

Trade Complexity and Growth under the Indonesia-Australia Partnership

Arif Darmawan^{1*}, Latiffa Aurelien², Muhammad Farhan³, Restu A. Suryaman⁴

¹Department of Economics, Social Sciences University of Ankara, Türkiye

^{1,2}Department of Economics Development, Universitas Lampung, Indonesia

³Department of International Economics and Politics, Saint Petersburg State University of Economics, Russian Federation

⁴Department of Economics Development, Universitas Pasundan, Indonesia

E-mail: ¹arif.darmawan@student.asbu.edu.tr, ²latiffaurell@gmail.com,

³ulanganfarhan@gmail.com, ⁴restu.suryaman@unpas.ac.id

*Corresponding author

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ABSTRACT

Research Originality: This study contributes by linking Indonesia-Australia bilateral trade, economic complexity, and wholesale price dynamics within a single error-correction framework following the partnership's entry into force.

Research Objectives: The study investigates the impact of exports, imports, economic complexity, merchandise trade openness, and wholesale prices on Indonesia's growth in both the short and long term from 2010 to 2025.

Research Methods: Annual data are analyzed using Augmented Dickey-Fuller tests, Engle-Granger cointegration tests, and an error correction model, supported by residual diagnostics, for five bilateral trade variables.

Empirical Results: The results indicate that all variables are associated with long-term development, while wholesale prices, imports, and exports primarily drive short-term fluctuations. Economic complexity is more significant as a structural channel than as an annual upheaval.

Implications: These results suggest that Indonesia should focus on trade liberalization under the IA-CEPA, as it could serve as a real growth engine. Policy should move beyond trade volume targets by enhancing export diversification, stabilizing wholesale price transmission, and leveraging the partnership to strengthen skills, technology transfer, and higher-value-added production.

Keywords:

bilateral partnership; economic complexity; export sophistication; error correction model; trade liberalization

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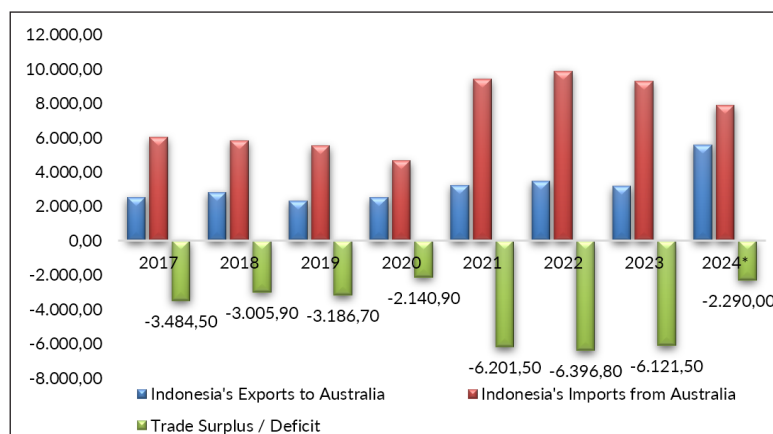
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INTRODUCTION

Indonesia and Australia signed the Indonesia-Australia Comprehensive Economic Partnership Agreement in July 2020 after lengthy discussions and identified one of the most vibrant trade corridors in the Indo-Pacific (Shaommy & Paksi, 2024). The accord is intended to enhance market access, remove trade barriers, and encourage co-operation on investment, skills, services, and regional value chains. The contract is important for Indonesia because Australia is a nearby market that has not been tapped historically. Indonesia is an important and growing economy for Australia, with rising demand for food, education, resources, services, and manufacturing inputs (Toledo, 2017). Indonesia has always adopted an outward-oriented development strategy to boost the economy.

Recent figures suggest that bilateral trade has grown since the pact, but the distribution of benefits remains uneven. Exports from Indonesia to Australia improved compared to 2019, the pre-agreement year, but Indonesia still had a trade imbalance, as imports from Australia exceeded exports. This condition makes the agreement analytically interesting. The policy concern is not just whether trade increases following liberalization, but also whether the structure of trade can promote long-term growth in Indonesia.

