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Education, Economic Growth, and Population on Bandung and Surabaya Unemployment

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ABSTRACT

This research aims to analyze the influence of education level, economic growth, and population on the unemployment rate in Bandung and Surabaya during the period 2015-2024. Utilizing a quantitative approach with panel data, this research employs the Random Effects Model, selected based on the results of the Chow test, Hausman test, and Lagrange Multiplier test. The findings indicate that the three independent variables collectively have a significant effect on the unemployment rate. However, when analyzed partially, none of the variables show a statistically significant individual effect on unemployment. This insignificance suggests that unemployment issues are not solely determined by education, economic growth, or population size, but are also influenced by other factors such as the mismatch between skills and labor market needs, the quality of education, and the regional economic structure that has yet to become fully inclusive. Therefore, the results of this study highlight the need for a more integrated and locally responsive employment development strategy. This research contributes to policymakers by providing insights for designing concrete and sustainable measures to reduce unemployment

INTRODUCTION

Economic development is the main objective of macroeconomic policies in various developing countries, including Indonesia (Fitriady et al., 2022). This objective not only focuses on Gross Domestic Product (GDP) growth, but also includes poverty reduction, improving people's welfare, and job creation (Coscieme et al., 2020). In practice, economic development often faces challenges such as income inequality, structural poverty, and environmental damage. This raises the need for alternative approaches that are fairer, more inclusive, and sustainable. One approach that is increasingly receiving attention is sharia economics.

Sharia economics is an economic system based on Islamic principles, such as justice, balance, and blessings (Yasen, 2018). Unlike conventional systems that are often solely profit-oriented, sharia economics combines worldly and afterlife interests by emphasizing moral and spiritual values. In this system, economic activities are regulated so that they do not contain elements of usury, gharar (uncertainty), and maysir (speculation). Instead, the principle of profit sharing, fair trading, and social instruments such as zakat and waqf are used. Indonesia, as the country with the largest Muslim population in the world, has great potential to develop sharia economics as the main pillar of development. The government has also shown its commitment through the establishment of the National Committee for Sharia Economics and Finance (KNEKS), as well as various policies that support the growth of this sector (Hidayat et al., 2021). However, this potential has not been fully

maximized. There are still limitations in terms of public literacy, regulations, and adequate supporting infrastructure for the development of sharia economics as a whole.

According to Arifin & Chotib, (2025) The development of sharia economics in the context of sustainable development includes several important dimensions. First, there is a drive to realize social justice through the redistribution of wealth, especially through the mechanisms of zakat, infak, sedekah, and waqf. Second, there is a financial system based on ethics that can reduce speculation and financial crises. Third, there is a drive to create businesses that do not only seek profit, but also provide benefits to the wider community and the environment.

In practice, sharia economics also supports the economic empowerment of small and medium enterprises (MSMEs) through sharia-based financing schemes that do not burden with high interest (Suraiya, 2022). This is important considering that the MSME sector is the backbone of the Indonesian economy. In addition, sharia economics also provides space for women and marginalized groups to be actively involved in economic activities without discrimination.

Despite its many potentials, the implementation of sharia economics in driving economic development still faces various structural and technical challenges. One of them is the gap between regulations and practices in the field (Muhammad, 2019). In addition, the lack of integration between the sharia financial sector and the real sector is also an obstacle in creating a significant economic impact. This shows that the development of sharia economics requires a holistic and synergistic approach between stakeholders.

This study aims to explore and analyze how Islamic economics can contribute significantly to sustainable economic development in Indonesia. Emphasis is placed on the role of Islamic financial institutions, socio-religious instruments, and community economic empowerment based on Islamic values. This study is expected to provide scientific and practical contributions in supporting Islamic economic policies as a pillar of national development. Thus, the Islamic economic approach in the context of development not only offers an ethical system but can also be a strategic solution in overcoming various social and economic problems. Therefore, an in-depth study is needed that is not only theoretical but also based on data and empirical experience in the field to ensure that the Islamic economy is truly able to encourage inclusive and sustainable economic development in Indonesia.

