Macroeconomic Determinants of Unemployment in ASEAN Countries: Implications for Education and SDGs

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Info Articles	Abstract
	Unemployment remains a persistent challenge for many ASEAN countries and reflects not only economic instability but also the effectiveness of education systems in preparing a productive workforce. Macroeconomic conditions such as economic growth, inflation, foreign investment, and exchange rate fluctuations may influence labor market outcomes and the absorption of human resources. This study aims to analyze the effects of macroeconomic variables on unemployment in ASEAN countries and to examine their implications for education and sustainable development. The study employs panel data regression analysis using secondary data from eleven ASEAN countries during the 2021–2023 period obtained from the World Bank database. Model estimation was conducted using the Pooled Least Square, Fixed Effect Model, and Random Effect Model approaches, followed by model selection tests. The findings indicate that inflation and exchange rates significantly affect unemployment, while economic growth and foreign direct investment do not show a significant influence. These results suggest that macroeconomic stability plays an important role in shaping employment opportunities and workforce outcomes in the ASEAN region. The study contributes empirical evidence linking macroeconomic dynamics with labor market conditions and provides insights for education and employment policies aligned with the Sustainable Development Goals.

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INTRODUCTION

Unemployment remains one of the most persistent socioeconomic challenges faced by both developed and developing countries. In many regions, unemployment not only reflects macroeconomic instability but also indicates structural issues related to labor markets, education systems, and economic development policies. ASEAN countries, which consist of economies with diverse levels of development, continue to experience fluctuations in unemployment rates influenced by global and regional economic dynamics. In developing economies, unemployment problems are generally more complex because governments often have limited resources to provide adequate social protection for unemployed workers. In contrast, developed countries tend to have stronger social security systems capable of supporting unemployed individuals through unemployment benefits and employment assistance programs.

According to the International Labour Organization (2024), the unemployment rate refers to the proportion of the labor force that does not have employment but is actively seeking work and is available for employment. Similarly, the Organisation for Economic Co-operation and Development (2024) defines unemployment as individuals of working age who do not have a job but have actively searched for work within a specific reference period. In the Indonesian context, Badan Pusat Statistik (2021) describes unemployment as individuals who are not working but are actively looking for work, preparing to start a new business, or waiting to begin employment after receiving a job offer. These definitions highlight that unemployment reflects the imbalance between labor supply and labor demand in the labor market.

In the ASEAN region, unemployment trends show varying patterns among member countries. During the period of 2021–2023, unemployment rates across eleven ASEAN countries experienced fluctuations due to the economic recovery following the COVID-19 pandemic and the influence of global economic uncertainty. In 2021, unemployment rates were relatively high due to restrictions on mobility and economic disruptions caused by the pandemic. Countries such as Brunei Darussalam, Singapore, Malaysia, and Myanmar experienced unemployment rates exceeding four percent, while other ASEAN countries recorded relatively lower unemployment levels. In subsequent years, most ASEAN countries experienced gradual reductions in unemployment as economic activity recovered. However, some countries still experienced increases in unemployment due to structural economic adjustments and changing labor market conditions. These variations indicate that unemployment in ASEAN countries is influenced by multiple economic and structural factors.

From a theoretical perspective, unemployment has been widely discussed in macroeconomic literature. Keynesian economic theory emphasizes that unemployment is primarily driven by insufficient aggregate demand and declining labor demand during economic downturns (Ogujiuba & Cornelissen, 2020). According to Keynesian perspectives, government intervention through fiscal and monetary policies is necessary to stimulate economic activity and reduce unemployment. In contrast, classical economic theories argue that unemployment occurs when labor market equilibrium is disrupted by rigid wage structures or institutional factors that prevent wage adjustments.

Population-based economic theories also explain the relationship between population growth and unemployment. Malthusian theory suggests that rapid population growth may exceed the capacity of economies to provide employment opportunities, resulting in labor surplus and unemployment (Geloso & Kufenko, 2015; Sari, 2020). Meanwhile, Okun's Law proposes an inverse relationship between economic growth and unemployment, suggesting that higher economic growth generally leads to increased employment opportunities and reduced unemployment rates (Nasir et al., 2024).