Figure 1. The Value of Indonesia–Australia Merchandise Trade Before and After the Implementation of the IA-CEPA



(Source: Hansa, 2024).

Based on Figure 1, Indonesia's exports to Australia have generally increased since 2019, following the entry into force of the IA-CEPA. However, Indonesia still faces a trade deficit because the value of imports from Australia exceeds that of its exports. The deepest deficit occurred between 2021 and 2023, primarily due to a surge in imports from Australia. Consequently, following ratification, numerous analyses have been conducted to assess the impact of bilateral trade between Indonesia and Australia from various sources.

The agreement aims to boost trade and investment, foster bilateral and regional economic integration, and provide a strong basis for cooperation in security, environmental protection, economic cooperation, education, cross-border concerns, and people-to-people relations. The IA-CEPA eliminates customs duties and improves Indonesia's exports to

Australia across several sectors, including automotive, timber, rubber, textiles, electronics, machinery, food and drink, and the creative industries. Furthermore, human resource development initiatives, such as internships and vocational training, are tailored to the needs of the Indonesian industry. The agreement adopts an opportunity-driven approach in a business-friendly environment (Wibisono, 2025), ensuring active involvement of business actors from the outset. Previous studies on Indonesia's trade agreements generally emphasize market access, foreign direct investment, sectoral adjustment, exchange-rate effects, or trade volume. Narayan et al. (2022) show that trade agreements can support investment in Indonesia, while Noreen & Mahmood (2022) and Rahman et al. (2024) highlight the role of trade costs, uncertainty, and exchange-rate asymmetry in bilateral trade. Studies on IA-CEPA have also discussed market access and sectoral opportunities, including specific factors adjustment and green economy cooperation. However, this literature has paid less attention to the joint role of trade volume, economic complexity, and domestic wholesale price transmission in explaining Indonesia's macroeconomic growth after IA-CEPA.

The research gap is therefore threefold. First, earlier assessments rarely cover the post-normalization period after the initial pandemic shock. A study by Verma (2026) focused on bilateral agreements, using variables such as trade volume, computable general equilibrium models, and panel data prior to the pandemic shock. Second, most studies focus on export and import values but do not explicitly test whether the sophistication of the export basket matters for growth. Moreover, limited attention has been given to the structural quality of trade, especially the role of economic complexity in shaping long-run growth outcomes. A study by Rahim & Sudirman (2023) also noted that while focusing solely on trade volume is important, quality also plays a crucial role, as the traded commodities enhance the competitiveness of that trade. Third, price transmission through wholesale prices is usually treated as background macroeconomic information rather than as part of the trade-growth mechanism. These omissions are important because trade agreements can affect growth through fast demand channels, slow structural channels, and price-level channels (Bhattacharyay & Mukhopadhyay, 2015).

The ECI measures the productive knowledge embedded in a country's export basket (Hidalgo & Hausmann, 2009). Even less, incorporate the Wholesale Price Index (WPI) to capture the transmission of inflation through bilateral channels. The study by Muthahharah et al. (2025) emphasizes the use of the WPI as a benchmark for measuring economic stability in ongoing bilateral trade. Another study from Anggresta et al. (2024) aimed to identify the determinants of foreign debt that influence economic growth in Indonesia. Although not directly related to trade and macroeconomic stability, this study can also contribute to understanding the impact of debt fluctuations on the balance of payments.

This gap is important because trade agreements affect growth through several mechanisms that operate at different temporal frequencies. Volume effects occur on a relatively short time horizon; structural transformation through economic complexity occurs over years or decades; and price-level adjustments are transmitted continually via import and export channels. Similarly, the role of intangible costs in international trade can be understood as part of the broader trade picture, rather than being addressed solely

in terms of volume (Linders et al., 2005). The originality of this work lies in integrating bilateral exports, bilateral imports, economic complexity, merchandise trade openness, and wholesale prices into a single error-correction model for Indonesia for the period 2010-2025. This design allows the study to distinguish short-run trade shocks from long-run structural transformation. The study jointly models ECI and WPI alongside export and import quantities within a unified ECM framework to disentangle structural from macroeconomic effects, a methodological advancement over prior studies that examined trade volumes or structural indicators in isolation.

