

Foreign direct investment, economic growth, and unemployment in Indonesia: A VECM-based analysis with implications for sustainable development

La Tondi La Tondi , Muhamad Armawaddin , Ahmad Ahmad 

Faculty of Economics and Business, Halu Oleo University,

Kampus Hijau Bumi Tridharma, Anduonohu, Kec. Kambu, Kota Kendari, Sulawesi Tenggara 93232, Indonesia



Article history:

Received: December 16, 2025

1st Revision: May 22, 2026

Accepted: September 30, 2026

JEL classification:

F21

E24

F43

C32

O11

DOI:

[10.14254/jems.2026.11-2.3](https://doi.org/10.14254/jems.2026.11-2.3)

Abstract: *Purpose.* To analyze the dynamic short-run and long-run relationships between foreign direct investment (FDI), economic growth, and unemployment in Indonesia. *Methodology.* The study uses a Vector Error Correction Model (VECM) on annual time-series data from 2000 to 2024, using Augmented Dickey-Fuller stationarity tests, Johansen cointegration, Granger causality, and variance decomposition. *Results.* Findings reveal a stable long-run equilibrium among the variables. However, short-run dynamics show no significant causal impact of FDI on economic growth or unemployment. Instead, unidirectional causality runs from economic growth to FDI, indicating that domestic market expansion drives foreign investment more than FDI drives immediate job creation. *Theoretical contribution.* This research enriches endogenous growth theory and Okun's Law by showing that, in developing economies, the transmission mechanism from FDI to the real sector is structurally delayed and depends on domestic absorptive capacity. *Practical implications.* Policymakers should prioritize reorienting FDI toward labor-intensive sectors, enhancing human capital, and implementing labor market reforms to ensure foreign investment translates into inclusive, sustainable job creation aligned with SDGs 8 and 9.

Keywords: foreign direct investment, economic growth, unemployment dynamics, vector error correction model, cointegration, sustainable development, Indonesia

Sustainable Development Goals (SDGs): SDG 8: Decent Work and Economic Growth; SDG 9: Industry,

Innovation and Infrastructure; **SDG 10**: Reduced Inequalities

1. Introduction

Foreign Direct Investment (FDI) has become a primary driver of global economic integration and structural transformation in developing countries. In an open-economy framework, FDI serves not only as a source of external financing but also as a mechanism for technology transfer, productivity enhancement, integration into global value chains, and job creation (Borensztein et al., 1998; Alfaro et al., 2004). Endogenous growth theory emphasizes that foreign investment can accelerate domestic knowledge accumulation and innovation through technological spillovers (Romer, 1990; Grossman & Helpman, 1991). Accordingly, FDI is often positioned as a strategic instrument for accelerating economic growth and improving societal welfare.

For Indonesia, FDI has played an important role in supporting economic development in the post-liberalization and structural reform era. The government has consistently implemented investment deregulation, streamlined licensing procedures, and strengthened infrastructure development to make foreign investment more attractive. Over the past two decades, FDI contributions to gross fixed capital formation and industrial sector expansion have risen significantly. However, rising FDI inflows have not always been accompanied by proportional reductions in unemployment. This raises fundamental questions regarding the quality of the economic growth generated.

Theoretically, economic growth is expected to reduce unemployment through the mechanism known as Okun's Law (Okun, 1962), which posits a negative relationship between output growth and unemployment. However, empirical evidence suggests that this relationship is not always stable, particularly in developing countries undergoing rapid structural transformation (Islam, 2004). Jobless growth describes a situation in which increases in gross domestic product are not matched by sufficient labor absorption. In Indonesia, this dynamic is particularly relevant, as economic growth tends to be driven by capital-intensive and technology-based sectors with relatively low labor elasticity.

The relationship between FDI and unemployment is also ambiguous. FDI directed toward labor-intensive sectors can expand employment opportunities and reduce unemployment (Lee & Vivarelli, 2006). Conversely, FDI oriented toward capital-intensive or high-technology sectors may increase productivity without significantly expanding labor absorption (Feenstra & Hanson, 1997). Moreover, technological transfer may generate labor substitution effects that widen skill gaps. Therefore, FDI's impact on the labor market depends heavily on sectoral structure, human capital quality, and domestic labor market policies.

In the global development context, the relationship between FDI, economic growth, and unemployment has become increasingly strategic. The United Nations, through the Sustainable Development Goals (SDGs), emphasizes inclusive economic growth, decent work creation, and sustainable industrialization. In particular, Goal 8 (Decent Work and Economic Growth) and Goal 9 (Industry, Innovation, and Infrastructure) stress that investment and industrialization must be oriented toward productive employment creation and sustainable economic transformation (United Nations, 2015). Therefore, an empirical evaluation of FDI's impact on growth and unemployment holds not only academic relevance but also direct implications for achieving Indonesia's sustainable development agenda.

Although international literature has extensively examined the relationship between FDI and economic growth, findings remain inconsistent, particularly regarding labor market effects. Some studies find a positive relationship between FDI and economic growth but insignificant effects on unemployment reduction. Others identify bidirectional causality between growth and FDI but fail to detect stable long-run cointegration. In Indonesia, most studies employ linear regression or Vector Autoregression (VAR) approaches without comprehensively testing long-run cointegration relationships and short-run adjustment mechanisms simultaneously. Consequently, a research gap remains in understanding the long-term structural dynamics among FDI, economic growth, and unemployment within an integrated analytical framework.

To address this gap, this study employs a Vector Error Correction Model (VECM) approach. This model identifies long-run equilibrium relationships through cointegration testing while analyzing short-run adjustment dynamics via the error correction term (Engle & Granger, 1987; Johansen, 1988). This approach is particularly appropriate because macroeconomic variables such as FDI, economic growth, and unemployment are generally non-stationary but tend to move together in the long run.

Based on the theoretical and empirical foundations, this study formulates the following hypotheses:

H1: Foreign direct investment positively affects economic growth in the long run.

H2: Foreign direct investment negatively affects the unemployment rate in the long run.

H3: Economic growth negatively affects the unemployment rate in accordance with Okun's Law.

H4: There exists a long-run cointegration relationship among FDI, economic growth, and unemployment in Indonesia.

These hypotheses allow simultaneous testing of the validity of endogenous growth theory and Okun's Law in Indonesia's open-economy context. Furthermore, the analysis evaluates whether the pattern of foreign investment during the study period supports inclusive growth consistent with SDG targets.

This study makes three primary contributions. First, theoretically, it enriches the literature on the interaction between international capital flows and labor market dynamics in developing countries. Second, methodologically, the use of VECM provides a more comprehensive understanding of short-run and long-run relationships than static approaches. Third, from a policy perspective, the findings are expected to inform investment strategies that focus not only on increasing national output but also on generating productive employment, strengthening sustainable industrial sectors, and advancing Indonesia's sustainable development targets.

Thus, this study extends beyond macroeconomic causality analysis by situating empirical findings within a broader sustainable development framework. Evaluating the quality of growth generated by FDI is crucial to ensuring that global economic integration delivers inclusive and sustainable benefits to the Indonesian economy.

2. Literature review

2.1. International investment theory (FDI)

Foreign Direct Investment (FDI) refers to a form of cross-border investment in which a foreign entity establishes a long-term interest and managerial control in a firm located in another country. According to internalization theory (Hymer, 1976), FDI arises because multinational enterprises seek to internalize foreign markets in order to reduce transaction costs and enhance efficiency. Dunning (1980, 1988), through the Eclectic Paradigm or OLI framework (Ownership, Location, Internalization), argues that FDI occurs when firms possess ownership-specific advantages (O), select favorable host-country characteristics (L), and benefit from internalizing their operations (I) rather than relying on market contracts.

From a classical international trade perspective, the theory of comparative advantage (Ricardo, 1817) suggests that FDI emerges due to differences in productivity and production costs across countries. Countries with specific factor endowments and efficiency advantages attract foreign investors seeking to optimize global production allocation. Similarly, Buckley and Casson (1976) emphasize that multinational firms prefer direct investment over licensing or contractual arrangements to minimize transaction costs, maintain control, and protect proprietary technology. Market imperfections theory (Hymer, 1976) further explains that FDI occurs due to imperfections in international markets, allowing firms to exploit monopolistic or firm-specific advantages abroad.