Another important theoretical framework is the concept of the Non-Accelerating Inflation Rate of Unemployment (NAIRU), which describes the level of unemployment consistent with stable inflation. According to this theory, attempts to reduce unemployment below its natural level may lead to accelerating inflation without generating sustainable employment growth (Vintu, 2025). Similarly, the natural rate of

unemployment theory suggests that unemployment levels are influenced by structural characteristics of labor markets, including technological change, labor skills, and institutional arrangements.

In addition to theoretical explanations, several macroeconomic variables are widely recognized as determinants of unemployment. Economic growth plays a crucial role in determining labor market conditions because economic expansion generally creates employment opportunities and increases labor demand (Mitsi, 2023). However, the relationship between economic growth and unemployment is not always linear, especially in economies experiencing technological transformation and structural changes.

Inflation is another macroeconomic variable closely related to unemployment through the Phillips Curve relationship. The Phillips Curve illustrates the trade-off between inflation and unemployment, suggesting that lower unemployment rates are often associated with higher inflation levels in the short term (Mitsi, 2023). However, the dynamics of inflation and unemployment may vary across countries depending on economic conditions and policy responses.

Foreign direct investment also plays a significant role in shaping labor market outcomes. Investment inflows may stimulate economic activity and create employment opportunities, particularly when investment occurs in labor-intensive sectors (Karimov et al., 2020). However, in many developing economies, foreign investment is increasingly directed toward capital-intensive industries that rely heavily on automation and advanced technologies, limiting their capacity to absorb labor.

Exchange rate fluctuations also influence unemployment through several economic channels. Currency depreciation can enhance export competitiveness and stimulate production, potentially increasing labor demand. Conversely, exchange rate instability may increase production costs and reduce investment, thereby negatively affecting employment levels (Atya, 2017; Frenkel, 2004).

Previous empirical studies have examined the relationship between macroeconomic variables and unemployment. Several studies found that economic growth has a negative effect on unemployment, indicating that stronger economic performance can reduce joblessness (Adiyadnya & Swara, 2021; Dewi & Arka, 2020; Shafira et al., 2020; Veronika & Mafruhat, 2022). Other studies highlight that inflation may also influence unemployment, although the direction of the relationship varies across contexts (Saefulloh & Fitriana, 2017; Putri, 2015). Research examining the impact of foreign direct investment also shows mixed results, with some studies indicating that investment can reduce unemployment by generating employment opportunities (Alalawneh & Nessa, 2020; Nasyla & Amri, 2023). However, the impact of foreign investment may differ depending on the sectoral distribution of investment and technological intensity.

Despite the growing body of literature examining unemployment determinants, limited research has simultaneously analyzed the combined effects of economic growth, inflation, foreign direct investment, and exchange rates on unemployment across ASEAN countries using recent data. Moreover, previous studies often focus on individual countries or specific regions, leaving a research gap in understanding the macroeconomic determinants of unemployment within the broader ASEAN context during the post-pandemic economic recovery period.

Therefore, this study aims to analyze the effects of economic growth, inflation, foreign direct investment, and exchange rates on unemployment in ASEAN countries during the 2021–2023 period. By employing panel data regression analysis, this research provides empirical evidence regarding the macroeconomic factors influencing unemployment in the ASEAN region. The findings of this study are expected to contribute to the understanding of labor market dynamics and provide insights for policymakers in designing economic and education policies that support employment opportunities and sustainable development.

METHODS

A quantitative research design using panel data regression analysis was employed to examine the influence of macroeconomic variables on unemployment in ASEAN countries. Panel data

analysis was selected because the approach combines cross-sectional and time-series observations, enabling the analysis of variations across countries and across time simultaneously (Gujarati, 2003). Such an approach improves the efficiency of estimation and provides more comprehensive empirical evidence compared with single cross-sectional or time-series models.

Secondary data obtained from the World Bank database were used in the analysis. The dataset consists of annual observations from eleven ASEAN countries during the period 2021–2023, including Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Vietnam. Unemployment rate serves as the dependent variable and is measured as the percentage of the labor force that is unemployed. Independent variables include economic growth, inflation, foreign direct investment, and exchange rates. Economic growth is measured by the annual percentage change in gross domestic product (GDP), inflation is measured by the annual percentage change in consumer prices, foreign direct investment is measured in United States dollars, and exchange rates represent the value of national currencies relative to the United States dollar.

