

The Dynamics of Gross Regional Domestic Product, Labor Force Participation Rate, and Poverty on the Open Unemployment Rate: Evidence from Panel Data in the Gerbangkertosusila Metropolitan Area, 2012–2024

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Abstract

This study aims to analyse the effect of Gross Regional Domestic Product (GRDP), Labor Force Participation Rate (LFPR), and the percentage of poor population on the Open Unemployment Rate in the Gerbangkertosusila region during the period 2012–2024. The study employed a quantitative approach using panel data regression analysis on seven regencies/cities in the Gerbangkertosusila area. The data used were secondary data obtained from the Central Statistics Agency (Badan Pusat Statistik/BPS). The model selection results indicated that the most appropriate model was the Fixed Effect Model (FEM) with robust standard errors. The results showed that GRDP had a negative relationship but did not significantly affect the Open Unemployment Rate. Meanwhile, the Labor Force Participation Rate (LFPR) had a positive and significant effect on the Open Unemployment Rate, while the percentage of poor population had a negative and significant effect on the Open Unemployment Rate. The negative relationship indicates that low-income communities tend to continue working in the informal sector or vulnerable employment, causing them not to be fully classified as openly unemployed. Simultaneously, GRDP, LFPR, and the percentage of poor population significantly affected the Open Unemployment Rate in the Gerbangkertosusila region. However, the relatively low within R-squared value indicates that the Open Unemployment Rate is also influenced by other factors outside the research model. Therefore, local governments are expected to improve job creation policies, develop labor-intensive sectors, and enhance

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the quality of human resources to reduce the Open Unemployment Rate in the Gerbangkertosusila region.

Keywords: Open Unemployment, Gross Regional Domestic Product, Labor Force Participation Rate, Poverty, Panel Data.

INTRODUCTION

Unemployment remains one of the major economic challenges in regional development in Indonesia. The Open Unemployment Rate (OUR) is widely used to measure the proportion of the labor force that is unemployed and actively seeking employment. The Gerbangkertosusila metropolitan area, comprising Gresik, Bangkalan, Mojokerto, Lamongan, Sidoarjo, Mojokerto City, and Surabaya City, is the second-largest metropolitan region in Indonesia after Jabodetabek and plays a strategic role in supporting the economic growth of East Java. Although Gross Regional Domestic Product (GRDP) has continued to increase across the region, this growth has not generated employment opportunities at the same pace. As a result, unemployment continues to pose a major challenge to regional development. In addition, the Labor Force Participation Rate (LFPR) and the percentage of the poor population also influence labor market conditions. These circumstances indicate that unemployment is determined not only by economic growth but also by labor market dynamics and broader socioeconomic factors.

The relationships among the research variables can be explained through several theoretical perspectives. Endogenous Growth Theory proposed by (Romer, 1986) argues that economic growth is driven by innovation, technological advancement, and productivity improvements, which do not necessarily lead to proportional increases in employment. Natural Rate of Unemployment Theory introduced by (Phelps, 1967) suggests that unemployment is influenced by structural labor market characteristics, including skill mismatch and job-search frictions. Meanwhile, the Capability Approach developed by (Sen, 1985) emphasizes that poverty reflects limited individual capabilities to access economic opportunities, thereby affecting labor market outcomes. Therefore, Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR), and the percentage of the poor population are theoretically expected to influence the Open Unemployment Rate.

Previous empirical studies have reported inconsistent findings regarding the determinants of unemployment. (Gina & Sabar, 2025; Khoirunnisa & Rofiki, 2025) found

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that GRDP significantly affects the Open Unemployment Rate, whereas (Hafiszrianda & Iek, 2024) argued that economic growth does not necessarily reduce unemployment because of the dominance of capital-intensive industries. The Labor Force Participation Rate significantly affects unemployment (Rahmayani et al., 2025), while (Wulandari et al., 2024) identified a significant relationship between poverty and the Open Unemployment Rate. These inconsistent findings reveal a research gap, particularly in metropolitan regions with complex economic structures and labor market characteristics such as Gerbangkertosusila. Most previous studies have focused on national or provincial levels, whereas panel data studies specifically examining the Gerbangkertosusila metropolitan area remain limited. Furthermore, previous studies generally examined these determinants separately, whereas the present study simultaneously investigates the effects of GRDP, LFPR, and the percentage of the poor population using a panel data regression approach.

