Exploring the Dynamics of Okun's Law: Youth Unemployment and Economic Growth in ASEAN-5 Economies

Kamarudin Othman[1] and Muhamad Amirul Salehhin[2]

[1]University Teknologi MARA Kedah, Malaysia

[2]University Teknologi MARA Shah Alam, Malaysia.

DOI: https://dx.doi.org/10.47772/IJRISS.2024.8100038

Received: 16 October 2024; Accepted: 21 October 2024; Published: 29 October 2024

ABSTRACT

Objective
This study examines the relationship between youth unemployment and economic growth in ASEAN-5 countries, assessing the relevance of Okun's Law in developing economies.

Methodology
The analysis uses a Panel Autoregressive Distributed Lag (ARDL) model to study the short- and long-term effects of GDP growth, inflation, and other macroeconomic factors on youth unemployment. The panel data covers 1991 to 2022.

Results
The findings show a positive relationship between GDP growth and youth unemployment, differing from Okun's Law expectations. Inflation also has a significant positive effect on youth unemployment. Labor market issues in ASEAN-5 limit the impact of economic growth on reducing youth unemployment.

Conclusion
The study suggests that Okun's Law may not fully apply to ASEAN-5, as structural labor market problems, such as skill mismatches, hinder expected reductions in unemployment. The results indicate a need for targeted reforms to address labor market challenges in these economies.

Keywords: Youth unemployment, ASEAN-5, Okun's Law, economic growth, inflation, panel ARDL, labor market, labor market challenges, structural reforms, developing economies.

INTRODUCTION

Youth unemployment remains a significant socio-economic challenge in ASEAN-5 countries. The joblessness rate among young people is much higher than that of the adult population. This disparity has significant economic and societal effects. It worsens poverty, reduces consumer demand, and increases social unrest (International Labour Organization [ILO], 2020). Youth labor markets are highly sensitive to economic fluctuations. Structural shifts can increase volatility and create uncertainties in employment outcomes (Blanchflower & Freeman, 2000). ASEAN-5 faces labor market issues that hinder the region's ability to reduce youth unemployment. Understanding how these structural factors affect youth unemployment is crucial for developing policies that support inclusive growth. Given these challenges, understanding the economic mechanisms that influence unemployment rates, such as the relationship between GDP growth and employment, becomes crucial.

Okun's Law is a widely accepted framework for analyzing the relationship between economic growth and unemployment. It suggests an inverse relationship between unemployment and GDP growth. As economic

growth increases, unemployment rates should decrease proportionately. While Okun's Law has been extensively tested in developed economies, its application in developing regions like ASEAN-5 remains less studied (Ncube, 2008; Hasan & Sasana, 2020). The region's high levels of informal employment, rigid labor markets, and economic diversity make it an important case for further testing. Since youth unemployment in ASEAN-5 is a challenge due to demographic pressures and structural issues, examining how economic growth affects this segment is timely and important.

This study examines the applicability of Okun's Law to youth unemployment in ASEAN-5 economies. It focuses on how macroeconomic factors like GDP, population, and inflation influence this relationship. The research tests Okun's Law using a Panel Autoregressive Distributed Lag (ARDL) model, which captures both short- and long-term effects. This model provides a deeper understanding of how economic growth affects youth unemployment over time. The Panel ARDL model is ideal for this analysis because it handles variables with different integration orders (I(0) and I(1)) without needing unit root pre-tests, making it suitable for studying the complex economies of developing countries (Pesaran, et al., 1999).

This paper makes several key contributions to the literature. First, it expands the empirical analysis of Okun's Law to ASEAN-5. This region faces significant labor market challenges and economic volatility. Second, it provides new insights into how economic growth affects youth unemployment specifically, a demographic that is often overlooked in traditional macroeconomic analyses. Third, this study uses the Panel ARDL model to capture both short- and long-term effects. It provides a detailed view of the economic forces driving youth unemployment. The study aims to offer practical recommendations for policymakers in ASEAN-5. It highlights the need for labor market reforms to address structural inefficiencies while promoting economic growth.

LITERATURE REVIEW

Empirical Evidence and Variations of Okun's Law Across Economies

Okun's Law is a foundational concept in macroeconomics, showing an inverse relationship between GDP growth and unemployment. It suggests that a percentage increase in GDP leads to a proportional decrease in unemployment (Prachowny, 1993). However, in developing economies, the relationship is often less straightforward due to structural factors such as informal employment, rigid labor markets, and economic volatility. Studies in developed countries, such as the United States and the European Union, have confirmed Okun's Law, with a consistent inverse relationship (King & Morley, 2007; Knotek, 2007). For example, in the United States, a 1% increase in GDP is linked to a 0.3% decrease in unemployment (Prachowny, 1993).

In developing economies, like those in Sub-Saharan Africa and Central and Eastern Europe, the application of Okun's Law is more complex (Ncube, at el., 2013; Katumo & Maingi, 2020). High levels of informal employment, skill mismatches, and rigid labor markets often distort the traditional relationship between economic growth and unemployment. This complexity is particularly evident in ASEAN-5 economies, where rapid economic growth has not consistently translated into reduced youth unemployment. Economic instability, including high inflation and currency fluctuations, further complicates labor market dynamics in these regions (Dabla-Norris et al., 2020).

Recent studies highlight the need for additional variables, such as inflation and foreign direct investment (FDI), to better understand the relationship between GDP and unemployment in developing economies (Legese, 2019; Zhao & Jin, 2020). In ASEAN-5, structural labor issues, such as limited vocational training and education mismatches, exacerbate the problem. As a result, the inverse relationship proposed by Okun's Law does not consistently apply to youth unemployment in these economies (Hasan & Sasana, 2020).

Youth Unemployment in ASEAN-5

Youth unemployment remains a critical issue in ASEAN-5 countries. Unemployment rates for young people

(ages 15-24) are significantly higher than those of adults due to demographic pressures, skill mismatches, and labor market inefficiencies (ILO, 2020). This segment of the labor market is particularly sensitive to economic fluctuations and structural shifts, leading to high levels of joblessness even during periods of economic growth (Blanchflower & Freeman, 2000). Studies show that rigid labor markets, poor alignment between education systems and job requirements, and inadequate vocational training programs are key drivers of high youth unemployment in ASEAN-5 (Kim et al., 2020).

