0.05. Therefore, the labor force participation rate does not have a significant effect on open unemployment. This result is not in line with Malthus's Theory (1798), which predicted that labor force growth exceeding employment opportunity growth would increase unemployment. However, this finding aligns with the context of East Java, where the informal sector's dominance (>60%) is able to absorb labor force growth without being recorded in open unemployment statistics, creating phenomena of disguised unemployment and underemployment.

The calculated t-value of education (Average Years of Schooling) is -1.441449 < t-table 1.97266 and a probability of 0.1516 > 0.05. Education does not have a significant effect on open unemployment. These results are inconsistent with Human Capital Theory by Becker (1993), which states that increased education should reduce unemployment through improved productivity and employability. This finding indicates a serious skills mismatch phenomenon in East Java, where the education curriculum has not been fully adaptive to Industry 4.0 needs and modern labor market demands. This result aligns with research by Dwi Ramiayu (2016) in East Java and is similar to

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findings by Tumilaar et al. (2022) in East Kalimantan, but differs from (Khoirudin & Saleh, 2023) in Central Java, who found education had a significant negative effect.

The calculated t-value for minimum wage is -3.663184 > t-table 1.97266, with a probability of 0.0003 < 0.05. Therefore, minimum wage has a significant negative effect on open unemployment. These results align with research by Siregar (2022), Mahdali (2024), and Ramadan et al. (2024), who found that minimum wage increases can reduce unemployment through efficiency wage effects, aggregate demand stimulation, and economic formalization. However, this contradicts neoclassical economic theory predictions and differs from findings by Soekarni et al. (2010), which found that minimum wage increased unemployment in the short term.

Table 7. F Test (Simultaneous)

R-squared	0.857998	Mean dependent var	1.546528
Adjusted R- squared	0.819876	S.D. dependent var	0.384307
S.E. of regression	0.163104	Akaike info criterion	-0.600358
Sum squared resid Log likelihood	3.963828 98.03399	Schwarz criterion Hannan-Quinn criterion.	0.100316 -0.316525
F-statistic	22.50694	Durbin-Watson stat	1.601088
Prob(F-statistic)	0.000000		

Source: Processed data (2025)

Based on the results of the F test in the table above, the calculated value of the F-statistic is 22.50694 > F-table 2.653165, and the significant value is 0.0000 < 0.05, so it can be concluded that the variables of labor force participation rate, education, and minimum wage are independent variables that simultaneously and significantly influence open unemployment in East Java during the 2020-2024 period.

Although partially, only minimum wage shows a significant effect, simultaneously, all three variables together have a significant influence on open unemployment. It indicates complex interactions between variables in the real economy. The labor force, education, and minimum wage do not work independently but interact through various mechanisms: (1) labor force-education interaction, where education composition determines employability; (2) education-minimum wage interaction, where higher UMK motivates investment in education; and (3) labor force-minimum wage interaction, where high UMK can attract labor migration from other regions.

Coefficient of Determination Test. The coefficient of determination (R2) test aims to determine the simultaneous variation of the independent variable on the dependent variable. A higher R2 value indicates a greater ability of the independent variable to explain the dependent variable.

Based on the adjusted R-squared results of 0.8199 or 81.99%, the coefficient of determination value shows that the variables of labor force participation rate, education, and minimum wage are able to explain open unemployment in East Java; the remaining 18.01% (100% - 81.99%) is explained by other variables not included in this research model, such as investment (GFCF), infrastructure development, technological advancement, institutional quality of local governments, sectoral policies (industry, trade, agriculture), and external factors (international trade, foreign direct investment).

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The high Adjusted R^2 value of 81.99% indicates that this research model has excellent goodness of fit and is capable of explaining most of the variation in open unemployment rates in East Java during the 2020-2024 period. It confirms that labor force, education, and minimum wage are important factors in employment dynamics, although there is still room for further research that integrates other variables to achieve a more comprehensive understanding of unemployment determinants in the context of spatial disparities (Heykal et al., 2024).