LITERATURE REVIEW

Previous empirical studies have extensively examined the relationship between population dynamics, education level, economic growth, and unemployment, particularly in developing economies. George et al. (2014) conducted a regional study in North Minahasa Regency, Indonesia, analyzing the effects of population size, education level, and economic growth on unemployment. Their findings indicate that population growth exerts a positive and significant effect on unemployment, suggesting that increases in population without proportional job creation intensify labor market pressure. Conversely, education level demonstrates a negative and significant effect, implying that higher educational attainment enhances employability and reduces unemployment. Economic growth, however, shows a negative but statistically insignificant relationship with unemployment, reflecting the phenomenon of jobless growth where economic expansion does not sufficiently absorb labor.

Extending the socio-economic perspective, Falaq and Wijaya (2024) examined the influence of education, population size, open unemployment, and minimum wages on poverty levels in Bojonegoro Regency. Although poverty was used as the dependent variable, the study remains highly relevant due to the strong linkage between unemployment and poverty. Their results reveal that education significantly reduces poverty, while population size exhibits a positive but insignificant effect. Open unemployment also shows an insignificant relationship, suggesting structural labor market rigidities.

These findings reinforce the argument that education plays a pivotal role in mitigating socio-economic problems, while population pressure and unemployment require more targeted labor market interventions.

Further insight is provided by Purnamasari (2024), who investigated the effects of population size, unemployment, and education level on economic growth across Java Island. The study finds that population size and education level positively and significantly influence economic growth. This result suggests that population growth can act as an economic asset when supported by adequate education and productive employment opportunities. Importantly, the study indirectly supports the hypothesis that improving education quality can simultaneously stimulate economic growth and reduce unemployment, highlighting the interdependence of human capital and labor market outcomes.

Maulidiyah et al. (2024) approached the issue from a demographic and social mobility perspective by examining the effects of unemployment and life expectancy on population distribution in Indonesia. Their findings demonstrate that unemployment significantly influences population mobility and spatial distribution, particularly through migration and urbanization processes. This study emphasizes that unemployment is not merely an economic issue but also a social and demographic phenomenon, influencing population concentration in urban areas and potentially exacerbating unemployment problems when labor absorption capacity is limited.

At the macroeconomic level, Anagun and Agosu (2024) analyzed the impact of exchange rate depreciation and trade balance on long-term economic growth in Nigeria. Although unemployment was not directly examined, the study underscores the importance of macroeconomic stability and sustained economic growth in improving labor market conditions. Strong economic performance, driven by favorable macroeconomic indicators, is often associated with increased employment opportunities. This finding aligns with theoretical expectations that economic growth serves as a prerequisite for employment creation, although its effectiveness depends on sectoral composition and labor intensity.

Overall, the reviewed studies reveal mixed empirical evidence regarding the effects of education, population size, and economic growth on unemployment. While education consistently demonstrates a negative relationship with unemployment, population growth tends to increase unemployment when not accompanied by sufficient job creation. Economic growth, meanwhile, shows inconsistent effects, often failing to significantly reduce unemployment due to structural and sectoral constraints. These inconsistencies highlight the need for region-specific empirical analysis, particularly in urban centers such as Bandung and Surabaya, where rapid population growth, educational disparities, and structural economic transformation intersect. Therefore, this study aims to empirically re-examine these relationships, providing more robust evidence for the formulation of regional labor market policies.

METHODS

This study employs a quantitative research approach to examine the relationship and causal effects of education level, economic growth, and population size on the unemployment rate in two major Indonesian cities: Bandung and Surabaya. The quantitative approach is selected as it enables objective hypothesis testing through statistical analysis and econometric modeling.

The data used in this study consist of secondary panel data, combining time-series and cross-sectional dimensions. The time-series data cover the period from 2015 to 2024, while the cross-sectional units comprise two observation areas: Bandung City and Surabaya City. All data were obtained from official publications of the Central Bureau of Statistics (Badan Pusat Statistik – BPS) of each respective city, including data on education level, economic growth, population size, and

unemployment rate. The use of official statistical sources ensures data reliability, validity, and consistency across regions and time periods.

