

Trade Openness and Indonesia's Economic Growth: Empirical Evidence of the Role of Exports and Imports in Gross Domestic Product

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ABSTRACT

Purpose: This study examines the effects of exports and imports, as indicators of trade openness, on Indonesia's real Gross Domestic Product (GDP) in both the short run and the long run.

Research Method: Quarterly data from the first quarter of 2015 to the first quarter of 2026 (45 observations) were obtained from Statistics Indonesia. The study employs the Autoregressive Distributed Lag (ARDL) approach, including descriptive statistics, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, lag selection using the Akaike Information Criterion (AIC), bounds testing, and short-run dynamic estimation.

Results and Discussion: The results show that all variables are non-stationary at level but none is integrated of order two, validating the use of the ARDL model. The optimal specification is ARDL (1,4,1). The bounds test produces an F-statistic of 1.737, below the 5% lower critical bound (4.135), indicating no long-run equilibrium relationship between trade openness and real GDP. Moreover, exports and imports have no statistically significant short-run effects on economic growth. In contrast, significant second- and third-quarter dummy variables reveal seasonal patterns in GDP fluctuations, suggesting that aggregate trade values alone do not sufficiently explain economic growth.

Implications: Trade policies should prioritize increasing domestic value added, improving productivity, and strengthening industrial linkages rather than merely expanding trade volumes.

Originality: This study provides recent evidence on the trade openness-growth nexus in Indonesia using post-2015 quarterly data and demonstrates the limited explanatory power of aggregate trade flows in the absence of stronger domestic productive capacity.

Keywords: ARDL; economic growth; exports; imports; real gross domestic product; trade openness.

1. Introduction

International trade has long been recognized as one of the primary engines of economic growth by expanding market access, generating foreign exchange earnings, and facilitating the transfer of capital goods, intermediate inputs, and advanced technologies (Anoruo & Ahmad, 2000; Yusoff & Febrina, 2014; Elfaki *et al.*, 2021). Through exports and imports, trade openness enables countries to integrate into global production networks and benefit from specialization, economies of scale, and knowledge spillovers, thereby improving productivity and long-term economic performance (Ali *et al.*, 2023; Millia *et al.*, 2021; Tahir *et al.*, 2026). Nevertheless, the contribution of trade to economic growth is far from



automatic. The extent to which trade enhances output depends on domestic productive capacity, technological capabilities, institutional quality, and the ability of firms to absorb and transform imported knowledge into higher productivity (Siregar & Widjanarko, 2022; Putra *et al.*, 2025). Recent evidence suggests that while trade openness generally promotes economic growth, its effects differ substantially across countries depending on industrial competitiveness, innovation capacity, policy support, and structural characteristics of the economy (Nam & Ryu, 2024; Wen *et al.*, 2023; Bouattour *et al.*, 2026). This heterogeneous relationship is particularly relevant for emerging economies such as Indonesia, where the growth-enhancing effects of international trade are conditioned by the country's industrialization process, financial development, and macroeconomic environment (Elfaki *et al.*, 2021; Suryandaru, 2023; Bank, 2024). Moreover, empirical studies focusing on Indonesia consistently report that exports, imports, and trade openness play significant roles in stimulating economic growth, although the magnitude and direction of these effects may vary across different periods and economic conditions (Hodijah & Angelina, 2021; Nopiana *et al.*, 2022; Juniarti & Septriani, 2024).

From a theoretical perspective, the export-led growth hypothesis argues that exports stimulate economic growth by increasing aggregate demand, encouraging specialization, improving resource allocation, and generating productivity gains through learning-by-exporting (Anoruo & Ahmad, 2000; Yusoff & Febrina, 2014). By expanding access to international markets, exports enable firms to exploit economies of scale, enhance production efficiency, and foster technological upgrading, thereby contributing to sustained economic growth (Ali *et al.*, 2023; Millia *et al.*, 2021; Tahir *et al.*, 2026). However, export expansion does not necessarily translate into higher real output. Rising export values may simply reflect increases in commodity prices or exchange rate movements rather than genuine improvements in production capacity or productivity (Nopiana *et al.*, 2022; Suryandaru, 2023). Moreover, the growth effect of exports largely depends on the proportion of domestic value added embodied in exported products, as well as the economy's industrial structure and technological capabilities. Economies that rely heavily on imported intermediate inputs may experience weaker domestic multiplier effects despite increasing export values because a substantial share of export earnings leaks abroad through import dependence (Elfaki *et al.*, 2021; Putra *et al.*, 2025). Consequently, the economic benefits of export growth are likely to be stronger in countries with higher industrial competitiveness, greater innovation capacity, and stronger linkages between export-oriented industries and domestic production networks (Nam & Ryu, 2024; Wen *et al.*, 2023; Siregar & Widjanarko, 2022).

