

12-03-2026

The symmetric effects of inflation, exchange rates, and international trade on Indonesia's balance of payments 2015-2024 based on ARDL

Dyah Ayu Setianingrum, Rachel Dwitya Angellita, Priyagung Jati Pamungkas, Anzar Alfat Firdaus, Ratna Setyawati Gunawan

To cite this article: Setianingrum, D. A., Angellita, R. D., Pamungkas, P. J., Firdaus, A. A., & Gunawan, R. S. (2026). The symmetric effects of inflation, exchange rates, and international trade on Indonesia's balance of payments 2015–2024 based on ARDL. *Priviet Social Sciences Journal*, 6(3), 281-303. <https://doi.org/10.55942/pssj.v6i3.1111>

To link to this article: <https://doi.org/10.55942/pssj.v6i3.1111>



Follow this and additional works at: <https://journal.privietlab.org/index.php/PSSJ>
Priviet Social Sciences Journal is licensed under a Creative Commons Attribution 4.0 International License.

This PSSJ: Original Article is brought to you for free and open access by Privietlab. It has been accepted for inclusion in Priviet Social Sciences Journal by an authorized editor of Privietlab Journals

Full Terms & Conditions of access and use are available at <https://journal.privietlab.org/index.php/PSSJ/about>



The symmetric effects of inflation, exchange rates, and international trade on Indonesia's balance of payments 2015-2024 based on ARDL

Dyah Ayu Setianingrum, Rachel Dwitya Angellita, Priyagung Jati Pamungkas, Anzar Alfat Firdaus^{ID}, Ratna Setyawati Gunawan^{ID}

¹Development Economics, Faculty of Economics and Business, Jenderal Soedirman University, Purwokerto, Central Java, Indonesia
*e-mail: dyah.setianingrum@mhs.unsoed.ac.id

Received 22 November 2025
Revised 2 February 2026
Accepted 11 March 2026

ABSTRACT

This research utilizes the Autoregressive Distributed Lag (ARDL) approach to examine the symmetrical effects of inflation, exchange rates, and international trade on Indonesia's balance of payments over the period from 2015 to 2024. Amidst global economic instability, exacerbated by the US-China trade war, the persistent pandemic COVID-19, and ongoing geopolitical tensions, the Republic of Indonesia faces significant challenges in maintaining its external balance. This study employs quarterly time series secondary data sourced from Bank Indonesia, Statistics Indonesia (BPS), and the Ministry of Trade. The long-run estimation results indicate a negative correlation between inflation and the balance of payments, with a coefficient of -3468.811 ($p=0.059$). This means that if inflation goes up a lot, it could make the country's external position worse. The export coefficient, at 2.4342 ($p=0.000$), indicates a substantial positive impact, whereas the import coefficient, at -2.5669 ($p=0.000$), signifies a considerable negative effect. The exchange rate's long-term influence appears relatively weak, as evidenced by a coefficient of -0.635 ($p=0.082$). Short-run estimations reveal that the error correction term (ECT) coefficient is -0.9766 ($p=0.000$), suggesting a rapid convergence towards long-run equilibrium. These findings carry significant implications for Indonesian economic policy, particularly concerning inflation control and export promotion, both of which are essential for maintaining external stability. Consequently, to enhance the long-term balance of payments, the implementation of prudent monetary and trade policies that foster export expansion while managing import levels is crucial.

Keywords: ARDL; balance of payments; exchange rate; international trade

priviet lab.
RESEARCH & PUBLISHING



1. INTRODUCTION

From 2015 to 2024, the global trading system underwent considerable shifts, driven by a surge in protectionism, escalating geopolitical tensions, and fundamental changes in trade policy structures. The United States-China trade war, commenced in 2018, imposed tariffs on more than \$350 billion of bilateral commerce and provoked retaliatory actions that impacted global supply chains (Bown & Kolb, 2018; Fajgelbaum & Khandelwal, 2022). Recent geopolitical tensions, notably the Russia-Ukraine conflict commencing in February 2022 and the Israel-Palestine escalation in October 2023, have exacerbated disruptions in commodity flows, especially within energy, food, and raw materials markets, leading to considerable price volatility and alterations in trade routes (Beeson & Stubbs, 2012; UNCTAD, 2023). Emerging economies such as Indonesia face significant hurdles in sustaining balance of payments equilibrium within a fragmented and unpredictable international trade landscape due to external shocks.

Indonesia's policy reaction to these global developments has been notably substantial. From 2015 to 2024, President Joko Widodo's administration enacted 15 significant non-tariff measures (NTMs) impacting trade relations with 127 partner nations, designed to safeguard domestic industries, enhance export diversification, and diminish import reliance in critical sectors (UNCTAD, 2018; Tritto, 2026). This strategy has mostly focused on an assertive downstream policy, especially in the extractive and commodities industries. The most notable instance is the incremental ban on nickel exports. Indonesia enacted a prohibition on unprocessed nickel ore exports in 2020, compelling foreign purchasers to invest in local smelting and refining operations, thereby converting Indonesia from a raw material exporter into a producer of processed nickel and battery precursors (Hamdani, 2023; Hati et al., 2024). Similar downstreaming programs were implemented for bauxite, tin, and coal, alongside local content mandates in manufacturing and import licensing constraints on consumer goods. While designed to enhance Indonesia's trade balance, generate value-added employment, and strengthen industrial competitiveness, these policies have generated complex and potentially contradictory effects on exchange rates, inflation, and overall balance of payments dynamics that require systematic empirical investigation (Warburton, 2017; Lazuardi et al., 2024).

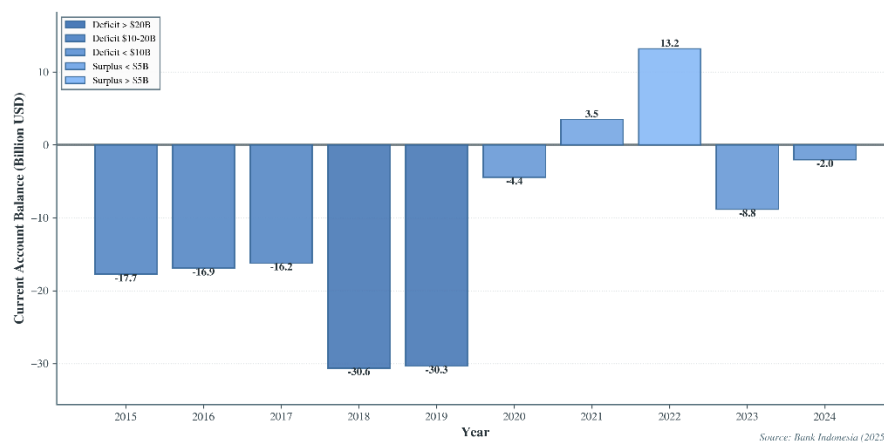


Figure 1. Indonesia's Balance of Payments Fluctuation 2015-2024

In Figure 1 Indonesia's balance of payments has demonstrated significant volatility during this period, indicative of foreign pressures and domestic policy modifications. The current account balance transitioned from a deficit of 2.98% of GDP in 2018 to a surplus of 0.4% in 2021, attributed to pandemic-induced import contraction, before recovering to a deficit of 1.0% of GDP by the conclusion of 2023 (Bank Indonesia, 2024a). This volatility has corresponded with significant exchange rate fluctuations, when the rupiah declined by around 28% against the US dollar from mid-2018 to March 2020, reaching IDR 16,367 per dollar, although it has subsequently stabilized

within the IDR 15,000-15,500 range (Bank Indonesia, 2024b). Inflationary pressures have varied, reaching a peak of 5.95% year-on-year in September 2022, the highest since 2015 due to global commodity price increases and supply chain disruptions, before decreasing to 2.61% by December 2023 (BPS, 2024). Comprehending the interaction of these macroeconomic variables amid changing trade policy frameworks and geopolitical uncertainty is crucial for preserving Indonesia's external stability and fostering sustainable economic growth in a progressively protectionist global landscape. Meanwhile, the emergence of the COVID-19 pandemic caused major disruptions to global supply chains, which directly affected Indonesia's international trade volume. Indonesia continues to be involved in bilateral and regional free trade agreements, the economic benefits of which are still under debate (Xu et al., 2020). Simulation studies show that some FTAs can have positive outcomes for Indonesia (Cali et al., 2019).

The link between exchange rates and trade balance remains a prominent emphasis in international economics, with the Marshall-Lerner condition providing the underlying theoretical framework. This condition indicates that currency depreciation improves the trade balance only when the sum of price elasticities of export and import demand exceeds unity. Recent empirical studies indicate that this relationship has become increasingly intricate in the contemporary global economy. A recent study by Bussière et al. (2020) and Adler, Meleshchuk, Buitron, et al. (2019) indicates that the efficacy of exchange rate fluctuations has significantly diminished in the context of global value chains and the dominance of dollar invoicing. The intricacies of intermediate products trade and currency pass-through hinder the traditional expenditure-switching mechanism, rendering exchange rate regulation less efficacious than previously expected (Ocampo-Gaviria et al., 2023; Nopeline et al., 2024).

The inflation and trade balance nexus occurs through several interrelated routes that affect both export competitiveness and import demand. The purchasing power parity paradigm argues that rising domestic inflation erodes international price competitiveness by raising the relative pricing of domestically produced goods. Recent empirical research by Umaru et al. (2019) indicates that sustained inflation differentials significantly influence real exchange rates and trade performance in emerging economies. Caldara et al. (2019) illustrate that inflation volatility inhibits commerce by elevating uncertainty and transaction costs, especially in developing economies. Nonetheless, studies examining the concurrent effects of inflationary pressures, currency exchange rate fluctuations, and disaggregated trade flows are few, particularly during times of increased global protectionism and supply chain disruptions.