Given the strategic role of Gerbangkertosusila as the second-largest metropolitan area in Indonesia, this study is particularly important because it provides empirical evidence on the interaction between economic growth, labor force participation, and poverty in shaping unemployment dynamics. Unlike previous studies that primarily focused on individual determinants or broader geographical units, this study simultaneously examines these factors using panel data at the metropolitan level. The findings are expected to contribute to the literature on regional labor economics while providing practical insights for policymakers in formulating more effective, inclusive, and sustainable employment policies.

Objectives

As the second-largest metropolitan region in Indonesia, Gerbangkertosusila plays a strategic role in driving the economic growth of East Java. However, its strong economic performance has not been fully accompanied by adequate employment creation. Therefore, examining the determinants of the Open Unemployment Rate in Gerbangkertosusila is essential to provide empirical evidence on the relationships among economic growth, labor force participation, poverty, and unemployment.

This study aims to analyze the effects of Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR), and the percentage of the poor population on the Open Unemployment Rate in the Gerbangkertosusila metropolitan area during the period 2012–2024 using a panel data regression approach. The findings are expected to provide empirical evidence regarding the determinants of open

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unemployment and to serve as a reference for regional governments in designing more effective, inclusive, and sustainable employment and economic development policies.

THEORETICAL FOUNDATION

Open Unemployment Rate

The Open Unemployment Rate (OUR) represents the percentage of the labor force that is unemployed and actively seeking employment. According to Statistics Indonesia (BPS), open unemployment includes individuals of working age who are not employed but are available for work and actively searching for jobs. As one of the key labor market indicators, the Open Unemployment Rate reflects the ability of an economy to absorb its labor force.

The concept of unemployment is explained by the Natural Rate of Unemployment Theory proposed by (Phelps, 1967). This theory argues that unemployment cannot be completely eliminated because labor markets are characterized by job-search frictions, imperfect information, and skill mismatches between workers and employers. Consequently, unemployment is influenced not only by economic growth but also by structural conditions within the labor market.

Gross Regional Domestic Product (GRDP)

Gross Regional Domestic Product (GRDP) measures the total value added generated by all economic sectors within a region during a given period and is widely used as an indicator of regional economic growth. Higher GRDP generally reflects greater economic activity and production capacity.

The relationship between GRDP and unemployment is explained by the Endogenous Growth Theory developed by (Romer, 1986). The theory emphasizes that long-term economic growth is driven by innovation, technological progress, human capital development, and knowledge accumulation. However, improvements in productivity and technology do not necessarily increase labor demand proportionally. As a result, economic growth may occur without substantial employment creation, leading to the phenomenon of jobless growth, particularly in regions dominated by capital-intensive industries.



Labor Force Participation Rate (LFPR)

The Labor Force Participation Rate (LFPR) measures the proportion of the working-age population that is economically active, either employed or actively seeking employment. A higher LFPR indicates greater labor market participation.

The relationship between LFPR and unemployment can be explained by the Search and Matching Theory proposed by (Bentolila & Bertola, 1990). This theory argues that labor markets are characterized by imperfect matching between job seekers and available vacancies. Consequently, an increase in labor force participation does not automatically reduce unemployment if job creation is unable to keep pace with the growth of labor supply.

Percentage of the Poor Population

The percentage of the poor population represents the proportion of individuals whose expenditure falls below the official poverty line established by Statistics Indonesia (BPS). Poverty reflects not only insufficient income but also limited access to education, skills development, healthcare, and economic opportunities.

This relationship is explained by the Capability Approach introduced by (Sen, 1985). According to this theory, poverty arises from limited capabilities that restrict individuals' opportunities to participate productively in economic activities. Limited education, inadequate skills, and restricted access to formal employment increase vulnerability in the labor market. Nevertheless, individuals living in poverty often continue working in informal or low-productivity sectors to secure basic livelihoods, which may reduce measured open unemployment without improving employment quality.

Regional Economic Development

Differences in unemployment across regions can be understood through the New Economic Geography Theory proposed by (Krugman, 1991). The theory emphasizes that industrial agglomeration, regional specialization, and geographic concentration of economic activities influence labor mobility, employment opportunities, and regional development.

In metropolitan areas such as Gerbangkertosusila, economic activities are concentrated in Surabaya and its surrounding industrial districts. This concentration attracts labor migration and increases competition in the labor market. Consequently, variations in regional economic structures may lead to differences in employment absorption and unemployment across districts and cities.

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HYPOTHESES

Based on the theoretical framework and previous empirical findings, the conceptual relationship among the variables is presented in Figure 1.