The relationship between imports and economic growth is even more nuanced. Although imports are deducted in the national income identity to avoid double counting foreign production, they frequently serve as productive inputs rather than merely representing domestic expenditure leakage. Imports of capital goods, intermediate inputs, and advanced technologies can enhance production efficiency, facilitate technological upgrading, strengthen industrial competitiveness, and improve long-term productivity by enabling firms to access superior production technologies and knowledge spillovers (Elfaki *et al.*, 2021; Wen *et al.*, 2023; Tahir *et al.*, 2026). Conversely, imports dominated by final consumer goods may substitute for domestic production, reduce domestic value creation, and weaken industrial development, particularly when domestic firms possess limited technological capabilities and low import absorption capacity (Hodijah & Angelina, 2021; Nopiana *et al.*, 2022; Putra *et al.*, 2025). Consequently, the net contribution of imports to economic growth is theoretically ambiguous and must be evaluated empirically rather than inferred solely from national accounting identities. Empirical evidence for Indonesia and other developing economies indicates that the growth effects of imports depend critically on import composition, industrial structure, and the extent to which imported goods

complement rather than replace domestic production (Millia *et al.*, 2021; Nam & Ryu, 2024; Bouattour *et al.*, 2026). This perspective suggests that productive imports associated with investment and technological upgrading are more likely to stimulate sustainable economic growth than imports primarily intended for final consumption (Ali *et al.*, 2023; Siregar & Widjanarko, 2022).

Indonesia provides an important context for examining these relationships. As one of Southeast Asia's largest emerging economies, Indonesia's economic growth is closely linked to international trade through commodity exports, manufacturing activities, foreign investment, and imported production inputs, making trade openness a key driver of structural transformation and long-term development (Elfaki *et al.*, 2021; Putra *et al.*, 2025; Bank, 2024). Furthermore, the period between 2015 and the first quarter of 2026 encompasses several major economic shocks and structural changes, including fluctuations in global commodity prices, the COVID-19 pandemic and subsequent recovery, global supply chain disruptions, and post-pandemic trade normalization. These events have substantially reshaped Indonesia's trade patterns, industrial activities, and macroeconomic performance, potentially altering the dynamic relationship between international trade and economic growth (Bank, 2024; Tahir *et al.*, 2026). Descriptive evidence also indicates that exports and imports exhibit considerably greater volatility than real GDP, implying that increases in trade values are not necessarily accompanied by proportional increases in domestic production. Such discrepancies may arise because trade values are influenced by changes in international commodity prices, exchange rate movements, and imported input intensity, whereas GDP primarily reflects domestic value added (Hodijah & Angelina, 2021; Suryandaru, 2023; Nam & Ryu, 2024). Therefore, understanding whether fluctuations in exports and imports translate into sustained economic growth requires empirical investigation that explicitly accounts for both short-run dynamics and long-run equilibrium relationships (Kripfganz & Schneider, 2023; Juniarti & Septriani, 2024).

Despite extensive research on the trade–growth nexus, empirical findings remain inconclusive. A substantial body of literature reports that exports, imports, and trade openness contribute positively to Indonesia's economic growth by enhancing productivity, investment, and technological diffusion (Millia *et al.*, 2021; Hodijah & Angelina, 2021; Elfaki *et al.*, 2021). Similarly, studies focusing on ASEAN and other developing economies generally support the view that greater trade integration stimulates long-term economic performance through market expansion and efficiency gains (Anoruo & Ahmad, 2000; Nam & Ryu, 2024; Tahir *et al.*, 2026). In contrast, other studies employing different sample periods, data frequencies, model specifications, and measures of trade openness produce substantially different conclusions. For example, Putra *et al.*, (2025), using annual data and an aggregate measure of trade openness, find evidence of a positive long-run relationship between trade openness and economic growth, whereas Suryandaru (2023) demonstrates that the relationship may exhibit both symmetric and asymmetric dynamics depending on macroeconomic conditions. Likewise, Bouattour *et al.*, (2026) reveal that the effect of trade openness on economic growth is nonlinear, suggesting that the benefits of openness vary across different stages of economic development and institutional environments. These inconsistencies indicate that the estimated relationship is highly sensitive to data frequency, sample period, variable measurement, and econometric specification, highlighting the need for updated empirical evidence using recent observations and appropriate time-series techniques capable of distinguishing short-run dynamics from long-run equilibrium relationships (Kripfganz & Schneider, 2023; Juniarti & Septriani, 2024).

This study addresses three important gaps in the existing literature. First, it provides updated evidence by employing quarterly data covering the period from the first quarter of 2015 to the first

quarter of 2026, thereby capturing major structural changes in Indonesia's economy, including the COVID-19 pandemic, global supply chain disruptions, commodity price fluctuations, and the subsequent economic recovery (Bank, 2024). Second, unlike many previous studies that rely on aggregate measures of trade openness (e.g., Anoruo & Ahmad, 2000; Putra *et al.*, 2025; Juniarti & Septriani, 2024), this research separately examines the roles of exports and imports, allowing for a more comprehensive understanding of their potentially asymmetric and distinct contributions to economic growth. Such disaggregation is important because exports and imports influence economic activity through different transmission mechanisms and may generate heterogeneous short-run and long-run effects (Elfaki *et al.*, 2021; Millia *et al.*, 2021; Nam & Ryu, 2024). Third, by applying the Autoregressive Distributed Lag (ARDL) approach, the study simultaneously investigates short-run dynamics and long-run equilibrium relationships while accommodating variables with mixed orders of integration, making it particularly suitable for macroeconomic time-series analysis (Kripfganz & Schneider, 2023). This methodological approach also enables the identification of both the immediate and persistent effects of international trade on economic growth, which are often overlooked in conventional static regression models (Suryandaru, 2023; Bouattour *et al.*, 2026). Accordingly, the primary objective of this study is to determine whether exports and imports exert significant short-run and long-run effects on Indonesia's real Gross Domestic Product and to assess whether a stable long-run equilibrium relationship exists between international trade and economic growth, thereby providing updated empirical evidence to inform trade and economic development policies in Indonesia (Bank, 2024; Tahir *et al.*, 2026).

