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Okun's law, FDI, and economic structure on unemployment in ASEAN countries

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ABSTRACT

This study aims to analyze the effect of economic growth on unemployment rates in ASEAN countries using Okun's Law and incorporating control variables of Foreign Direct Investment (FDI) and economic structure consisting of industry value added and service value added. The data used is panel data from 8 ASEAN countries over several years obtained from the World Bank. The results show that economic growth has a negative relationship with the unemployment rate, thus supporting the validity of Okun's Law in the ASEAN region. The FDI control variable shows varying effects between countries, but in general, FDI is not always able to significantly reduce unemployment. Meanwhile, the economic structure shows that an increase in the contribution of the industrial sector tends to be associated with a decrease in unemployment, while an increase in the contribution of the service sector has an effect that depends on the economic characteristics of each country. These findings confirm that stable economic growth and the strengthening of productive sectors are important factors in reducing unemployment in ASEAN. This study has implications for the governments of ASEAN countries to strengthen their industrialization strategies, increase job creation, and direct foreign investment flows to labor-intensive sectors.

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1. INTRODUCTION

Unemployment is one of the main challenges faced by countries in the Southeast Asian region. Although ASEAN is known as a region with relatively high economic growth, the ability of each country to reduce unemployment rates often shows significant differences. This phenomenon raises the question of whether economic growth is truly capable of driving optimal job creation. In this context, the relationship between economic growth and unemployment is relevant to analyze, particularly through the framework of Okun's Law, which states that increased economic growth tends to reduce unemployment rates (Foroni & Furlanetto, n.d.).

FDI and the economics structure are included as control variables because the Okun relationship is theoretically influenced by structural factors that determine an economy's capacity to translate growth into employment. FDI can increase or reduce unemployment through production expansion and changes in capital intensity, thereby strengthening or weakening the growth unemployment linkage. Meanwhile, the composition of the industrial and services sectors shapes the labor intensity of the economy in line with structural transformation theory. Differences in

sectoral structure can alter the magnitude of unemployment's response to growth. Therefore, these variables as controls to avoid omitted variable bias in testing Okun's Law.

However, the dynamics of the ASEAN economy are not only influenced by economic growth rates, but also by other factors such as Foreign Direct Investment (FDI) flows and economic sector structure, particularly the contribution of the industrial and service sectors to the economy (Chizema, 2025). FDI is often considered capable of increasing employment through the expansion of productive sectors. Meanwhile, the shift in economic structure from the agricultural sector to industry and services is also believed to affect a country's ability to create jobs. Countries with a strong base tend to be able to absorb large numbers of workers, while service-based economies are characterized by high productivity but are not always labor-intensive.

The differences in economic characteristics between ASEAN countries such as Vietnam and Cambodia, which are experiencing high growth but have different industrial structures from Indonesia and Thailand, make the study of the effectiveness of Okun's Law in this region even more interesting. In addition, countries such as Singapore, which are highly dependent on the service sector, have a different pattern of relationships compared to countries based on industry or agriculture. Therefore, a more comprehensive empirical analysis is needed to understand how economic growth, FDI, and economic sector structure simultaneously affect the unemployment rate (Ullah et al., 2023).

In studies on the effect of economic growth on unemployment in ASEAN countries, Okun's Law is the main theoretical framework used to explain the relationship between these two variables. Okun's Law states that there is an inverse relationship between economic growth, as measured by an increase in Gross Domestic Product (GDP), and the unemployment rate. Research in various countries shows that for every percentage increase in GDP, the unemployment rate tends to decrease proportionally. However, the results obtained may vary depending on the economic and social context of each country.

Foreign Direct Investment (FDI) is often considered a key driver of economic growth. FDI can increase the number of jobs and influence labor market dynamics by channeling capital and technology into the local economy. (Kublikova, 2024) emphasizes the importance of creating a favorable investment climate to attract FDI, as well as the role of stable fiscal and political policies in attracting more foreign investment. With increased FDI, countries can provide more jobs, which in turn supports a decline in unemployment rates.