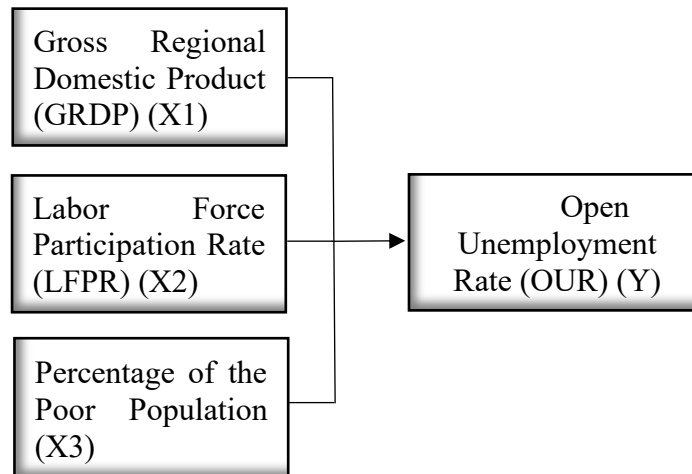


Figure 1. Research Hypothesis Framework

Based on the proposed framework, the following hypotheses are formulated:

1. H1: Gross Regional Domestic Product (GRDP) significantly affects the Open Unemployment Rate in the Gerbangkertosusila metropolitan area during 2012–2024.
2. H2: The Labor Force Participation Rate (LFPR) significantly affects the Open Unemployment Rate in the Gerbangkertosusila metropolitan area during 2012–2024.
3. H3: The percentage of the poor population significantly affects the Open Unemployment Rate in the Gerbangkertosusila metropolitan area during 2012–2024.
3. H4: Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR), and the percentage of the poor population simultaneously affect the Open Unemployment Rate in the Gerbangkertosusila metropolitan area during 2012–2024.

RESEARCH METHODOLOGY**Data and Data Sources**

This study employed a quantitative explanatory approach to examine the effects of Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR),

and the Percentage of the Poor Population on the Open Unemployment Rate (OUR) in the Gerbangkertosusila metropolitan area. Secondary panel data were obtained from official publications of Statistics Indonesia (Badan Pusat Statistik/BPS). The dataset consists of annual observations from seven regencies/cities in Gerbangkertosusila Gresik, Bangkalan, Mojokerto Regency, Mojokerto City, Surabaya City, Sidoarjo, and Lamongan covering the period 2012–2024. The panel dataset combines time-series and cross-sectional dimensions, resulting in 91 observations.

Data Collection Method

The data were collected using the documentation method. Secondary data on GRDP, LFPR, the Percentage of the Poor Population, and the Open Unemployment Rate were compiled from official BPS publications, including *Regency/City in Figures*, Labor Statistics, Poverty Statistics, and East Java Regional Statistics. All datasets were verified and standardized before analysis to ensure consistency and reliability.

Operational Definitions and Measurement of Variables

The dependent variable in this study is the Open Unemployment Rate (OUR), measured as the percentage of unemployed individuals actively seeking work relative to the total labor force. The independent variables consist of Gross Regional Domestic Product (GRDP) at constant prices (billion rupiah), Labor Force Participation Rate (LFPR) measured as the percentage of the working-age population participating in the labor force, and the Percentage of the Poor Population, measured as the proportion of the population living below the poverty line. All variables were obtained from Statistics Indonesia (BPS) and measured on a ratio scale.

Analysis Methods

Panel data regression was employed to analyze the relationships between the independent variables and the Open Unemployment Rate. The general regression model is expressed as:

$$Y_{it} = \alpha + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \mu_{it}$$

Where OUR denotes the Open Unemployment Rate, GRDP represents Gross Regional Domestic Product, LFPR is the Labor Force Participation Rate, POV is the



Percentage of the Poor Population, α is the intercept, β_1 – β_3 are the regression coefficients, and ε is the error term.

The analysis was performed using STATA 17. Model selection was conducted through the Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test to determine the most appropriate panel regression specification. The test results indicated that the Fixed Effect Model (FEM) was the most suitable model. To address potential heteroscedasticity and autocorrelation and improve the reliability of statistical inference, the final estimation employed robust standard errors. Hypothesis testing was conducted using a 10% significance level ($\alpha = 0.10$).