The econometric model used in the study is expressed as follows:

$$UNEMP_{it} = \beta_0 + \beta_1\, GROWTH_{it} + \beta_2\, INF_{it} + \beta_3\, FDI_{it} + \beta_4\, NT_{it} + \varepsilon_{it}$$

where UNEMP represents the unemployment rate, GROWTH represents economic growth, INF represents inflation, FDI represents foreign direct investment, and NT represents the exchange rate. The parameter β_0 denotes the constant, while β_1–β_4 represent the regression coefficients of the independent variables. The index i indicates the country unit of observation and t denotes the time period. The term ε represents the error component of the model.

Model specification was developed by adapting several empirical studies. The economic growth variable follows the model proposed by Dewi and Arka (2020), inflation refers to the specification used by Saefulloh and Fitriana (2017), and foreign direct investment follows the model introduced by Alalawneh and Nessa

(2020). The exchange rate variable was incorporated to capture additional macroeconomic dynamics that may influence unemployment across countries.

Panel data estimation was conducted using three alternative models: the Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). The Pooled Least Square model assumes homogeneity across cross-sectional units, while the Fixed Effect Model allows differences in intercepts across countries. The Random Effect Model treats individual effects as random components that are uncorrelated with explanatory variables.

Model selection was carried out through the Chow test and the Hausman test. The Chow test compares the Pooled Least Square model and the Fixed Effect Model by examining the probability value of the F-statistic. A significant probability value indicates that the Fixed Effect Model is more appropriate. The Hausman test compares the Fixed Effect Model and the Random Effect Model using the Chi-square statistic. A significant result suggests that the Fixed Effect Model should be selected, whereas a non-significant result indicates that the Random Effect Model is more suitable. In addition, the Lagrange Multiplier test may be applied to confirm the suitability of the Random Effect Model when required.

After determining the most appropriate model, goodness-of-fit testing was conducted to evaluate the explanatory power of the regression model. Hypothesis testing was performed using the F-test to examine the simultaneous effects of independent variables and the t-test to analyze partial effects on unemployment. The analytical procedure enables the identification of macroeconomic factors influencing unemployment dynamics in ASEAN countries.

RESULTS AND DISCUSSION

Panel data regression analysis was conducted to examine the influence of several macroeconomic variables on unemployment across ASEAN countries during the period 2021–2023. The estimation process employed three econometric approaches commonly used in panel data analysis, namely the Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). Each estimation method has

Table 1. Panel Data Regression Econometric Model Estimation Results - Cross section

Variable	Regression Coefficient		
	PLS	FEM	REM
C	2,0646	-6,2091	2,2511
$GROWTH$	0,0498	-0,0268	-0,0091
INF	-0,0004	0,0155	0,0102
FDI	2,5100	-2,6100	-0,0221
NT	1,7861	37,4057	1,5966
R^2	0,1862	0,9541	0,1026
Adjusted. R^2	0,0699	0,9185	-0,0256
Statistik F	1,601141	26,74315	0,800579
Prob. Statistik F	0,2017	0,0000	0,5351

Model Selection Test
(1) Chow
   Cross- Section $F(10,18) = 30,1356$; Prob. $F(13,36) = 0,0000$
(2) Hausman
   Cross-Section random $\chi^2(4) = 7,1651$; Prob. $\chi^2 = 0,1274$
 Source: World Bank, processed.

different assumptions regarding the characteristics of cross-sectional units and the structure of the error term. Model comparison and selection tests were therefore applied to determine the most appropriate specification for the empirical analysis. The estimation results of the three models together with the model selection tests are presented in **Table 1**.

The estimation results presented in **Table 1** show notable differences in explanatory power among the Pooled Least Square, Fixed Effect Model, and Random Effect Model approaches. The Pooled Least Square model assumes that all countries share identical intercept values and that there are no structural differences among cross-sectional units. Such an assumption may be unrealistic in multi-country datasets because ASEAN countries differ substantially in economic structure, labor market institutions, industrial development, and human capital characteristics. The regression results reported in **Table 1** indicate that the PLS model has relatively low explanatory power in explaining unemployment variations across ASEAN countries. The coefficient of determination of the PLS model suggests that the independent variables included in the model explain only a limited proportion of unemployment fluctuations in the region.