FDI is widely regarded as a catalyst for capital accumulation, technology transfer, productivity improvement, skills enhancement, and integration into global markets. However, critical perspectives challenge the neoclassical and liberal view. Dependency theory, advanced by Andre Gunder Frank and Theotonio dos Santos, argues that FDI may reinforce developing countries' structural dependence on advanced economies. According to this view, foreign capital can lead to resource exploitation, foreign dominance of strategic sectors, and distortions in domestic economic structures, potentially hindering long-term development.

Overall, these theoretical perspectives suggest that FDI represents a corporate strategy to maximize global profits while simultaneously serving as a potential source of capital, technology, and employment for host countries. Nevertheless, they also emphasize the importance of appropriate regulation and institutional oversight to ensure that FDI benefits contribute meaningfully to national development and unemployment reduction rather than being captured solely by foreign investors.

2.2. Economic growth theory

Economic growth refers to the sustained increase in a country's output of goods and services over time. The neoclassical growth model developed by Solow (1956) posits that economic growth is determined by capital accumulation, labor force growth, and exogenous technological progress. Within this framework, FDI is an additional source of capital that increases national production capacity.

The Harrod-Domar model (1946) similarly emphasizes savings and investment efficiency in driving growth, suggesting that FDI can supplement domestic savings and accelerate output expansion. The Solow-Swan model further incorporates population growth and technological progress, treating technology as exogenous. In this context, FDI contributes to growth through capital deepening and technology transfer.

In contrast, endogenous growth theory (Romer, 1986, 1990; Lucas, 1988) highlights knowledge, innovation, human capital, and research and development (R&D) as internal drivers of long-term growth. Unlike the neoclassical model, endogenous growth theory allows policy variables to influence long-run growth trajectories. FDI can therefore promote sustained growth through technological spillovers, knowledge diffusion, and improvements in labor quality.

Todaro (2000) argues that employment creation in modern development contexts depends not only on the rate of economic growth but also on its structure and inclusiveness. Growth concentrated in capital-intensive sectors may fail to reduce unemployment significantly. In this regard, FDI directed toward labor-intensive industries is considered more effective in generating employment than investment concentrated in capital-intensive sectors such as mining or high-technology industries.

In developing countries such as Indonesia, economic dualism theory explains that the economy consists of two main sectors: a traditional (subsistence) sector and a modern (capitalist) sector. FDI typically flows into the modern, high-productivity sector, while the traditional sector often remains marginalized. W. Arthur Lewis (1954), in the Lewis Two-Sector Model, argues that development occurs when surplus labor from the traditional sector migrates to the modern sector. FDI can catalyze this process by creating employment opportunities in the modern sector. However, without redistributive or inclusive policies, growth benefits may remain unevenly distributed.

2.3. Unemployment theory

In macroeconomic theory, unemployment refers to a condition in which individuals within the labor force are willing and able to work but cannot find employment. Classical theory posits that labor markets naturally adjust to equilibrium, and unemployment is largely voluntary, arising from wage rigidities or institutional distortions such as excessive regulation or minimum wage policies.

In contrast, Keynesian theory argues that unemployment can be involuntary and results from insufficient aggregate demand. During economic downturns, labor markets may fail to self-adjust, requiring government intervention to stimulate demand and job creation. From this perspective, FDI can reduce unemployment by increasing aggregate demand through productive investment, factory establishment, and market expansion, thereby generating both direct and indirect (multiplier) employment effects.

Structural unemployment theory emphasizes skill mismatches between labor supply and market demand. FDI that introduces new technologies and production processes may initially increase structural unemployment if local workers lack the necessary skills. Conversely, if accompanied by training and technology transfer, FDI can enhance human capital and reduce long-term unemployment.

The dual-sector model (Lewis) suggests that FDI, by entering the modern industrial sector, can absorb surplus labor from the traditional agricultural sector, thereby reducing disguised unemployment and increasing overall productivity. Meanwhile, Efficiency Wage Theory posits that firms may pay wages above market-clearing levels to enhance productivity and worker loyalty. Multinational enterprises often adopt such strategies, potentially raising wage standards. However, if recruitment is limited to highly skilled workers, short-term unemployment among less-skilled labor may increase.

Finally, Okun's Law (Okun, 1962) establishes an empirical negative relationship between economic growth and unemployment, suggesting that a one percent increase in output growth is generally associated with a proportional reduction in unemployment. This relationship provides a theoretical foundation for examining whether economic growth – potentially stimulated by FDI translates into improved labor market outcomes.

In summary, unemployment can be understood through classical, Keynesian, structuralist, and dual-sector perspectives. The impact of FDI on unemployment is therefore conditional upon sectoral allocation, labor market structure, institutional quality, and the absorptive capacity of the domestic economy.

2.4. Foreign direct investment and economic growth

The relationship between Foreign Direct Investment (FDI) and economic growth has been a central focus in the development economics literature. Within the framework of endogenous growth theory, FDI is viewed as a channel for technology transfer and knowledge diffusion that enhances total factor productivity (Romer, 1990; Grossman & Helpman, 1991). Borensztein et al. (1998) find that FDI contributes positively to economic growth, particularly in countries with adequate levels of education and absorptive capacity. Alfaro et al. (2004) reinforce this finding, showing that domestic financial sector development is a critical precondition for maximizing FDI's growth-enhancing effects.

However, empirical evidence remains mixed. Durham (2004) argues that FDI's impact on growth depends heavily on institutional quality and macroeconomic stability. In some cases, FDI concentrated in extractive sectors generates limited spillover effects for the broader domestic economy. Thus, FDI's growth effects are not automatic but depend on host-country characteristics and structural conditions.

In developing countries, including Indonesia, FDI is often regarded as a strategic instrument for accelerating industrialization and integrating into global value chains. Based on endogenous growth theory and the dominant empirical findings suggesting a positive contribution of FDI to national output, this study formulates the following hypothesis:

H1: Foreign direct investment has a positive effect on economic growth in the long run.

2.5. Foreign direct investment and unemployment

The relationship between FDI and unemployment is more complex than that between FDI and economic growth. Theoretically, FDI can generate employment opportunities through expanded production capacity and the entry of multinational enterprises that require domestic labor (Markusen & Venables, 1999). Lee and Vivarelli (2006) find that FDI in labor-intensive manufacturing sectors contributes positively to employment absorption in developing countries. Conversely, Feenstra and Hanson (1997) argue that technology-intensive FDI tends to increase demand for skilled labor and may widen skill disparities. Under such conditions, FDI does not necessarily reduce aggregate unemployment, particularly when the domestic workforce lacks the required competencies. This explains why some empirical studies report insignificant or even positive short-run relationships between FDI and unemployment.

In the Indonesian context, FDI inflows are largely concentrated in manufacturing, mining, and infrastructure sectors. This raises important questions regarding whether such investments generate inclusive employment opportunities. Based on the theoretical argument that FDI has the potential to create jobs through production expansion, the second hypothesis is formulated as follows:

H2: Foreign direct investment reduces the unemployment rate in the long run.

2.6. Economic growth and unemployment

The relationship between economic growth and unemployment is classically explained by Okun's Law (Okun, 1962), which posits a negative relationship between output growth and unemployment. Numerous cross-country empirical studies confirm this relationship, although with varying elasticities (Knotek, 2007). However, Islam (2004) shows that in developing countries, the relationship is often weaker because of dualistic economic structures and the dominance of informal sectors. Jobless growth further indicates that increases in GDP do not always translate into substantial employment gains.

In Indonesia, ongoing structural transformation toward technology-based and modern service sectors may influence the elasticity of growth with respect to employment absorption. Therefore, empirically testing the validity of Okun's Law in the Indonesian context is essential. Based on prevailing theoretical arguments and dominant empirical findings, this study proposes the third hypothesis:

H3: Economic growth hurts the unemployment rate in the long run.

2.7. Dynamic relationships and long-run cointegration

Although studies have extensively examined the bilateral relationships between FDI and growth, as well as growth and unemployment, studies that analyze these three variables simultaneously within a dynamic framework remain relatively limited, particularly in the Indonesian context, in the long run, FDI, economic growth, and unemployment may form a mutually interdependent system.

The Vector Error Correction Model (VECM) approach identifies long-run cointegration relationships while capturing short-run adjustment dynamics (Engle & Granger, 1987; Johansen, 1988). If these variables are cointegrated, it implies a stable long-run equilibrium linking the movements of FDI, economic growth, and unemployment.