Export and import dynamics display complicated patterns that extend beyond simple accounting identities in balance of payments calculation. Export expansion creates foreign exchange earnings that boost the current account, but the quantity depends on export price elasticities, global demand circumstances, and the import content of exports. This is particularly essential for economies connected into global production networks (Furceri et al., 2022; Diep et al., 2024). Import dynamics bring additional complication because imports impair the trade balance directly yet remain crucial for productive capacity and export competitiveness. Recent research on rising Asian economies by Mutreja et al. (2016) underline the need of distinguishing between consumption products, intermediate inputs, and capital goods imports, since each category responds differently to macroeconomic shocks and policy interventions.

Despite a substantial body of scholarship on the drivers of balance of payments, considerable gaps persist in comprehending the dynamics of Indonesia's external balance from 2015 to 2024. Methodologically, the majority of previous research on Indonesia utilize static cointegration approaches or ordinary least squares regression, which inadequately account for short-run dynamics and unequal adjustment processes (Faudzi & Asmara, 2023; Kusuma et al., 2024). These methodologies impose stringent stationarity assumptions and are incapable of differentiating between transient shocks and lasting equilibrium alterations. Existing empirical studies primarily encompass periods concluding prior to 2020, thus overlooking significant structural disruptions such as the COVID-19 pandemic, the global inflation escalation from 2021 to 2023, heightened

US-China strategic rivalry, and commodity market disturbances instigated by the Russia-Ukraine and Middle East conflicts (Beeson & Zeng, 2022; Aizenman et al., 2023). Indonesia's vigorous enactment of 15 non-tariff measures and downstreaming policies from 2015 to 2024 signifies a substantial shift in policy regime, the implications of which on balance of payments dynamics remain unexamined in peer-reviewed scholarly literature.

Theoretically and practically, the interaction mechanisms among inflation, currency rates, and disaggregated trade flows are insufficiently examined in the Indonesian context. Although certain studies investigate bilateral relationships like exchange rates and exports or inflation and imports, few comprehensively model the concurrent interactions among all four variables, considering both short-term adjustment dynamics and long-term equilibrium constraints (Hsing, 2016). This constraint is especially problematic as policy actions in one domain may produce unforeseen repercussions in another. For instance, managing currency rates to enhance exports may induce imported inflation, necessitating a complete multivariate framework for precise evaluation. Moreover, inconsistent results continue to exist about the extent and influence of exchange rate fluctuations on Indonesia's trade balance. Certain studies indicate considerable adverse consequences associated with import dominance (Sugiharti et al., 2020), whereas others identify beneficial effects that endorse export responsiveness (Iqbal et al., 2021), and additional research reveals negligible associations (Fitriani, 2017). These discrepancies provide policymakers with little direction for effective external balance management (Rajkovic, 2020; Salim, 2021).

This analysis explores the symmetric effects of inflation, exchange rates, exports, and imports on Indonesia's balance of payments between 2015Q1-2024Q4, with special focus to structural changes generated by recent global trade policy shifts and geopolitical upheavals. The research covers three key questions. Initially, it examines the long-run equilibrium linkages between inflation, exchange rates, exports, imports, and Indonesia's balance of payments. Next, it analyzes how short-run departures from equilibrium adjust and determines the speed of this adjustment process. Finally, it investigates whether these associations display stability across the research period or whether recent structural changes have affected the underlying dynamics. Based on these questions, researchers are expected to be able to make more accurate assessments of Indonesia's economic status and recommendations for better policies in the future through a deep understanding of how these variables interact with each other. (Hanipah et al., 2023).

This study utilizes the Autoregressive Distributed Lag (ARDL) limits testing methodology established by Pesaran et al. (2001) to rigorously address these inquiries. The ARDL framework provides numerous methodological benefits compared to traditional approaches. Initially, it permits mixed orders of integration, allowing variables to be stationary at levels (I(0)) or after first differencing (I(1)), without necessitating that all variables be cointegrated to the same order. This adaptability circumvents the rigid pre-testing prerequisites of conventional cointegration techniques (Ghouse et al., 2021). The ARDL approach concurrently estimates short-run dynamics via an error correction mechanism and long-run equilibrium connections, offering a comprehensive characterisation of adjustment processes crucial for evaluating policy timing (Shrestha & Bhatta, 2018). Third, ARDL demonstrates consistent reliability with relatively small samples while preserving adequate statistical power, and it explicitly mitigates potential endogeneity using suitable lag structures (Nkoro & Uko, 2016). This study treats exports and imports as distinct explanatory variables instead of merging them into net exports, facilitating the identification of asymmetric responses that would be concealed in aggregated models (Bahmani-Oskooee & Baek, 2016).

Furthermore, this study provides four distinct contributions to the scholarly literature and policy discussions. This study offers present empirical evidence on a period of unparalleled global economic transformation, encompassing pandemic disruption, geopolitical fragmentation, and Indonesia's proactive trade policy measures, which have not been sufficiently examined in previous peer-reviewed literature. This study extends its analysis through 2024 to encompass the complete cycle of shock, adjustment, and recovery. Secondly, it utilizes a methodologically advanced dynamic modeling technique that distinctly differentiates between temporary variations and enduring

changes, mitigates any endogeneity issues, and delivers accurate estimates of adjustment rates essential for formulating prompt policy interventions. The disaggregated analysis of trade flows for a detailed identification of balance of payments determinants, highlighting which elements are most susceptible to policy interventions and which display higher resistance to change. This level of detail is crucial for precise policy formulation. The findings provide actionable policy insights for maintaining external stability amid increasing protectionism and fragmented global governance, thereby affecting Indonesia's trade policy framework, monetary policy approach, and methods for managing external balance (Metaxas & Weber, 2016; Adhikari, 2023) (See Figure 2)

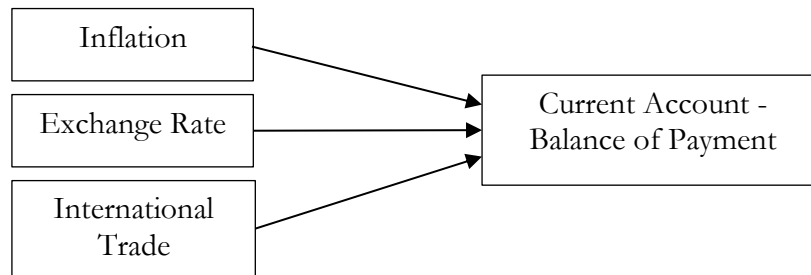


Figure 2. Research Framework

2. METHOD

This study uses a quantitative approach, specifically time series econometric analysis, to examine the symmetrical effects of inflation, exchange rates, and international trade on Indonesia's balance of payments. The analysis uses quarterly secondary data from 2015Q1-2024Q4, yielding 40 observations. This period is significant because it includes the US-China trade conflict (2018-2019), the COVID-19 pandemic (2020-2021), and Indonesia's implementation of 15 non-tariff measures, which affected 127 trading partners, as part of its downstreaming policy. The dependent variable is the current account in balance of payments (CA) measured in millions of US dollars, sourced from Bank Indonesia's Statistics. Independent variables include the exchange rate (ER) representing rupiah per US dollar using the Jakarta Interbank Spot Dollar Rate, inflation rate (INF) calculated as year-on-year percentage change in the Consumer Price Index from Badan Pusat Statistik, exports (EXP) and imports (IMP) measured in millions of US dollars from BPS Foreign Trade Statistics, cross-verified with Ministry of Trade data.

Data were collected systematically through the documentation method, involving the retrieval of macroeconomic statistics from official institutional databases. All data series were cross-verified between multiple sources to ensure reliability before processing. Exchange rates represent quarterly averages of daily rates, while trade values represent quarterly sums of monthly data. The data were standardized for unit consistency and temporal comparability, organized in Microsoft Excel, then processed using EViews 12 software. This systematic approach ensures transparency, reliability, and full replicability.

Based on the source, the data used in this study is a time series (t) with the following long-term and short-term estimation models (ECM-ARDL):

$$CA_t = \beta_0 + \beta_1 ER_t + \beta_2 INF_t + \beta_3 EXP_t + \beta_4 IMP_t + \epsilon_t \dots \dots \dots (1)$$

$$\Delta CA_t = \theta CointEq(-1) + \sum lag\ variabel + \epsilon_t \dots \dots \dots (2)$$

The analytical procedure employs the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001), selected for several methodological advantages over alternative cointegration techniques. Unlike the Johansen cointegration method which requires all variables to be integrated of the same order and is sensitive to small sample sizes, ARDL accommodates mixed integration orders $I(0)$ and $I(1)$ without requiring uniform cointegration

(Ghouse et al., 2021). Compared to the Engle-Granger two-step procedure which estimates long-run and short-run relationships separately and suffers from small sample bias, ARDL simultaneously estimates both relationships through a single reduced-form equation, improving efficiency and avoiding the loss of information inherent in sequential estimation (Nkoro & Uko, 2016). The ARDL framework performs reliably with relatively small sample sizes while maintaining statistical power (Shrestha & Bhatta, 2018), explicitly addresses potential endogeneity concerns through appropriate lag structures that capture dynamic feedback effects (Kripfganz & Schneider, 2023), and provides robust inference even when regressors are not strictly exogenous. These methodological strengths make ARDL particularly suitable for analyzing Indonesia's balance of payments dynamics using the 40 quarterly observations available for this study. The analysis proceeds through interconnected stages ensuring methodological rigor and valid inference.