To analyze the impact of the independent variables on the dependent variable, this study applies panel data regression analysis. Panel regression is considered superior to purely time-series or cross-sectional analysis because it captures both temporal dynamics and regional heterogeneity, reduces estimation bias, and improves the efficiency of parameter estimates. Three alternative estimation models are commonly used in panel data analysis: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). To determine the most appropriate model for this study, a series of model selection tests were conducted. The Chow test was employed to choose between the CEM and FEM, the Hausman test was used to determine whether FEM or REM was more suitable, and the Lagrange Multiplier (LM) test was applied to compare the CEM and REM. The final regression model was selected based on the outcomes of these tests.

The functional form of the panel regression model is specified as follows:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \epsilon$$

where:

Yit = Unemployment rate
X_{1it} = Education level
X_{2it} = Economic growth
X_{3it} = Population size
β_0 = Intercept
β_1,β_2,β_3 = Regression coefficients
ε_{it} = Error term

RESULT AND DISCUSSION

Model Selection Tests

Panel data regression requires careful model selection to ensure that unobserved heterogeneity across cross-sectional units is properly addressed. In this study, which analyzes unemployment dynamics in Bandung and Surabaya over the period 2015–2024, three alternative panel data estimation approaches are considered: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). Each model relies on different assumptions regarding the existence and treatment of individual-specific effects. Selecting an inappropriate model may lead to biased, inconsistent, or inefficient parameter estimates (Baltagi, 2021; Gujarati & Porter, 2020).

To identify the most suitable model, a sequential testing procedure is applied, consisting of the Chow test, the Hausman test, and the Lagrange Multiplier (LM) test. These tests are commonly employed in panel data analysis to determine whether cross-sectional effects exist and how they should be modeled (Wooldridge, 2019).

Chow Test

The Chow test is used as the first step to compare the Common Effect Model and the Fixed Effect Model. The null hypothesis of the Chow test states that there are no individual (cross-sectional) effects, implying that the pooled Ordinary Least Squares (OLS) estimator is appropriate. Conversely, rejection of the null hypothesis indicates that individual-specific intercepts differ significantly across cross-sectional units, thus favoring the Fixed Effect Model.

Table 4.1 Chow Test Results

Effect Test	Statistic	d.f.	Probability
Cross-section F	3.884456	(1,15)	0.0675
Cross-section Chi-square	4.605779	1	0.0319

Source: Processed data using EViews 12 (2025)

As shown in Table 4.1, the probability value of the cross-section Chi-square statistic is 0.0319, which is below the 5 percent significance level. This result leads to the rejection of the null hypothesis and indicates that the Common Effect Model is not suitable. Therefore, the Fixed Effect Model is statistically preferred at this stage. The presence of significant cross-sectional effects suggests that Bandung and Surabaya exhibit distinct characteristics that systematically influence unemployment rates.

These differences may arise from variations in industrial structure, labor market institutions, urban development policies, and demographic composition. Ignoring such heterogeneity could oversimplify the analysis and result in misleading conclusions. The Chow test outcome thus confirms that panel heterogeneity must be explicitly modeled. However, while the Fixed Effect Model accounts for individual effects, it does not yet establish whether these effects are correlated with the explanatory variables. To address this issue, the Hausman test is required.

Hausman Test

The Hausman test is conducted to determine whether the Fixed Effect Model or the Random Effect Model is more appropriate. The null hypothesis of the Hausman test states that the individual effects are uncorrelated with the independent variables, in which case the Random Effect Model is consistent and efficient. Rejection of the null hypothesis implies correlation between individual effects and regressors, thereby favoring the Fixed Effect Model (Hausman, 1978).

Table 4.2 Hausman Test Results

Test Summary	Chi-square Statistic	d.f.	Probability
Cross-section random	0.000000	3	1.0000

Source: Processed data using EViews 12 (2025)

Table 4.2 shows that the probability value of the Hausman test is 1.000, which is substantially greater than the 5 percent significance threshold. This result indicates that the null hypothesis cannot be rejected. Accordingly, the Random Effect Model is preferred over the Fixed Effect Model. This finding suggests that the unobserved individual effects specific to Bandung and Surabaya are not systematically correlated with the explanatory variables, namely education level, economic growth, and population size.

From an econometric perspective, the Random Effect Model offers efficiency gains because it exploits both within-group and between-group variations in the data. Unlike the Fixed Effect Model, which eliminates time-invariant characteristics, the Random Effect Model allows these characteristics to remain in the error structure, provided they are uncorrelated with the regressors. Given the limited number of cross-sectional units in this study, the REM is particularly advantageous in preserving degrees of freedom and improving estimation efficiency.