The structure of the economic sector also plays an important role in determining how economic growth affects unemployment. ASEAN countries show significant variations in their economic structure. For example, countries such as Singapore and Malaysia are increasingly shifting to the service sector, while Indonesia and Vietnam still have a strong economic base in the agricultural and industrial sectors (Valentyna Mazurenko et al., 2020). The balance between the industrial and service sectors in the context of economic growth can affect how effective a country's economy is in creating jobs (Dolgova et al., 2023).

Previous research confirms that sustained growth in labor-intensive sectors can lead to a reduction in unemployment. (Maksymenko, 2020) reveals that sectors that tend to absorb labor can substantially reduce unemployment during periods of strong growth. (Mujitapha et al., 2023) found that there is a long-term relationship between GDP growth and unemployment in several countries. Cross-country results are not uniform, so Okun's law applies in some countries but not in others. The study confirms the heterogeneity of Okun's results in the region, emphasizing the importance of including controls such as FDI/sector structure to explain cross-country variations.

(Cahyani Rahmawati & Kurniasari, 2024) prove support for Okun's law in several subsamples, with short-term and long-term effects differing, and FDI and other macroeconomic conditions moderating the relationship. Regional studies that include FDI as a control variable are useful as models for future research on control variables. (Alimuddin & Suriyanti, 2024) FDI has an impact on industrial productivity and worker welfare, but its effects vary by country and sector. The implications for unemployment rates are not always direct due to issues of labor quality and employment structure. This study shows that FDI can influence the relationship between GDP and unemployment through sectoral channels (industry/job composition). It is important to include sectoral structure variables as moderators or controls.

(Samuda, 2023) found that countries integrated into the Global Value Chain (GVC) tend to show different patterns of job creation. GVC integration and shifts in sector composition can weaken or strengthen the effect of growth on unemployment. This research supports the idea that sector structure and value chain integration moderate the law of law relationship and are relevant for measuring the contribution of the industrial and service sectors.

(Pratysto, 2025) Domestic investment and FDI show an influence on unemployment with a clearer long-term effect, with results varying between countries. The Covid-19 pandemic temporarily changed the dynamics. This study provides empirical support that including investment/FDI controls and separating short-term and long-term effects (ARDL/ECM) can enrich Okun's law analysis.

In ASEAN, the shift from an industry-oriented economy to a more flexible service economy can create greater employment opportunities, supporting the policy goal of reducing unemployment (Buera & Kaboski, n.d.). Furthermore, research shows that inequality in the distribution of FDI and economic growth among ASEAN member countries can affect employment outcomes. This highlights the importance of further analysis of how variations in FDI and economic growth rates can contribute to disparities in unemployment, as stated by, given the regionally varying impact of foreign investment (Kalinin, 2019).

The concept of economic inclusion is also relevant to discussions on how economic growth can contribute to reducing unemployment. (Zvarych & Brodovska, 2023) and (Kublikova, 2024) note that high levels of education and accessibility to training are important elements in ensuring that the population is prepared to meet the changing demands of the labor market. Investment in education and training can strengthen the contribution of economic growth to labor absorption, especially in countries with high unemployment rates.

In addition, economic instability analysis can provide additional insight into the impact of economic growth on unemployment. External factors, such as global markets, can influence this relationship (Kublikova, 2024). Adaptive fiscal policies are needed to protect the labor market from negative impacts and support inclusive growth. Based on existing views, the results of this study prove that exploring the relationship between economic growth, FDI, and economic sector structure is important for formulating effective policies to create jobs in the ASEAN region. This study is expected to provide critical insights for policymakers in developing strategies to combat unemployment based on sustainable and inclusive economic growth.

Overall, this literature review shows that the impact of economic growth on unemployment in ASEAN countries is complex and influenced by various factors. These diverse results are useful for understanding and developing more sophisticated policies that are responsive to the needs of each country in achieving more inclusive growth benefits. This study contributes to the literature clarifying how the growth unemployment relationship behaves in developing countries integrated into global value chains. By accounting for FDI and sectoral structure, the analysis demonstrates how external integration and structural transformation shape the responsiveness of unemployment to economic growth. The findings refine the applicability of Okun’s Law in GVC-oriented developing economies and provide evidence on whether globalization strengthens, weakens, or alters the traditional growth unemployment nexus.