In countries like Indonesia and the Philippines, informal employment distorts official unemployment data, further complicating the relationship between economic growth and job creation for youth (Ofreneo, 2013). This suggests that economic growth alone is insufficient to reduce youth unemployment in developing economies. The mismatch between the skills demanded by the labor market and those possessed by young workers remains a significant obstacle, preventing economic growth from translating into job creation (Ncube et al., 2013).

In contrast to developed economies, where Okun's Law tends to hold more consistently, the relationship between economic growth and youth unemployment in ASEAN-5 is more complex due to structural factors such as informal employment and skill mismatches. The presence of large informal sectors in countries like Indonesia and the Philippines exacerbates youth unemployment and makes it difficult for growth to reduce unemployment rates (Hasan & Sasana, 2020).

Critique of Okun's Law in Developing Economies

Critics argue that Okun's Law oversimplifies the relationship between economic growth and unemployment, particularly in developing economies (Consing et al., 2018). Increased globalization, technological advancements, and labor market flexibility have weakened the traditional link between GDP growth and unemployment, especially in regions with high economic volatility (Gordon, 2010). In developing economies, economic instability and large informal sectors make the relationship between GDP growth and unemployment highly unstable (Ball et al., 2017).

In ASEAN-5, the mismatch between education and labor market needs further complicates the relationship between economic growth and youth unemployment (Rayhan et al., 2020). Countries like Malaysia and Thailand experience high youth unemployment despite periods of economic growth because high-growth sectors often struggle to find workers with the necessary skills. This suggests that Okun's Law may need adjustments to account for structural challenges, such as skill mismatches and underemployment, in developing economies (Legese, 2019; Zhao & Jin, 2020).

Overall, the limitations of Okun's Law in developing economies highlight the need for broader models that incorporate additional variables like inflation and FDI. This approach provides a more accurate understanding of unemployment dynamics in economies facing structural challenges, such as those in ASEAN-5.

METHODOLOGY

This study uses a robust econometric approach to examine Okun's Law in the context of youth unemployment in ASEAN-5 countries. The Panel Autoregressive Distributed Lag (Panel ARDL) model is applied to explore the relationship between GDP growth and youth unemployment, considering the economic diversity of these nations. The Panel ARDL model is ideal for this analysis because it handles variables with different integration orders (I(0) and I(1)) without requiring unit root pre-testing (Pesaran et al., 1999). It also estimates both short- and long-term dynamics, providing a complete view of how GDP growth affects youth unemployment over time. The model assumes stability in long-term relationships and homogeneity across countries, while allowing short-term differences, capturing the unique economic fluctuations in each ASEAN-5 country.

Additionally, the Panel ARDL (PARDL) model is ideal for managing potential cross-sectional dependence that may occur due to the interconnected economies of ASEAN-5. This is important because economic

integration in the region can lead to spillover effects and shared economic shocks. By using the PARDL model, the study effectively addresses these dependencies, improving the robustness and reliability of the results.

Model Assumptions

The Panel ARDL model assumes that the long-term relationship between variables is stable, and short-term changes are driven by deviations from this equilibrium. In this study, the assumption of long-term stability is important. It helps explore how structural factors, like the informal labor market and inflation, affect the adjustment back to equilibrium.

Moreover, the Panel ARDL model assumes homogeneity in the long-run coefficients across the panel, while allowing for heterogeneity in the short-run dynamics. This assumption is justified given the shared economic characteristics and policy environments within ASEAN-5, which likely lead to similar long-term relationships between GDP growth and youth unemployment. However, the model's flexibility in accommodating short-term heterogeneity is crucial for capturing country-specific responses to economic fluctuations, which may differ due to varying levels of economic development, labor market structures, and policy interventions.

The study also acknowledges the potential limitations of these assumptions and conducts robustness checks, including the Hausman test, to ensure the consistency and efficiency of the chosen model. These robustness checks are critical for validating the appropriateness of the PARDL approach and for confirming that the study's findings are not unduly influenced by model-specific assumptions.

Data Sources and Variables

The analysis utilizes panel data spanning from 1991 to 2022, sourced from the World Development Indicators provided by the World Bank. The primary dependent variable is Youth Unemployment Rate (YU), while the key independent variables include Gross Domestic Product (GDP), Inflation Rate (INF), Population Growth (POP), and Foreign Direct Investment (FDI). All variables are transformed into their natural logarithms to address issues of heteroscedasticity and to interpret the coefficients as elasticities.

Table 1: Description of variables.

Variables	Description and Unit	Source	Period
YU	Share of the labor force ages 15-24 without work but available for and seeking employment (%)	World Bank Data	1990–2019
INF	General level of price increases for goods and services, indicating a fall in purchasing power of currency (%)	World Bank Data	1990–2019
GDP	Annual percentage growth of GDP at market rates, based on constant 2010 U.S. dollars (%)	World Bank Data	1990–2019
POP	Annual population growth rate based on the de facto definition of population, midyear estimates (%)	World Bank Data	1990–2019
FDI	Net inflows of investment to acquire lasting management interest (10% or more of voting stock) in an enterprise operating in a different economy, as a percentage of GDP (%)	World Bank Data	1990–2019

Source: World Development Indicators, World Bank

Panel Unit Root Tests

Before proceeding to the main estimations, it's important to check if the data is stationary. Since the dataset is a panel, unit root tests designed for panel data are used. This study applies the Im-Pesaran-Shin (IPS) test, the Levin-Lin-Chu (LLC) test, and the Cross-sectionally Augmented IPS (CIPS) test (Pesaran, 2007). The IPS test allows for differences in the autoregressive parameter across units, while the LLC test assumes it is the

same. The CIPS test accounts for cross-sectional dependence, which is relevant due to the interconnected ASEAN-5 economies. In all these tests, the null hypothesis is that the series has a unit root, and the optimal lag length is chosen using the Bayesian-Schwarz criterion.