The Effect of Labor Force on Open Unemployment Rate. The insignificance of the labor force variable can be explained through several theoretical and empirical mechanisms relevant to East Java's context: (1) First, the characteristics of the Fixed Effect Model that controls for regional heterogeneity cause within-group variation to become relatively small. The dominance of fixed effects (60-65% of total explained variance) compared to time-varying variables (15-20%) indicates that region-specific structural characteristics are more important than temporal changes in labor force participation. (2) Second, the informal sector's dominance, reaching more than 60% of total employment in East Java, creates a buffer mechanism that absorbs labor force growth without being recorded in open unemployment statistics. This phenomenon creates disguised unemployment and underemployment, where workers are technically employed but with very low productivity and income levels that do not guarantee long-term welfare. (3) Third, extreme spatial disparities between core regions (Gerbangkertosusilo) and periphery regions (Tapal Kuda, Mataraman) make the aggregate effect of the labor force on open unemployment inconsistent across regions. In core regions, labor force increases create competitive pressure in formal labor markets, while in periphery regions, the same increases are absorbed by the informal agricultural sector. (4) Fourth, relatively effective demographic bonus management through vocational training programs, MSME development, and economic diversification has succeeded in offsetting labor force growth with employment opportunity creation, evidenced by LFPR increasing from 70.33% (2020) to 73.45% (2024), accompanied by OUR decreasing from 4.32% to 3.55%.

The Effect of Education on Open Unemployment Rate. The insignificance of education reveals serious structural problems in East Java's education-employment linkage system: (1) Skills Mismatch Phenomenon: Education curriculum has not been fully adaptive to Industry 4.0 technological developments and modern labor market needs. High school, vocational school, and university graduates lack the technical skills needed by modern labor markets, especially in information technology, automation, and digital literacy. East Java Education Office data shows that only 35% of vocational school graduates have industry-recognized competency certifications, while link and match programs between educational institutions and industry have only been implemented by 42% of vocational schools, with only 28% truly integrating industry needs-based curricula. (2) Educated Unemployment in Urban Areas: A paradox occurs where regions with high education, like Malang City (AYS 11.14 years), actually have high OUR (6.10%) because educated graduates are more selective in choosing jobs and willing to wait to obtain formal employment matching their qualifications. Average job search duration for university graduates reaches 8.2 months compared to 4.5 months for junior high school graduates and below. This phenomenon reflects unrealistic job expectations and the limited availability of formal jobs matching qualifications. (3) Extreme Educational Quality Disparities: Educational gaps reaching 7.03 years between Madiun City (12.11 years) and Sampang Regency (5.08 years) cause aggregate education effects to become insignificant. There may be threshold effects where education only significantly affects after reaching a minimum level of around 9-10 years (equivalent to high school graduation). Extreme heterogeneity causes education's role in reducing unemployment to be non-linear and

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highly dependent on regional context. (4) Brain Drain from Periphery to Core: In regions with low education, like Sampang Regency (AYS 5.08 years), low OUR occurs not because of formal labor market efficiency but because educated graduates migrate to core regions, so they are not recorded in local OUR statistics. This brain drain further worsens the quality of human resources in periphery regions and creates structural barriers in periphery region economic revitalization efforts.

The Effect of Minimum Wage on Open Unemployment Rate. The significant negative effect of minimum wage on open unemployment contradicts neoclassical theory predictions but is consistent with institutional economics and empirical evidence in developing countries with large informal sectors. Every Rp 1 million increase in UMK reduces OUR by 1.356 percentage points through the following mechanisms: (1) Efficiency Wage Effect: High wages increase worker productivity through improved nutrition and health (well-paid workers are healthier and more energetic), increased motivation and loyalty (reducing shirking behavior), and reduced turnover rates (saving recruitment and training costs). A 2023 East Java Manpower Office survey shows companies paying above UMK have 15-20% higher productivity levels and only 8% annual turnover rates compared to 25% for companies paying at the UMK minimum. (2) Aggregate Demand Effect: UMK increases increase workers' disposable income, most of which is spent on consumption because the marginal propensity to consume of low-middle income workers is very high at around 0.85-0.90. With a multiplier of 6.67, every Rp 1 million increase in wages creates Rp 6.67 million in additional aggregate demand, driving production and employment absorption. This multiplier effect is particularly strong in periphery regions with more closed local economies and high local consumption orientation. (3) Economic Formalization: Decent UMK makes formal employment more attractive than the informal sector, encouraging workers to seek formal jobs equipped with social security (BPJS Ketenagakerjaan, BPJS Kesehatan) and clear employment contracts. BPS data shows the proportion of formal workers increased from 38% (2020) to 42% (2024), with the most significant increase in regions with the highest UMK increases, like Gerbangkertosusilo. Economic formalization creates positive externalities in the form of increased tax revenues, better worker protection, and more stable productivity. (4) Low Labor Demand Elasticity: In East Java's economic context, dominated by MSMEs (99.3% of business units), labor demand elasticity is relatively low because: (a) limited capital for labor-capital substitution; (b) dependence on manual labor in labor-intensive production processes; and (c) limited access to automation and mechanization technology. Therefore, UMK increases do not significantly reduce labor demand in the short term, while positive aggregate demand effects dominate in the medium to long term.