2. RESEARCH METHOD

The data used is panel data, which is a combination of cross-sectional data and time series data. The cross-sectional panel data consists of the eight ASEAN countries (Indonesia, Malaysia, Thailand, the Philippines, Singapore, Vietnam, Laos, and Cambodia). Meanwhile, the time series data consists of annual data for the period 2000-2023, sourced from the World Bank. The operational definitions of the variables used include economic growth (GDP growth, annual %), which is the annual growth rate of Gross Domestic Product (GDP) based on constant prices. GDP itself is calculated as the sum of the gross value added of all domestic producers + product taxes – subsidies. This data is in annual form and uses real GDP so that the effect of inflation is eliminated (Mian et al., n.d.).

The second variable is FDI net inflows (% of GDP), which is the net inflow of foreign direct investment (FDI) in a given year, compared to GDP and measured as a percentage of GDP (Net

inflows means net foreign investment inflows into the country during the observed period). FDI net inflows are used as a measure of the intensity of foreign investment relative to the size of the economy (Leogrande, n.d.). The third variable is industry value added (% of GDP), which is the contribution of the industrial sector (including construction, manufacturing, mining, utilities, etc.) to national output, calculated as the value added of the industrial sector divided by GDP as a percentage. Value added is obtained from sector output minus intermediate consumption (intermediate inputs), which is used to measure how much the industrial sector contributes to the economy (United Nation IMF, 2011).

The fourth variable is service value added (% of GDP), which is the percentage of the working population that is not working but actively seeking work, calculated as (number of unemployed ÷ total workforce) x 100. International data uses estimates from the ILO/official agencies reported annually. This variable is used to measure the extent to which the economy absorbs labor (Gomis et al., 2022). This variable is the main dependent variable in Okun's law test.

Okun's Law basic model:
$Unemp_{it} = \alpha\ \beta_1 GDPG_{it} + \varepsilon_{it}$

Complete regression model with controls:
$Unemp_{(it)} = \alpha + \beta_1\ GDPG_{it} + \beta_2\ FDI_{it} + \beta_3\ INDV\ A_{it} + \beta_4\ SEVV\ A_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where, i = country, t = year, μ_i = country fixed effect, λ_t = time fixed effect (optional)

Panel Data Model

This study uses econometrics to analyze the effect of economic growth on unemployment and tests Okun's Law with FDI and economic sector structure as control variables in ASEAN countries. Panel data is data obtained from cross-sectional data observed repeatedly on the same unit at different times. The static model is employed because Okun's Law theoretically focuses on the contemporaneous relationship between output growth and unemployment. In addition, the ASEAN panel has a small number of cross-sections, which may lead to biased or unstable estimates in dynamic panel methods such as GMM. Using a static specification keeps the model parsimonious, stable, and aligned with the main objective of the study-testing the validity of Okun's Law directly. Although lagged effects may exist, the static approach remains valid and widely used when data limitations and the research focus prioritize short run relationships.

In panel data econometrics, there are three approaches to estimation: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) (Wooldridge, 2013). To select the appropriate model, the Chow Test and Hausman Test are used by conducting an F-statistic test (Gujarati, 2009). Then, the Classical Assumption Test, which consists of the Multicollinearity Test, Heteroscedasticity Test, and Panel Autocorrelation Test, as well as the final FEM estimation with robust standard errors, are conducted. Once the data is in long form, we need to set is as panel so we can use Stata's application (Oscar Torres Reyna, 2007).