Although the Hausman test already supports the use of the Random Effect Model, a final confirmation is required to determine whether panel effects exist at all. This is accomplished through

the Lagrange Multiplier test, which compares the Random Effect Model with the Common Effect Model.

Normality Test

Before interpreting the regression results, it is essential to ensure that the data satisfy the classical assumption of normality. The normality test aims to verify whether the residuals of the regression model are normally distributed, which is a crucial requirement for the validity of statistical inference in panel regression analysis. A normally distributed residual indicates that the estimated coefficients are unbiased and efficient.

In this study, the Jarque–Bera (JB) test was employed to examine the normality of the residuals. The Jarque–Bera test evaluates skewness and kurtosis simultaneously to determine whether the residual distribution deviates from normality. A probability value greater than 0.05 indicates that the null hypothesis of normally distributed residuals cannot be rejected.

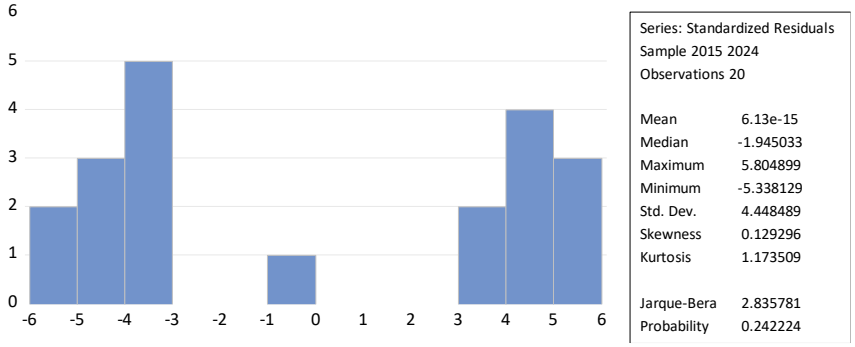

Figure 1. Jarque–Bera Normality Test Result
(Source: Processed data using EViews 12, 2025)

The test result shows a Jarque–Bera probability value of 0.242, which exceeds the 5% significance level. This finding confirms that the residuals are normally distributed, indicating that the regression model satisfies the normality assumption. Consequently, the model is considered appropriate for further hypothesis testing and interpretation.

Heteroskedasticity Test

The heteroskedasticity test is conducted to determine whether the variance of the residuals is constant across observations. The presence of heteroskedasticity can lead to inefficient estimators and biased standard errors, which may invalidate hypothesis testing results.

In this study, heteroskedasticity was assessed using a residual scatterplot approach. This method examines whether the residuals exhibit a specific pattern when plotted against the predicted values. A random and evenly dispersed pattern around zero indicates homoskedasticity, while a clear systematic pattern suggests heteroskedasticity.

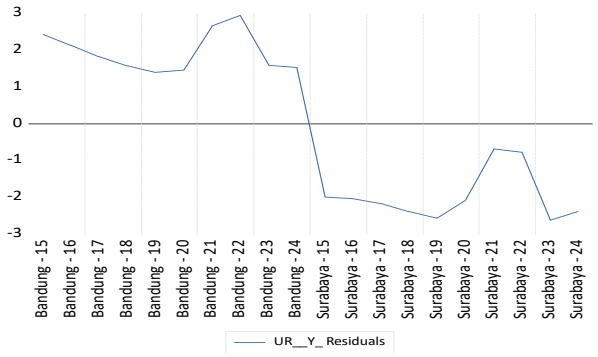

Figure 4.2 Residual Scatterplot for Heteroskedasticity Test
(Source: Processed data using EViews 12, 2025)

The residual plot demonstrates a random and stable dispersion without forming a discernible pattern. This result indicates the absence of heteroskedasticity, confirming that the regression model meets the homoskedasticity assumption and can be reliably interpreted.

Panel Data Regression Equation

After confirming that the classical assumptions are satisfied, the panel regression model was estimated using the selected Random Effect Model (REM). The estimated regression equation is expressed as follows:

$$UR = 18{,}8 – 1{,}55\ LoE – 0{,}28\ GDP + 2{,}28\ POP$$

where *UR* denotes the unemployment rate, *LoE* represents the level of education, *GDP* indicates economic growth, and *POP* refers to population size.