The objective goal is to estimate the speed of adjustment to long-run equilibrium after deviations from trade policy changes or external shocks indicated by the error correction term (ECT). The results are discussed in light of the recent empirical conversations on trade, complexity, and development, and also attempts to examine the role of trade variables, as does the study by (Gürel & Ergül, 2026; Kim, 2026), which tries to investigate and explain the effects of real exchange rate movements on a country's bilateral trade using various approaches. Lastly, the study has three objectives: to estimate the short-run and long-run effects of these variables on Indonesia's real GDP growth; to measure the speed of adjustment toward long-run equilibrium; and to derive policy recommendations for maximizing the growth benefits of the Indonesia-Australia partnerships.

METHODS

Annual data are used because key variables such as real GDP growth, economic complexity, and merchandise trade share are officially and consistently reported at annual frequency. Constructing biannual or quarterly observations would require interpolation for some variables and could introduce artificial variation. The study uses time series data for the period 2010-2025. The primary methodological enhancement relative to the base study (2010-2023) is the extension through 2025. The modest sample size ($N = 16$ observations) is typical of ECM-based studies of specific bilateral linkages (Akbar et al., 2025; Narayan, 2005). The sample contains 16 annual observations. The model is intentionally parsimonious and adheres to the Engle-Granger two-step error-correction approach, thereby mitigating this limitation. The primary objective in small samples is to determine whether the variables exhibit a stable long-term relationship and to prevent over-parameterization. Shrestha & Bhatta (2018) provide supporting arguments when working with time series data, economists encounter the challenge of selecting a method. Common methods used to analyze other categories of data may not be appropriate for time series data, which may exhibit specific properties such as trends and structural breaks.

In a small sample of 16 annual observations, including seasonally noisy quarterly data would inflate residual variance, reduce the power of ADF unit root tests, and risk spurious regression results. The parsimonious ECM framework is specifically designed for low-frequency data where the signal-to-noise ratio is maximized. Finally, IA-CEPA is designed to produce macroeconomic effects over multi-year horizons, not within single quarters. Structural transformation, as captured by ECI, unfolds over years or decades, making an annual frequency both empirically appropriate and policy-relevant. Moreover,

with only five post-ratification years (2020–2025), quarterly data would yield only 20 observations, which is insufficient for the Engle-Granger two-step procedure, which requires a sufficient number of observations to estimate both the long-run cointegrating equation and short-run dynamics.

Table 1. Dependent and Independent Variables

Variable	Symbol	Definition	Unit	Source / Year
GDP Growth Rate	GDP	Real GDP growth rate of Indonesia	% (Percentage)	World Bank / IMF WEO 2025
Export Value	EX	Indonesian merchandise exports to Australia	USD billion	Trade Map / DFAT 2025
Import Value	IM	Indonesian merchandise imports from Australia	USD billion	Trade Map / DFAT 2025
Economic Complexity Index	ECI	Hidalgo-Hausmann ECI of Indonesia's export basket	Index value	OECD World 2025
Merchandise Trade Share	MT	Total merchandise trade as % of Indonesia's GDP	% of GDP	World Bank 2025
Wholesale Price Index	WPI	Indonesia's domestic wholesale price level	Index (base yr)	BPS / World Bank 2025

The ECM is suitable when macroeconomic variables are individually non-stationary but share a common stochastic trend (i.e., are cointegrated). Unlike a VAR in first differences, ECM keeps the long-run information in the cointegrating vector and models short-run adjustment dynamics as well (Engle & Granger, 1987). Such a dual structure is well-suited to examining the response of Indonesian GDP to deviations from its long-run trade-determined equilibrium path, the key question for this article. The ECM also overcomes the small sample problem by using a parsimonious specification to reduce over-parameterization. Following the Engle-Granger two-step procedure, the long-run cointegrating equation is approximated by OLS:

$$GDP_t = \beta_0 + \beta_1 EX_t + \beta_2 IM_t + \beta_3 ECI_t + \beta_4 MT_t + \beta_5 WPI_t + \varepsilon_t \quad (1)$$