Within the framework of sustainable development, this interrelationship is particularly important. The United Nations, through the Sustainable Development Goals (SDGs), emphasizes inclusive economic growth and decent work creation as fundamental pillars of sustainable development. Therefore, analyzing long-run cointegration among these variables is not only econometrically relevant but also policy-relevant. Based on these arguments, the fourth hypothesis is formulated as follows:

H4: There exists a long-run cointegration relationship among foreign direct investment, economic growth, and unemployment in Indonesia.

3. Research methodology

This study employs a quantitative approach with an explanatory research design to analyze the dynamic relationship among Foreign Direct Investment (FDI), economic growth, and unemployment in Indonesia within a sustainable development framework. The econometric model used is the Vector Error Correction Model (VECM), which captures both short-run dynamics and long-run equilibrium relationships among cointegrated time-series variables. Annual time-series data are obtained from the World Bank, Statistics Indonesia (BPS), UNCTAD, and Bank Indonesia. These sources ensure data reliability, consistency, and international comparability.

The empirical analysis follows several sequential steps. First, the Augmented Dickey–Fuller (ADF) unit root test examines the variables' stationarity. Second, the Johansen cointegration test is applied to determine whether long-run equilibrium relationships exist among FDI, economic growth, and unemployment. Third, the Granger causality test is performed to identify the direction of short-run causal relationships. Finally, the study further analyzes dynamic interactions among the variables using the Impulse Response Function (IRF) and Variance Decomposition (VDC) to evaluate each variable's response to shocks and assess the relative contribution of innovations within the system. Through this methodological framework, the study provides a comprehensive examination of both short-term adjustment mechanisms and long-term structural relationships among FDI, economic growth, and unemployment in Indonesia.

4.1. Research results

4.1.1. Stationarity test

The stationarity test is conducted at the initial stage of time-series data analysis to ensure that the variables do not contain a unit root. Non-stationary data may lead to spurious or misleading regression results (Winarno, 2015). According to Winarno (2015), a time-series variable is considered stationary if: Its mean remains constant over time. . Its covariance between periods depends only on the time lag between them and not on the actual time at which it is measured. The most commonly applied procedure for testing stationarity is the Augmented Dickey–Fuller (ADF) unit root test (Basuki, 2015). The hypotheses for the ADF test are formulated as follows: H_0 : The data are non-stationary (contain a unit root).

H_1 : The data are stationary (do not contain a unit root).

The decision rule compares the ADF t-statistic with the MacKinnon critical values at the 1%, 5%, or 10% significance levels. If the absolute value of the ADF t-statistic is greater than the critical value (i.e., more negative than the critical value), H_0 is rejected, indicating that the data are stationary. Conversely, if the ADF t-statistic is less negative than the critical value, H_0 cannot be rejected, implying that the series is non-stationary.

Table 1: Stationarity test of FDI at first difference (ADF Test)

Null Hypothesis: D(FDI) has a unit root		
Exogenous: Constant		
Lag Length: 0 (Automatic - based on SIC, maxlag=5)		
Augmented Dickey-Fuller test statistic	t-Statistic	Prob.*
	-6.6111	0.0000
Test critical values:	1% level	-3.7529
	5% level	-2.9980
	10% level	-2.6387

Source: Processed data using EViews v13, 2025.

The results of the Augmented Dickey-Fuller (ADF) unit root test indicate that the FDI variable at the first-difference level has a t-statistic of -6.6111 with a probability value of 0.0000. This value is more negative than the critical values at the 1% (-3.7529), 5% (-2.9980), and 10% (-2.6387) significance levels. Therefore, we reject the null hypothesis that D(FDI) contains a unit root at the 1% significance level. These findings indicate that the FDI variable becomes stationary after first differencing, meaning it is integrated of order one, I(1). This result satisfies the prerequisite for proceeding to the Johansen cointegration test and estimating the Vector Error Correction Model (VECM), as these approaches require variables to be integrated of the same order.

2. Stationarity test of GDP

Table 2: Stationarity test of GDP at first difference (ADF Test)

Null Hypothesis: D(PDB) has a unit root		
Exogenous: Constant		
Lag Length: 1 (Automatic - based on SIC, maxlag=5)		
Augmented Dickey-Fuller test statistic	t-Statistic	Prob.*
	-4.4935	0.0019
Test critical values:	1% level	-3.7695
	5% level	-3.0048
	10% level	-2.6422

Source: Processed data using EViews v13, 2025.

The Augmented Dickey-Fuller (ADF) unit root test for the GDP variable at the first-difference level yields a t-statistic of -4.4935 and a probability value of 0.0019. This statistic is more negative than the critical values at the 1% (-3.7695), 5% (-3.0048), and 10% (-2.6422) significance levels. Moreover, the p-value below 0.05 indicates that we can reject the null hypothesis that D(GDP) contains a unit root at the 1% significance level.

Thus, the GDP variable is stationary at the first-difference level, meaning it is integrated of order one, I(1). This finding indicates that GDP fluctuations become stable after first differencing and satisfy the prerequisite for the Johansen cointegration test and the estimation of the Vector Error Correction Model (VECM). Consistent orders of integration across variables are essential for identifying long-run equilibrium relationships within the estimated system.

3. Stationarity test of unemployment rate

Table 3: Stationarity test of unemployment rate at first difference (ADF Test)

Null Hypothesis: D(TP) has a unit root		
Exogenous: Constant		
Lag Length: 0 (Automatic - based on SIC, maxlag=5)		
Augmented Dickey-Fuller test statistic	t-Statistic	Prob.*
	-4.5767	0.0015
Test critical values:	1% level	-3.7529
	5% level	-2.9980
	10% level	-2.6387

*MacKinnon (1996) one-sided p-values.

Source: Processed data using EViews v13, 2025.

The results of the Augmented Dickey-Fuller (ADF) unit root test for the Unemployment Rate (UR) variable at the first-difference level indicate a t-statistic of -4.5767 with a probability value of 0.0015. This value is more negative than the critical values at the 1% (-3.7529), 5% (-2.9980), and 10% (-2.6387) significance levels. The p-value below 0.05 further confirms that we can reject the null hypothesis that D(UR) contains a unit root at the 1% significance level. Therefore, the unemployment rate variable is stationary after first differencing, implying that it is integrated of order one, I(1). Since

all research variables (FDI, GDP, and UR) are integrated of the same order, $I(1)$, the necessary condition for conducting the Johansen cointegration test is fulfilled. This allows the estimation of the Vector Error Correction Model (VECM) to examine both short-run dynamics and long-run equilibrium relationships among the variables within the system.

4.1.2. Optimal lag selection test

After conducting the stationarity test, the next step is to determine the optimal lag length, which is essential in constructing the VECM model. The lag length must be long enough to capture dynamic interactions among variables, but not so long that it reduces degrees of freedom due to the large number of estimated parameters.

Researchers generally determine the optimal lag length using several statistical criteria, including the Likelihood Ratio (LR) test, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan–Quinn Criterion (HQ). The preferred lag is selected based on the optimal criterion value—typically the smallest—so the model produces efficient, consistent, and unbiased estimates (Tanjung & Devi, 2013). The following table presents the results of the optimal lag selection test.

Table 4: Optimal lag test

VAR Lag Order Selection Criteria						
Endogenous variables: D(FDI) D(PDB) D(TP)						
Exogenous variables: C						
Date: 06/21/25 Time: 22:32						
Sample: 2000 2024						
Included observations: 19						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	33.8683	NA	7.79e-06	-3.249302	-3.100180	-3.224065
1	39.9965	9.676071	1.07e-05	-2.947005	-2.350517	-2.846056
2	46.8628	8.673250	1.47e-05	-2.722408	-1.678554	-2.545746
3	52.7511	5.578361	2.60e-05	-2.394857	-0.903638	-2.142483
4	56.8422	2.583867	7.67e-05	-1.878133	0.060452	-1.550047
5	114.0365	18.06135*	1.95e-06*	-6.951216*	-4.565265*	-6.547418*

Source: Processed data using EViews v13, 2025.

The optimal lag selection test results indicate that lag 5 is the most appropriate lag length based on the LR, FPE, AIC, SC, and HQ criteria, as it yields the minimum value for each indicator. Therefore, this study estimates the VAR/VECM model using five lags to capture dynamic interactions among variables optimally without compromising the validity and efficiency of the estimation results.