Dynamic Panel ARDL Model

This method investigates the co-integration of variables in both the long and short term and explores the panel characteristics of the Error Correction Model (ECM) to understand short-term dynamics. Other co-integration methods, like the Johansen and Juselius (1990) and Johansen (1988) approaches, were considered. However, the panel autoregressive distributed lag (ARDL) model was chosen for its additional advantages.

The Panel ARDL approach differs from traditional co-integration methods, which usually focus on long-term relationships across multiple equations. Instead, the ARDL model uses a single equation (Pesaran, 1999). Equation 1 shows the relationship between youth unemployment and various macroeconomic variables, allowing variables integrated at order zero, one, or both (I(0) and I(1)) (Sulaiman & Abdul-Rahim, 2018). Unlike standard co-integration tests, which do not permit different lags for each variable, the Panel ARDL model offers this flexibility and estimates both long- and short-term coefficients (Sheng & Guo, 2016; Sulaiman et al., 2015). Additionally, as improved by Narayan (2004), this method is suitable for small sample sizes, making it ideal for this study. The general production function is shown in Equation 3.

$$Y_{it} = a_{it} + \beta'_{it} X_{it} + \varepsilon_{it} \quad (1)$$

$$Y_{it} = a_{it} + \sum_{i=1}^{k} \delta_{ij} Y_{j,t-i} + \sum_{i=0}^{q} \beta'_{it} X_{j,t-i} + \varepsilon_{it} \quad (2)$$

$$\Delta lnYU_{it} = \beta_1 + \sum_{i=1}^{k} a_{ij} \Delta lnYU_{j,t-i} + \sum_{i=0}^{k} \beta_{ij} \Delta lnINF_{j,t-i} + \sum_{i=0}^{k} X_{ij} \Delta lnGDP_{j,t-i} + \sum_{i=0}^{k} \delta_{ij} \Delta lnPOP_{j,t-i} + \sum_{i=0}^{k} \vartheta_{ij} \Delta lnFDI_{j,t-i} + \theta_1 lnYU_{j,t-1} + \theta_2 lnINF_{j,t-1} + \theta_3 lnGDP_{j,t-1} + \theta_4 lnPOP_{j,t-1} + \theta_5 lnFDI_{j,t-1} + \varepsilon_{jt} \quad (3)$$

In Equation 1, *i* represents the country indicator, *t* stands for the time-period, and *εit* denotes the random error term. This equation cannot be directly estimated due to the data limitations of N = n × T points. Equation 2 involves certain assumptions about the parameters, error terms, and the homogeneity of the regressors, leading to various panel data models. In Equation 3, *ln YU* refers to youth unemployment, *ln INF* to the inflation rate, *ln GDP* to gross domestic product, *ln POP* to the population rate, and *ln FDI* to foreign direct investment. The symbol Δ represents the first-difference operator, *t* is time, *i* refers to the country, and *k* indicates the ideal lag length.

To test for long-term co-integration, the following hypotheses are formulated:

$H_0: \theta 1 = \theta 2 = \theta 3 = \theta 4 = \theta 5 = 0$ (There is no co-integration).

$H_a: \theta 1 \neq \theta 2 \neq \theta 3 \neq \theta 4 \neq \theta 5 \neq 0$ (There is co-integration).

An F-test, which does not follow a standard distribution, is used to test for co-integration, depending on whether the variables are I(0), I(1), or a combination of both. The test also depends on the number of regressors and whether the model includes an intercept, trend, or both.

Given the study's small sample size, the critical values for the F-test, provided by Narayan and Narayan (2005), were used. The test evaluates the co-integration using the ARDL approach. There are two critical values: one for the lower bound, which assumes all variables are I(0), and one for the upper bound, which assumes all variables are I(1). If the F-statistic exceeds the upper bound, the null hypothesis is rejected, indicating co-integration. Conversely, if the F-statistic falls below the lower bound, the null hypothesis is accepted, implying no co-integration. If the F-statistic lies between the two bounds, the result is inconclusive.

If co-integration is confirmed, the long-term and short-term effects are modeled as shown in Equations 5 and 6:

If co-integration is confirmed, the long-term and short-term effects are modeled as shown in Equations 4 and 5:

$$lnYU_{it} = \beta_2 + \sum_{i=1}^{k} \alpha_{i2} lnYU_{j,t-i} + \sum_{i=0}^{k} \beta_{i2} lnINF_{j,t-i} + \sum_{i=0}^{k} X_{i2} lnGDP_{j,t-i} + \sum_{i=0}^{k} \delta_{i2} lnPOP_{j,t-i} + \sum_{i=0}^{k} \vartheta_{i2} lnFDI_{j,t-i} + \varepsilon_{it2} \quad (4)$$

$$\Delta lnYU_{it} = \beta_3 + \sum_{i=1}^{k} \alpha_{i3} \Delta lnYU_{j,t-i} + \sum_{i=0}^{k} \beta_{i3} \Delta lnINF_{j,t-i} + \sum_{i=0}^{k} X_{i3} \Delta lnGDP_{j,t-i} + \sum_{i=0}^{k} \delta_{i3} \Delta lnPOP_{j,t-i} + \sum_{i=0}^{k} \vartheta_{i3} \Delta lnFDI_{j,t-i} + \gamma ECT_{j,t-i} + \varepsilon_{it3} \quad (5)$$

Finally, the error correction term (ECT) is specified in Equation 6:

$$ECT_{j,t} = lnYU_{it} - \beta_2 - \sum_{i=1}^{k} \alpha_{i2} lnYU_{j,t-i} - \sum_{i=0}^{k} \beta_{i2} lnINF_{j,t-i} - \sum_{i=0}^{k} X_{i2} lnGDP_{j,t-i} - \sum_{i=0}^{k} \delta_{i2} lnPOP_{j,t-i} - \sum_{i=0}^{k} \vartheta_{i2} lnFDI_{j,t-i} \quad (6)$$

In this context, γ represents the speed at which variables adjust to restore equilibrium after a short-term shock. The coefficient of the ECT in Equation 6 offers insights into the long-term relationship between the variables in Equation 7. Validation tests will be performed to assess the accuracy and reliability of the estimates, ensuring the robustness of the results.