Table 1. Model selection criteria

Panel Model Selection Test	Result	Decision
Chow Test	Prob. > 0,05	CEM
	Prob. < 0,05	FEM
Hausman Test	Prob. > 0,05	REM
	Prob. < 0,05	FEM
Legrange Multiplier Test	Prob. > 0,05	CEM
	Prob. < 0,05	REM

Source: Processed by the author based on Baltagi (2025), Wooldridge (2013), Gujarati (2009)

3. RESULTS AND DISCUSSIONS

Chow Test

Table 2. Chow test result

Statistic	Value
Null Hypothesis	All individual effect u_i
F-value	88.57
Degrees of Freedom	(7, 180)
Prob > F	0.0000

Source: Stata processed 2025

From Chow Test results, the Prob. value is 0.0000 < 0.05, so FEM is selected.

Hausman Test

Table 3. Hausman test result

Item	Value
R^2 (Overall)	0.0035
Wald χ^2 (4)	26.51
Prob > χ^2	0.0000

Source: Stata processed 2025

Then, Hausman Test Result, Prob. 0.0000 < 0.05, FEM is selected. Based on these two tests, FEM is selected and must be retested with the Classical Assumption Test, which consists of the Multicollinearity Test and the Heteroscedasticity Test (Basuki, 2014) and (Napitupulu, 2021).

Multicollinearity Test

Table 4. Multicollinearity test result

Variable	1	2	3	4
x1	—	0.076	-0.0984	-0.2714
x2	0.076	—	-0.4474	0.5534
x3	-0.0984	-0.4474	—	-0.3739
x4	-0.2714	0.5534	-0.3739	—

Source: Stata processed 2025

From Multicollinearity Test result, the correlation coefficients of X1, X2, X3, and X4 are 0.2714 < 0.85, so it can be concluded that they are free from multicollinearity.

Heteroscedasticity Test

Table 5. Heteroscedasticity test result

Component	Result
Assumption	Normal error terms
Variable	Fitted values of *y*
Null hypothesis (H_0)	Constant variance
Chi-square (χ2)	11.55
p-value (Prob > χ2)	0.0007

Source: Stata processed 2025

Heteroscedasticity Test result show a Prob. value of 0.0007 < 0.05, indicating heteroscedasticity or BLUE (Best Linear Unbiased Estimator) properties, which are overcome using the Robust and GLS methods.

Robust and GLS Methods

Table 6. Robust methods 1 result

Variable	Coef.	p-value
x2	0.182	0.049
x3	-0.118	0.131
x4	-0.338	0.025

Source: Stata processed 2025

If the coefficient has changed, then the robust method has been successful. To reconfirm this, it is necessary to check the model before changing it as follows:

Table 7. Robust methods 2 result

Variable	Coef.	Std. Error	p-value
x1	0.0862	0.0580	0.142
x2	-1.8193	0.0741	0.015
x3	-0.8939	0.0684	0.011
x4	-33.3767	0.0956	0.001
Constant	24.7949	6.2521	0.0000

Source: Stata processed 2025

As seen from the two results above, the standard error value has changed, so it can be confirmed that the panel data regression model is BLUE and free from heteroscedasticity and autocorrelation. Then, to confirm whether the data is truly BLUE, we can use the GLS (General Least Square) formula, and the results are as follows (Bai et al., 2020).

Table 8. GLS methods result

Variable	Coef.	Std. Error	z-value	p-value
x1	-0.02422	0.00959	-2.53	0.012
x2	0.003212	0.01434	0.22	0.823
x3	0.04223	0.01655	2.55	0.011
x4	0.04454	0.0152	2.8	0.005
Constant	-1.15235	1.0665	-1.08	0.28

Source: Stata processed 2025

The changes observed in certain coefficients under robust estimation and GLS indicate that the model is sensitive to heteroskedasticity and potential correlation in the error term. However, the consistency in the direction and significance of the key variables suggest that the core findings of the study remain stable. The differences in coefficient magnitudes primarily reflect adjusments to data characteristics such as non constant variance or correlated errors rather than substantive changes in the underlying relationships. Therefore, the robust and GLS result strengthen the reliability of the model by demonstrating that the main conclusions hold even when estimated using methods that are more resilient to classical assumption violations.