4.1.3. Stability test

The next step is to conduct the VECM stability test, also known as the VECM stability condition check. This test determines whether the variables used in the model are stable and valid at the lag length previously selected through the optimal lag test. This step is crucial to ensure that the Impulse Response Function (IRF) and Variance Decomposition (VD) analyses produce reliable and accurate results. The stability of the VAR/VECM model is assessed by examining the roots of the characteristic polynomial.

The decision criterion is based on the modulus (absolute value) of the roots. If all roots have a modulus less than one ($|\text{root}| < 1$), the model is considered stable. Under this condition, the null hypothesis (H_0) of instability is rejected, and the alternative hypothesis (H_1) is accepted, indicating that the model satisfies the stability requirement.

Table 5: VECM stability test**Roots of Characteristic Polynomial**

Endogenous variables: D(FDI) D(PDB)

D(TP)

Exogenous variables: C

Lag specification: 1 4

Date: 06/21/25 Time: 22:53

Root	Modulus
0.238638 - 0.854510i	0.887206
0.238638 + 0.854510i	0.887206
0.414279 - 0.758489i	0.864252
0.414279 + 0.758489i	0.864252
-0.689333 - 0.502591i	0.853098
-0.689333 + 0.502591i	0.853098
-0.807949	0.807948
0.807568	0.807568
-0.332531 - 0.454409i	0.563084
-0.332531 + 0.454409i	0.563084
0.236959 - 0.293444i	0.377171
0.236959 + 0.293444i	0.377171

Source: Processed data using EViews v13, 2025.

The stability test results show that all characteristic roots have a modulus less than one, with the highest value at 0.887206. This indicates that the VECM model satisfies the stability condition. Since all roots lie inside the unit circle, any shocks occurring within the system are temporary and will gradually converge toward long-run equilibrium. Therefore, the VECM is appropriate for analyzing both short-run dynamics and long-run relationships.

4.1.4. Granger causality test

The Granger causality test is widely used in econometric time series analysis to examine causal relationships among variables. This test aims to determine whether past values of one variable can significantly influence or help predict another variable's current value.

In other words, the Granger causality test helps identify the direction of causality between variables within an economic model. It does not imply true causality in a philosophical sense, but rather predictive causality based on statistical evidence. Table 6 presents the results of the Granger causality test.

Table 6: UGranger causality test**Pairwise Granger Causality Tests**

Date: 06/21/25 Time: 22:54

Sample: 2000 2024

Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
PDB does not Granger Cause FDI	21	3.1573	0.0545
FDI does not Granger Cause PDB		0.3189	0.8598
TP does not Granger Cause FDI	21	1.4893	0.2662
FDI does not Granger Cause TP		0.0967	0.9815
TP does not Granger Cause PDB	21	0.2750	0.8884
PDB does not Granger Cause TP		0.9405	0.4735

Source: Processed data using EViews v13, 2025.

The results of the Granger causality test indicate that there is no evidence of bidirectional causality among the variables in the short run. However, the results indicate unidirectional causality from GDP to FDI at the 10% significance level, suggesting that economic growth tends to precede increases in foreign direct investment. Conversely, FDI does not statistically influence GDP or the unemployment rate in the short term. These findings imply that the interactions among the variables are more structural and long-term than short-run dynamics.

4.1.5. Cointegration test

The cointegration test determines whether a long-run equilibrium relationship exists among the variables in the model. Although each variable may be individually non-stationary, a linear combination of them can be stationary, indicating cointegration. This test is performed after confirming that the variables are stationary in first differences to ensure the existence of long-run relationships.

Two commonly used approaches are the Engle–Granger test and the Johansen test. If cointegration is detected, the VAR model is no longer appropriate and must be replaced with the Vector Error Correction Model (VECM).

The decision criteria (Basuki & Prawoto, 2016) are as follows:

1. H_0 : No cointegration exists.
2. H_1 : Cointegration exists.
3. Reject H_0 (cointegration exists) if the trace statistic > 5% critical value.
4. Fail to reject H_0 (no cointegration) if the trace statistic < 5% critical value.

Table 7: Cointegration test

Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None *	0.9820	105.3170	29.7970	0.0000
At most 1 *	0.6383	28.9234	15.4947	0.0002
At most 2 *	0.3966	9.5998	3.8414	0.0019

Trace test indicates 3 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Processed data using EViews v13, 2025.

The Johansen cointegration test results based on the Trace Statistic indicate that all null hypotheses can be rejected at the 5% significance level. The trace statistic for the hypothesis "None" (105.3170) exceeds the 5% critical value (29.7970) with a p-value of 0.0000. Similarly, the hypotheses "At most 1" and "At most 2" are also statistically significant. Thus, the system has three cointegrating equations, implying a long-run equilibrium relationship among FDI, GDP, and the unemployment rate. These findings confirm that despite short-run fluctuations, the three variables are structurally linked in the long term. Therefore, the VECM estimation is appropriate to capture the short-run dynamics and the speed of adjustment toward long-run equilibrium.

4.1.6. VECM estimation test

The Vector Error Correction Model (VECM) is an econometric model used to analyze variables' short-run dynamics while capturing their long-run equilibrium relationships. VECM is particularly appropriate for multivariate time series data that are non-stationary but cointegrated, meaning that a linear combination of the variables is stationary. In such cases, the standard VAR model must be transformed into a VECM by incorporating first differences and an error correction term.

VECM is essentially a restricted form of the Vector Autoregression (VAR) model. The key distinction between VAR and VECM lies in the presence of cointegration among variables. While VAR models only capture short-run interactions, VECM explicitly includes a long-run equilibrium relationship through the error correction mechanism.

The VECM framework accounts for deviations from long-run equilibrium and measures the speed of adjustment toward that equilibrium after a short-run shock. In other words, it allows for the investigation of how the dependent variable responds to disequilibrium conditions caused by changes in other variables within the system. This study used EViews 13 as the primary econometric software tool.

Table 8: VECM estimation test

Vector Error Correction Estimates			
Date: 06/21/25 Time: 22:59			
Sample (adjusted): 2006 2024			
Included observations: 19 after adjustments			
Standard errors in () & t-statistics in []			
Lags interval (in first differences): 1 to 4			
Endogenous variables: D(FDI) D(PDB) D(TP)			
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius):			
Cointegrating relationship includes a constant. Short-run dynamics include a constant.			
Cointegrating Eq:	CointEq1		
D(FDI(-1))	1		
D(PDB(-1))	38.1963		
	(2.2741)		
	[16.7955]		
D(TP(-1))	-0.1118		
	(0.0253)		
	[-4.41826]		
C	-1.1254		
Error Correction:	D(FDI,2)	D(PDB,2)	D(TP,2)
COINTEQ1	-0.0138	-0.0616	2.8741
	(0.5555)	(0.0212)	(1.6666)
	[-0.02487]	[-2.89558]	[1.72447]
D(FDI(-1),2)	-0.8276	0.0570	-2.4799
	(0.6266)	(0.0239)	(1.8798)
	[-1.32085]	[2.37683]	[-1.31927]
D(FDI(-2),2)	-0.4872	0.0422	-2.4772
	(0.5859)	(0.0220)	(1.7577)
	[-0.83158]	[1.88124]	[-1.40933]
D(FDI(-3),2)	-0.5228	-0.0145	-1.2839
	(0.4821)	(0.0184)	(1.4463)
	[-1.08448]	[-0.78760]	[-0.88770]
D(FDI(-4),2)	-0.3971	-0.0124	-1.9993
	(0.3463)	(0.0132)	(1.0389)
	[-1.14670]	[-0.94087]	[-1.92435]
D(PDB(-1),2)	13.9470	1.5256	-97.3477
	(18.8860)	(0.7232)	(56.6572)
	[0.73849]	[2.10946]	[-1.71819]
D(PDB(-2),2)	-2.9410	0.9533	-80.0702
	(17.8391)	(0.6831)	(53.5168)
	[-0.16487]	[1.39548]	[-1.49617]
D(PDB(-3),2)	1.4496	0.5951	-43.5907
	(14.8848)	(0.5700)	(44.6539)
	[0.09739]	[1.04417]	[-0.97619]
D(PDB(-4),2)	-2.1262	0.7692	-37.6079
	(11.9225)	(0.4565)	(35.7670)
	[-0.17834]	[1.68489]	[-1.05147]
D(TP(-1),2)	0.0935	-0.0035	-0.3318
	(0.1234)	(0.0047)	(0.3704)
	[0.75760]	[-0.74579]	[-0.89578]
D(TP(-2),2)	0.0042	0.0037	-0.2445
	(0.1484)	(0.0056)	(0.4452)
	[0.02842]	[0.65470]	[-0.54934]
D(TP(-3),2)	0.0162	(0.0080)	-0.1195
	(0.1378)	(0.0052)	(0.4135)
	[0.11800]	[1.53153]	[-0.28895]
D(TP(-4),2)	0.0722	0.0125	-0.1537
	(0.1180)	(0.0045)	(0.3540)
	[0.61230]	[2.78532]	[-0.43442]
C	0.0003	-0.0038	0.2118
	(0.1015)	(0.0038)	(0.3045)
	[0.00305]	[-0.98865]	[0.69575]
R-squared	0.84074	0.87030	0.78570
Adj. R-squared	0.42667	0.53310	0.22853
Sum sq. resids	0.59207	0.00086	5.32851
S.E. equation	0.34411	0.01317	1.03232
F-statistic	2.03042	2.58098	1.41017
Log likelihood	5.99151	67.97805	-14.88185
Akaike AIC	0.84299	-5.68190	3.04019
Schwarz SC	1.53890	-4.98599	3.73609
Mean dependent	-0.00052	-0.00052	-0.09421
S.D. dependent	0.45446	0.01928	1.17533
Determinant resid covariance (dof adj.)		0.0000	
Determinant resid covariance		0.0000	
Log likelihood		99.57483	
Akaike information criterion		-5.74471	
Schwarz criterion		-3.50789	
Number of coefficients		45	