Hausman Test for Model Selection

The Hausman test is used to choose between the Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE) estimators. The PMG estimator allows for differences in short-run dynamics but assumes the same long-run coefficients, and it is compared to the MG and DFE estimators. The null hypothesis states that the PMG estimator is consistent and efficient. If rejected, the MG estimator would be preferred. In this study, the Hausman test results indicate that the PMG estimator is the best model due to its efficiency in managing long-run homogeneity across ASEAN-5 countries (Pesaran, et al., 999).

Short-Run and Long-Run Dynamics

After estimating the long-run coefficients, the short-run dynamics are analyzed using the error correction mechanism (ECM). The ECM coefficient shows how quickly deviations from the long-run equilibrium are corrected in the short run. A significant negative ECM coefficient confirms the stability of the long-run relationship. In this study, the results indicate that GDP and inflation significantly affect youth unemployment in both the short and long run, consistent with theory. However, some unexpected positive correlations were found, which require further investigation.

RESULT

Descriptive Analysis

The researchers conducted a descriptive analysis of the key variables such as Youth Unemployment (YU), Gross Domestic Product (GDP), Inflation Rate (INF), Population Growth (POP), and Foreign Direct Investment (FDI) across ASEAN-5 countries from 1990 to 2019. Table 2 presents the descriptive statistics for the 145 observations used in this study. Youth unemployment averages 9.97%, with significant variability across countries, particularly Indonesia and the Philippines, due to informal employment and skill mismatches. GDP growth shows minimal variation between countries (standard deviation 0.67), but substantial within-country fluctuations (standard deviation 3.42) are evident, especially in Thailand and Indonesia, where political instability disrupts job creation. Inflation has an average of 4.38%, but its volatility is high, peaking at 58.45% in Indonesia, contributing to economic uncertainty. FDI shows the greatest between-country

variation, with Singapore receiving more due to its stable environment, while Indonesia and the Philippines experience lower inflows due to political risks. Population growth is stable (mean 1.63%), with limited variation, emphasizing that structural labor market issues, rather than demographics, drive youth unemployment. These findings underscore the need for targeted labor market reforms, inflation control, and policies to enhance investment.

Table 2: Descriptive Analysis

Variable		Observations	Mean	Std. dev.	Min	Max
yu	overall	145	9.973	4.730	1.090	25.820
	between			4.565	4.172	16.838
	within			2.363	0.695	18.955
inf	overall	145	4.381	5.670	-0.900	58.450
	between			3.080	1.633	9.300
	within			4.951	-1.889	53.531
gdp	overall	145	4.999	3.473	-13.127	14.526
	between			0.673	4.152	5.685
	within			3.420	-12.992	13.840
pop	overall	145	1.631	0.864	-1.475	5.322
	between			0.588	0.717	2.162
	within			0.684	-2.005	4.791
fdi	overall	145	5.372	6.885	-2.757	28.598
	between			6.716	1.241	17.232
	within			3.327	-7.632	16.738

Source: Author's calculations.

Correlation Matrix

The correlation matrix (Table 3) reveals generally weak to moderate relationships between youth unemployment (YU), inflation (INF), GDP growth (GDP), population growth (POP), and Foreign Direct Investment (FDI). Inflation has a moderate negative correlation with GDP growth (-0.4086) and a weak negative correlation with FDI (-0.288), implying that higher inflation might slow economic growth and reduce foreign investment. Youth unemployment shows weak positive correlations with inflation (0.3463) and weak negative correlations with GDP (-0.0387) and FDI (-0.1109), suggesting that the relationships between youth unemployment and macroeconomic factors require further analysis, especially given the weak linear associations. These preliminary findings highlight the importance of investigating deeper dynamics, particularly using advanced econometric techniques like ARDL.

Table 3: Correlation Analysis

	YU	*INF*	*GDP*	*POP*	*FDI*
YU	1				
INF	0.3463	1			
GDP	-0.0387	-0.4086	1		
POP	0.0885	0.0508	0.1155	1	
FDI	-0.1109	-0.288	0.1467	0.1537	1

Source: Author's calculations.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume VIII Issue X October 2024

Panel Unit Root Test

Before applying the panel ARDL approach, it was important to determine the order of integration for each variable. The Breitung, Levin, Lin, Chu, and Im, Pesaran, and Shin tests were used for this purpose. Table 4 shows the results of the unit root tests for both Constant and Constant with Trend specifications. The results indicate a mix of I(0) and I(1) variables, with no I(2) variables, confirming the suitability of the panel ARDL model. As highlighted by Muchapondwa & Pimhidzai (2011), the combination of I(0) and I(1) variables allows the use of panel ARDL models as a cointegration method. This approach is ideal for handling the combination of I(0) and I(1) variables, allowing for both short-term and long-term relationship estimation. The use of multiple unit root tests strengthens the analysis by ensuring that all variables meet the necessary stationarity requirements.