The analysis begins with stationarity testing using the Augmented Dickey-Fuller (ADF) test to determine each variable's integration order. This step proves essential because ARDL requires variables integrated of order $I(0)$ or $I(1)$ but not $I(2)$ or higher (Nkoro & Uko, 2016). The ADF test examines the null hypothesis of unit root presence against stationarity, with specifications including both constant and trend components. Subsequently, optimal lag length is determined through Vector Autoregression (VAR) estimation using multiple information criteria: Akaike (AIC), Schwarz (SIC), and Hannan-Quinn (HQ). The SIC receives priority due to its consistency property and superior small-sample performance, selecting more parsimonious models that avoid overfitting (Kutu & Ngilawa, 2016). The selected lag serves as the upper bound for ARDL specification, capturing relevant dynamics without consuming excessive degrees of freedom.

Next, the ARDL bounds testing procedure tests for cointegration among the variables. The null hypothesis of no cointegration is tested using the F-statistic with critical values adjusted for small samples following Kripfganz & Schneider (2023). When the F-statistic exceeds the upper bound, cointegration is confirmed, indicating a long-run equilibrium relationship exists among the variables. Conditional on confirming cointegration, long-run coefficients are derived representing equilibrium relationships where permanent changes in explanatory variables affect the balance of payments after all adjustments occur. These parameters capture structural relationships persisting over extended horizons, informing sustainable policy strategies. Simultaneously, short-run dynamics are captured through the Error Correction Model, where the error correction term measures adjustment speed toward equilibrium. A statistically significant negative error correction coefficient indicates deviations from long-run equilibrium are systematically corrected over time, with the magnitude revealing how rapidly the system returns to equilibrium following temporary shocks (McNown et al., 2018).

Finally, comprehensive diagnostic tests validate model specification and ensure reliable inference. The Jarque-Bera test assesses residual normality, the Breusch-Pagan-Godfrey test examines heteroscedasticity to confirm constant error variance, and the Breusch-Godfrey Lagrange Multiplier test detects serial correlation to ensure the model captures all dynamic structures. Multicollinearity is assessed through Variance Inflation Factors (VIF) and correlation matrices, with VIF exceeding 10 indicating problematic collinearity (Shrestha, 2020). These procedures ensure coefficient estimates are unbiased and efficient, and statistical inference remains valid (Asteriou & Hall, 2021; Brooks, 2019). To verify the robustness of the baseline results, several sensitivity checks are performed. The model stability is examined across different sub-periods to assess whether structural breaks associated with major economic events such as the COVID-19 pandemic or trade policy shifts systematically affect the estimated relationships. Alternative lag specifications are tested to confirm that the optimal lag selection is not driving the main findings. Additionally, the estimation is repeated using different information criteria (SIC and HQ) to ensure the results are not sensitive to the particular model selection approach employed. These robustness checks collectively provide confidence that the reported findings reflect genuine economic relationships rather than specification artifacts or sample-specific anomalies.

3. RESULTS AND DISCUSSION

3.1. Stationarity and Integration Tests

Based on these analytical procedures, the final ARDL (1,2,2,0,0) specification was selected from 2,500 evaluated models using the Akaike Information Criterion. The estimated long-run and short-run models capture both equilibrium relationships and dynamic adjustment processes, with all coefficients interpreted in the context of Indonesia's external balance management and international trade dynamics during the study period. (See Table 1)

Table 1. Stationarity Test (ADF)

Series	Statistics	Prob.
D_CA	-7.255891	0.000
ER, INF, EXP, IMP	21.198	0.0066

Source: Processed data with EViews 12

The integration characteristics of the variables in the data were examined using the Augmented Dickey-Fuller test shown in Table 1, which revealed mixed properties. CA became stationary after the first differentiation (D_CA), as reflected in the ADF statistic value of -7.256 with a probability of 0.000. This confirms that the CA variable has an integration order of one, I (1). Conversely, ER, INF, EXP, and IMP are stationary at the level with a probability of 0.0066 (< 1%), so they can be treated as I(0). This combination of I(0)–I(1) meets the prerequisites for ARDL modeling, as long as there are no variables of order I(2). Methodologically, these results indicate that short-term dynamics (through the first difference of CA) and long-term relationships length (through explanatory variable levels) can be estimated consistently within the ARDL framework, followed by lag length selection and bounds testing to test for cointegration.

3.2. Optimal Lag Length Selection

Table 2. Optimal Lag Length Test (VAR Estimation)

Lag	LogL	AIC
0	-1211.367	67.575
1	-1,118,908	63,828
2	-1,103,775	64,376
3	-1,088,209	64.9
4	-1,035,671	63.37

Source: Processed data with EViews 12

In Table 2 The results of the lag length selection based on the Akaike Info Criterion (AIC) in the VAR estimation are shown in Table 2, with the lowest AIC value at lag 4 (AIC = 63.37), which is smaller than other alternatives (e.g., lag 1 = 63.83). The consistent increase in LogL with the addition of lags and the minimum AIC at lag 4 indicate that the inter- variable dynamic structure is best represented by four lags. With quarterly data (2015-2024), this choice is also in line with practical rules that generally allow up to four lags to capture seasonal cycles and policy delays. In the ARDL context, these results can be used as an upper bound for lag selection, for example, setting a maximum lag of 4 for the dependent and explanatory variables, then determining the most

effective lag combination with AIC/SIC in the final ARDL estimation.

3.3. ARDL Bound Test and Cointegration Analysis

Table 3. ARDL Cointegration Test (Bound Test)

Statistical Test	Value	Sig.	I(1)
F-Statistic	33.733	5	3.49
k	4		

Source: Processed data with EViews 12

In Table 3 The results of the ARDL bounds test (Table 3) show strong evidence of cointegration between CA and its four independent variables (ER, INF, EXP, IMP). The F-statistic value of 33.733 far exceeds the upper limit (I(1)) at the 5% level of 3.49 for k = 4, so the null hypothesis of "no long-term relationship" is rejected. Thus, this model is feasible to estimate within the ARDL framework with separation of long-run coefficients and short-run adjustment mechanism through the Error Correction Model (ECM). Thus, this model can interpret the level coefficient as a long-run effect binding on the CA equilibrium, while the first differentiated component captures short-run dynamics. As expected, the error correction term (ECT) in the ECM model will be significant and the sign of the will be negative reflecting the speed of CA adjustment back to the long-run path after a deviation.

3.4. Long-Run Estimation Results

Table 4. Long-Run ARDL Estimation

Variable	Coeff. (β)	Std. Error	t-Stat	Prob.
C	5157.833	4563.265	1.1303	0.267
NT	-0.635	0.3520	-1.8038	0.082
INF	-3468.811	1767.482	-1.963	0.059
EXP	2.4342	0.1214	20.425	0.000
IMP	-2.5669	0.1651	-15,549	0.000

Source: Processed data with EViews 12

The long-term ARDL estimation model that can be formulated in this study is as follows:

$$CA_t = 5157.833 - 0.635ER_t - 3468.811INF_t + 2.434EXP_t - 2.566IMP_t.....(3)$$

Based on the long-term ARDL model estimates in Table 4, Indonesia's balance of payments indicates several significant relationships between the economic variables tested. Inflation (INF) has a significant negative coefficient at the 10% level, with a value of -3468.811, indicating that an increase in inflation has the potential to worsen the balance of payments. This shows that inflationary pressure tends to reduce Indonesia's external competitiveness, thereby reducing the performance of the balance of payments in the long term. Conversely, the exchange rate (ER) shows a negative coefficient of -0.635, although the result is not entirely significant at the 5% level (p = 0.082), suggesting that exchange rate fluctuations have a relatively weak but still significant impact on the balance of payments.

Meanwhile, the export variable (EXP) has a highly significant positive coefficient of 2.4342,

with a very high t-statistic value ($t = 20.425$) and a probability close to zero ($p = 0.000$), indicating that an increase in exports clearly contributes positively to the balance of payments. This is in line with expectations that the expansion of international trade can improve the country's foreign exchange flows. On the other hand, imports (IMP) have a very negative effect on the balance of payments, with a highly significant coefficient of -2.5669 ($t = -15.549$), indicating that an increase in imports will burden Indonesia's balance of payments, creating an imbalance that needs to be watched in economic policy. All these findings illustrate how interactions between economic variables affect Indonesia's balance of payments in the period studied, with international trade and more cautious macroeconomic policies being key to maintaining the country's economic stability.