RESEARCH FINDINGS

The effects of Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR), and the Percentage of the Poor Population on the Open Unemployment Rate (OUR) were estimated using the Fixed Effect Model (FEM) with robust standard errors. Hypothesis testing was conducted at a significance level of 10% ($\alpha = 0.10$). The estimation results are presented in Table 1.

Table 1. Fixed Effect Model Estimation Results (Robust Standard Errors)

Variabel	Koefisien	Std. Error (Robust)	t-statistic	Prob.
GRDP (X1)	-4.26E-06	2.41E-06	-1.76	0.128
LFPR (X2)	0.1507138	0.0318583	4.73	0.003
Percentage of the Poor Population (X3)	-0.1148887	0.053301	-2.16	0.075
Constant	-3.119714	2.322797	-1.34	0.228
Description		Value		
Number of observations		91		
Number of groups		7		
Prob > F		0.0046		
R-squared (within)		0.0760		

Source: STATA Output Processed by the Authors



Based on the estimation results presented in Table 1, the following findings were obtained.

1. GRDP (X1) has a negative coefficient ($-4.26E-06$) with a probability value of 0.128. Therefore, GRDP has a negative but statistically insignificant effect on the Open Unemployment Rate.
2. The Labor Force Participation Rate (LFPR) (X2) has a coefficient of 0.1507138 with a probability value of 0.003. Thus, LFPR has a positive and statistically significant effect on the Open Unemployment Rate.
3. The Percentage of the Poor Population (X3) has a coefficient of -0.1148887 with a probability value of 0.075. At the 10% significance level, this variable has a negative and statistically significant effect on the Open Unemployment Rate.
4. The simultaneous test shows $\text{Prob} > F = 0.0046$, indicating that GRDP, LFPR, and the Percentage of the Poor Population jointly have a significant effect on the Open Unemployment Rate.
5. The within R-squared value is 0.0760, indicating that the independent variables explain 7.60% of the variation in the Open Unemployment Rate, while the remaining 92.40% is explained by variables outside the model.

DISCUSSION

The results indicate that Gross Regional Domestic Product (GRDP) has a negative but statistically insignificant effect on the Open Unemployment Rate (OUR) in the Gerbangkertosusila metropolitan area during the 2012–2024 period. Although the estimated coefficient suggests that higher regional economic output tends to reduce unemployment, the relationship is not statistically significant. This finding indicates that economic growth in Gerbangkertosusila has not been accompanied by proportional employment creation. As a metropolitan region dominated by manufacturing, logistics, trade, and modern service industries, economic expansion is likely driven by productivity improvements, technological advancement, and capital-intensive production rather than labor-intensive activities. Consequently, economic growth does not automatically translate into greater employment opportunities, giving rise to the phenomenon of *jobless growth*. This finding is consistent with Endogenous Growth Theory (Romer, 1986), which argues that technological progress and innovation can increase output without proportionally increasing labor demand. It also supports the Natural Rate of Unemployment Theory (Phelps, 1967), which emphasizes that unemployment is influenced by structural labor market factors such as skill mismatch and job-search

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frictions. However, the result differs from the findings of (Argawandani, 2025; Gina & Sabar, 2025; Khoirunnisa & Rofiki, 2025), who reported a significant negative relationship between GRDP and unemployment. The discrepancy may be attributed to differences in regional economic structures, where Gerbangkertosusila is characterized by a higher concentration of capital-intensive industries. These findings imply that regional economic growth should be accompanied by labor-intensive investment, workforce upskilling, and employment-oriented development policies to ensure that economic expansion generates broader employment opportunities.

Unlike GRDP, the Labor Force Participation Rate (LFPR) exhibits a positive and statistically significant effect on the Open Unemployment Rate. The estimated coefficient indicates that a one-percent increase in LFPR is associated with an increase of approximately 0.15 percent in the unemployment rate, holding other variables constant. This finding suggests that the growth of the labor force has exceeded the capacity of the regional economy to generate new employment opportunities. As more individuals enter the labor market, competition for available jobs intensifies, resulting in higher unemployment. This result is consistent with the Search and Matching Theory (Bentolila & Bertola, 1990), which explains that labor markets are characterized by imperfect matching between job seekers and vacancies because of differences in skills, information, and job requirements. The finding is also supported by the Natural Rate of Unemployment Theory (Phelps, 1967), which argues that unemployment increases when labor supply expands more rapidly than labor demand. Empirically, this result is in line with the findings of (Khoirunnisa & Rofiki, 2025; Rahmayani et al., 2025; Singh, 2023), who reported that increasing labor force participation may lead to higher unemployment when employment growth fails to absorb the expanding workforce. These findings highlight the importance of expanding productive employment opportunities, strengthening vocational education, and improving the alignment between workforce competencies and industrial demand.