The constant term of 18.8 implies that when all independent variables are assumed to be zero, the unemployment rate is projected to be 18.8 percent. Although this condition is theoretical, the constant provides a baseline reference for the model. The coefficient of education level (LoE) is –1.55, indicating that a 1% increase in education level is associated with a 1.55% decrease in the unemployment rate, ceteris paribus. This negative relationship aligns with human capital theory, which suggests that education enhances employability, although the statistical significance must be further evaluated.

The economic growth (GDP) coefficient of –0.28 suggests that a 1% increase in GDP is associated with a 0.28% reduction in unemployment, holding other variables constant. This result reflects the expected inverse relationship between economic growth and unemployment, commonly discussed in macroeconomic theory. In contrast, the population coefficient of 2.28 indicates that a 1% increase in population leads to a 2.28% increase in unemployment, assuming other factors remain unchanged. This positive relationship suggests that population growth may exert pressure on labor markets when job creation does not keep pace.

Hypothesis Testing

The t-test is used to examine the partial effect of each independent variable on the dependent variable. This test determines whether each regression coefficient differs significantly from zero, indicating a statistically significant relationship.

Table 4.5 Partial Test Results (t-test)

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	18.80410	6.349545	2.961488	0.0092
LoE (X1)	–1.551756	1.277422	–1.214756	0.2421
GDP (X2)	–0.281489	0.063659	–4.421844	0.6363
POP (X3)	2.29E–06	4.75E–06	0.481977	0.6363

Source: Processed data using EViews 12, 2025

The results indicate that none of the independent variables—education level, economic growth, or population—have a statistically significant partial effect on unemployment, as all probability values exceed the 0.05 threshold. This suggests that, individually, these variables do not significantly explain variations in unemployment during the study period.

Simultaneous Test (F-test)

The F-test evaluates whether all independent variables jointly influence the dependent variable. This test is essential to assess the overall explanatory power of the regression model.

Table 4.6 Simultaneous Test Results (F-test)

Indicator	Value
F-statistic	9.434277
Probability (F-statistic)	0.000796
R-squared	0.638849

Source: Processed data using EViews 12, 2025

The probability value of 0.000796, which is lower than 0.05, indicates that the null hypothesis is rejected. Therefore, education level, economic growth, and population jointly have a significant effect on unemployment. This finding suggests that while the variables may not be significant individually, their combined influence is substantial.

Coefficient of Determination (R^2)

The coefficient of determination measures the proportion of variation in the dependent variable explained by the independent variables.

Table 4.7 Coefficient of Determination Results

Indicator	Value
R-squared	0.638849
Adjusted R-squared	0.571133
Standard Error of Regression	0.678369

Source: Processed data using EViews 12, 2025

The adjusted R-squared value of 0.571133 indicates that approximately 57.11% of the variation in unemployment can be explained by education level, economic growth, and population. The remaining 42.89% is influenced by other factors not included in the model, such as labor market mismatch, industrial structure, institutional policies, and technological change.

Final Model Selection Decision

Based on the sequential testing procedure, the final model selection can be summarized as follows. The Chow test rejects the Common Effect Model in favor of the Fixed Effect Model. The Hausman test then favors the Random Effect Model over the Fixed Effect Model. Finally, the Lagrange Multiplier test confirms that the Random Effect Model is superior to the Common Effect Model. Taken together, these results indicate that the Random Effect Model (REM) is the most appropriate specification for analyzing the relationship between education level, economic growth, population size, and unemployment in Bandung and Surabaya.

With the estimation model firmly established, the analysis proceeds to the classical assumption tests to ensure that the Random Effect Model satisfies the required econometric assumptions. The next subsection therefore examines multicollinearity, followed by tests of normality and heteroskedasticity, before presenting the regression results and hypothesis testing.

Discussion

Effect of Education Level on Unemployment

The empirical results indicate that the education level (LoE) variable yields a t-statistic of 1.214756 with a probability value of 0.241, which exceeds the conventional significance threshold of 0.05. This finding implies that education level does not exert a statistically significant effect on unemployment rates in Bandung and Surabaya during the study period. Although education is theoretically expected to enhance employability by improving human capital, the absence of statistical significance suggests that higher educational attainment alone is insufficient to reduce unemployment in the observed context.