3.5. Short-Term Estimation Results

Table 5. Short-Term Estimation (ECM-ARDL)

Variable Δ	Coeff.	Std. Error	t-Stat	Prob.
CointEq(-1) (ECT)	-0.9766	0.0632	-15.4448	0.000
D(ER)	-0.635	0.3520	-1.8038	0.082
D(ER(-1))	-3468.811	1767.482	-1.963	0.059
D(INF)	2.4342	0.1214	20.425	0.000
D(INF(-1))	-2.5669	0.1651	-15.549	0.000

Source: Processed data with EViews 12

The short-term ECM-ARDL model with error correction term (ECT) in this study can be formulated as follows:

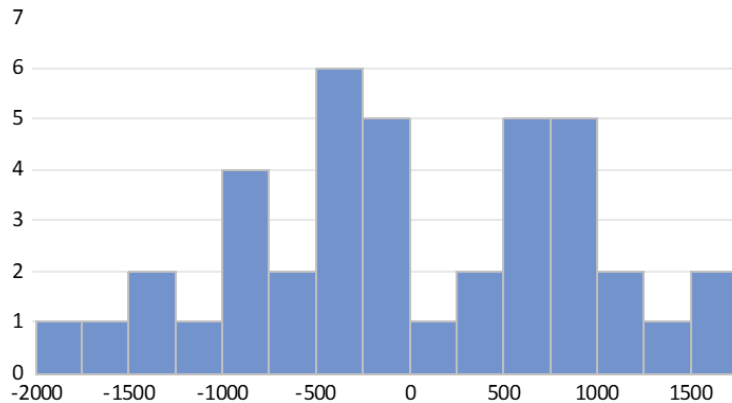
$$\Delta CA_t = -0.9766CointEq(-1) + (-0.635\Delta ER_t + 2.434\Delta INF_t - 2.566\Delta INF_{(t-1)})..(4)$$

Short-term estimates using the ECM-ARDL model (Table 5) show an interesting dynamic relationship between economic variables in explaining movements in Indonesia's balance of payments. The CointEq(-1) coefficient or error correction term (ECT) of -0.9766 indicates a rapid and significant adjustment in the short term to return to long-term equilibrium after a disturbance. The very large t-statistic value ($t = -15.4448$) and probability close to zero ($p = 0.000$) confirm that the adjustment process towards long-term equilibrium is quite efficient.

In addition, changes in exchange rates (ΔER) and inflation (ΔINF) have a significant impact, although there are differences in the direction and intensity of their effects. For the exchange rate, current changes ($D(ER)$) have a significant negative impact on the balance of payments ($p = 0.082$), while changes in the exchange rate in the previous period ($D(ER(-1))$) have a significant negative impact on Indonesia's balance of payments ($p = 0.059$). On the other hand, changes in inflation ($D(INF)$) have a significant positive effect with a coefficient of 2.4342 ($p = 0.000$), which shows that short-term inflation fluctuations can improve the balance of payments, although this effect appears to contradict the long-term results. Conversely, changes in inflation in the previous period ($D(INF(-1))$) have a very significant negative effect on the balance of payments ($p = 0.000$), indicating that the impact of inflation is more pronounced if it continues. Overall, these results illustrate a complex and dynamic relationship between inflation, exchange rates, and the balance of payments in the short term.

3.6. Model Diagnostic Tests

Figure 3. Normality Test (Jaque-Bera)



Source: Processed data with EViews 12

In **Figure 3** The results of the residual normality test conducted using the Jarque-Bera test show a statistical value of 1.013453 with a probability of 0.602465. This probability value is greater than 0.05, so indicates that there is insufficient evidence to reject the null hypothesis, which states that the residuals from the ARDL model follow a normal distribution. Thus, it can be concluded that the residuals generated from this model do not show significant deviations from normality, which is an important indication that the regression model used is valid for further analysis.

Table 6. Multicollinearity Correlation Test

Correlation	ER	INF	EXP	IMP
ER	1,000			
INF	-0.175	1,000		
EXP	0.737	0.056	1,000	
IMP	0.748	0.045	0.952	1,000

Source: Processed data with EViews 12

Based on **Table 6** the results of the multicollinearity test shown in the table 6, there are several things that need to be considered regarding the relationship between variables in this model. The test results show that there is a fairly strong positive correlation between the export (EXP) and import (IMP) variables, with a correlation value of 0.952. This high correlation indicates a close relationship between the two, which can cause multicollinearity problems if both are included in a single regression model. Meanwhile, the exchange rate (ER) and inflation (INF) variables show a relatively weak negative correlation (-0.175), while the correlation between exports (EXP) and the exchange rate (ER) of 0.737 is also quite high, although not as high as the correlation between exports and imports. The correlation between imports (IMP) and exchange rate (ER), which reaches 0.748, shows a fairly strong positive relationship, although not as strong as the correlation between exports and imports. Overall, although there are no extreme correlations (above 0.9) between variables in the model, the high correlation between exports and imports needs to be watched carefully because it can make it hard to identify the independent effects of each variable in the model. Even so, this ARDL model is still worth continuing because, theoretically, the close relationship between exports and imports reflects a normal interaction in an open economy, where these two variables directly influence each other in determining the trade balance.

It should be noted that in the context of the ARDL model, although multicollinearity can cause variability in short-term coefficient estimates, this model remains robust in separating the long-term and short-term effects between variables. Therefore, even though the correlation or VIF indicates a high correlation, the ARDL model is still able to identify dynamic relationships between relevant variables, both in the long term and short term. Adding lags to variables also reduces multicollinearity issues because it takes into account past effects, which can reduce direct dependence between these variables.

Table 7. Heteroscedasticity Test (Breusch-Pagan-Godfrey)

F-Statistic	0.693
Obs* R-squared	6.922

Source: Processed data with EViews 12

Based on [Table 7](#) the results of the Breusch-Pagan-Godfrey test, there is insufficient evidence to detect heteroscedasticity in the model. In other words, the model residuals do not show a pattern of non-constant variance with changes in predicted values, which means that the assumption of homoscedasticity (constant residual variance) is maintained. Therefore, this model can be considered valid in terms of heteroscedasticity, and the estimation of its coefficients is not affected by the problem of non-constant variance.

Table 8. Autocorrelation Test (Breusch-Godfrey LM)

F-Statistic	0.552
Obs* R-squared	3.201

Source: Processed data with EViews 12

In [Table 8](#) the results of the autocorrelation test using Breusch-Godfrey LM show that the model does not experience significant autocorrelation problems. The F-statistic value obtained is 0.552 and the Obs R-squared value is 3.201, which is lower than the critical value at a significance level of 5%, indicating that there is insufficient evidence to reject the null hypothesis that the model residuals do not have autocorrelation. In other words, the ARDL model residuals do not show serial correlation between errors in adjacent periods, which indicates that the assumption of residual independence is maintained. Therefore, this model can be considered valid in terms of the absence of autocorrelation, which strengthens the reliability of coefficient estimation and provides a strong basis for further analysis without distortion due to inter-residual correlation.

3.7. Discussion of Findings

The empirical results reveal that macroeconomic variables and international trade dynamics exert significant and theoretically consistent influences on Indonesia's balance of payments during the 2015-2024 period, providing robust evidence that external balance management remains highly sensitive to domestic price stability, exchange rate movements, and trade flows. The negative effect of inflation on the balance of payments operates through multiple interconnected transmission mechanisms rooted in the purchasing power parity framework, whereby sustained domestic inflation erodes international price competitiveness by raising the relative cost of domestically produced goods, thereby reducing export demand while simultaneously stimulating imports of cheaper foreign alternatives. This competitiveness erosion proves particularly pronounced in Indonesia's case, where export composition remains heavily weighted toward commodities and intermediate goods competing in highly price-sensitive global markets. Recent empirical evidence from emerging Asian economies confirms that inflation volatility significantly dampens export

performance through increased pricing uncertainty and reduced predictability in cross-border transactions (Pham et al., 2023; Thorbecke & Salike, 2020). Beyond direct price competitiveness, elevated inflation generates broader macroeconomic uncertainty that discourages both domestic and foreign investment in tradable sectors, constraining productive capacity expansion that would otherwise support export growth (Ha et al., 2019). This inflation-uncertainty nexus proves especially detrimental during periods of global trade fragmentation, as risk-averse exporters and importers face compounded difficulties in forecasting returns and managing exchange rate exposure.

The relatively weak and marginally insignificant long-run effect of the exchange rate on Indonesia's balance of payments warrants careful interpretation, as it appears to contradict the conventional Marshall-Lerner condition predicting that currency depreciation should improve the trade balance when demand elasticities are sufficiently high. This finding aligns with recent research demonstrating that the traditional expenditure-switching mechanism has weakened substantially in the era of global value chains and fragmented production networks (Adler, Meleshchuk, & Buitron, 2019; Bussière et al., 2020). Indonesia's deep integration into regional and global supply chains, particularly in manufacturing and electronics assembly, implies that a significant proportion of export value comprises imported intermediate inputs and capital goods. Consequently, rupiah depreciation generates opposing effects by reducing the foreign currency price of final exports while simultaneously raising the domestic currency cost of imported inputs, compressing profit margins and potentially offsetting volume gains. Empirical studies on ASEAN economies confirm this import content channel, showing that export price elasticities have declined markedly as production sharing intensifies (Thorbecke & Salike, 2020). Furthermore, Indonesia's commodity export structure introduces additional complexity, as global prices for coal, palm oil, nickel, and other primary products are predominantly determined by international demand conditions and dollar-denominated contracts rather than bilateral exchange rates. The prevalence of dollar invoicing means that exchange rate pass-through to export volumes operates with substantial lags and uncertainty, particularly when global demand remains sluggish (Gopinath et al., 2020). These structural characteristics collectively explain why exchange rate adjustments produce limited balance of payments improvements in the short to medium term, underscoring the importance of complementary policies targeting productivity enhancement and value-added upgrading rather than relying solely on exchange rate depreciation as a balancing mechanism.