Source: Processed data using EViews v13, 2025.

The VECM estimation results reveal a significant long-run equilibrium relationship among GDP, the unemployment rate, and FDI. The error correction term (ECT) coefficient is negative and statistically significant in the economic growth equation, indicating an adjustment mechanism toward long-run equilibrium. This implies that any short-run deviation from equilibrium will be

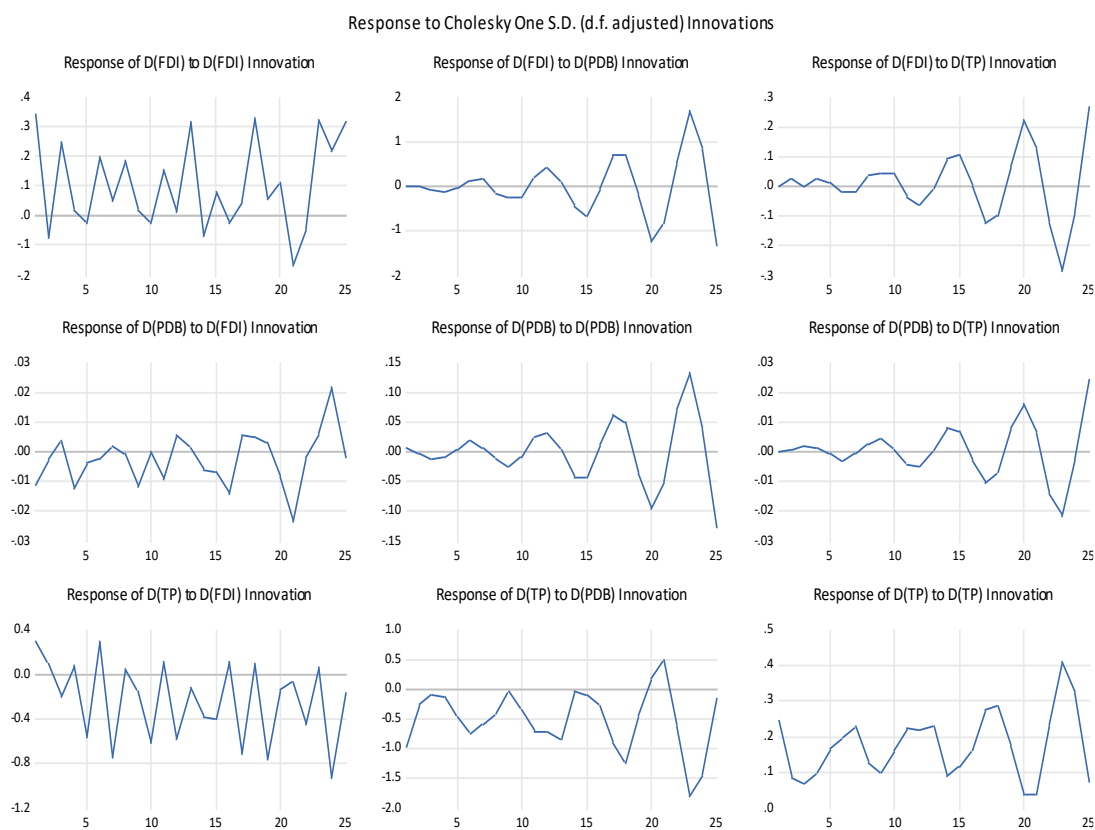
corrected over time, with the system gradually converging back to its long-run path. In the short run, the interactions among variables appear relatively limited. However, changes in FDI influence economic growth in the previous period, suggesting short-run dynamic effects. Overall, these findings indicate that the relationship among FDI, economic growth, and unemployment in Indonesia is predominantly structural and long-term in nature rather than driven by short-term fluctuations.

4.1.7. Impulse response function (IRF) test

The Impulse Response Function (IRF) analysis is conducted after completing the preceding tests. This step is essential for understanding how each endogenous variable responds over time to shocks originating from itself and from other variables in the system. The IRF helps identify the dynamic pattern of changes caused by unexpected shocks to a particular variable and how these shocks propagate through the system over time. This approach also lets you assess whether a shock's impact is temporary or persistent.

If the impulse response graph shows that the fluctuation paths gradually converge toward the equilibrium point or return to their initial position, this indicates that shocks to the variables dissipate over time. In other words, the effects are dynamic and temporary rather than permanent, and the system will eventually stabilize in the long run.

Figure 4.1: Impulse response function (IRF) results



Source: Processed data using EViews v13, 2025.

The Impulse Response Function (IRF) analysis evaluates the dynamic responses of endogenous variables to a one-standard-deviation shock within the VECM system over a 25-period horizon. Since the model satisfies the stability condition (all characteristic roots lie inside the unit circle), the IRF results are valid for interpreting short- to medium-term adjustment dynamics.

1. Response of FDI to FDI Shock. FDI's response to its own shock exhibits a fluctuating pattern with relatively large amplitudes in the initial periods. This reflects internal volatility and short-run inertia effects. Over time, the response gradually converges toward equilibrium, indicating that internal shocks are temporary and do not generate permanent long-run effects.
2. Response of FDI to GDP Shock. The response of FDI to a GDP shock is relatively small and tends to approach zero over the time horizon. The fluctuations do not show a strong expansionary pattern. This finding suggests that the short-run transmission of economic

growth to foreign investment inflows is limited. It is consistent with the Granger causality results, which indicate only weak significance (10%) from GDP to FDI.

3. Response of FDI to Unemployment Shock. FDI's response to an unemployment shock shows moderate fluctuations without a persistent pattern. The initially negative effect does not continue into the medium term. This indicates that labor market dynamics are not a primary determinant of short-run changes in FDI.
4. Response of GDP to FDI Shock. GDP responds positively and gradually to an FDI shock after the initial periods. Although the immediate impact is relatively small, the gradual upward pattern suggests a potential medium-term contribution of FDI to economic growth. However, since the Granger causality test does not confirm significant causality from FDI to GDP, this effect is better interpreted as dynamic rather than strictly causal in the short run.
5. Response of GDP to GDP Shock. GDP's response to its own shock is relatively stable and positive, with limited fluctuations. This indicates persistence in economic growth and the strength of internal factors in maintaining output momentum.
6. Response of GDP to Unemployment Shock. GDP's response to an unemployment shock is very small and quickly returns to equilibrium. This suggests that labor market shocks do not directly influence short-run growth dynamics.
7. Response of Unemployment to FDI Shock. The unemployment rate responds negatively to an FDI shock in the initial periods, indicating that increased FDI can reduce unemployment in the short run. However, the effect is relatively small and not persistent, suggesting that FDI's contribution to job creation remains limited.
8. Response of Unemployment to GDP Shock. Unemployment's response to a GDP shock shows a consistently negative pattern in the early to medium periods. This finding aligns with Okun's Law, which describes the negative relationship between output growth and unemployment, where higher economic activity leads to lower unemployment.
9. Response of Unemployment to an Unemployment Shock. Unemployment's response to its own shock shows relatively strong fluctuations that persist for several periods before converging. This reflects labor market rigidities and the persistence of unemployment across periods.