The remainder of this paper is organized as follows. Section 2 provides a literature review and hypothesis development. Section 3 presents the research method and design. Section 4 provides the results and discussion. Section 5 presents concluding remarks and Recommendations.

2. Literature Review and Hypothesis Development

2.1 Trade Openness and Economic Growth

Trade openness has long been regarded as a fundamental driver of economic growth because it enables countries to expand market access, improve resource allocation, and integrate into global production networks. Classical and neoclassical trade theories argue that international trade increases welfare through comparative advantage and specialization, while endogenous growth theory emphasizes that trade accelerates technological diffusion, knowledge spillovers, innovation, and productivity improvements. Consequently, economies that are more integrated into international markets are expected to achieve higher levels of output and sustainable economic growth (Anoruo & Ahmad, 2000; Yusoff & Febrina, 2014; Wen *et al.*, 2023). A growing body of empirical evidence also supports this theoretical proposition by demonstrating that trade openness enhances economic performance through greater industrial competitiveness, technology transfer, and more efficient allocation of productive resources (Elfaki *et al.*, 2021; Nam & Ryu, 2024; Tahir *et al.*, 2026). Nevertheless, the magnitude of these benefits depends on countries' structural characteristics, institutional quality, and their capacity to absorb external knowledge and technologies, suggesting that the growth effects of trade openness are heterogeneous across economies (Siregar & Widjanarko, 2022; Putra *et al.*, 2025; Bouattour *et al.*, 2026).

Recent empirical evidence generally supports this theoretical proposition, although the magnitude and direction of the relationship vary across countries. Using a broad sample of developing countries, Nam and Ryu (2024) show that trade openness promotes economic growth, but the effect depends on the level of economic development and structural characteristics. Similarly, Wen *et al.*, (2023) demonstrate that the growth-enhancing effect of economic openness becomes stronger when

supported by innovation capacity and appropriate public policies, suggesting that trade alone is insufficient to generate sustained economic growth without complementary domestic conditions. Consistent with these findings, Tahir *et al.*, (2026) report that trade openness, together with foreign direct investment, significantly stimulates industrial growth across ASEAN economies, highlighting the complementary role of international integration and domestic productive capacity. Furthermore, Bouattour *et al.*, (2026) reveal that the relationship between trade openness and economic growth is nonlinear, implying that the benefits of trade integration vary according to countries' economic structures and stages of development. Evidence from Indonesia also supports the positive role of trade openness while emphasizing the importance of domestic conditions. Elfaki *et al.*, (2021) find that trade openness contributes positively to Indonesia's economic growth alongside industrialization, financial development, and energy consumption, whereas Putra *et al.*, (2025) confirm a positive long-run relationship between trade openness and economic growth. Collectively, these studies suggest that the growth effects of trade openness are conditional rather than universal, depending on the interaction between external trade integration and domestic economic fundamentals.

For Indonesia, the role of trade openness is particularly important because the economy relies heavily on commodity exports, manufactured products, and imported production inputs, making international trade a key determinant of economic performance and structural transformation (Elfaki *et al.*, 2021; Putra *et al.*, 2025). According to the World Bank (2024), strengthening trade competitiveness, promoting export diversification, and increasing domestic value added are essential components of Indonesia's long-term development strategy toward Vision 2045. In addition, empirical evidence indicates that exports, imports, and trade openness have made important contributions to Indonesia's economic growth, although their impacts vary depending on macroeconomic conditions, industrial development, and trade composition (Hodijah & Angelina, 2021; Millia *et al.*, 2021; Suryandaru, 2023). However, the benefits of trade depend not only on increasing trade volumes but also on improving productivity, accelerating industrial upgrading, fostering technological innovation, and strengthening the integration of domestic industries into global value chains (Wen *et al.*, 2023; Nam & Ryu, 2024; Tahir *et al.*, 2026). Consequently, policies aimed at expanding international trade should be accompanied by measures that enhance domestic productive capacity and technological capabilities to ensure that the gains from trade translate into sustainable long-term economic growth (Siregar & Widjanarko, 2022; Bouattour *et al.*, 2026).

Given that trade openness is represented by both exports and imports, each component may influence economic growth through different transmission mechanisms. Exports primarily stimulate growth by expanding external demand, generating foreign exchange earnings, promoting economies of scale, and enhancing productivity through learning-by-exporting, whereas imports contribute by supplying capital goods, intermediate inputs, and advanced technologies that support industrial production and technological upgrading (Ali *et al.*, 2023; Elfaki *et al.*, 2021; Millia *et al.*, 2021). At the same time, the economic effects of imports depend on their composition, as productive imports are more likely to enhance domestic output than imports dominated by final consumption goods (Hodijah & Angelina, 2021; Nopiana *et al.*, 2022). Consequently, analyzing exports and imports separately provides a clearer understanding of the distinct channels through which international trade influences Indonesia's economic performance and avoids masking potentially heterogeneous effects that may arise when trade openness is measured solely as an aggregate indicator (Putra *et al.*, 2025; Nam & Ryu, 2024; Juniarti & Septriani, 2024). Such an approach is particularly relevant for Indonesia, where export- and import-related activities play different roles in supporting economic growth, industrial development, and integration into global value chains (Bank, 2024; Tahir *et al.*, 2026).