The highly significant positive effect of exports and substantial negative effect of imports on the balance of payments confirm standard open economy macroeconomic predictions while revealing important asymmetries in Indonesia's trade structure. Export expansion generates current account inflows financing import payments, servicing external debt, and building foreign reserve buffers essential for managing capital account volatility. The magnitude of the export coefficient suggests that policies promoting diversification and market access improvement can yield substantial balance of payments benefits, particularly when targeted toward high-value-added manufacturing and services sectors with lower import content. Recent evidence demonstrates that export sophistication and quality upgrading significantly enhance trade balance resilience to external shocks (Henn et al., 2017). Indonesia's downstreaming policy, which restricts raw material exports to promote domestic processing, represents an ambitious attempt to shift export composition toward higher-value products. While this strategy has succeeded in attracting foreign direct investment in nickel smelting and battery precursor industries, it has also generated tensions with trading partners and raised concerns about optimal resource allocation (Patunru, 2023). The policy's long-run balance of payments impact remains contingent on whether domestic processing industries achieve international competitiveness and whether forward linkages to downstream manufacturing emerge, enabling sustained value capture beyond initial mineral refining stages. Conversely, the import coefficient magnitude exceeds that of exports, indicating that import growth exerts stronger proportional impact on external balance deterioration than equivalent export growth contributes to improvement. This asymmetry reflects Indonesia's import structure dominated by intermediate inputs, capital goods, and consumption items with limited domestic production substitutes.

Empirical decomposition reveals that industrial intermediate goods and machinery constitute the largest share, reflecting technology and input dependencies of Indonesia's manufacturing sector (Athukorala & Patunru, 2025). While these imports prove essential for maintaining productive capacity and export competitiveness, they create structural vulnerability whereby any domestic demand expansion or investment surge automatically generates proportional import increases, constraining balance of payments improvement achievable through conventional expenditure-switching policies.

The coexistence of export expansion in capital-intensive extractive sectors and import penetration in labor-intensive manufacturing creates critical wage inequality dynamics with profound social and economic implications that warrant careful policy attention. Theoretical models of trade and inequality predict that developing countries should experience wage convergence and poverty reduction through export-led growth in labor-intensive sectors, yet Indonesia's recent experience deviates from this Stolper-Samuelson prediction due to its particular export specialization pattern (Helpman, 2017). The concentration of export growth in natural resource processing and extraction industries, rather than labor-intensive manufacturing, limits distributional benefits of trade integration. Empirical evidence from Indonesia's labor markets confirms that workers employed in export-oriented extractive industries earn substantial wage premiums relative to manufacturing workers, with the gap widening significantly following implementation of downstreaming policies directing investment toward capital-intensive nickel and aluminum smelters rather than labor-absorbing final goods production (Lahadalia et al., 2024). Simultaneously, import competition in textiles, garments, and footwear has suppressed wage growth among lower-skilled workers, many of whom are women concentrated in specific industrial districts. Recent studies on ASEAN trade integration document that import exposure reduces employment and earnings in affected manufacturing sectors, with limited worker transitions to expanding industries due to geographic and skill mismatches (McCaig & Pavcnik, 2018). These labor market rigidities imply that balance of payments adjustments achieved through export promotion in extractive sectors and import liberalization in manufacturing generate distributional costs that standard aggregate welfare analysis overlooks. When trade integration produces concentrated gains for capital owners and skilled workers in export industries while imposing diffuse losses on semi-skilled manufacturing workers, public support for open trade policies erodes, creating political economy pressures for protectionist interventions that may ultimately prove counterproductive for aggregate welfare and growth (Colantone & Stanig, 2018). Indonesia's recent turn toward more restrictive trade policies, including expansion of non-tariff measures affecting 127 trading partners, partly reflects these distributional tensions and perceived need to shield vulnerable domestic industries from foreign competition.

Addressing export-import wage inequality concerns requires integrated policy responses extending beyond conventional macroeconomic management to encompass active labor market policies, education investments, and targeted support for workers and communities adversely affected by trade adjustment, while maintaining the efficiency gains from trade integration. International experience demonstrates that effective adjustment assistance programs combining income support, retraining opportunities, and mobility subsidies can mitigate distributional costs while preserving aggregate efficiency gains (Autor et al., 2013). In Indonesia's context, priority interventions should include expanding vocational training programs aligned with emerging skill demands in growing industries, improving geographic mobility through housing and transportation support, and strengthening social safety nets to buffer income shocks during sectoral transitions. Industrial policy initiatives should explicitly consider employment generation alongside value-added objectives, directing incentives toward sectors combining export competitiveness with substantial labor absorption capacity. The downstreaming strategy could be refined to prioritize downstream processing stages and final goods manufacturing employing larger workforces rather than focusing exclusively on capital-intensive smelting operations. Recent research on industrial policy effectiveness in developing Asia highlights those successful cases such as Vietnam and Bangladesh

achieved rapid export growth and poverty reduction by promoting labor-intensive manufacturing exports, suggesting Indonesia's resource-focused strategy may need complementary interventions to achieve inclusive growth outcomes (Juhász et al., 2024). From monetary policy and exchange rate management perspectives, the relatively weak exchange rate effect suggests that relying on currency depreciation as the primary adjustment mechanism proves insufficient. Bank Indonesia should therefore prioritize inflation stability as the foundational prerequisite for external balance, as empirical results demonstrate that sustained price pressures generate more substantial balance of payments deterioration than exchange rate fluctuations produce improvements. This inflation-first approach aligns with current monetary policy frameworks emphasizing credible inflation targeting, but requires vigilant monitoring of second-round effects from commodity price shocks and imported inflation that can destabilize domestic price expectations. Trade policy authorities face the challenge of balancing protectionist pressures arising from distributional concerns against efficiency and growth benefits of open markets. The Ministry of Trade should pursue strategic trade agreements securing market access for Indonesia's emerging processed commodity exports while negotiating temporary safeguards and adjustment assistance mechanisms for import-sensitive industries undergoing structural transformation. Indonesia's participation in the Regional Comprehensive Economic Partnership offers potential export expansion opportunities, but realizing these gains requires parallel investments in trade facilitation infrastructure, customs modernization, and standards harmonization that reduce transaction costs (Grainger et al., 2018). The Financial Services Authority should monitor how balance of payments pressures transmits to banking sector vulnerabilities through exchange rate exposures, foreign currency borrowing, and sectoral credit concentrations, implementing macroprudential regulations including loan-to-value limits, sectoral exposure caps, and countercyclical capital buffers to insulate the financial system while maintaining credit availability (Ghosh et al., 2018).

3.8. Policy Implications and Recommendations

This study provides several important implications regarding the relationship between exchange rates, inflation, exports, imports, and Indonesia's balance of payments. Through the result the long-term and short-term effects of economic variables by the ARDL model that successfully identified, thus policymakers, communities, NGOs, educators, industry, or local governments need to take consistent steps to strengthen Indonesia's position in international trade through the balance of payments.

Bank Indonesia should strengthen its inflation targeting framework by maintaining the policy rate at levels consistent with achieving the 2-4% inflation target band over the medium term, recognizing that sustained price stability constitutes the most critical prerequisite for balance of payments equilibrium based on empirical evidence. Operationally, this requires transparent forward guidance on monetary policy intentions, data-dependent decision-making responsive to emerging inflation pressures, and enhanced communication strategies anchoring inflation expectations among households and businesses. When facing external shocks such as global commodity price surges or supply chain disruptions, the central bank should clearly distinguish between temporary price level adjustments and persistent inflation dynamics, avoiding excessive monetary tightening that could unnecessarily suppress output when inflation proves transitory. Bank Indonesia should enhance analytical capacity for decomposing inflation into imported, domestic demand-driven, and supply-constrained components, enabling more precise calibration of monetary instruments to address specific inflationary sources. Given limited exchange rate pass-through to the balance of payments documented in this study, Bank Indonesia should avoid relying on currency depreciation as the primary external adjustment tool, instead prioritizing exchange rate stability within a managed float regime that limits excessive volatility while permitting gradual adjustments reflecting fundamental changes in terms of trade and productivity differentials. This balanced approach requires sufficient foreign reserve buffers to intervene when disorderly market conditions threaten financial stability, while avoiding prolonged one-sided interventions that distort price signals and encourage speculative

positioning.

The Ministry of Trade should reform Indonesia's export promotion strategy to prioritize sectors combining high value-added potential with substantial employment generation capacity, moving beyond the current narrow focus on capital-intensive resource processing delivering limited distributional benefits. Specifically, the government should identify and support export opportunities in labor-intensive manufacturing subsectors including garments, footwear, furniture, and food processing where Indonesia maintains latent comparative advantage but faces competitiveness constraints due to infrastructure deficiencies, regulatory barriers, and skill gaps. Concrete interventions should include establishing dedicated export processing zones with streamlined customs procedures, reliable utilities, and logistics connectivity; providing matching grants for quality certification and international standards compliance; facilitating access to export credit through subsidized guarantee schemes targeting small and medium enterprises; and negotiating bilateral and regional trade agreements securing preferential market access for priority products. These initiatives should be implemented through a coordinated institutional framework led by the Ministry of Trade with active participation from the Investment Coordinating Board, Ministry of Industry, and provincial governments, with annual performance reviews assessing export value growth, employment creation, and market diversification outcomes against predetermined targets. The downstreaming policy should be refined to incorporate explicit labor intensity criteria alongside value-added metrics when determining which processing stages receive export restriction exemptions or investment incentives, ensuring industrial policy generates inclusive growth rather than concentrating benefits among capital owners.