Table 4: Panel Unit Root Test

Variable	Test Type	Constant	Constant & Trend	Stationarity Level
YU	Level			I(1)
	Im, Pesaran and Shin	-0.66	0.53	
	Breitung	-1.26	0.78	
	Levin, Lin, Chu	-3.91	-3.75	
	1st Difference			
	Im, Pesaran and Shin	-5.93***	-5.93***	
	Breitung	-4.68***	-4.96***	
	Levin, Lin, Chu	-9.06***	-3.76***	
INF	Level			I(0)
	Im, Pesaran and Shin	-3.12*	-3.35**	
	Breitung	-2.58**	-3.78**	
	Levin, Lin, Chu	-6.41**	-8.21**	
	1st Difference			
	Im, Pesaran and Shin	-11.79***	-3.35**	
	Breitung	-6.88***	-5.27***	
	Levin, Lin, Chu	-15.17***	-15.25***	
GDP	Level			I(0)
	Im, Pesaran and Shin	-4.76***	-4.35***	
	Breitung	-2.78**	-4.33***	
	Levin, Lin, Chu	-7.99***	-9.11***	
	1st Difference			
	Im, Pesaran and Shin	-11.15***	-9.92***	
	Breitung	-6.21***	-7.30***	
	Levin, Lin, Chu	-14.43***	-14.54***	
POP	Level			I(1)
	Im, Pesaran and Shin	1.35	-15.83***	
	Breitung	0.39	0.18	
	Levin, Lin, Chu	-1.24	-14.94***	
	1st Difference			
	Im, Pesaran and Shin	-14.01***	-14.01***	
	Breitung	0.39	-0.89	
	Levin, Lin, Chu	-1.24	-15.95***	

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume VIII Issue X October 2024

FDI	Level			I(0)
	Im, Pesaran and Shin	-2.73**	-2.61**	
	Breitung	-1.37*	-2.75**	
	Levin, Lin, Chu	-6.15**	-7.02**	
	1st Difference			
	Im, Pesaran and Shin	-2.73**	-8.31***	
	Breitung	-3.42**	-5.66***	
	Levin, Lin, Chu	-6.15**	-12.62***	

Note: *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Source: Author's calculations.

The optimal lag selections

The Table 5 shows the selection of the optimal lag based on several criteria such as Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC). The optimal lag is selected based on the lowest value for each criterion, which is indicated by an asterisk (*) in the original output. The most common lag selected for the Panel ARDL model is (2, 2, 2, 2, 2), which is used for further estimations. The correct lag structure is crucial for accurately capturing the dynamic effects of the independent variables on youth unemployment.

Table 5: Optimal lag selections

Country ID	Optimal Lag	FPE	AIC	HQIC	SBIC
Indonesia	2	0.017624*	9.89997*	10.6849*	12.5396*
Malaysia	2	0.003599*	8.31138*	9.09629*	10.951*
Philippines	2	0.00051*	6.35755*	7.14246*	8.99722*
Singapore	2	516.797*	20.1861*	20.971*	22.8258
Thailand	2	0.018383*	9.94212*	10.727*	12.5818*

Note: * Optimal lag

Source: Author's calculations.

Panel ARDL Model Selection

This study investigated the short- and long-term relationships between selected macroeconomic factors and youth unemployment. The analysis was conducted using the autoregressive distributed lag (ARDL) approach, employing three estimators to integrate the heterogeneous panel regression into the error correction model. Table 6 presents these estimators of the Mean Group (MG), the Pooled Mean Group (PMG), and the Dynamic Fixed Effects (DFE).

Table 6. PMG, MG and DFE Estimators.

Variables	PMG D.yu	MG D.yu	DFE D. yu
LR			
INF	0.449* (0.203)	0.268 (0.488)	0.0639 (0.112)
GDP	-0.944*** (0.256)	-0.528 (0.360)	-1.006*** (0.280)

POP	-0.519 (0.389)	-1.430 (2.747)	0.147 (0.829)
FDI	-0.0945 (0.102)	-0.531 (0.926)	-0.194 (0.202)
SR			
ECT	-0.239** (0.0752)	-0.241*** (0.0717)	-0.200*** (0.0412)
F.INF	0.0537 (0.0671)	0.0120 (0.111)	-0.00278 (0.0197)
D.GDP	0.100** (0.0384)	0.0818* (0.0350)	0.0637* (0.0299)
D.POP	-3.187 (2.165)	-1.952 (1.752)	-0.143 (0.214)
D.FDI	0.0765 (0.128)	0.0792 (0.140)	-0.0137 (0.0370)
__CONS	3.295** (1.239)	3.378* (1.397)	3.214*** (0.602)
N	135	135	135

Note: Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001

Source: Author's calculations.

The study employed the Hausman test (Table 7) to compare different estimators, specifically the Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE) approaches, in determining the most efficient estimator for the analysis. The initial comparison between the PMG and MG estimators resulted in a chi-square value of 2.33 with a corresponding p-value of 0.6758. Since the p-value exceeds the 0.05 significance threshold, the null hypothesis that the PMG estimator is more efficient is not rejected. Therefore, the study concludes that the PMG estimator is preferred over the MG estimator under these conditions.

Further comparison between the PMG and DFE estimators yielded a chi-square value of 2.66, with a p-value of 0.6159. Similarly, this p-value is greater than the 0.05 threshold, leading to the conclusion that the PMG estimator is more efficient than the DFE estimator under the null hypothesis.

Table 7: Hausman Test Result

Comparison	chi2 Value	Prob>chi2	Conclusion
PMG vs. MG	2.33	0.6758	PMG is the more efficient estimator under the null hypothesis
PMG vs. DFE	2.66	0.6159	PMG is the more efficient estimator under the null hypothesis

Source: Author's calculations.

While the Hausman Test results (table 7) indicate that the PMG estimator is the most efficient, it is important to acknowledge the economic diversity within the ASEAN-5 countries, which may lead to variations in long-term relationships between macroeconomic variables and youth unemployment. For example, Singapore's advanced economy differs greatly from Indonesia's, which has a large labor market challenge. These structural differences suggest that assuming homogeneity in long-term effects across all countries might overlook important country-specific dynamics.

To address this limitation, future research could explore country-specific long-term effects by using separate models for each country or grouping countries based on economic similarities. This would provide a more nuanced understanding of how different economic structures influence the long-term relationship between

GDP growth and youth unemployment in each ASEAN-5 country.

Overall, the Hausman test results indicate that the PMG estimator is the most appropriate and efficient method for the analysis, particularly when assessing the long-run and short-run dynamics of the relationships in the model. The PMG estimator was found to better accommodate the potential heterogeneity and dynamics across the panel data, making it the preferred approach for this study.