One plausible explanation for this result lies in the mismatch between educational outcomes and labor market requirements. When the skills produced by the education system are not aligned with industry needs, higher educational attainment may not translate into immediate employment opportunities. This phenomenon is frequently observed in urban labor markets where graduates face intense competition and limited absorption capacity. Additionally, variations in education quality across institutions may weaken the effectiveness of education in improving labor market outcomes, thereby diluting its impact on unemployment reduction.

Effect of Economic Growth on Unemployment

The regression results show that economic growth (GDP) exhibits a relatively high t-statistic of 4.218144; however, the associated probability value of 0.6363 indicates that the effect is statistically insignificant. This outcome suggests that economic growth does not significantly influence unemployment levels in the two cities under study. Despite theoretical expectations rooted in Keynesian and neoclassical frameworks, which posit that higher economic growth should generate employment through increased aggregate demand, the empirical evidence does not support this relationship in the present case.

This finding may reflect the presence of non-inclusive or jobless growth, where increases in output are driven primarily by capital-intensive sectors rather than labor-intensive activities. In such circumstances, economic expansion fails to create sufficient employment opportunities to absorb the growing labor force. Structural changes in the economy, technological adoption, and productivity-driven growth may further reduce labor demand, weakening the link between GDP growth and

employment creation. Consequently, economic growth alone may not be an effective mechanism for reducing unemployment without complementary labor market policies.

Effect of Population Size on Unemployment

The population variable (POP) produces a t-statistic of 0.481977 with a probability value exceeding 0.05, indicating that population size does not have a statistically significant effect on unemployment. This result suggests that changes in population levels do not directly translate into changes in unemployment rates. Instead, the impact of population dynamics on unemployment appears to be mediated by the economy's capacity to generate productive employment opportunities.

An increasing population may serve as a potential demographic dividend if accompanied by adequate job creation, skill development, and labor market flexibility. Conversely, without sufficient economic absorption capacity, population growth may place additional pressure on labor markets. The insignificant result obtained in this study implies that population growth alone is not a decisive factor in shaping unemployment trends; rather, it is the interaction between population growth and labor demand that determines employment outcomes.

Taken together, the partial t-test results demonstrate that education level, economic growth, and population size do not individually exert a statistically significant influence on unemployment in the selected cities. Although these variables are widely acknowledged in economic theory as key determinants of labor market performance, the empirical findings suggest that their effects may be indirect, conditional, or overshadowed by other structural factors. Issues such as labor market rigidity, skill mismatches, technological change, and institutional constraints may play a more dominant role in shaping unemployment dynamics.

The absence of significant partial effects also highlights the importance of integrated policy interventions. Improvements in education and economic growth must be accompanied by targeted labor market strategies, including vocational training, industry–education linkages, and the promotion of labor-intensive sectors. Without such complementary measures, investments in education and economic expansion may fail to translate into meaningful reductions in unemployment. These findings underscore the need for policymakers to adopt a holistic approach that aligns human capital development with labor market demand to effectively address unemployment challenges.

CONSLUSION

This study aims to empirically examine the effects of education level, economic growth, and population size on the unemployment rate in Bandung and Surabaya during the 2015–2024 period using a panel data regression approach with a Random Effect Model. The results indicate that, simultaneously, education level, economic growth, and population size have a statistically significant effect on unemployment, whereas partial testing shows that none of these variables individually exert a significant influence. The insignificance of education suggests a mismatch between graduates' competencies and labor market demands, while economic growth appears insufficiently inclusive to generate broad-based employment opportunities, particularly in labor-intensive sectors. Meanwhile, population growth does not significantly affect unemployment, indicating that increases in labor supply have not been accompanied by optimal labor absorption mechanisms. These findings imply that unemployment cannot be effectively addressed through improvements in education or economic growth alone but requires a more holistic and integrated policy framework. Consequently, local governments should prioritize labor market–oriented education quality, vocational training, stronger linkages between education and industry, and inclusive job creation strategies, while future research is

encouraged to incorporate additional variables such as institutional quality, real sector investment, urbanization, and regional labor policies to better capture the complexity of unemployment dynamics.

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