2.2 Export and Economic Growth

Export-led Growth (ELG) theory argues that exports stimulate economic growth by increasing aggregate demand, expanding production capacity, improving economies of scale, and encouraging firms to



become more competitive through exposure to international markets (Anoruo & Ahmad, 2000; Yusoff & Febrina, 2014). Export-oriented firms also benefit from the learning-by-exporting mechanism, whereby participation in global markets enhances productivity through technological learning, knowledge spillovers, innovation, and improvements in managerial capabilities (Wen *et al.*, 2023; Nam & Ryu, 2024). In addition, sustained export expansion generates foreign exchange earnings that enable countries to finance imports of capital goods and advanced technologies, further strengthening industrial competitiveness and long-term economic growth (Ali *et al.*, 2023; Tahir *et al.*, 2026). Empirical evidence from Indonesia supports this theoretical perspective, showing that export growth contributes positively to economic performance, particularly when accompanied by industrial development, financial deepening, and technological upgrading (Elfaki *et al.*, 2021; Millia *et al.*, 2021; Hodijah & Angelina, 2021). Nevertheless, the magnitude of the export-led growth effect depends on the level of domestic value added embodied in exports, productive capacity, and the extent to which export-oriented industries are integrated with domestic supply chains rather than relying heavily on imported intermediate inputs (Putra *et al.*, 2025; Siregar & Widjanarko, 2022).

Nevertheless, export expansion does not automatically generate higher economic growth. The economic contribution of exports depends on the domestic value added embodied in exported products, the degree of industrial diversification, and the capacity of domestic firms to absorb and utilize technological knowledge acquired through international trade (Wen *et al.*, 2023; Nam & Ryu, 2024). When export growth is driven primarily by commodity price increases or relies heavily on imported intermediate inputs, the domestic multiplier effect may be limited because a substantial share of export earnings leaks abroad through import dependence rather than stimulating domestic production and employment (Elfaki *et al.*, 2021; Putra *et al.*, 2025). Likewise, economies with a narrow export base concentrated in primary commodities may experience weaker and more volatile growth effects than those exporting higher value-added manufactured products (Siregar & Widjanarko, 2022; Tahir *et al.*, 2026). Empirical evidence also indicates that the relationship between exports and economic growth is heterogeneous across countries and periods, reflecting differences in economic structure, institutional quality, technological capabilities, and policy environments (Bouattour *et al.*, 2026; Nam & Ryu, 2024). Consequently, the extent to which export expansion translates into sustained economic growth remains an empirical question that must be evaluated within the specific economic context of each country (Millia *et al.*, 2021; Hodijah & Angelina, 2021).

Empirical evidence on Indonesia also produces mixed findings. Millia *et al.*, (2021) report that exports positively contribute to Indonesia's economic growth in both the short and long run. Likewise, Hodijah and Angelina (2021) find that export performance plays an important role in supporting national economic growth. In contrast, studies employing different data frequencies and measurements of trade openness obtain different conclusions. Putra *et al.*, (2025), for example, use aggregate trade openness indicators and identify a positive long-run relationship, indicating that empirical results are sensitive to model specification and variable measurement. Considering the theoretical arguments and previous empirical findings, exports are expected to contribute positively to Indonesia's real economic output.

H1: Exports have a positive effect on Indonesia's real Gross Domestic Product (GDP).

2.3 Import and Economic Growth

Unlike exports, the effect of imports on economic growth is theoretically more complex. In the national income identity, imports are deducted from gross domestic product because they represent foreign production. However, this accounting treatment does not imply that imports reduce economic growth. A substantial proportion of imports consists of capital goods, machinery, intermediate inputs, and advanced technologies that improve production efficiency, facilitate technological upgrading, stimulate innovation, and increase domestic productive capacity (Elfaki *et al.*, 2021; Millia *et al.*, 2021). From the perspective of endogenous growth theory, imports provide access to superior technologies, advanced

production processes, and high-quality intermediate inputs that are unavailable domestically, thereby enhancing productivity, knowledge diffusion, and long-term economic growth (Wen *et al.*, 2023; Nam & Ryu, 2024).

Moreover, imports of capital and intermediate goods enable firms to integrate into global value chains and improve industrial competitiveness, particularly in developing economies undergoing structural transformation (Tahir *et al.*, 2026; Ali *et al.*, 2023). Conversely, excessive dependence on imported consumer goods may substitute for domestic production, weaken industrial competitiveness, reduce domestic value creation, and increase vulnerability to external shocks (Hodijah & Angelina, 2021; Nopiana *et al.*, 2022). Consequently, the overall impact of imports on economic growth depends largely on import composition, the technological intensity of imported goods, and the extent to which imports complement rather than replace domestic production activities (Siregar & Widjanarko, 2022; Putra *et al.*, 2025). This perspective explains why empirical studies often report mixed findings regarding the import–growth relationship, suggesting that imports can either stimulate or constrain economic growth depending on the structural characteristics and productive capacity of the domestic economy (Bouattour *et al.*, 2026; Suryandaru, 2023).