The Ministry of Manpower in coordination with the Ministry of Education should expand active labor market programs supporting workers displaced by import competition or sectoral restructuring to address export-import wage inequality dynamics documented in this study. Specifically, the government should establish regional retraining centers in manufacturing-intensive provinces offering vocational courses aligned with emerging skill demands in export-competitive industries, logistics, and services sectors. These programs should provide stipends covering living expenses during training periods, placement assistance connecting graduates with employers, and portable credential systems enabling skill recognition across regions and firms. Financing should come from dedicated trade adjustment assistance funds capitalized through import tariff revenues or general budget allocations, with benefit eligibility determined through objective criteria including prior employment in import-affected sectors, regional unemployment rates, and household income levels. International experience suggests that effective programs combine income support, skill upgrading, and mobility assistance, with successful cases achieving 60-70% re-employment rates within twelve months (Hyman, 2018). Indonesia should pilot such initiatives in textile and footwear manufacturing districts experiencing concentrated import exposure, scaling programs gradually as implementation capacity strengthens and outcome evaluations demonstrate effectiveness.

The Ministry of Finance should strengthen fiscal-monetary coordination mechanisms through formalized consultation processes ensuring that expenditure policies, subsidy programs, and revenue mobilization strategies align with inflation targeting objectives and external balance sustainability. When inflation pressures emerge, particularly from supply-side constraints in food or energy markets, fiscal authorities should prioritize targeted interventions addressing specific bottlenecks rather than broad subsidies exacerbating demand pressures and complicating monetary management. For example, infrastructure investments improving agricultural productivity and distribution efficiency prove more effective than blanket fuel subsidies stimulating consumption and widening the current account deficit. The Ministry should develop contingency fiscal plans activating automatically when the balance of payments deteriorates beyond predetermined thresholds, including expenditure adjustments, revenue enhancement measures, and external financing arrangements preventing disorderly adjustments threatening macroeconomic stability. These automatic stabilizers should be designed transparently and enacted through legislation, avoiding discretionary interventions subject to political interference. The Financial Services Authority should

enhance macroprudential regulations governing banks' foreign exchange exposures and sectoral credit concentrations to mitigate financial stability risks arising from balance of payments pressures. Specifically, OJK should tighten loan-to-value limits on foreign currency borrowing by non-exporting corporates, introduce dynamic provisioning requirements increasing with aggregate credit growth rates, and implement sectoral exposure caps preventing excessive lending to import-dependent industries vulnerable to exchange rate shocks. These regulations should be calibrated countercyclically, tightening during credit booms and external surplus periods while relaxing moderately during downturns to avoid procyclical tightening amplifying contractions. OJK should strengthen supervision of banks' currency mismatch positions through regular stress testing scenarios incorporating balance of payments crises, exchange rate depreciation, and sudden capital flow reversals, requiring institutions failing robustness tests to raise additional capital or reduce risk exposures.

Successful implementation of these recommendations requires political commitment at the highest levels, bureaucratic coordination across ministries and agencies with overlapping responsibilities, and sustained monitoring mechanisms tracking progress against measurable indicators. The National Economic Council or equivalent coordinating body should establish an external balance task force with quarterly reporting obligations to the President, ensuring accountability and enabling rapid course corrections when policies prove ineffective or generate unintended consequences. Public communication explaining policy rationale and expected outcomes can build stakeholder support while managing expectations about adjustment timelines and distributional tradeoffs. Ultimately, achieving sustainable balance of payments equilibrium compatible with inclusive growth requires integrated policy frameworks addressing macroeconomic stability, structural competitiveness, labor market flexibility, and social protection simultaneously rather than relying on isolated interventions in any single domain. Recent evidence from successful emerging market experiences demonstrates that coordinated approaches combining prudent monetary policy, strategic industrial development, effective social safety nets, and proactive labor market interventions generate superior outcomes in terms of both external stability and distributional equity compared to fragmented policy responses addressing each dimension separately (Juhász et al., 2023). Indonesia's policymakers should draw lessons from these experiences while adapting recommendations to the country's specific institutional capacities, political economy constraints, and development priorities.

4. CONCLUSION

Based on the results of empirical analysis using the Autoregressive Distributed Lag (ARDL) approach, this study concludes that the variables of inflation, exchange rate, Exports and imports have a significant impact on Indonesia's balance of payments performance during the 2015-2024 period. Findings show that inflation has a negative effect on the balance of payments in the long term, indicating that increased domestic price pressures can reduce export competitiveness and worsen Indonesia's external position. The rupiah exchange rate also has a negative effect, although not entirely significant, which indicating that the weakening of the rupiah has not been fully able to boost exports due to high dependence on imported goods and foreign raw materials.

Conversely, the export variable has a very significant positive effect on the balance of payments. Increased exports have proven to play an important role in improving the current account balance through increased national foreign exchange earnings. On the other hand, imports have a negative and significant effect, indicating that an increase in import activity worsens the balance of payments, especially if it is dominated by imported consumer goods or raw materials that are not offset by an increase in exports. These results reinforce the view that the trade balance is a major factor in determining the external stability of the Indonesian economy. Meanwhile, the Short-term analysis using the Error Correction Model (ECM) shows that deviations from long-term equilibrium will be corrected quickly, as reflected in the significant and negative error correction

term (ECT) value of -0.9766. This indicates that Indonesia's economic adjustment mechanism to external shocks is quite efficient, so that the balance of payments tends to return to equilibrium in a relatively short time. In addition, the results of the classical assumption test show that the ARDL model used has met the validity criteria, with normal residuals, no heteroscedasticity or autocorrelation, and correlations between variables that are still within reasonable limits.

From monetary policy and exchange rate management perspectives, the relatively weak exchange rate effect suggests that relying on currency depreciation as the primary adjustment mechanism proves insufficient. Bank Indonesia should therefore prioritize inflation stability as the foundational prerequisite for external balance, as empirical results demonstrate that sustained price pressures generate more substantial balance of payments deterioration than exchange rate fluctuations produce improvements. This inflation-first approach aligns with current monetary policy frameworks emphasizing credible inflation targeting, but requires vigilant monitoring of second-round effects from commodity price shocks and imported inflation that can destabilize domestic price expectations. Trade policy authorities face the challenge of balancing protectionist pressures arising from distributional concerns against efficiency and growth benefits of open markets. The Ministry of Trade should pursue strategic trade agreements securing market access for Indonesia's emerging processed commodity exports while negotiating temporary safeguards and adjustment assistance mechanisms for import-sensitive industries undergoing structural transformation. Indonesia's participation in the Regional Comprehensive Economic Partnership offers potential export expansion opportunities, but realizing these gains requires parallel investments in trade facilitation infrastructure, customs modernization, and standards harmonization that reduce transaction costs (Grainger et al., 2018). The Financial Services Authority should monitor how balance of payments pressures transmits to banking sector vulnerabilities through exchange rate exposures, foreign currency borrowing, and sectoral credit concentrations, implementing macroprudential regulations including loan-to-value limits, sectoral exposure caps, and countercyclical capital buffers to insulate the financial system while maintaining credit availability (Ghosh et al., 2018).

Despite the robust empirical findings and their policy relevance, this study confronts several methodological and contextual limitations that constrain generalizability and causal interpretation, necessitating careful qualification of conclusions and suggesting specific directions for future research. Methodologically, the reliance on aggregate quarterly national-level data obscures substantial sectoral and regional heterogeneity in balance of payments dynamics that may critically shape policy effectiveness. For instance, the exchange rate effects on exports likely differ markedly between commodity sectors where prices are set in global markets versus manufacturing sectors competing on price and quality, yet the aggregate specification cannot distinguish these differential responses. Similarly, import sensitivities to domestic demand and exchange rates plausibly vary across consumption goods, intermediate inputs, and capital equipment, with distinct implications for optimal trade and industrial policies that remain unidentified in this framework. The 40-observation sample, while adequate for ARDL estimation, limits statistical power to detect smaller effects or complex non-linearities, and precludes robust subsample analysis examining whether relationships have evolved over distinct sub-periods such as pre-pandemic versus post-pandemic eras or across different monetary policy regimes. The quarterly data frequency, though appropriate for capturing macroeconomic adjustment dynamics, cannot illuminate higher-frequency responses to policy announcements or external shocks that may prove relevant for financial market participants and short-term policy calibration. Measurement limitations also warrant acknowledgment: the balance of payments aggregates employed obscure compositional shifts within the current account, such as movements between goods trade, services trade, and primary income flows that may respond heterogeneously to explanatory variables and carry distinct welfare implications. The reliance on official exchange rate data overlooks parallel market or informal sector transactions that may constitute non-negligible components of external flows in emerging economies, potentially biasing estimates if informal transactions respond differently to

macroeconomic conditions than formal recorded flows.

Contextually, the study's geographic focus on Indonesia limits external validity and generalizability to other emerging markets facing distinct structural characteristics, institutional frameworks, and policy environments. Indonesia's unique combination of commodity export dependence, archipelagic geography, demographic dividend, and political economy of resource nationalism may generate balance of payments dynamics that diverge substantially from other developing economies, implying that coefficient magnitudes and even directional effects estimated here should not be extrapolated mechanically to alternative settings without careful contextual adjustment. The omission of potentially important explanatory variables constitutes another limitation. Global financial conditions such as US Federal Reserve policy rates, international risk sentiment measured by indicators like the VIX, and terms of trade shocks affecting commodity exporters are excluded from the specification despite theoretical and empirical evidence suggesting their relevance for emerging market external balances (Shousha, 2016; Miranda-Agrippino & Rey, 2020). Similarly, the model does not explicitly incorporate measures of trade policy restrictiveness, capital account openness, or foreign direct investment flows that likely mediate how inflation, exchange rates, and trade volumes translate into balance of payments outcomes. The cross-sectional nature of the data precludes identification of causal effects in the strict sense, as simultaneity and reverse causality concerns persist despite ARDL's superior handling of endogeneity relative to static methods: for example, balance of payments pressures may trigger policy responses affecting inflation and exchange rates, generating bidirectional causality that the reduced-form ARDL specification cannot fully disentangle. The potential for structural breaks associated with major economic events including the 2020 pandemic, the 2018-2019 trade war escalation, or Indonesia's 2020 nickel export ban remains inadequately addressed, as the baseline specification imposes parameter constancy throughout the sample period despite theoretical reasons to expect regime-dependent relationships.