Short Run Dynamic Relationship

After estimating the long-run coefficients, the short-run dynamics were derived using the Error-Correction Term (ECT). The ECT shows how quickly the economy returns to equilibrium after a shock. In the ASEAN-5 region, the ECT value of -0.239 indicates that 23.9% of any imbalance is corrected each year, meaning it would take about four years for the economy to return to equilibrium. The ECT values across the five countries show significant adjustment speeds, with Singapore (-0.510) and Thailand (-0.293) adjusting faster compared to Indonesia (-0.125) and the Philippines (-0.105). Malaysia's ECT (-0.164) indicates a moderate adjustment speed.

Table 8: Short Run Dynamic for PMG Model for Each Countries

Variables	Indonesia	Malaysia	Philippine	Singapore	Thailand
Short Run					
ECT	-0.125* (-2.38)	-0.164** (-2.98)	-0.105* (-2.21)	-0.510*** (-4.01)	-0.293** (-3.24)
F.INF	0.00668 (0.25	0.0882 (0.90)	-0.0210 (-0.52)	0.294* (1.98)	-0.0991 (-1.04)
D.GDP	0.0500 (0.67)	0.0748 (1.79	0.0144 (0.32)	0.235** (3.25)	0.126* (2.04)
D.POP	11.50 (-0.76)	-1.660 (-0.77)	-0.0359 (-0.01)	0.336 (1.27)	-3.079 (-0.77)
D.FDI	0.558* (2.11)	-0.200* (-2.25)	-0.0406 (-0.37)	0.00385 (0.09	0.0610 (0.54)
__CONS	2.241 (1.75)	2.353** (3.09)	1.350* (1.98)	8.194*** (5.27)	2.336*** (4.70)

Note: t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Source: Author's calculations.

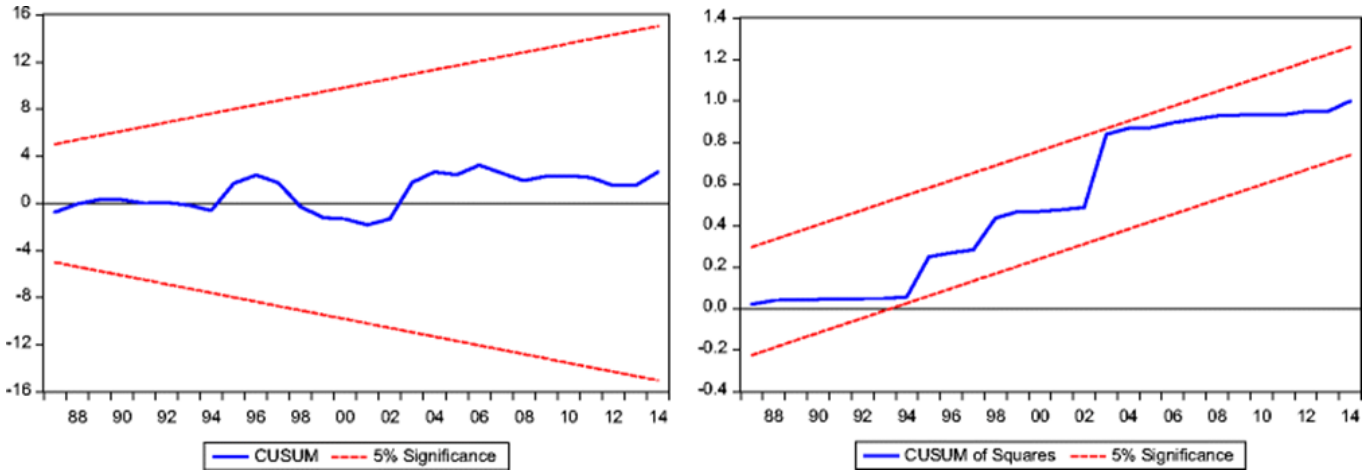
Table 8 shows the short-run PMG model highlights different effects of macroeconomic variables across these countries. Inflation (F.INF) has an insignificant short-run impact in most countries except for Singapore, where it shows a positive and significant effect (0.294), suggesting that inflation can boost short-term growth. In the long run, however, inflation shows a positive relationship with youth unemployment in ASEAN-5, where a 1% increase in inflation leads to a 0.49% rise in unemployment. GDP growth (D.GDP) has significant short-run effects in Singapore (0.235) and Thailand (0.126), while the impact is weaker in other countries. In the long term, GDP growth is linked to a 0.94% increase in youth unemployment in the region.

Foreign Direct Investment (FDI) plays different roles in short-run dynamics. Indonesia sees a significant positive impact from FDI (0.558), showing its importance in short-term economic growth. In Malaysia, however, FDI has a negative effect (-0.200), suggesting short-term FDI inflows may challenge the economy. For the Philippines, Singapore, and Thailand, FDI shows no significant short-run impact. These findings suggest that while inflation and GDP growth affect unemployment over the long term, their short-term effects on economic dynamics differ, requiring specific policy responses for each country.

Diagnostics Test

Diagnostic tests were conducted to ensure the model's robustness. The Wooldridge test showed no significant autocorrelation ($F(1, 4) = 1.235$, $p = 0.312$), indicating that residuals were not serially correlated. The Breusch-Pagan test found no evidence of heteroskedasticity ($chi2(1) = 0.45$, $p = 0.502$), confirming constant variance of residuals. The Shapiro-Wilk test showed residuals were normally distributed ($W = 0.9780$, $p = 0.675$). The CUSUM and CUSUM Squares (Figure 1) test indicated model stability, as the plot remained within the 5% boundaries. Overall, these results validate the reliability of the Panel ARDL model used in the study.

Figure 1: CUSUM and CUSUM Squares Test Result



Sources: Author's calculations.

DISCUSSION

This study provides important insights into the relationship between youth unemployment and economic growth in ASEAN-5 economies. The results challenge the conventional application of Okun's Law in developing countries, particularly when examining youth unemployment. Using the Panel ARDL model, the findings reveal unexpected dynamics that reshape our understanding of economic growth and labor market outcomes in this region.