Previous studies also provide inconsistent evidence regarding the impact of imports on Indonesia's economic growth. Millia *et al.*, (2021) find that imports contribute positively because they supply productive inputs required by domestic industries. Hodijah and Angelina (2021) similarly report that imports are associated with economic growth, particularly when imported goods support production activities. However, these relationships remain sensitive to economic conditions, sample periods, and empirical specifications, indicating that further investigation using more recent data is necessary. Given Indonesia's reliance on imported capital goods and intermediate inputs, productive imports are expected to support domestic economic activity.

H2: Imports have a positive effect on Indonesia's real Gross Domestic Product (GDP).

3. Research Method

This study employs a quantitative explanatory research design using a time-series approach to examine the relationship between international trade and economic growth in Indonesia. The unit of analysis is the Indonesian economy, while the unit of observation consists of quarterly macroeconomic data. The study utilizes a census (total sampling) approach by including all available observations on exports, imports, and real Gross Domestic Product (GDP) during the study period. The final dataset comprises 45 quarterly observations covering the period from the first quarter of 2015 to the first quarter of 2026.

Secondary data were obtained from the official publications of Statistics Indonesia (Badan Pusat Statistik—BPS), which provide consistent and nationally representative macroeconomic statistics. Real GDP is used as a proxy for economic growth, while exports and imports represent the components of trade openness. The quarterly frequency enables the analysis to capture short-term economic dynamics and seasonal fluctuations that may not be observable in annual data.

To estimate both the short-run and long-run relationships among the variables, this study applies the Autoregressive Distributed Lag (ARDL) model proposed by Kripfganz and Schneider (2023). The ARDL approach is particularly appropriate because it can be applied to variables with mixed orders of integration, provided that none of the variables is integrated of order two, $I(2)$. The empirical analysis consists of descriptive statistics, Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests, optimal lag selection based on the Akaike Information Criterion (AIC), bounds testing for cointegration, and short-run dynamic estimation through the selected ARDL specification.

Table 1. Operational definitions and data sources

Variable	Operational Definition	Unit of Measurement	Source
 Real GDP	The total value of final goods and services produced in Indonesia measured at constant 2010 prices.	Billion Indonesian Rupiah per quarter	Statistics Indonesia (BPS)
 Exports	The value of goods sold from Indonesia to foreign countries, recorded on a Free on Board (FOB) basis.	Million US dollars per quarter	Statistics Indonesia (BPS)
 Imports	The value of goods entering Indonesia from foreign countries, recorded on a Cost, Insurance, and Freight (CIF) basis.	Million US dollars per quarter	Statistics Indonesia (BPS)

Notes: FOB = Free on Board; CIF = Cost, Insurance, and Freight.

Source: Statistics Indonesia (Badan Pusat Statistik, BPS).

Monthly export and import data were aggregated into quarterly values because both variables represent flow measures. Prior to the analysis, the dataset was screened to ensure consistency in variable definitions, chronological ordering, measurement units, and duplicate observations. No missing values were identified across the 45 quarterly observations. In addition, real Gross Domestic Product (GDP) was measured at constant 2010 prices rather than current prices to ensure that the estimated relationships reflect changes in real economic activity rather than price fluctuations (Statistics Indonesia, 2025, 2026). To reduce scale differences, stabilize variance, and facilitate elasticity interpretation, all variables were transformed into natural logarithms, denoted as LNGDP, LNEXP, and LNIMP. The baseline empirical model is specified as follows: $LNPDB_t = 0 + 1LNEXP_t + 2LNIMP_t + t$.

The empirical analysis employs the Autoregressive Distributed Lag (ARDL) approach because quarterly macroeconomic data generally exhibit dynamic intertemporal dependence. Moreover, the ARDL framework is appropriate for estimating both short-run and long-run relationships when the variables are integrated of order zero, $I(0)$, order one, $I(1)$, or a combination of both, provided that none of the variables is integrated of order two, $I(2)$ (Kripfganz & Schneider, 2023).

The analytical procedure consists of several stages. First, descriptive statistics are reported to summarize the characteristics of the variables. Second, stationarity is examined using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. Third, the optimal lag length is selected using the Akaike Information Criterion (AIC), with a maximum lag of four quarters to capture annual dynamics. Fourth, the ARDL Bounds Test is employed to determine the existence of a long-run equilibrium relationship among the variables. For relatively small samples, the use of adjusted critical values or bootstrap procedures may improve the reliability of the bounds test (Bertelli *et al.*, 2022). Fifth, once the optimal model is identified, short-run dynamics are estimated through the ARDL specification.

The ARDL model is usually written as follows: $LNPDB_t = 0 + \sum_{i=1}^p \alpha_i LNPDB_{t-i} + \sum_{j=1}^q \beta_j LNEXP_{t-j} + \sum_{k=1}^r \gamma_k LNIMP_{t-k} + 2Q2_t + 3Q3_t + 4Q4_t + \epsilon_t$. To control for seasonal patterns, the first quarter is used as the reference category. To assess the long-run relationship, the F-bounds test statistic is used. If the F statistic is less than the lower bound $I(0)$, the hypothesis of no level relationship is not rejected; conversely, if the F statistic is greater than the upper bound $I(1)$, evidence of cointegration is found. The

coefficients of changes in imports and exports are used to measure the short-run effects. The hypothesis decision is made based on a 5% significance level.