4.1.8. Variance decomposition test

Variance Decomposition (VD), also known as Forecast Error Variance Decomposition (FEVD), is used to analyze how much of the forecast error variance of each endogenous variable is explained by shocks to itself and to other variables in the system. According to Basuki and Yuliadi (2015), variance decomposition analysis aims to measure the magnitude and composition of the contribution of each independent variable to the dependent variable. This method provides information not only on the magnitude of a particular shock's impact, but also on how long the effect persists over the observation horizon. Through VD analysis, researchers can identify the relative importance of each variable in explaining the dynamic behavior of other variables within the model. In other words, it allows assessment of each independent variable's contribution to shaping the dependent variable over time.

The table below presents the results of the variance decomposition test.

Table 9: Variance decomposition test

Variance Decomposition of D(FDI):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	0.34411	100	0	0
2	0.35201	99.56333	0.00402	0.43263
3	0.43708	96.50025	3.21866	0.28107
4	0.45102	90.87738	8.57065	0.55195
5	0.45560	89.26822	10.14838	0.58339
6	0.51649	84.55160	14.89831	0.55008
7	0.55052	75.19938	24.17110	0.62951
8	0.60663	71.58774	27.46315	0.94909
9	0.66317	60.00265	38.72300	1.27432
10	0.71476	51.75252	46.75560	1.49187
11	0.76378	49.55424	48.87563	1.57011
12	0.87368	37.89602	60.44558	1.65839
13	0.93419	44.60784	53.93921	1.45293
14	1.03638	36.67339	61.31146	2.01514
15	1.23990	26.07963	71.79763	2.12272
16	1.24046	26.10046	71.77849	2.12103
17	1.42835	19.82328	77.82910	2.34760
18	1.63173	19.23836	78.58769	2.17393
19	1.64670	19.00602	78.69601	2.29795
20	2.07230	12.28157	85.13807	2.58035
21	2.24156	11.04132	86.45728	2.50138
22	2.31135	10.41748	86.95531	2.62720

23	2.89462	7.87168	89.50352	2.62478
24	3.02140	7.74131	89.76191	2.49677
25	3.33985	7.26645	90.01890	2.71464
Variance Decomposition of D(PDB):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	0.01317	74.6574	25.34257	0
2	0.01360	73.53503	26.10325	0.36170
3	0.01860	43.38223	55.16952	1.44823
4	0.02405	51.34142	47.42721	1.23135
5	0.02447	51.99835	46.79113	1.21051
6	0.03107	32.81719	65.50817	1.67462
7	0.03190	31.38703	66.97903	1.63393
8	0.03440	27.06566	70.89239	2.04194
9	0.04481	22.74113	75.04211	2.21674
10	0.04572	21.84768	75.99544	2.15687
11	0.05297	19.29641	78.44326	2.26032
12	0.06194	14.88569	82.81708	2.29721
13	0.06202	14.88011	82.80973	2.31015
14	0.07589	10.54996	86.85939	2.59063
15	0.08774	8.46399	89.02117	2.51482
16	0.08966	10.58157	86.88402	2.53439
17	0.10952	7.36670	89.96228	2.67100
18	0.12081	6.23886	91.24424	2.51689
19	0.12648	5.75633	91.53115	2.71250
20	0.15885	3.93416	93.30949	2.75633
21	0.16852	5.46783	91.93825	2.59393
22	0.18312	4.63920	92.55307	2.80771
23	0.22813	3.06156	94.22414	2.71428
24	0.23211	3.83863	93.52713	2.63423
25	0.26695	2.90952	94.22275	2.86772
Variance Decomposition of D(TP):				
Period	S.E.	D(FDI)	D(PDB)	D(TP)
1	1.03232	8.03338	86.40408	5.56253
2	1.06986	8.27687	85.92118	5.80193
3	1.09315	11.16280	82.87172	5.96547
4	1.10963	11.24867	82.10823	6.64308
5	1.33367	25.32415	68.54743	6.12840
6	1.57605	21.53550	72.47665	5.98783
7	1.85128	31.56755	62.57459	5.85784
8	1.90269	29.94871	64.06917	5.98210
9	1.91226	30.29627	63.49318	6.21053
10	2.04582	35.48843	58.44013	6.07142
11	2.17862	31.58905	62.00081	6.41013
12	2.37296	32.68418	61.05468	6.26113
13	2.53161	28.92181	64.74454	6.33364
14	2.56113	30.41140	63.27372	6.31486
15	2.59504	31.92408	61.73181	6.34409
16	2.61878	31.52689	61.86751	6.60559
17	2.87786	32.26035	61.33986	6.39978
18	3.15460	26.95304	66.88436	6.16259
19	3.28163	30.39692	63.63690	5.96617
20	3.28914	30.42192	63.62346	5.95460
21	3.32686	29.78172	64.38290	5.83537
22	3.42279	29.85665	64.16256	5.98077
23	3.88688	23.18342	71.06394	5.75263
24	4.25727	24.02117	70.60958	5.36924
25	4.26270	24.10213	70.51389	5.38397

Cholesky One S.D. (d.f. adjusted) Innovations

Cholesky ordering: D(FDI) D(PDB) D(TP)

Source: Processed data using EViews v13, 2025.

The variance decomposition results indicate that, in the long run, shocks to economic growth increasingly dominate variation in FDI, with the contribution exceeding 90% by period 25. This finding suggests that economic growth plays a decisive role in explaining long-term fluctuations in foreign direct investment. Conversely, the contribution of FDI shocks to economic growth appears to be short-lived and declines substantially over longer horizons. This implies that while FDI may exert temporary dynamic effects, it is not the primary driver of long-term growth variability within the system. Furthermore, shocks to economic growth consistently dominate variation in the unemployment rate, reinforcing growth's central role in shaping labor market dynamics. Overall, these findings indicate that economic growth is the key variable in the system and the main transmission channel through which foreign investment affects employment dynamics.

4.2. Discussion

4.2.1. Long-run relationship among FDI, GDP, and unemployment in Indonesia

Based on the Johansen cointegration test results, three cointegrating equations were identified at the 5 percent significance level. The trace statistics for the hypotheses *none*, *at most 1*, and *at most 2* are all greater than their respective critical values, with probabilities below 0.05. This indicates a stable long-run equilibrium relationship among FDI, GDP, and the unemployment rate in Indonesia. Therefore, applying the Vector Error Correction Model (VECM) in this study is methodologically appropriate and justified.

The estimated cointegration equation shows that, in the long run, GDP and the unemployment rate significantly affect FDI. The GDP coefficient is positive, implying that higher domestic economic activity enhances Indonesia's attractiveness to foreign investors. From an economic perspective, economic growth reflects macroeconomic stability, increasing purchasing power, and higher expected profitability, thereby stimulating foreign investment inflows.

Meanwhile, the unemployment coefficient is negative and significant, indicating that higher unemployment reduces FDI in the long run. Elevated unemployment may signal weak labor quality or low productivity, thereby diminishing investor confidence. This finding is consistent with Paul Romer's (1990) endogenous growth theory, which emphasizes that investment, including FDI, contributes to capital accumulation and technology transfer that reinforce long-term growth. Similarly, the Robert Solow growth model positions investment as a key determinant of long-run output growth.

Empirically, these results align with Eduardo Borensztein et al. (1998), who found that FDI positively affects long-run growth, particularly in countries with adequate human capital capacity. Laura Alfaro et al. (2004) also emphasize that FDI's long-term impact depends heavily on economic stability and the quality of domestic institutions.

The relationship between FDI and unemployment can further be explained through the Roy Harrod–Evsey Domar growth framework, which highlights that investment increases production capacity and labor absorption. Chaido Dritsaki and Emmanouil Stiakakis (2014) also documented cointegration among FDI, growth, and unemployment in European countries. Thus, this study reinforces the literature suggesting that the relationship among foreign investment, economic growth, and employment is structurally long-term.

4.2.2. Short-run effects of FDI on economic growth and unemployment

The Granger causality test results indicate that FDI has no statistically significant short-run effect on GDP or the unemployment rate. The probability values for the hypotheses "FDI does not Granger-cause GDP" and "FDI does not Granger-cause unemployment" are 0.8598 and 0.9815 ($p > 0.05$), respectively. This implies that short-term changes in FDI do not directly trigger changes in economic growth or unemployment.