The study confirms a positive long-term relationship between GDP growth and youth unemployment, indicating that economic growth in ASEAN-5 economies does not automatically lead to job creation for young people. This result contrasts with the traditional view of Okun's Law, which posits that economic growth reduces unemployment. The positive correlation is primarily explained by structural labor market issues, such as underemployment, informal employment, and skill mismatches. These factors prevent economic growth from translating into meaningful employment opportunities for the youth. As a result, the expected inverse relationship between GDP growth and unemployment does not hold in ASEAN-5 economies.

Inflation also plays a significant role in increasing youth unemployment, as the study finds a positive long-term relationship between inflation and unemployment. A 1% rise in inflation leads to a 0.49% increase in youth unemployment. This finding underscores the challenges faced by ASEAN-5 economies, where inflationary pressures reduce businesses' ability to hire and create job opportunities. In high-inflation

environments, young workers are often the first to face employment difficulties as businesses cut costs or reduce hiring to cope with rising expenses.

In the short run, the effects of GDP growth on youth unemployment vary across countries. Singapore and Thailand show significant positive short-term effects of GDP growth on employment, suggesting that their more developed economies can absorb growth more efficiently, leading to better labor market outcomes for the youth. In contrast, the weaker effects in other countries like Indonesia and the Philippines highlight the need for reforms to improve the labor market's ability to create jobs during periods of economic expansion. The differences across countries reflect the diverse economic structures within ASEAN-5, with some countries better equipped to manage short-term economic shocks and convert growth into employment gains.

The findings also highlight the complex role of Foreign Direct Investment (FDI) in the short term. In Indonesia, FDI positively affects youth employment, suggesting that foreign investment can stimulate job creation in labor-intensive sectors. However, in Malaysia, FDI has a negative short-term effect on youth employment, reflecting potential challenges in absorbing FDI into sectors that immediately generate employment. This divergence emphasizes the need for country-specific policies that channel FDI into sectors that align with national labor market needs.

The Error Correction Term (ECT) of -0.239 suggests that 23.9% of any imbalance between youth unemployment and macroeconomic factors is corrected each year, meaning it would take approximately four years for the economy to return to equilibrium after a shock. The adjustment speeds vary across countries, with Singapore and Thailand exhibiting faster correction rates, while Indonesia and the Philippines show slower adjustment processes. These results underscore the importance of considering country-specific structural differences in labor market flexibility and resilience when formulating policies.

POLICY IMPLICATIONS

The findings have significant implications for policymakers in ASEAN-5 countries. Reforms to address structural labor market issues are critical to ensure that economic growth translates into job creation for youth. The positive long-term relationship between GDP growth and youth unemployment highlights the need for targeted interventions that address underemployment, skill mismatches, and informal employment. Education and vocational training programs should be reformed to better align with market needs, ensuring that young workers possess the skills required by high-growth industries such as technology, healthcare, and manufacturing.

To further strengthen vocational training, partnerships between governments and industries should be encouraged. By offering apprenticeships and internships, businesses can help bridge the gap between education and employment, providing young workers with practical experience and skills that are directly applicable in the workforce.

Additionally, labor market flexibility must be enhanced. Revising labor laws to allow for more flexible work arrangements, such as part-time work, freelance opportunities, and remote work, will expand employment options for young people. This will enable businesses to adapt to economic fluctuations without resorting to layoffs, promoting employment stability while addressing youth unemployment.

Inflation control must also be prioritized as part of broader macroeconomic stability measures. The positive link between inflation and youth unemployment underscores the need for policies that balance economic growth with price stability. Policymakers should implement strategies to mitigate the impact of inflation on businesses' hiring capacities, especially in sectors most affected by price fluctuations. This will help ensure that inflationary pressures do not disproportionately harm young workers' employment prospects.

Finally, FDI policies should be tailored to each country's specific labor market needs. Countries like Indonesia, which benefit from FDI in labor-intensive sectors, should continue to attract investment in these areas.

However, Malaysia and other ASEAN-5 countries that face challenges in converting FDI into youth employment should focus on channeling investment into sectors that create sustainable employment opportunities for young workers. This can be achieved by encouraging FDI in industries that require higher levels of labor input or that provide long-term job creation rather than relying on short-term capital inflows.

CONCLUSION

This study provides important contributions to literature by challenging the traditional understanding of Okun's Law in developing economies, particularly in ASEAN-5 countries. The results emphasize that economic growth alone is insufficient to reduce youth unemployment without addressing structural labor market issues. Additionally, the positive correlation between inflation and youth unemployment highlights the vulnerability of these economies to inflationary pressures. To effectively reduce youth unemployment, comprehensive labor market reforms are essential. These should focus on improving education and vocational training systems, reducing skill mismatches, and formalizing employment opportunities to ensure that economic growth leads to sustainable and inclusive labor market outcomes in ASEAN-5.