The existence of a long-run relationship is evaluated using the Bounds Test. The null hypothesis of no level relationship is rejected when the F-statistic exceeds the upper critical bound, whereas it cannot be rejected when the F-statistic falls below the lower critical bound. The short-run effects of exports and imports are assessed from the estimated dynamic coefficients, and all statistical inferences are conducted at the 5% significance level. Finally, a series of diagnostic tests is performed to evaluate model adequacy. Residual normality is assessed using the Jarque–Bera test, serial correlation is examined through the Breusch–Godfrey LM test, heteroskedasticity is tested using the Breusch–Pagan/Cook–Weisberg test, functional form misspecification is evaluated with the Ramsey RESET test, and parameter stability is examined using the CUSUM stability test. To ensure robust statistical inference in the presence of potential heteroskedasticity, heteroskedasticity-consistent HC1 robust standard errors are reported.

4. Results and Discussion

The dataset comprises 45 complete quarterly observations covering the period from the first quarter of 2015 to the first quarter of 2026. Throughout the sample period, real Gross Domestic Product (GDP) exhibits a generally upward trend, interrupted by a pronounced contraction during the COVID-19 pandemic in 2020 before recovering in subsequent periods. In contrast, exports and imports display considerably greater volatility, reflecting fluctuations in global demand, commodity prices, and international trade conditions during both the economic downturn and the post-pandemic recovery. The descriptive statistics of the study variables are presented in Table 2.

Table 2. Descriptive statistics of research variables

Variable	N	Mean	Standard Deviation	Minimum	Maximum	KV
PDB riil (billion rupiah)	45	2.789.079,18	362.405,74	2.158.040,00	3.474.461,20	12,99%
Ekspor (million US\$)	45	52.776,18	14.202,87	33.710,70	78.107,90	26,91%
Impor (million US\$)	45	47.389,16	10.507,40	31.734,10	65.535,70	22,17%

Source: Processed research data, 2026.

The coefficient of variation of GDP is the lowest, while exports are the highest. Exports exceed imports by an average of US\$5,387.02 million each month. Imports were lowest in the second quarter of 2020, while exports were highest in the third quarter of 2022. Logarithmic correlations are 0.872 between GDP and exports, 0.871 between GDP and imports, and 0.957 between exports and imports. Because all variables show a trend, a high correlation cannot yet be considered an influence.

All variables are non-stationary, according to the unit root test. After the first differentiation, exports and imports are stagnant at the 1% level according to the ADF and PP, and the first significant GDP differentiation is at 10% according to the ADF and 1% according to PP. Because no I(2) variables were found, the ARDL analysis can be continued.

Table 3. Stationarity Test Result

Variable	Level	ADF (Test Statistic)	p-value ADF	PP (Test Statistic)	p-value PP	Conclusion
LNPDDB	Level	-0.127	0.947	-0.924	0.780	Non-stationary
	First difference (Δ)	-2.777	0.062	-8.242	<0.001	Stationary
LNEXP	Level	-0.937	0.776	-0.847	0.805	Non-stationary
	First difference (Δ)	-4.974	<0.001	-5.587	<0.001	Stationary
LNIMP	Level	-1.314	0.623	-0.895	0.790	Non-stationary
	First difference (Δ)	-5.019	<0.001	-5.993	<0.001	Stationary

Notes: ADF = Augmented Dickey-Fuller test; PP = Phillips-Perron test; Δ = first difference.

Source: Processed research data, 2026.

The optimal model specification was selected using the Akaike Information Criterion (AIC), resulting in an ARDL (1,4,1) model, which includes one lag of real GDP, four lags of exports, and one lag of imports. The estimated model is based on 41 effective quarterly observations after accounting for the selected lag structure. The model exhibits a high goodness-of-fit, with an adjusted R^2 of 0.987, indicating that the explanatory variables account for a substantial proportion of the variation in real GDP. However, the adjusted R^2 is not interpreted as the primary indicator of model adequacy because time-series regressions estimated in levels often produce high coefficients of determination due to common stochastic trends rather than genuine economic relationships. Consequently, the validity of the empirical findings is assessed primarily through the ARDL Bounds Test for long-run cointegration, together with residual diagnostic tests and parameter stability tests, which provide more reliable evidence regarding the existence and robustness of the estimated relationships.

Table 4. Model summary and ARDL bounds test

Indicator	Value
Model specification	ARDL (1,4,1)
Effective observations	41
Adjusted R^2	0.987
F-statistic (model)	376.646; $p < 0.001$
Bounds test F-statistic	1.737
Lower bound (5%)	4.135
Upper bound (5%)	5.276

Notes: ARDL = Autoregressive Distributed Lag. The bounds critical values are from Pesaran, Shin, and Smith (2001) for a model with an intercept and no trend.

Source: Processed research data, 2026.