The VECM estimation results support this finding, as the differenced FDI coefficients in the GDP and unemployment equations are statistically insignificant. Conversely, evidence suggests that GDP influences FDI in the short run, indicating that foreign investment flows respond more to domestic economic conditions than they do as a primary driver of short-run growth.

Theoretically, this can be explained because foreign investment requires time to be transformed into productive activity and job creation. Within the Solow framework, investment affects output gradually through capital accumulation. Hence, the impact of FDI on GDP and unemployment is not instantaneous.

These findings are consistent with Dierk Herzer et al. (2008), who found that the short-run impact of FDI on growth tends to be insignificant in developing countries with limited technological absorptive capacity. Ali Acaravci and Ilhan Ozturk (2012) also reported that FDI's employment effects become visible only when investment is directed toward labor-intensive sectors.

In the Indonesian context, FDI's dominance in capital-intensive sectors such as mining and infrastructure, which require long gestation periods, helps explain the absence of significant short-run effects on GDP and unemployment. This implies the importance of policies that channel FDI into productive sectors with direct impacts on the real economy and job creation.

4.2.3. Adjustment process of GDP and unemployment toward long-run equilibrium

Within the VECM framework, the Error Correction Term (ECT) represents the adjustment mechanism toward long-run equilibrium. A negative and statistically significant ECT coefficient indicates an error-correction mechanism. The results show that only GDP has a significant and negative ECT coefficient (approximately -0.06 to -0.08). This implies that when deviations from long-run equilibrium occur, economic growth adjusts back toward equilibrium at about 6–8 percent per period.

In contrast, the ECT coefficients for unemployment and FDI are not statistically significant. The unemployment coefficient is even positive, indicating no meaningful correction mechanism. This suggests labor market rigidities in Indonesia, where unemployment tends to be persistent and slow to adjust to economic shocks. This finding is consistent with the cointegration framework developed by Robert F. Engle and Clive Granger (1987), which states that in a cointegrated system, at least one variable must adjust to restore equilibrium. In this study, GDP serves as the primary adjustment variable.

Elena Pelinescu (2015) also found that in developing countries, GDP is often the most responsive variable in long-run correction mechanisms. Meanwhile, Olivier Blanchard and Justin Wolfers (2000) highlight that unemployment in many economies is rigid and responds only weakly to macroeconomic shocks.

The lack of a correction response in FDI suggests that external factors such as global capital flows, geopolitical conditions, and investor risk perceptions influence this variable more strongly. Thus, FDI appears relatively exogenous in the long-run system.

Overall, these findings confirm that economic growth plays a central role in maintaining macroeconomic stability in Indonesia. Policies aimed at strengthening domestic growth not only stimulate investment but also help sustain long-run equilibrium between capital accumulation and labor market dynamics.

5. Conclusion and policy recommendations

5.1. Conclusion

This study analyzes the long-run and short-run relationship between Foreign Direct Investment (FDI), economic growth (GDP), and the unemployment rate in Indonesia using the Vector Error Correction Model (VECM) approach. Based on the empirical results, several main conclusions can be drawn:

1. A significant long-run relationship exists among FDI, GDP, and unemployment. The Johansen cointegration test indicates a long-run equilibrium relationship among the three variables. This finding confirms that foreign investment, economic growth, and labor market conditions are structurally interconnected within Indonesia's macroeconomic system.
2. In the long run, economic growth plays an important role in influencing FDI, while unemployment negatively affects FDI. Higher economic growth increases Indonesia's attractiveness to foreign investors, whereas higher unemployment reduces investor interest, as it reflects weak productivity or labor market inefficiencies.
3. FDI does not have a significant short-run effect on economic growth and unemployment. The Granger causality test and VECM estimation results show that FDI shocks do not directly affect GDP or the unemployment rate in the short run. This suggests that FDI's impact takes time to materialize through capital accumulation and production integration.
4. Economic growth is the main adjustment variable in the long-run system. A significant and negative Error Correction Term (ECT) coefficient is found only in the GDP equation. This implies that when deviations from long-run equilibrium occur, economic growth adjusts to restore the system to equilibrium.
5. In the long run, economic growth largely drives the dynamics of FDI and unemployment.

The Variance Decomposition results indicate that long-run variations in FDI are explained mainly by GDP shocks, while changes in economic growth consistently drive variations in unemployment. Thus, economic growth is the key variable in the system.

5.2. Policy recommendations

Based on the findings, several policy recommendations can be proposed:

1. Strengthening the fundamentals of economic growth. Because economic growth is the dominant variable in the system, the government should prioritize macroeconomic stability, strengthen the real sector, and enhance national productivity. Stable growth will increase investor confidence and reinforce Indonesia's attractiveness as an investment destination.
2. Reorienting FDI strategy toward productive and labor-intensive sectors. Given the absence of a direct short-run impact of FDI on unemployment, the government should encourage foreign investment in sectors with high multiplier effects and strong employment absorption, such as manufacturing, downstream industries, and the creative economy.
3. Improving human capital quality. To maximize the long-term benefits of FDI, it is essential to enhance labor quality through vocational education, industrial training, and technological skill development. This will strengthen technological absorption capacity and increase the spillover effects of foreign investment.
4. Labor market reform. The rigidity of the labor market, reflected in the insignificant unemployment adjustment mechanism, suggests the need for structural reforms. Policies promoting labor flexibility, sectoral mobility, and simplified labor regulations can accelerate adjustment to economic shocks.
5. Encouraging synergy between domestic and foreign investment. FDI should not stand alone; it should integrate with domestic investment to create complementary effects. Strengthening MSMEs, industrial linkages, and downstream industrial policies can enhance sectoral integration between foreign investors and domestic businesses.

Overall, policies that strengthen domestic economic growth and improve the economy's structural quality will be the most effective strategy to optimize FDI's role in supporting development and job creation in Indonesia.

Conflict of interest statement

The authors declare no conflicts of interest.

Declaration of generative AI and AI-assisted technologies in the writing process

Grammarly was used to check grammar and improve the language of the manuscript. All three authors reviewed and verified the final manuscript and take full responsibility for its content.

Citation information

La Tondi, L. T., Armawaddin, M., & Ahmad, A. (2026). Foreign direct investment, economic growth, and unemployment in Indonesia: A VECM-based analysis with implications for sustainable development. *Economics, Management and Sustainability*, 11(2), 29-47. doi:10.14254/jems.2026.11-2.3.

References

- Abbes, S. M., Mostéfa, B., Seghir, G., & Zakarya, G. Y. (2015). Causal interactions between FDI and economic growth: Evidence from dynamic panel cointegration. *Procedia Economics and Finance*, 23, 276-290. [https://doi.org/10.1016/S2212-5671\(15\)00541-9](https://doi.org/10.1016/S2212-5671(15)00541-9)
- Aitken, B., & Harrison, A. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review*, 89(3), 605-618. <https://doi.org/10.1257/aer.89.3.605>
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: The role of local financial markets. *Journal of International Economics*, 64(1), 89-112. [https://doi.org/10.1016/S0022-1996\(03\)00081-3](https://doi.org/10.1016/S0022-1996(03)00081-3)
- Azman-Saini, W. N. W., Law, S. H., & Ahmad, A. H. (2010). FDI and economic growth: New evidence on the role of financial markets. *Economics Letters*, 107(2), 211-213. <https://doi.org/10.1016/j.econlet.2010.01.027>
- Bank Indonesia. (n.d.). *Economic & market data* [Data set]. <https://www.bi.go.id/en/iru/economic-market-data/default.aspx>
- Barro, R. J. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106(2), 407-443. <https://doi.org/10.2307/2937943>