Model selection was subsequently conducted using the Chow test and the Hausman test. The results of the Chow test presented in **Table 1** indicate that the Fixed Effect Model performs significantly better than the Pooled Least Square model. The statistically significant probability value of the Chow test suggests that country-specific effects exist within the dataset. Differences among countries therefore need to be considered explicitly in the regression model. Structural differences in economic development, institutional arrangements, labor market conditions, and demographic characteristics may contribute to variations in unemployment patterns across ASEAN countries.

The Hausman test was further employed to compare the Fixed Effect Model and the Random Effect Model. The results reported in **Table 1** indicate that the Random Effect Model is not statistically rejected. However, evaluation of the estimation results obtained from the Random Effect Model, as shown in **Table 2**, reveals that the overall regression model is not statistically significant. The probability value of the F-statistic presented in **Table 2** indicates that the independent variables collectively do not provide a statistically meaningful explanation of unemployment variations in ASEAN countries. In addition, the coefficient of determination reported in **Table 2** shows that the explanatory variables included in the model account for only a small proportion of the variation in unemployment.

Limited explanatory performance of the Random Effect Model suggests that random variations alone are insufficient to capture the

Table 2. Random Effect Model (REM) Estimation

Variable	Coefficient	Probability
GROWTH	-0.0091	0.6449
INF	0.0102	0.1798
FDI	-0.0221	0.8142
NT	1.5966	0.2613

$R^2 = 0.1026$

DW = 1.5057

F = 0.8006

Prob F = 0.5351

Source: World Bank (processed data)

structural characteristics of labor markets across ASEAN countries. Differences among countries appear to be systematic rather than random, indicating that country-specific structural conditions play an important role in shaping unemployment dynamics. For that reason, the interpretation of the regression results focuses on the Fixed Effect Model presented in **Table 3**, which demonstrates stronger statistical significance and substantially higher explanatory power.

The regression results obtained from the Fixed Effect Model shown in **Table 3** indicate that inflation and exchange rate variables have statistically significant effects on unemployment in ASEAN countries. In contrast, economic growth and foreign direct investment do not show statistically significant relationships with unemployment during the observation period. These findings highlight the complex interactions between macroeconomic conditions and labor market outcomes in the ASEAN region.

The coefficient of the inflation variable reported in **Table 3** indicates a positive relationship between inflation and unemployment. An increase in inflation is associated with an increase in unemployment across ASEAN countries. Several economic mechanisms may explain this relationship. Inflation during the period of 2021–2023 in many ASEAN economies was largely driven by cost-push factors rather than demand expansion. Rising energy prices, disruptions in global supply chains, and geopolitical tensions contributed to higher production costs in many sectors. Firms experiencing increasing input costs may reduce production expansion or delay hiring decisions in order to maintain profitability. Under such conditions, inflation can contribute to weaker labor demand and slower employment growth.

Macroeconomic conditions during the post-pandemic recovery period further reinforce the relationship between inflation and unemployment observed in **Table 3**. Economic recovery after the COVID-19 pandemic occurred unevenly across sectors and countries. Some industries recovered rapidly, while others experienced prolonged disruptions due to global economic uncertainty. Firms often prioritized operational stability and cost management rather than expanding employment levels. As a result, inflation driven by supply-side pressures did not generate strong employment expansion in many ASEAN economies.

The exchange rate variable also demonstrates a statistically significant positive relationship with unemployment according to the estimation results reported in **Table 3**. Currency depreciation tends to increase production costs in many ASEAN economies because manufacturing industries often rely on imported raw materials, intermediate goods, and capital equipment. When domestic currencies weaken relative to the United States dollar, the cost of imported inputs increases. Higher production costs may reduce industrial competitiveness and discourage firms from expanding production activities. Firms facing higher operating costs may also limit hiring or postpone recruitment plans, which can lead to higher unemployment levels.