The ARDL Bounds Test produces an F-statistic of 1.737, which is below the 5% lower critical bound of 4.135. Accordingly, the null hypothesis of no long-run relationship cannot be rejected, indicating that there is no evidence of a stable long-run equilibrium relationship among real Gross Domestic Product (GDP), exports, and imports during the study period. Consequently, the long-run coefficients and the associated error-correction mechanism are not interpreted, as the prerequisite for estimating a valid long-run equilibrium relationship is not satisfied. The short-run dynamic estimates further indicate that changes in exports, both contemporaneously and across the first three lagged periods, do not exert a statistically significant effect on real GDP. Similarly, changes in imports are not

statistically significant in explaining short-run economic growth. In contrast, the seasonal dummy variables reveal significant quarterly effects. The coefficients for the second quarter (Q2) and third quarter (Q3) are positive and statistically significant, suggesting the presence of systematic seasonal fluctuations in Indonesia's economic activity. However, the coefficient for the fourth quarter (Q4) is statistically insignificant, indicating that GDP growth in the fourth quarter does not differ significantly from the reference period (the first quarter).

Table 5. Short-term dynamics estimation

Variable	Coefficient	SE (HC1)	p-value	95% Confidence Interval
$\Delta LNEXP_t$	0,0739	0,0622	0,244	-0,053 to 0,201
$\Delta LNEXP_{t-1}$	-0,0675	0,0434	0,130	-0,156 to 0,021
$\Delta LNEXP_{t-2}$	-0,0172	0,0313	0,587	-0,081 to 0,047
$\Delta LNEXP_{t-3}$	-0,0587	0,0405	0,158	-0,142 to 0,024
$\Delta LNIMP_t$	0,0602	0,0520	0,256	-0,046 to 0,167
Dummy quarter II	0,0325	0,0082	<0,001	0,016 to 0,049
Dummy quarter III	0,0217	0,0102	0,042	0,001 to 0,042
Dummy quarter IV	-0,0050	0,0091	0,586	-0,023 to 0,013

Notes: SE (HC1) = Heteroskedasticity-consistent standard error (HC1); 95% Confidence Interval (CI) reported.

Source: Processed research data, 2026.

To assess the joint short-run effects of trade variables, Wald tests were conducted for the export and import coefficients. The joint significance test for the contemporaneous and lagged changes in exports yielded a Wald statistic of 4.516 with a p-value of 0.341, indicating that the export coefficients are not jointly statistically significant. Similarly, the Wald test for changes in imports produced a test statistic of 1.343 with a p-value of 0.246, suggesting that imports also do not exert a statistically significant short-run effect on real GDP. Because both p-values exceed the 5% significance level, the null hypothesis that the short-run coefficients are jointly equal to zero cannot be rejected. These findings indicate that neither exports nor imports have a statistically significant short-run impact on Indonesia's real Gross Domestic Product during the study period.

Table 6. Model diagnostic test

Test	Statistic	p-value	Conclusion
Jarque-Bera	5.516	0.063	Residuals are normally distributed at the 5% level
Breusch-Godfrey, lag 4	7.119	0.130	No evidence of autocorrelation
Breusch-Pagan	21.659	0.027	Evidence of heteroskedasticity
Ramsey RESET	1.157	0.291	Functional form is adequate
CUSUM	Within 5% bounds	—	Parameters are relatively stable

Notes: p-values are based on the respective test statistics.

Source: Processed research data, 2026.

The diagnostic test results indicate that the estimated ARDL model satisfies the key assumptions required for reliable statistical inference. The Breusch–Godfrey LM test provides no evidence of serial

correlation, while the Ramsey RESET test suggests that the model is correctly specified, indicating no functional form misspecification. Furthermore, the CUSUM stability test shows that all cumulative recursive residuals remain within the 5% critical bounds, confirming that the estimated parameters are stable throughout the sample period. The Jarque–Bera test also indicates that the residuals are approximately normally distributed at the 5% significance level. The Breusch–Pagan test, however, detects the presence of heteroskedasticity. To address this issue and ensure valid statistical inference, all coefficient estimates, hypothesis tests, and 95% confidence intervals are reported using HC1 heteroskedasticity-consistent robust standard errors. Consequently, the statistical significance of the estimated coefficients remains robust despite the presence of heteroskedasticity.

4.2. Discussion

4.2.1 Main Findings

The empirical results reveal a clear distinction between descriptive associations and econometric relationships. Although real GDP, exports, and imports exhibit strong positive correlations in their level series, these associations disappear once non-stationarity, lag structures, and seasonal effects are taken into account. The ARDL Bounds Test indicates the absence of a long-run equilibrium relationship among the variables, while the short-run estimates show that neither exports nor imports exert statistically significant effects on Indonesia's real GDP. These findings suggest that the co-movement of macroeconomic variables over time should not be interpreted as evidence of a stable causal relationship.

4.2.2 Why Do Exports Not Stimulate GDP?

The insignificant effect of exports suggests that increases in Indonesia's aggregate export value do not necessarily translate into higher real economic output. Several explanations may account for this result. First, exports are measured in current US dollars, whereas real GDP is expressed in constant 2010 Indonesian rupiah. Consequently, fluctuations in international commodity prices or exchange rates may increase export values without reflecting corresponding increases in production volume. Second, the economic benefits of exports depend critically on domestic value added. Exports relying heavily on imported intermediate inputs generate smaller domestic multiplier effects than exports produced largely through domestic production networks. Third, Indonesia's aggregate exports comprise heterogeneous sectors—including commodities and manufactured products—with substantially different productivity levels and domestic backward linkages. Aggregating these sectors may obscure sector-specific contributions to economic growth.