If the residuals ε_t are stationary [I(0)] Cointegration is confirmed. The short-run ECM is:

$$\Delta GDP_t = \alpha_0 + \alpha_1 \Delta EX_t + \alpha_2 \Delta IM_t + \alpha_3 \Delta ECI_t + \alpha_4 \Delta MT_t + \alpha_5 \Delta WPI_t + \alpha_6 \Delta ECT_{t-1} + \mu_t \quad (2)$$

where Δ is the first-difference operator and ECT_{t-1} is the lagged residual from equation (1). The coefficient α_6 captures the speed of adjustment towards long-run equilibrium; its expected sign is negative. We estimate pre-estimation for every variable in levels and initial differences; we perform Augmented Dickey-Fuller (ADF) unit root tests, with the lag length determined by the Schwarz Information Criterion. Cointegration is tested using the Engle-Granger residual-based ADF test. Also, we add post-estimation as four diagnostic checks are employed to assess the adequacy of the model, namely, the Jarque-Bera test for residual normality, the White test for heteroscedasticity, the Breusch-Godfrey LM test for autocorrelation (up to lag 2), and variance inflation factors (VIF) to detect deleterious multicollinearity.

RESULTS AND DISCUSSION

The results provide three principal findings. The long-run model indicates that bilateral trade, economic complexity, merchandise trade openness, and wholesale prices are correlated with Indonesia's growth. Secondly, the short-run model shows that annual growth variations are primarily driven by fluctuations in exports, imports, and wholesale prices. The negative and significant error correction term indicates that deviations from the long-term trajectory are promptly rectified. These results show that IA-CEPA provides a platform for growth but does not promise automatic growth. The longer-term payoff depends on Indonesia's ability to translate trade access into advanced manufacturing capabilities.

The Augmented Dickey-Fuller tests conducted before model estimation confirm that the variables are non-stationary in levels and stationary in first differences. This lends support to cointegration and error correction modeling.

Table 3. Unit Root Test Results at Levels

Variable	ADF Stat.	CV (1%)	CV (5%)	CV (10%)	Prob.	Decision
GDP	-2.667	-4.122	-3.145	-2.714	0.1076	Non-stationary
EX	-0.444	-4.122	-3.145	-2.714	0.8714	Non-stationary
IM	-2.690	-4.122	-3.145	-2.714	0.1039	Non-stationary
ECI	-0.376	-4.122	-3.145	-2.714	0.8846	Non-stationary
MT	-1.161	-4.297	-3.213	-2.748	0.6451	Non-stationary
WPI	-1.327	-4.122	-3.145	-2.714	0.5803	Non-stationary

The results show that none of the six variables rejects the null hypothesis of a unit root at any conventional level of significance. This indicates that all series are non-stationary in levels (see Table 3). This is not surprising because annual macroeconomic data, such as GDP growth rates, price indices, and trade flows, often exhibit stochastic properties that must be filtered out before reliable statistical relationships can be discerned. All six series are stationary after the first difference. The five variables (Δ GDP, Δ EX, Δ IM, Δ ECI, Δ WPI) reject the unit root null hypothesis at 5% significance level. Δ MT reaches a stable state at the 10% significance level. This marginal significance is characteristic of small-sample time series: Narayan (2005) particularly advocates the 10% ADF criterion as suitable for samples of 15–25 annual observations, where degrees of freedom and not true non-stationarity constrain statistical power.