Exchange rate instability may also influence unemployment through investment and financial channels. Volatile exchange rates increase uncertainty for investors and multinational

Table 3. Fixed Effect Model (FEM) Estimation

Variable	Coefficient	Probability
GROWTH	-0.0268	0.2144
INF	0.0155	0.0612***
FDI	-2.6100	0.1103
NT	37.4057	0.0427**

$R^2 = 0.9541$
DW = 2.1032
F = 26.7431
Prob F = 0.0000
Significance Levels:
***$p<0.10$
**$p<0.05$
*$p<0.01$
Source: World Bank (processed data)

corporations operating in international markets. Investment decisions may be postponed when currency fluctuations create unpredictable cost structures and revenue expectations. Reduced investment activity can limit job creation and weaken employment growth. Therefore, exchange rate movements can influence labor markets indirectly through their effects on production costs, trade competitiveness, and investment behavior.

Economic growth does not demonstrate a statistically significant effect on unemployment according to the regression results presented in **Table 3**. Classical macroeconomic theory and Okun's Law suggest that higher economic growth should lead to increased labor demand and reduced unemployment rates. However, empirical evidence from ASEAN countries during the observation period indicates that economic growth did not translate directly into substantial employment expansion.

Several structural factors may explain the weak relationship between economic growth and unemployment in the ASEAN region. Economic recovery after the COVID-19 pandemic was often driven by sectors characterized by high productivity and technological intensity rather than labor-intensive industries. Digitalization, automation, and technological innovation allowed firms to increase production efficiency without proportionally increasing labor demand. Growth generated by such sectors may therefore produce limited employment opportunities, especially for low-skilled workers.

Foreign direct investment also does not show a statistically significant relationship with unemployment according to the estimation results reported in **Table 3**. Investment inflows into ASEAN countries during the observation period were largely concentrated in technology-intensive sectors such as electronics manufacturing, digital services, renewable energy industries, and financial technology. These sectors rely heavily on advanced technologies and highly skilled workers rather than large numbers of general laborers. Capital-intensive production structures therefore reduce the potential of foreign investment to generate large-scale employment opportunities in the short term.

Unemployment dynamics in ASEAN countries are shaped by both macroeconomic stability and structural economic conditions. Inflation and exchange rate movements appear to have significant influences on employment outcomes, while economic growth and foreign direct investment do not automatically translate into employment expansion. Such findings highlight the importance of considering structural labor market characteristics and economic transformation when analyzing unemployment patterns in the ASEAN region.

Further interpretation of the regression results presented in **Table 3** reveals that macroeconomic stability plays a critical role in shaping labor market outcomes in ASEAN countries. Inflation and exchange rate fluctuations demonstrate statistically significant relationships with unemployment, suggesting that instability in

macroeconomic conditions may weaken labor market performance. Inflation, particularly when driven by rising production costs, can reduce purchasing power and limit economic expansion. Firms experiencing increasing costs often respond by delaying investment and recruitment decisions. Under such conditions, inflation may indirectly increase unemployment through reduced labor demand. Similar conclusions have been reported in several empirical studies examining the relationship between inflation and unemployment in developing economies. Research conducted by Purba et al. (2022) and Octavia and Samsuddin (2025) found that inflation can significantly influence unemployment rates because rising production costs reduce firms' ability to expand output and create new jobs.

Macroeconomic theory provides several perspectives explaining the interaction between inflation and unemployment. The Phillips Curve originally proposed an inverse relationship between inflation and unemployment, suggesting that lower unemployment may be associated with higher inflation. However, subsequent empirical evidence has shown that the relationship is not always stable across time and economic conditions (Parkin, 2018). Supply-side inflation driven by rising energy prices, commodity shortages, or exchange rate depreciation may increase production costs without stimulating economic growth. Such conditions may simultaneously increase unemployment and inflation. Findings obtained in the ASEAN context therefore support the argument that the relationship between inflation and unemployment depends heavily on the underlying sources of inflationary pressure.

Exchange rate fluctuations represent another important determinant of unemployment dynamics in open economies. The regression results reported in **Table 3** show that exchange rate depreciation is associated with higher unemployment levels in ASEAN countries. Currency depreciation increases the cost of imported raw materials, capital equipment, and intermediate goods required for industrial production. Many ASEAN economies depend heavily on imported production inputs. Depreciation of domestic currencies therefore increases production costs and may reduce industrial competitiveness. Firms facing higher

operational expenses may adjust production strategies by limiting output expansion or reducing labor demand. Empirical evidence from several countries has shown that exchange rate instability may negatively influence employment conditions. Research conducted by Atya (2017) and Bakhshi and Ebrahimi (2016) found that exchange rate volatility affects unemployment through changes in production costs, investment behavior, and export competitiveness.