These findings therefore do not invalidate the export-led growth hypothesis. Rather, they suggest that export-led growth is conditional upon complementary factors such as productivity improvement, industrial upgrading, technological innovation, and stronger domestic supply chains. This interpretation is consistent with Wen *et al.*, (2023), who argue that innovation serves as a critical transmission channel through which trade openness contributes to economic growth. Since innovation is not explicitly incorporated into the present model, the direct impact of exports is likely to be underestimated.

4.2.3 Why Are Imports Also Insignificant?

The insignificant coefficient for imports reflects the dual nature of imports in developing economies. On the one hand, imports of capital goods, machinery, intermediate inputs, and advanced technologies enhance productive capacity and improve long-term productivity. On the other hand, imports of final

consumer goods may substitute domestic production and reduce domestic value creation. When these heterogeneous categories are aggregated, their positive and negative effects may offset each other, producing an overall insignificant coefficient.

Moreover, the productivity gains associated with imported capital goods often materialize only after installation, technological adaptation, and production adjustment, implying that their economic effects may occur beyond the contemporaneous quarter captured in the model. The very high correlation between exports and imports also reflects Indonesia's integration into global value chains, where export production frequently depends on imported intermediate inputs. Such interdependence makes it difficult to isolate the individual contribution of each trade component, particularly within a relatively small quarterly sample.

Accordingly, these results should not be interpreted as evidence that imports are economically unproductive. Rather, they indicate that aggregate imports do not constitute a statistically significant short-run predictor of Indonesia's real GDP under the current empirical specification.

4.2.4 Comparison with Previous Studies

The present findings differ from those reported by Millia *et al.*, (2021), who document positive short-run and long-run effects of exports and imports on Indonesia's economic growth. These differences are likely attributable to variations in sample periods, data frequency, model specification, and the inclusion of the COVID-19 pandemic and subsequent recovery within the present study. The period 2015–2026 encompasses unprecedented disruptions in global trade, commodity prices, and supply chains, potentially weakening the conventional relationship between trade and output.

Similarly, Putra *et al.*, (2025) report a positive long-run effect of aggregate trade openness using annual data spanning 1984–2023. Unlike their study, the present research employs quarterly observations and estimates exports and imports separately. Differences in data frequency, variable measurement, and econometric specification may therefore explain the contrasting conclusions. These comparisons reinforce the notion that the trade–growth relationship is highly context-dependent and sensitive to methodological choices.

4.2.5 Theoretical and Policy Implications

The findings support the view that trade openness should be regarded as an enabling condition rather than a sufficient determinant of economic growth. Consistent with Nam and Ryu (2024), the growth effects of trade depend on domestic industrial capability, technological readiness, and policy quality. Expanding trade volumes alone is unlikely to generate sustained economic growth unless accompanied by higher domestic value added, productivity enhancement, and stronger integration between international trade and domestic production.

From a policy perspective, the results suggest that Indonesia should shift its focus from increasing the volume of trade toward improving the quality of trade. Export policies should prioritize industrial upgrading, downstream processing, diversification, and stronger domestic supplier participation to maximize domestic value creation. Likewise, import policies should distinguish between productive imports—such as capital goods, machinery, and intermediate inputs—and final consumer goods. Trade policy should therefore be closely integrated with industrial, innovation, investment, logistics, and human capital policies to strengthen the domestic production base and enhance the long-term contribution of international trade to economic growth.

5. Conclusion

This study examined the effects of exports and imports on Indonesia's real Gross Domestic Product (GDP) using quarterly data from the first quarter of 2015 to the first quarter of 2026 within the Autoregressive Distributed Lag (ARDL) framework. The empirical findings indicate that neither exports nor imports exert statistically significant short-run effects on real GDP, while the ARDL Bounds Test provides no evidence of a stable long-run equilibrium relationship among the variables. These results suggest that aggregate trade values alone are insufficient to explain Indonesia's economic growth during the study period. Rather than implying that international trade is unimportant, the findings indicate that the growth-enhancing effects of trade are conditional on domestic economic fundamentals. The contribution of exports depends on the extent of domestic value added, productivity, industrial upgrading, and export composition, whereas the impact of imports varies according to whether imported goods serve as productive inputs or final consumption goods. The significant seasonal effects further suggest that domestic economic conditions remain an important source of fluctuations in Indonesia's real output.

This study contributes to the literature by providing updated evidence based on recent quarterly data and by demonstrating the importance of distinguishing simple correlations from econometric relationships after accounting for non-stationarity, dynamic adjustments, and seasonal effects. The findings also imply that trade policy should emphasize improving the quality of trade through export diversification, downstream industrial development, higher domestic value added, and selective imports that strengthen productive capacity rather than focusing solely on expanding trade volumes.

Several limitations should be acknowledged. The analysis is based on aggregate export and import values and a relatively short quarterly sample, while other important determinants of economic growth—such as investment, government expenditure, exchange rates, productivity, and innovation—are not explicitly incorporated into the model. Future research may extend the analysis by employing disaggregated trade data, incorporating additional macroeconomic variables, and exploring sectoral or causal relationships to provide a more comprehensive understanding of the trade-growth nexus in Indonesia.

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