The percentage of the poor population is found to have a negative and statistically significant effect on the Open Unemployment Rate at the 10 percent significance level. This result does not imply that increasing poverty reduces unemployment. Instead, it indicates that economic hardship compels low-income individuals to accept any available work, particularly in informal, low-paid, or vulnerable employment, in order to secure their livelihoods. Consequently, many economically vulnerable individuals remain employed and are therefore not classified as openly unemployed, despite experiencing underemployment or poor job quality. This finding is consistent with the Capability



Approach proposed by (Sen, 1985), which views poverty as a limitation of individual capabilities and access to productive economic opportunities rather than merely a lack of income. It is also consistent with the Natural Rate of Unemployment Theory (Phelps, 1967), which emphasizes the influence of labor market characteristics on unemployment. The empirical evidence supports the findings of (Wulandari et al., 2024), who also identified a significant relationship between poverty and unemployment. Nevertheless, the negative relationship observed in this study primarily reflects the prevalence of informal employment rather than an actual improvement in labor market conditions. Therefore, poverty reduction policies should not only focus on income enhancement but also promote decent work, improve labor productivity, and expand access to education and skills development.

The joint significance test demonstrates that GRDP, LFPR, and the percentage of the poor population simultaneously influence the Open Unemployment Rate in the Gerbangkertosusila metropolitan area. This finding confirms that unemployment is a multidimensional issue shaped by the interaction of economic, labor market, and social factors. The result is consistent with New Economic Geography Theory (Krugman, 1991), which emphasizes that regional economic concentration and differences in industrial structures influence labor mobility and employment opportunities across regions. It also supports the Natural Rate of Unemployment Theory (Phelps, 1967), which explains unemployment as the outcome of multiple structural factors within the labor market. The findings are consistent with those reported by (Khoirunnisa & Rofiki, 2025; Singh, 2023; Wulandari et al., 2024), who concluded that economic and social factors jointly determine unemployment. Nevertheless, the within R-squared value of 0.0760 indicates that the model explains only 7.60% of the variation in the Open Unemployment Rate, suggesting that other variables, such as investment, minimum wages, inflation, educational attainment, labor market institutions, and digital economic transformation, also play important roles. These findings imply that reducing unemployment in metropolitan regions requires comprehensive policies that combine inclusive economic growth with employment creation, human capital development, labor market reforms, and social protection to achieve sustainable and inclusive regional development.

CONCLUSION

This study examined the effects of Gross Regional Domestic Product (GRDP), the Labor Force Participation Rate (LFPR), and the percentage of the poor population on the Open Unemployment Rate (OUR) in the Gerbangkertosusila metropolitan area during the

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2012–2024 period using panel data regression with the Fixed Effect Model (FEM) and robust standard errors. The findings indicate that GRDP has a negative but statistically insignificant relationship with the Open Unemployment Rate, suggesting the presence of jobless growth in Gerbangkertosusila. In contrast, the Labor Force Participation Rate has a positive and statistically significant effect on unemployment, indicating that labor force growth has not been accompanied by sufficient job creation. Meanwhile, the percentage of the poor population has a negative and statistically significant effect on the Open Unemployment Rate, implying that economic pressure encourages low-income individuals to remain employed in informal or low-productivity occupations rather than being classified as openly unemployed. Furthermore, the joint significance test confirms that GRDP, the Labor Force Participation Rate, and the percentage of the poor population collectively influence the Open Unemployment Rate, highlighting that unemployment is shaped by the interaction of economic, labor market, and socioeconomic factors.

These findings provide empirical evidence that economic growth alone is insufficient to reduce unemployment unless it is accompanied by expanded employment opportunities and improvements in human capital. Therefore, regional governments should promote labor-intensive investment, strengthen vocational education and workforce development programs, and enhance the productivity of the informal sector to create more decent and sustainable employment opportunities. This study contributes to the literature on metropolitan labor economics by providing panel data evidence on the determinants of unemployment in Gerbangkertosusila. Nevertheless, the relatively low explanatory power of the model suggests that other factors, such as investment, education, inflation, minimum wages, and labor market institutions, should be incorporated into future research. Overall, the findings underscore the importance of integrated employment policies that combine inclusive economic growth, human capital development, and labor market improvements to achieve sustainable regional development.

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