The relationship between exchange rates and employment is particularly relevant for ASEAN economies because international trade plays a central role in regional economic development. Many ASEAN countries rely heavily on export-oriented manufacturing industries. Exchange rate movements therefore influence not only trade competitiveness but also investment decisions and industrial productivity. When exchange rates become unstable, investors may postpone expansion plans due to uncertainty regarding production costs and market demand. Reduced investment activity can limit employment growth and increase unemployment levels. The empirical results presented in **Table 3** therefore highlight the importance of macroeconomic stability in maintaining favorable labor market conditions.

Economic growth does not show a statistically significant effect on unemployment according to the regression results reported in **Table 3**. Conventional macroeconomic theory often predicts a negative relationship between economic growth and unemployment, commonly described by Okun's Law. According to this theory, higher economic growth increases labor demand and reduces unemployment (Nasir et al., 2024). However, empirical findings from several countries suggest that the relationship between growth and employment may weaken when structural transformations occur in production systems. Technological progress, automation, and digitalization can increase productivity without requiring proportional increases in labor input.

Several empirical studies have also documented similar findings. Research conducted by Dewi and Arka (2020) and Salsabilla and Kusuma (2024) examining ASEAN countries found that economic growth does not always reduce unemployment. Growth in many developing economies is often concentrated in capital-intensive sectors such as manufacturing

automation, digital services, and financial industries. Such sectors generate high economic output but absorb relatively limited labor. Empirical evidence from ASEAN countries during the post-pandemic recovery period supports this interpretation. Economic recovery during 2021–2023 was largely driven by technological innovation, digital transformation, and industrial modernization rather than expansion of labor-intensive industries.

The absence of a strong relationship between economic growth and unemployment also reflects structural characteristics of labor markets in ASEAN countries. Rapid urbanization and industrial transformation have altered the composition of employment across sectors. Many workers remain employed in informal sectors characterized by low productivity and limited access to social protection. Recovery of informal economic activities following the COVID-19 pandemic occurred more slowly than recovery in formal industrial sectors. Such structural imbalances may limit the capacity of economic growth to significantly reduce unemployment rates.

Foreign direct investment also does not demonstrate a statistically significant influence on unemployment according to the estimation results presented in **Table 3**. Investment inflows are generally expected to stimulate economic development and generate employment opportunities. However, empirical evidence indicates that the employment effects of foreign investment depend largely on the sectoral distribution and technological characteristics of investment projects. Research conducted by Alalawneh and Nessa (2020) and Karimov et al. (2020) shows that foreign investment can reduce unemployment when investment occurs in labor-intensive sectors such as manufacturing and agriculture. Conversely, investment directed toward technology-intensive industries may produce limited employment effects.

Recent investment patterns in ASEAN countries appear consistent with the latter situation. Foreign investment has increasingly concentrated in sectors such as electronics manufacturing, renewable energy technology, digital infrastructure, and financial technology services. These industries rely heavily on advanced technologies and require highly skilled workers rather than large numbers of general laborers. As a result, increases in foreign investment may contribute more to productivity growth than to employment expansion. Similar findings were reported by Sukmawati (2024), who observed that foreign direct investment does not significantly influence unemployment rates in several ASEAN economies.

Structural differences among ASEAN countries further illustrate the importance of domestic economic characteristics in shaping unemployment patterns. The country-specific intercepts reported in **Table 3** indicate that baseline unemployment levels vary across countries even after controlling for macroeconomic variables. Differences in demographic structures, education systems, labor market institutions, and industrial policies contribute to such variations. Countries with more diversified industrial structures and stronger human capital development tend to experience more stable labor market conditions. Conversely, economies heavily dependent on limited sectors may face greater volatility in employment when external economic shocks occur.

The findings of the present study also highlight the critical role of education systems in addressing unemployment challenges. Education determines the quality of human capital available in the labor market. Rapid technological transformation and digitalization have increased demand for workers possessing advanced technical skills, digital literacy, and analytical capabilities. When education systems fail to adapt to these evolving requirements, labor markets may experience skill mismatches that contribute to structural unemployment. Research conducted by Saefulloh and Fitriana (2017) and Suhendra and Wicaksono (2016) emphasizes that education level and skill development significantly influence unemployment outcomes because education improves workers' productivity and adaptability.