- Belloumi, M. (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. *Economic Systems*, 38(2), 269–287. <https://doi.org/10.1016/j.ecosys.2013.09.002>
- Blanchard, O., & Wolfers, J. (2000). The role of shocks and institutions in the rise of European unemployment: The aggregate evidence. *The Economic Journal*, 110(462), C1–C33. <https://doi.org/10.1111/1468-0297.00518>
- Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, 45(1), 115–135. [https://doi.org/10.1016/S0022-1996\(97\)00033-0](https://doi.org/10.1016/S0022-1996(97)00033-0)
- BPS-Statistics Indonesia. (n.d.). *Number and percentage of employment and unemployment* [Data set]. <https://www.bps.go.id/en/statistics-table/2/MTk1MyMy/number-and-percentage-of-employment-and-unemployment.html>
- Buckley, P. J., & Casson, M. (1976). *The future of the multinational enterprise*. Macmillan.
- Carkovic, M., & Levine, R. (2005). Does foreign direct investment accelerate economic growth? In T. Moran, E. Graham, & M. Blomström (Eds.), *Does foreign direct investment promote development?* (pp. 195–220). Institute for International Economics.
- Domar, E. D. (1946). Capital expansion, rate of growth, and employment. *Econometrica*, 14(2), 137–147. <https://doi.org/10.2307/1905364>
- Dos Santos, T. (1970). The structure of dependence. *The American Economic Review*, 60(2), 231–236. <https://doi.org/10.5040/9798216384205.ch-013>
- Dunning, J. H. (1980). Toward an eclectic theory of international production: Some empirical tests. *Journal of International Business Studies*, 11(1), 9–31. <https://doi.org/10.1057/palgrave.jibs.8490593>
- Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies*, 19(1), 1–31. <https://doi.org/10.1057/palgrave.jibs.8490372>
- Durham, J. B. (2004). Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment on economic growth. *European Economic Review*, 48(2), 285–306. [https://doi.org/10.1016/S0014-2921\(02\)00264-7](https://doi.org/10.1016/S0014-2921(02)00264-7)
- Enders, W. (2015). *Applied econometric time series (4th ed.)*. Wiley.
- Engle, R. F., & Granger, C. W. J. (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251–276. <https://doi.org/10.2307/1913236>
- Feenstra, R. C., & Hanson, G. H. (1997). Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras. *Journal of International Economics*, 42(3–4), 371–393. [https://doi.org/10.1016/S0022-1996\(96\)01475-4](https://doi.org/10.1016/S0022-1996(96)01475-4)
- Frank, A. G. (1967). *Capitalism and underdevelopment in Latin America: Historical studies of Chile and Brazil*. Monthly Review Press.
- Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424–438. <https://doi.org/10.2307/1912791>
- Grossman, G. M., & Helpman, E. (1991). *Innovation and growth in the global economy*. MIT Press.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics (5th ed.)*. McGraw-Hill.
- Harrod, R. F. (1939). An essay in dynamic theory. *The Economic Journal*, 49(193), 14–33. <https://doi.org/10.2307/2225181>
- Herzer, D., Klasen, S., & Nowak-Lehmann D., F. (2008). In search of FDI-led growth in developing countries: The way forward. *Economic Modelling*, 25(5), 793–810. <https://doi.org/10.1016/j.econmod.2007.11.005>
- Hsiao, F. S. T., & Hsiao, M.-C. W. (2006). FDI, exports, and GDP in East and Southeast Asia—Panel data versus time-series causality analyses. *Journal of Asian Economics*, 17(6), 1082–1106. <https://doi.org/10.1016/j.asieco.2006.09.011>
- Hymers, S. H. (1976). *The international operations of national firms: A study of direct foreign investment*. MIT Press.
- Iamsiraroj, S. (2016). The foreign direct investment–economic growth nexus. *International Review of Economics & Finance*, 42, 116–133. <https://doi.org/10.1016/j.iref.2015.10.044>
- Islam, R. (2004). *The nexus of economic growth, employment and poverty reduction: An empirical analysis* (Issues in Employment and Poverty Discussion Paper No. 14). International Labour Organization. <https://www.ilo.org/publications/nexus-economic-growth-employment-and-poverty-reduction-empirical-analysis>
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2–3), 231–254. [https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/10.1016/0165-1889(88)90041-3)
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration. *Oxford Bulletin of Economics and Statistics*, 52(2), 169–210. <https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- Jude, C., & Silaghi, M. I. P. (2016). Employment effects of foreign direct investment: New evidence from Central and Eastern European countries. *International Economics*, 145, 32–49. <https://doi.org/10.1016/j.inteco.2015.02.003>
- Kharisma, B., Remi, S. S., Wardhana, A., & Silalahi, F. R. (2025). Foreign direct investment, institutional quality and economic growth: Empirical evidence from ASEAN. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan*, 26(1), 108–125. <https://doi.org/10.23917/jep.v26i1.8822>

- Knotek, E. S., II. (2007). How useful is Okun's law? *Economic Review (Federal Reserve Bank of Kansas City)*, 92(4), 73–103. <https://www.kansascityfed.org/documents/955/2007-How%20Useful%20is%20Okun%27s%20Law%3F.pdf>
- Lee, E., & Vivarelli, M. (2006). The social impact of globalization in the developing countries. *International Labour Review*, 145(3), 167–184. <https://doi.org/10.1111/j.1564-913X.2006.tb00016.x>
- Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School*, 22(2), 139–191. <https://doi.org/10.1111/j.1467-9957.1954.tb00021.x>
- Lucas, R. E., Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, 11(6), 601–618. [https://doi.org/10.1002/\(SICI\)1099-1255\(199611\)11:6%3C601::AID-JAE417%3E3.0.CO;2-T](https://doi.org/10.1002/(SICI)1099-1255(199611)11:6%3C601::AID-JAE417%3E3.0.CO;2-T)
- MacKinnon, J. G., Haug, A. A., & Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics*, 14(5), 563–577. [https://doi.org/10.1002/\(SICI\)1099-1255\(199909/10\)14:5%3C563::AID-JAE530%3E3.0.CO;2-R](https://doi.org/10.1002/(SICI)1099-1255(199909/10)14:5%3C563::AID-JAE530%3E3.0.CO;2-R)
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2), 407–437. <https://doi.org/10.2307/2118477>
- Markusen, J. R., & Venables, A. J. (1999). Foreign direct investment as a catalyst for industrial development. *European Economic Review*, 43(2), 335–356. [https://doi.org/10.1016/S0014-2921\(98\)00048-8](https://doi.org/10.1016/S0014-2921(98)00048-8)
- Nguyen, C. P., Nguyen, A. N., Schinckus, C., & Su, T. D. (2021). The influence of foreign direct investment on productivity: An institutional perspective. *Review of Development Finance*, 11(1), 35–45. <https://hdl.handle.net/10520/ejc-rdfin-v11-n1-a3>
- Okun, A. M. (1962). Potential GNP: Its measurement and significance. *Proceedings of the Business and Economic Statistics Section*, 98–104.
- Pegkas, P. (2015). The impact of FDI on economic growth in Eurozone countries. *The Journal of Economic Asymmetries*, 12(2), 124–132. <https://doi.org/10.1016/j.jeca.2015.05.001>
- Ricardo, D. (1817). *On the principles of political economy and taxation*. John Murray.
- Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5), 1002–1037. <https://doi.org/10.1086/261420>
- Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5, Part 2), S71–S102. <https://doi.org/10.1086/261725>
- Sabir, S., Rafique, A., & Abbas, K. (2019). Institutions and FDI: Evidence from developed and developing countries. *Financial Innovation*, 5, 8. <https://doi.org/10.1186/s40854-019-0123-7>
- Saidi, Y., Ochi, A., & Maktouf, S. (2023). FDI inflows, economic growth, and governance quality trilogy in developing countries: A panel VAR analysis. *Bulletin of Economic Research*, 75(2), 426–449. <https://doi.org/10.1111/boer.12364>
- Sims, C. A. (1980). Macroeconomics and reality. *Econometrica*, 48(1), 1–48. <https://doi.org/10.2307/1912017>
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65–94. <https://doi.org/10.2307/1884513>
- UNCTAD. (n.d.). *Foreign direct investment: Inward and outward flows and stock, annual* [Data set]. <https://unctadstat.unctad.org/datacentre/dataviewer/US.FDIFlowsStock>
- United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. <https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981>
- World Bank. (2023). *World development indicators* [Data set]. <https://databank.worldbank.org/source/world-development-indicators>



© 2016-2026, Economics, Management and Sustainability. All rights reserved.

This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share – copy and redistribute the material in any medium or format. Adapt – remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution – You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Economics, Management and Sustainability (ISSN: 2520-6303) is published by Scientific Publishing House "CSR", Poland, EU and Scientific Publishing House "SciView", Poland

Publishing with JEMS ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the JEMS website
- Rapid publication
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a JEMS at <http://jems.sciview.net> or submit.jems@sciview.net