REFERENCES

1. Astari, M., Hamzah, L. M., & Ratih, A. (2019). Hukum OKUN: Pertumbuhan Ekonomi dan Tingkat Pengangguran di Indonesia. *Jurnal Ekonomi Pembangunan*, 8(1), 37-44. https://doi.org/10.23960/jep.v8i1.32
2. Ball, L., Leigh, D., & Loungani, P. (2017). Okun's law: Fit at 50? *Journal of Money, Credit and Banking*, 49(7), 1413-1441. https://doi.org/10.1111/jmcb.12346
3. Blanchflower, D. G., & Freeman, R. B. (2000). *Youth employment and joblessness in advanced countries*. University of Chicago Press.
4. Consing, R. M. M., Lumba, A. J. B., & Alvarez, J. T. (2018). Linking inflation differential across regions to unemployment in the Philippines. *Journal of Economics and Policy*, 6(3), 356-373. https://doi.org/10.18488/journal.8.2018.63.356.373
5. Dabla-Norris, E., Ganelli, G., Nguyen, A. T. N., Nguyen, M. T. T., & Vu, T. T. T. (2020). Role of individual characteristics and policies in driving labor informality in Vietnam. *Social Science Research Network (SSRN)*. https://doi.org/10.2139/ssrn.3772477
6. Fung, Y. V., & Nga, J. L. H. (2023). Economic growth and youth unemployment in Malaysia. *International Journal of Academic Research in Economics and Management Sciences*, 12(2), 1-16. https://doi.org/10.6007/ijarems/v12-i2/17494
7. Gordon, R. J. (2010). The demise of Okun's law and of procyclical fluctuations in conventional and unconventional measures of productivity. *NBER Working Paper No. 16426*. https://doi.org/10.3386/w16426
8. Hasan, R., & Sasana, H. (2020). Okun's law and youth unemployment in ASEAN-5: A comparative analysis. *Asian Economic Journal*, 34(4), 362-380. https://doi.org/10.1111/asej.12345
9. Hooper, V. J. (2017). Okun's law revisited within the context of high Eurozone unemployment: A note. *E-Journal of International and Comparative Labour Studies*, 6(2), 73-89. http://ejcls.adapt.it/index.php/ejcls_adapt/article/view/389/651
10. International Labour Organization (ILO). (2020). *Global employment trends for youth 2020: Technology and the future of jobs*. ILO Publishing. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_737648.pdf
11. Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
12. Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.
13. Katumo, G., & Maingi, P. M. (2020). Economic growth and youth unemployment in Central and Eastern Europe: A panel data analysis. *Journal of Policy Modeling*, 42(2), 78-98.

https://doi.org/10.1016/j.jpolmod.2020.04.002
14. Kim, J., Yoon, J. C., & Jei, S. Y. (2020). An empirical analysis of Okun's law in ASEAN using time-varying parameter model. *Physica A: Statistical Mechanics and Its Applications*, 540, 123068. https://doi.org/10.1016/j.physa.2019.123068
15. King, T. B., & Morley, J. (2007). In search of the natural rate of unemployment. *Journal of Monetary Economics*, 54(2), 550-564. https://doi.org/10.1016/j.jmoneco.2005.11.002
16. Knotek, E. S. (2007). How useful is Okun's law? *Federal Reserve Bank of Kansas City Economic Review*, 4th Quarter, 73-103. https://doi.org/10.2307/41929389
17. Lee, J. (2000). The robustness of Okun's law: Evidence from OECD countries. *Journal of Macroeconomics*, 22(2), 331-356. https://doi.org/10.1016/S0164-0704(00)00134-0
18. Muchapondwa, E., & Pimhidzai, O. (2011). Modelling international tourism demand for Zimbabwe. *International Journal of Business and Social Science*, 2(2), 71-81. https://doi.org/10.3386/w11353
19. Narayan, P. (2004). Reformulating critical values for the bounds F-statistics approach to cointegration: An application to the tourism demand model for Fiji. *Discussion Paper, Department of Economics, Monash University*, 2(04).
20. Narayan, S., & Narayan, P. K. (2005). An empirical analysis of Fiji's import demand function. *Journal of Economic Studies*, 32(2), 158-168.
21. Ncube, M. (2008). The labour market and decent work agenda in Southern Africa: Evidence and challenges. *International Labour Organization (ILO)*. https://www.ilo.org/global/research/publications/WCMS_096706/lang--en/index.htm
22. Ncube, M., Brixiová, Z., & Bicaba, Z. (2013). Can Okun's law be sped up? Differences in the impact of youth and adult unemployment on GDP growth in Africa. *African Development Review*, 25(4), 423-435. https://doi.org/10.1111/1467-8268.12050
23. Ofreneo, R. E. (2013). Precarious Philippines. *American Behavioral Scientist*, 57(4), 420-443. https://doi.org/10.1177/0002764212466237
24. Panayotou, T. (1994). Empirical tests and policy analysis of environmental degradation at different stages of economic development. *International Labour Organization (ILO) Working Paper*. https://EconPapers.repec.org/RePEc:ilo:ilowps:992927783402676
25. Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, 22(2), 265-312. https://doi.org/10.1002/jae.951
26. Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621-634. https://doi.org/10.1080/01621459.1999.10474156
27. Prachowny, M. F. (1993). Okun's law: Theoretical foundations and revised estimates. *The Review of Economics and Statistics*, 75(2), 331-336. https://doi.org/10.2307/2109578
28. Rayhan, A. A. M., Rusdarti, R., & Yanto, H. (2020). Factors influencing unemployment rate: A comparison among five ASEAN countries. *Journal of Economics Education and Research*, 9(1), 37-45. https://doi.org/10.15294/jeec.v9i1.38358
29. Schmillen, A., & Packard, T. G. (2016). Vietnam's labor market institutions, regulations, and interventions: Helping people grasp work opportunities in a risky world. *World Bank Policy Research Working Paper*, No. 7587. https://doi.org/10.1596/1813-9450-7587
30. Sheng, P., & Guo, X. (2016). The long-run and short-run impacts of urbanization on carbon dioxide emissions. *Economic Modelling*, 53, 208-215. https://doi.org/10.1016/j.econmod.2015.08.026
31. Sulaiman, C., Abdul-Rahim, A. S., Bala, U., Tijani, B., Waziri, M., & Maji, I. K. (2015). Panel ARDL approach: A robust method for the examination of dynamics in data. *Journal of Policy Modeling*, 37(2), 203-212. https://doi.org/10.1016/j.jpolmod.2015.01.003
32. Thắng, Đ. V. (2020). Informal employment and the life of informal economy workers in Vietnam. *American Journal of Social Science*, 6(3), 82-89. https://doi.org/10.11648/j.ash.20200603.11
33. Villaverde, J., & Maza, A. (2009). The robustness of Okun's law in Spain, 1980–2004: Regional evidence. *Journal of Policy Modeling*, 31(2), 289-297. https://doi.org/10.1016/j.jpolmod.2008.09.006
34. Zhao, S., & Jin, M. (2020). Globalization, innovation, and productivity. *Springer Nature*, 1-19. https://doi.org/10.1007/978-981-10-3450-3_28-1