Education policies therefore play an essential role in supporting employment creation in ASEAN countries. Vocational education and technical training programs can help bridge the gap between educational outcomes and industrial requirements. Collaboration between educational institutions and industry sectors may enhance the relevance of training programs and facilitate

smoother transitions from education to employment. Human capital development strategies focusing on digital skills, entrepreneurship, and technological innovation may also increase workforce competitiveness in global labor markets.

Connections between unemployment dynamics and education policy are closely aligned with the objectives of Sustainable Development Goal 8 (SDG 8), which promotes inclusive economic growth, productive employment, and decent work for all. Achieving SDG 8 requires not only economic expansion but also improvements in employment quality, workforce productivity, and equitable access to labor market opportunities. Macroeconomic stability, investment policies, and education reforms therefore need to operate in an integrated manner. Sustainable employment creation depends on the ability of economies to generate productive jobs supported by skilled human resources.

Human capital development becomes particularly important in the context of technological transformation and digital economy expansion. Educational institutions must emphasize lifelong learning, critical thinking, and digital competencies to prepare students for rapidly changing labor market conditions. Strengthening vocational training systems and promoting partnerships between universities, technical institutes, and industry sectors may significantly improve workforce readiness. Such strategies contribute to both economic competitiveness and social welfare by reducing unemployment and improving job quality.

Several policy implications emerge from the findings of the present research. First, maintaining macroeconomic stability remains essential for supporting employment creation. Inflation control and exchange rate stability contribute to a predictable economic environment in which firms can plan production and investment decisions more effectively. Second, economic growth strategies should prioritize sectors capable of generating broad employment opportunities. Development of labor-intensive industries and small- and medium-sized enterprises may enhance job creation in many ASEAN economies. Third, education systems must adapt to evolving technological and industrial demands to ensure

that workforce skills remain relevant in modern labor markets.

The present study contributes to the literature by providing updated empirical evidence on the macroeconomic determinants of unemployment across ASEAN countries using recent panel data covering the post-pandemic economic recovery period. Previous studies often focused on single-country analyses or limited regional samples. Multi-country panel data analysis enables a broader understanding of regional labor market dynamics and allows identification of both common patterns and country-specific characteristics. Integration of macroeconomic analysis with discussions on education policy and sustainable development also expands the analytical scope of unemployment research.

The findings indicate that unemployment dynamics in ASEAN countries are influenced by a combination of macroeconomic stability, structural economic conditions, and human capital development. Inflation and exchange rate stability play significant roles in shaping employment outcomes, while economic growth and foreign investment do not automatically translate into job creation when growth occurs in capital-intensive sectors. Addressing unemployment challenges therefore requires coordinated policy approaches that integrate macroeconomic management, industrial development strategies, and education reforms aimed at strengthening workforce readiness for future economic opportunities.

CONCLUSION

Panel data regression analysis examining the relationship between macroeconomic variables and unemployment in ASEAN countries during the period 2021–2023 reveals several important findings. Model selection procedures initially indicated the Random Effect Model as a potential specification; however, further evaluation demonstrated that the model lacked sufficient explanatory power. Interpretation therefore relied on the Fixed Effect Model, which provided stronger statistical significance and higher explanatory capability. Empirical results indicate that inflation and exchange rate variables significantly influence unemployment levels in ASEAN countries, while economic growth and

foreign direct investment do not show statistically significant effects during the observation period. Rising inflation and currency depreciation increase production costs and economic uncertainty, which may discourage firms from expanding employment. Economic growth and foreign investment, on the other hand, do not automatically generate employment opportunities when growth occurs in capital-intensive sectors or technology-driven industries. Strengths of the study include the use of recent panel data covering multiple ASEAN countries and the integration of macroeconomic analysis with labor market dynamics. Limitations arise from the relatively short observation period and the restricted set of explanatory variables included in the model. Future research may expand the dataset by incorporating longer time periods and additional variables such as education level, labor productivity, technological development, and institutional factors to obtain a more comprehensive understanding of unemployment dynamics in the ASEAN region and to support policies aligned with sustainable employment and workforce development.

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