Future research should address several key extensions to achieve more comprehensive understanding of Indonesia's balance of payments dynamics. Initially, disaggregated sectoral analysis using industry-level or firm-level panel data would reveal heterogeneous responses across tradable sectors, identifying which industries exhibit strongest sensitivity to exchange rates, inflation, or import dependence for more targeted policy interventions. Next, incorporating structural break tests and time-varying parameter models would formally assess whether balance of payments relationships have shifted across policy regimes, with attention to asymmetries between expansion and contraction phases that critically affect policy design. Additionally, augmenting the framework with global financial variables including US monetary policy indicators, commodity price indices, and financial volatility measures would better isolate Indonesia-specific factors from common external drivers, strengthening causal identification during global financial turbulence.

Furthermore, quasi-experimental designs exploiting discrete policy changes such as the nickel export ban or trade agreement signings could provide more credible causal identification through difference-in-differences or synthetic control methods. Integrating micro-level labor market data with trade exposure measures would enable direct examination of wage inequality mechanisms, tracing how import competition and export opportunities affect earnings across skill levels and regions. Moreover, comparative multi-country studies encompassing ASEAN economies would assess external validity of findings and leverage cross-country variation to achieve stronger causal identification. Finally, incorporating financial sector variables including bank credit growth, capital flows, and financial conditions would more comprehensively capture transmission channels linking real economy variables to external balance outcomes. These extensions would collectively strengthen the empirical foundation for evidence-based policymaking in Indonesia's external sector.

Ethical Approval

Not Applicable

Informed Consent Statement

Not Applicable

Authors' Contributions

DAS contributed to the conceptualization of the research, discussion on regional economic policy, and interpretation of results. RDA contributed to literature review, methodological framework, and manuscript writing. PJP contributed to the data processing, data analysis, and visualization. AAF and RSG contributed as supervisors, providing guidance, critical feedback, and academic review throughout the research process.

Disclosure Statement

No potential conflict of interest was reported by the authors

Data Availability Statement

All data used in this study are publicly available from official government databases, including Bank Indonesia (<https://www.bi.go.id/id/publikasi/laporan/>), Badan Pusat Statistik (<https://www.bps.go.id/id/statistics-table>), and Satu Data Perdagangan Kemendagri (<https://satudata.kemendag.go.id/data-informasi/>).

Funding

This study did not receive any external funding

Notes on Contributors

Dyah Ayu Setianingrum

Dyah Ayu Setianingrum is an undergraduate student from the Economics Development study program at Jenderal Soedirman University. She has participated in several academic projects related to Sustainable Economy and Digital Marketing. Her research interests include Monetary Economics, Sustainable Economy, and Regional Economic Development.

Rachel Dwitya Angellita

Rachel Dwitya Angellita is an undergraduate student of the Economics Development study program at Jenderal Soedirman University. She currently participated as Computer Laboratory Assistant. Her academic interests focus on Public Policy, Regional Development, and Environmental Economics.

Priyagung Jati Pamungkas

Priyagung Jati Pamungkas is an undergraduate student from the Economics Development study program at Jenderal Soedirman University. He currently works as Data Analyst Intern in several remote projects. His research interests include Data Analytics, Digital Economy, and Business Development.

Anzar Alfat Firdaus

<https://orcid.org/0009-0006-7915-3887>

Anzar graduated from the Economics at Sebelas Maret University. He currently works as a lecturer at the Jenderal Soedirman University in the Economics Development study program, with a research focus on the areas of Financial Stability, Industrial Economy, and Regional Economic Development.

Ratna Setyawati Gunawan

<https://orcid.org/0009-0007-9032-1017>

Ratna graduated from the Economics at Gajah Mada University. She currently works as a lecturer at the

Jenderal Soedirman University in the Economics Development study program, with a research focus on the Regional Economic Development, Business Empowerment, and Macroeconomic Dynamics.

REFERENCES

- Adhikari, S. (2023). External debt and economic growth of Nepal. *The Lumbini Journal of Business and Economics*, 11(1), 397–412. <https://doi.org/10.3126/ljbe.v11i1.54344>
- Adler, G., Meleshchuk, S., & Buitron, C. O. (2019). Global value chains and external adjustment: Do exchange rates still matter? *IMF Working Papers*, 2019(300). <https://doi.org/10.5089/9781513521985.001.A001>
- Aizenman, J., Lindahl, R., Stenvall, D., & Uddin, G. (2023). Geopolitical shocks and commodity market dynamics: New evidence from the Russian–Ukraine conflict. <https://EconPapers.repec.org/RePEc:nbr:nberwo:31950>
- Asteriou, D., & Hall, G. S. (2021). *Applied econometrics* (4th ed.). Bloomsbury Publishing. https://api.pageplace.de/preview/DT0400.9781352012033_A42593882/preview-9781352012033_A42593882.pdf
- Athukorala, P.-C., & Patunru, A. (2025). Indonesia in global manufacturing value chains: Policy ambivalence and arrested growth. <https://doi.org/10.1162/ASEP.a.961>
- Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6), 2121–2168. <https://doi.org/10.1257/aer.103.6.2121>
- Bahmani-Oskooee, M., & Baek, J. (2016). Do exchange rate changes have symmetric or asymmetric effects on the trade balance? Evidence from U.S.–Korea commodity trade. *Journal of Asian Economics*, 45, 15–30. <https://doi.org/10.1016/j.asieco.2016.06.001>
- Bank Indonesia. (2024a). *Statistik*. <https://www.bi.go.id/id/statistik/Default.aspx>
- Bank Indonesia. (2024b). *Laporan*. <https://www.bi.go.id/id/publikasi/laporan/default.aspx>
- Beeson, M., & Stubbs, R. (2012). *Routledge handbook of Asian regionalism*. Routledge. <https://doi.org/10.4324/9780203803608>
- Beeson, M., & Zeng, J. (2022). The BRICS and global governance: China’s contradictory role. *Third World Quarterly*, 39(10), 1962–1978. <https://doi.org/10.1080/01436597.2018.1438186>
- Bown, C. P., & Kolb, M. (2018). *Trump’s trade war timeline: An up-to-date guide*. Peterson Institute for International Economics. <https://www.piie.com>
- BPS. (2024). *Badan Pusat Statistik Indonesia*. <https://www.bps.go.id/id>
- Brooks, C. (2019). *Introductory econometrics for finance* (4th ed.). Cambridge University Press. <https://doi.org/10.1017/9781108524872>
- Bussière, M., Gaulier, G., & Steingress, W. (2020). Global trade flows: Revisiting the exchange rate elasticities. *Open Economies Review*, 31(1), 25–78. <https://doi.org/10.1007/s11079-019-09573-3>
- Caldara, D., Iacoviello, M., Molligo, P., Prestipino, A., & Raffo, A. (2019). The economic effects of trade policy uncertainty. *International Finance Discussion Papers*. <https://www.federalreserve.gov/econres/ifdp/files/ifdp1256.pdf>
- Calí, M., Maliszewska, M., Olekseyuk, Z., & Osorio-Rodarte, I. (2019). *Economic and distributional impacts of free trade agreements: The case of Indonesia*. World Bank. <https://documents1.worldbank.org/curated/en/926241569328187590/pdf/Economic-and-Distributional-Impacts-of-Free-Trade-Agreements-The-Case-of-Indonesia.pdf>
- Colantone, I., & Stanig, P. (2018). The trade origins of economic nationalism: Import competition and voting behavior in Western Europe. *American Journal of Political Science*, 62(4), 936–953. <https://doi.org/10.1111/ajps.12358>
- Diep, N. T. N., Canh, T. Q., & Thach, N. N. (2024). The impact of global value chain integration on export: Evidence from Vietnam. *Studies in Systems, Decision and Control*, 483, 440–448. https://doi.org/10.1007/978-3-031-35763-3_31