Panel Data Regression Equation

Table 9. Panel data regression equation

y	Coef.	Std. Error	t-value	p-value	95% Confidence Interval
x1	0.00647	0.01936	0.33	0.738	-0.03172 to 0.04467
x2	-0.04216	0.01961	-2.15	0.033	-0.08085 to -0.00347
x3	-0.03388	0.01809	-1.87	0.063	-0.00181 to 0.06957
x4	-0.05544	0.02577	-2.15	0.033	-0.10629 to -0.00458
Constant	4.464521	1.69737	2.63	0.009	1.11522 to 7.81382

Source: Stata processed 2025

From the data processing results, the regression equation is obtained:

$Y = 4.464521 + 0.0064719\ X1 - 0.0421603\ X2 + 0.0338834\ X3 - 0.0554387\ X4 + \varepsilon$,

The t-test results for the economic growth variable (X1) obtained a t-value of 0.33 < t-table 1.97 and a sig. value of 0.738 > 0.05, so H_a was rejected and H_0 was accepted, meaning that the economic growth variable did not affect the unemployment rate in ASEAN countries. These results indicate that fluctuations in economic growth are not statistically significant enough to explain changes in unemployment rates. Thus, economic growth is not a major determinant of unemployment in the study period. The main reason why economic growth is not significant to unemployment is that economic growth occurs but does not create jobs due to increases in productivity and technology (jobless growth). Growth originating from labor-intensive sectors, such as the financial sector, mining, or capital-intensive industries. The lag effect, where the impact of economic growth on labor absorption does not occur immediately in the same year. Furthermore, different economic structures cause the growth-unemployment relationship to be weak.

The t-test results for the FDI variable (X2) obtained a t-value of 2.15 > t-table 1.97 and a sig. value of 0.033 < 0.05, so H_0 is rejected and H_a is accepted, meaning that the FDI variable has a positive effect on unemployment rates in ASEAN countries. These results indicate that FDI plays an important role in labor absorption in the ASEAN region. Foreign investment tends to create new jobs through the opening of new factories or production facilities, expansion of industrial capacity, technology transfer that drives business growth, and increased export and production activities. Since the significance value is < 0.05, the contribution of FDI to unemployment is not coincidental but has a strong statistical relationship.

The t-test results for the industry variable (X3) obtained a t-value of 1.87 < t-table 1.97 and a sig. value of 0.063 > 0.05, so H_0 is accepted and H_a is rejected, meaning that the industry variable does not affect the unemployment rate in ASEAN countries. This result shows that the contribution of the industrial sector in ASEAN is not yet a major factor determining fluctuations in unemployment. The contributing factor is that the industrial structure in ASEAN relies more on machinery, automation, and technology, so that output growth does not always create many jobs. Reindustrialization or transformation of the industrial sector is slow. Several ASEAN countries are still at the mid-tech stage, so that productivity increases without increasing labor absorption. The contribution of industry among ASEAN countries is highly heterogeneous. Differences in industrial structure (Singapore is high-tech, Laos/Cambodia are labor-intensive) can weaken the average relationship. There is also a lag effect, whereby industry may only absorb labor after a certain period, not in the same year.

The t-test results for the service variable (X4) obtained a t-value of 2.15 > t-table 1.97 and a sig. value of 0.033 < 0.05, so H_0 is rejected and H_a is accepted, meaning that the service variable affects the unemployment rate in ASEAN countries. These results indicate that the service sector is the most effective sector in absorbing labor in ASEAN countries. Unlike the industrial sector, which tends to be capital-intensive, the service sector absorbs a lot of labor due to its labor-intensive nature. The service sector in ASEAN includes: wholesale and retail trade, transportation and logistics, restaurants and hotels, tourism, education, health, financial services, government services, and service-based MSMEs. These sectors rely on a large workforce, so when the contribution of the service sector increases, unemployment tends to decrease.