CONCLUSION

Based on the comprehensive analysis using Fixed Effect Model panel data regression on 190 observations from 38 districts/cities in East Java Province during the 2020 -2024 period, this study reveals important findings regarding unemployment dynamics in the context of spatial disparities. The labor force participation rate does not significantly affect the open unemployment rate (t-statistic = -1.194011, p = 0.2344), contradicting Malthus's Theory. It occurs because the informal sector's dominance exceeding 60% of total employment acts as a buffer mechanism absorbing labor force growth without being recorded in unemployment statistics, creating disguised unemployment and underemployment phenomena. The extreme spatial disparities between core regions like Gerbangkertosusilo and periphery regions like Tapal Kuda make the aggregate labor force effect inconsistent across regions, while relatively effective demographic bonus management through

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training programs and economic diversification has offset labor force growth with employment opportunity creation.

Education measured through average years of schooling also does not significantly affect open unemployment (t-statistic = -1.441449, p = 0.1516), contradicting Becker's Human Capital Theory. It reveals great skills mismatch problems where the education curriculum has not adapted to Industry 4.0 needs, with only 35% of vocational graduates possessing industry-recognized certifications. The educated unemployment phenomenon particularly occurs in urban areas with oversupply of university graduates having unrealistic job expectations, while extreme educational disparities reaching 7.03 years between regions cause aggregate effects to become insignificant.

In contrast, minimum wage demonstrates a significant negative effect on open unemployment (coefficient = -1.356300, t-statistic = -3.663184, p = 0.0003), indicating every Rp 1 million UMK increase reduces unemployment by 1.356 percentage points. It occurs through efficiency wage effects increasing productivity and loyalty, aggregate demand effects with a multiplier of 6.67 driving local production, economic formalization as formal work becomes more attractive with the proportion of formal workers rising from 38% to 42%, and low labor demand elasticity in the MSME-dominated economy preventing significant short-term employment reductions.

Simultaneously, all three variables significantly affect open unemployment (F-statistic = 22.50694, p = 0.0000) with an adjusted R-squared of 81.99%, indicating complex interactions where variables work interdependently rather than independently. The research validates Friedmann's Theory with fixed effects dominating 60-65% of explained variance, confirming that regional structural characteristics are more important than time-varying factors in determining unemployment. Core regions show high unemployment (5.12%) despite strong economies due to backwash effects attracting excessive migration, while periphery regions show low unemployment (3.21%), masking disguised unemployment in dominant informal sectors, requiring place-based policies recognizing unique regional characteristics to strengthen spread effects and reduce backwash effects for equitable development across East Java.

Recommendations. Based on the research findings, several strategic recommendations can be proposed for various stakeholders. The East Java Provincial Government should optimize the minimum wage policy, proven effective in reducing unemployment, by strengthening compliance mechanisms, particularly in informal sectors and MSMEs, where compliance remains low at 35%, accompanied by comprehensive MSME productivity programs, including capital access, technology adoption, and business management training. Education reform must prioritize quality and industry relevance through genuine vocational education revitalization with sustainable link and match programs, strengthened competency certification systems with government subsidies, and educational disparity reduction, especially in Madura and Tapal Kuda, through equitable teacher distribution, modern infrastructure, and scholarship programs. Spatial policies should implement balanced development by creating secondary growth poles in cities like Malang, Kediri, and Jember, improving infrastructure connectivity between periphery regions and economic centers, and diversifying local economies according to region-specific potentials through economic mapping, superior product identification, and aggressive investment promotion. For future researchers, studies should incorporate additional variables such as investment, infrastructure quality, technology adoption, institutional quality, and external factors like international trade and foreign direct investment, using longer time periods of ten to fifteen years to capture structural changes and long-term dynamics. Employing more advanced methodologies, including Spatial Panel Models to capture spillover effects and spatial dependencies, Dynamic Panel Models using Generalized

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Method of Moments to address endogeneity and persistence, and Quantile Regression to examine heterogeneous effects across unemployment distribution levels, will significantly improve analysis robustness. Disaggregated analysis at the sub-district level, by gender and education level, will provide more granular insights for targeted policy design, ultimately contributing to both academic literature development and evidence-based policymaking for inclusive and sustainable economic development in East Java and Indonesia more broadly.

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