- Fajgelbaum, P. D., & Khandelwal, A. K. (2022). The economic impacts of the US–China trade war. *Annual Review of Economics*, 14(1), 205–228. <https://doi.org/10.1146/annurev-economics-051420-110410>
- Faudzi, M., & Asmara, G. D. (2023). Analisis neraca perdagangan Indonesia: Pendekatan ARDL. *Journal of Macroeconomics and Social Development*, 1(1), 1–16. <https://doi.org/10.47134/jmsd.v1i1.17>
- Fitriani, S. (2017). The exchange rate volatility and export performance: The case of Indonesia's exports to Japan and the US. *Bulletin of Monetary Economics and Banking*, 20(1), 49–70. <https://doi.org/10.21098/bemp.v20i1.724>
- Furceri, D., Carriere-Swallow, Y., Deb, P., Jimenez, D., & Ostry, J. (2022). Shipping costs and inflation. *IMF Working Papers*, 2022(061). <https://doi.org/10.5089/9798400204685.001>
- Ghosh, A. R., Ostry, J. D., & Qureshi, M. S. (2018). *Taming the tide of capital flows: A policy guide*. MIT Press. <https://doi.org/10.7551/mitpress/9780262037167.001.0001>
- Ghouse, G., Khan, S. A., Rehman, A. U., Bhatti, M. I., Michelitsch, T., Riascos, A. P., & Polito, F. (2021). ARDL as an elixir approach to cure for spurious regression in nonstationary time series. *Mathematics*, 9(22), 2839. <https://doi.org/10.3390/math9222839>
- Gopinath, G., Boz, E., Casas, C., Díez, F. J., Gourinchas, P. O., & Plagborg-Møller, M. (2020). Dominant currency paradigm. *American Economic Review*, 110(3), 677–719. <https://doi.org/10.1257/aer.20171201>
- Grainger, A., Huiden, R., Rukanova, B., & Tan, Y. H. (2018). What is the cost of customs and borders across the supply chain? *World Customs Journal*, 12(2), 3–30. <https://doi.org/10.55596/001C.115725>
- Ha, J., Kose, M. A., & Ohnsorge, F. (2019). *Inflation in emerging and developing economies: Evolution, drivers, and policies*. World Bank. <https://documents1.worldbank.org/curated/en/749181542305098752/pdf/Inflation-in-Emerging-and-Developing-Economies-Evolution-Drivers-and-Policies.pdf>
- Hamdani, A. H. (2023). The research design of downstream minerals and processing locations in Indonesia. *BIO Web of Conferences*, 73, 03010. <https://doi.org/10.1051/bioconf/20237303010>
- Hanipah, H., Sugiartini, P., & Maula, I. M. (2023). Analysis of the impact of government fiscal and monetary policies on economic growth in Indonesia. *Journal of Social Research*, 2(11), 3867–3871. <https://doi.org/10.55324/josr.v2i11.1498>
- Hati, S. N. A. P., Hapsari, M. A., Ika, S. R., & Widagdo, A. K. (2024). Nickel ore export prohibition and mapping the business performance of nickel mining companies in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1412(1), 012026. <https://doi.org/10.1088/1755-1315/1412/1/012026>
- Helpman, E. (2017). Globalisation and wage inequality. *Journal of the British Academy*, 5, 125–162. <https://doi.org/10.5871/jba/005.125>
- Henn, C., Papageorgiou, C., Romero, J., & Spatafora, N. (2017). *Export quality in advanced and developing economies: Evidence from a new dataset*. World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/393571505412354558>
- Hsing, Y. (2016). Determinants of the ZAR/USD exchange rate and policy implications. *Cogent Economics & Finance*, 4(1), 1151131. <https://doi.org/10.1080/23322039.2016.1151131>
- Hyman, G. B. (2018). Can displaced labor be retrained? Evidence from quasi-random assignment to trade adjustment assistance. *Proceedings of the Annual Conference on Taxation*. <https://www.jstor.org/stable/26939524>
- Iqbal, J., Aziz, S., & Nosheen, M. (2021). The asymmetric effects of exchange rate volatility on US–Pakistan trade flows. *Economic Change and Restructuring*, 55(1), 225–255. <https://doi.org/10.1007/s10644-020-09310-8>
- Juhász, R., Lane, N., & Rodrik, D. (2024). The new economics of industrial policy. *Annual Review of Economics*, 16(1), 213–242. <https://doi.org/10.1146/annurev-economics-081023-024638>

- Kripfganz, S., & Schneider, D. C. (2023). ARDL: Estimating autoregressive distributed lag and equilibrium correction models. *The Stata Journal*, 23(4), 983–1019. <https://doi.org/10.1177/1536867x231212434>
- Kusuma, A. C., Wardani, A. P., Amirudin, A., & Yuliana, R. (2024). Apakah neraca pembayaran membatasi pertumbuhan ekonomi? *Seminar Nasional Official Statistics*, 2024(1), 383–392. <https://doi.org/10.34123/semnasoffstat.v2024i1.2248>
- Kutu, A. A., & Ngalawa, H. (2016). Monetary policy shocks and industrial sector performance in South Africa. *Journal of Economics and Behavioral Studies*, 8(3), 26–40. [https://doi.org/10.22610/jeps.v8i3\(j\).1286](https://doi.org/10.22610/jeps.v8i3(j).1286)
- Lahadalia, B., Wijaya, C., Dartanto, T., & Subroto, A. (2024). Nickel downstreaming in Indonesia. *Journal of ASEAN Studies*, 12(1), 79–106. <https://doi.org/10.21512/jas.v12i1.11128>
- Lazuardi, S. D., Hadi, F., Devintasari, D. V., Wuryaningrum, P., Riduwan, M., Noarista, O. S., & Alifia, S. F. (2024). The impact on downstream policy implementation for mineral export products in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1298(1), 012018. <https://doi.org/10.1088/1755-1315/1298/1/012018>
- McCaig, B., & Pavcnik, N. (2018). Export markets and labor allocation in a low-income country. *American Economic Review*, 108(7), 1899–1941. <https://doi.org/10.1257/aer.20141096>
- McNown, R., Sam, C. Y., & Goh, S. K. (2018). Bootstrapping the autoregressive distributed lag test for cointegration. *Applied Economics*, 50(13), 1509–1521. <https://doi.org/10.1080/00036846.2017.1366643>
- Metaxas, P. E., & Weber, E. J. (2016). The dependent economy model. *Economic Record*, 92(298), 464–497. <https://doi.org/10.1111/1475-4932.12264>
- Miranda-Agrippino, S., & Rey, H. (2020). U.S. monetary policy and the global financial cycle. *The Review of Economic Studies*, 87(6), 2754–2776. <https://doi.org/10.1093/restud/rdaa019>
- Mutreja, P., Ravikumar, B., & Sposi, M. (2016). Capital goods trade, relative prices, and economic development. Federal Reserve Bank of Dallas. <https://www.dallasfed.org/~media/documents/institute/wpapers/2016/0294.pdf>
- Nkoro, E., & Uko, A. K. (2016). Autoregressive distributed lag cointegration technique. *Journal of Statistical and Econometric Methods*, 5(4), 63–91.
- Nopeline, N., Sirojuzilam, S., Syafii, M., & Tanjung, A. (2024). Analysis of non-migas sector trade balance for Indonesia's largest trading partner. <https://doi.org/10.4108/eai.22-9-2022.2337482>
- Ocampo-Gaviria, J. A., Steiner Sampedro, R., Villamizar Villegas, M., Taboada Arango, B., Jaramillo Vallejo, J., Acosta-Navarro, O. L., & Villar Gómez, L. (2023). *Report of the board of directors to the Congress of Colombia*. <https://doi.org/10.32468/inf-jun-dir-con-rep-eng.03-2023>
- Patunru, A. A. (2023). Trade policy in Indonesia. *Bulletin of Indonesian Economic Studies*, 59(3), 1–30. <https://doi.org/10.1080/00074918.2023.2282821>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Pham, T. A. T., Nguyen, T. T., Nasir, M. A., & Duc Huynh, T. L. (2023). Exchange rate pass-through. *The Quarterly Review of Economics and Finance*, 87, 158–167. <https://doi.org/10.1016/j.qref.2020.07.010>
- Rajkovic, T. (2020). Lead independent directors and investment efficiency. *Journal of Corporate Finance*, 64, 101690. <https://doi.org/10.1016/j.jcorpfin.2020.101690>
- Salim, A. (2021). Pengaruh inflasi terhadap pertumbuhan ekonomi Indonesia. <https://doi.org/10.36908/esha.v7i1.268>
- Shousha, S. (2016). *Macroeconomic effects of commodity booms and busts*. [https://www.bcb.gov.br/conteudo/eventos/Documents/seminariodemetas/XVIII/SMETAS XVIII-%20Samer%20Shousha.pdf](https://www.bcb.gov.br/conteudo/eventos/Documents/seminariodemetas/XVIII/SMETAS%20XVIII-%20Samer%20Shousha.pdf)
- Shrestha, M. B., & Bhatta, G. R. (2018). Selecting appropriate methodological framework for time series data analysis. *Journal of Finance and Data Science*, 4(2), 71–89. <https://doi.org/10.1016/j.jfds.2017.11.001>

- Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, 8(2), 39–42. <https://doi.org/10.12691/ajams-8-2-1>
- Sugiharti, L., Esquivias, M. A., & Setyorani, B. (2020). The impact of exchange rate volatility on Indonesia's top exports. *Heliyon*, 6(1), e03141. <https://doi.org/10.1016/j.heliyon.2019.e03141>
- Thorbecke, W., & Salike, N. (2020). Export sophistication and trade elasticities. *Journal of Asian Economic Integration*, 2(1), 7–26. <https://doi.org/10.1177/2631684620910276>
- Tritto, A. (2026). Statism and state activism in response to China's Belt and Road Initiative. *Competition & Change*, 30(1), 219–243. <https://doi.org/10.1177/10245294241311417>
- Umaru, H., A., A. N., & Davies, N. O. (2019). The effects of exchange rate volatility on economic growth. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 8(4). <https://doi.org/10.6007/ijarafms/v8-i4/5470>
- UNCTAD. (2018). UNCTAD TRAINS: *The global database on non-tariff measures*. <https://unctad.org/publication/unctad-trains-global-database-non-tariff-measures>
- UNCTAD. (2023). *World investment report 2023: Investment and sustainable energy*.
- Warburton, E. (2017). *Resource nationalism in post-boom Indonesia: The new normal?*
- Xu, Z., Elomri, A., Kerbache, L., & El Omri, A. (2020). Impacts of COVID-19 on global supply chains. *IEEE Engineering Management Review*, 48(3), 153–166. <https://doi.org/10.1109/emr.2020.3018420>