F-test

Table 10. F-test result

Statistic	Value
Number of observations	192
Number of groups	8
R-squared (Within)	0.1375
R-squared (Between)	0.0335
R-squared (Overall)	0.0106
F(4,180)	7.17
Prob > F	0.0000

Source: Stata processed 2025

F test results show that the calculated F value is 7.17 > the table F value of 1.27 and the sig. value is 0.0000 < 0.05, so H_0 is rejected and H_a is accepted, meaning that the four independent variables together have the ability to explain changes in the unemployment rate. This means that the panel regression model used is valid for explaining the relationship between economic growth, FDI, the industrial sector, and the service sector, and the unemployment rate in ASEAN countries. Although some variables are not significant individually, the model remains significant overall.

Determination Coefficient Test (R^2)

Table 11. Determination coefficient test (R^2) result

Statistic	Value
Number of observations	192
Number of groups	8
R-squared (Within)	0.1375

Statistic	Value
R-squared (Between)	0.0335
R-squared (Overall)	0.0106
F(4,180)	7.17
Prob > F	0.0000

Source: Stata processed 2025

An adjusted R Square value of 0.1375 indicates that the variation in unemployment rates in ASEAN countries can be explained by the independent variables used in the model, including economic growth, FDI flows, the contribution of the industrial sector, and the contribution of the service sector, by 13.75%. Thus, 86.25% of the variation in unemployment rates is explained by other factors outside the scope of this study, such as labor market dynamics, human resource quality, demographic structure, technological changes, and macroeconomic and employment policies that were not included in the analysis.

4. CONCLUSION

This study aims to analyze the effect of economic growth, Foreign Direct Investment (FDI), the industrial sector, and the service sector on unemployment rates in ASEAN countries using Okun's law approach with panel data. The results show that economic growth does not have a significant effect on unemployment rates, indicating the phenomenon of jobless growth due to increasingly capital-intensive production processes, technological advances, and economic structural heterogeneity between countries. Conversely, FDI has been shown to have a significant effect in reducing unemployment rates, reflecting the role of foreign investment in creating new jobs through production expansion and technology transfer.

The most strategic policy implication for ASEAN goverments is to channel FDI toward activities with stronger employment generation potential. This includes providing targeted incentives for labor intensive and high linkage invesments, strengthening vocational and technical training systems to match labor skills with industry needs, and aligning investment policies with insdustrial development priorities. Such an approach ensures that FDI contributes not only to higher production but also to job creation through technology transfer, domestic supply chain development, and productivity upgrading. Another finding shows that the industrial sector does not have a significant effect on unemployment, indicating a strong trend toward automation and the use of technology that reduces the need for labor.

However, the service sector shows a significant influence on reducing unemployment, in line with its more labor-intensive characteristics and its major role in absorbing labor in the ASEAN region. Simultaneously, all variables in the model are proven to be significant, so that the regression model used is valid to explain the dynamics of unemployment, although its explanatory power is relatively limited with an adjusted R-squared value of 13.75%. These findings indicate that most of the variation in unemployment is still influenced by other factors not included in the model, such as human resource quality, minimum wages, inflation, urbanization, and institutional aspects.

Based on the results of this study, several policy implications can be conveyed to ASEAN countries. Governments need to encourage more inclusive economic growth by strengthening labor-intensive sectors and developing industries and services that have great potential in creating jobs. FDI-related policies also need to be directed so that foreign investment enters sectors that are able to absorb labor optimally, not only in capital-intensive high-tech industries. The development of the service sector needs to be continuously strengthened given its significant contribution to reducing unemployment, particularly through tourism, logistics, public services, and service-based MSMEs. On the other hand, industry players and investors are expected to optimize the use of local labor through skills enhancement and training, as well as developing technology-based service activities that remain oriented towards labor absorption.

Subsequent studies could incorporate additional factors such as labor force quality, labor productivity, labor market rigidity, digitalization indicators, and measures of global value chain participation. These variables may enrich the analysis by explaining the structural mechanisms that determine the capacity of growth to generate employment. Expanding both the methodological

framework and variable set would enable a more comprehensive understanding of the growth unemployment nexus in developing economies.

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