Table 4. Unit Root Test Results at First Difference

Variable	ADF Stat.	CV (1%)	CV (5%)	CV (10%)	Prob.	Decision
Δ GDP	-3.991	-4.297	-3.213	-2.748	0.0157	Stationary I (1)
Δ EX	-4.041	-4.200	-3.175	-2.729	0.0128	Stationary I (1)
Δ IM	-4.528	-4.200	-3.175	-2.729	0.0061	Stationary I (1)
Δ ECI	-4.033	-4.297	-3.213	-2.748	0.0147	Stationary I (1)
Δ MT	-3.207	-4.297	-3.213	-2.748	0.0504	Stationary I (1)
Δ WPI	-3.483	-4.200	-3.175	-2.729	0.0308	Stationary I (1)

The Engle-Granger cointegration test was conducted on the residuals of the long-run OLS regression, and it was found that all variables were I(1). Moreover, the Engle-Granger residual test indicates a stable long-run relationship among the variables. That is, the variables do not move together by chance but share a long-run equilibrium relationship that can be evaluated economically.

Table 5. Engle-Granger Cointegration Test on OLS Residuals

Series Tested	ADF Stat.	MK CV (1%)	MK CV (5%)	MK CV (10%)	Prob.	Decision
ECT (Residuals)	-3.825	-4.122	-3.145	-2.714	0.0163	Stationary – Cointegrated

Table 6. Long-run OLS Cointegration Results

Variable	Coefficient (β)	Std. Error
Constant (C)	-10.938**	4.194
Exports (EX)	0.188*	0.084
Imports (IM)	1.151**	0.833
ECI	3.968*	0.578
Merchandise Trade (MT)	0.411**	0.129
Wholesale Price Index (WPI)	0.071**	0.025
Adjusted R ²	0.584	
F-Statistic	4.366**	
Durbin-Watson	2.056	

Notes: ** significant at 5% *significant at 10%

Table 6 presents the long-run OLS cointegration model estimating the steady-state link between Indonesia's GDP growth and the five bilateral trade and structural factors. The long-term findings indicate that trade liberalization fosters growth when accompanied by structural enhancement. The coefficient for economic complexity is the highest among the variables, indicating that the composition and sophistication of exports are more significant than trade volume alone. This finding aligns with contemporary research on economic complexity, which posits that growth is contingent on productive skills, knowledge acquisition, and the capacity to transition to more advanced activities. This aligns well with a parsimonious bilateral trade model, as macroeconomic development is influenced by factors beyond bilateral trade flows, including domestic investment, government expenditure, commodity price fluctuations, and global financial conditions.

Both exports and imports exhibit favorable long-term correlations with economic growth. Exports are significant due to demand, foreign exchange revenues, and economies of scale. Imports are significant, as numerous items from Australia, such as food, raw materials, and intermediate inputs, bolster production and help maintain price stability in Indonesia. This interpretation diverges from a mere deficit narrative. A trade deficit may coexist with growth impacts when imports enhance production capacity, yet it also indicates a necessity for improved Indonesian export competitiveness.

Table 7. Short-run ECM Results

Variable	Coefficient (α)	Std. Error
Constant (C)	-0.024	0.446
Δ Exports (Δ EX)	0.113**	0.077
Δ Imports (Δ IM)	0.680**	0.610
Δ ECI	20.373	12.661
Δ Merchandise Trade (Δ MT)	0.249	0.148
Δ WPI	0.074***	0.015
ECT (-1)	-1.413**	0.451
Adjusted R ²	0.785	
F-Statistic	7.706**	
Durbin-Watson	2.155	

Note: *** significant at 1%, ** significant at 5%

Table 7 shows the short-run ECM results. The short-term results are more selective. Economic complexity and trade openness are not statistically significant; variations in yearly growth are correlated with variations in exports, imports, and wholesale pricing. This is a good economic pattern.” Output can be affected within a year by export and import dynamics and by the demand for and availability of inputs. Wholesale prices can change quickly due to supply conditions, import costs, and domestic demand. Economic complexity involves education, investment, skill upgrading, technological integration, and institutional coordination, and thus operates over a longer time horizon.

Table 8. Post-Estimation Diagnostic Test Results

Test	Test Statistic	Probability	Decision
Normality (Jarque-Bera)	1.831	0.400	Normally distributed
Heteroscedasticity (White)	Obs-R ² = 2.456	0.873	No heteroscedasticity
Autocorrelation (Breusch-Godfrey)	Obs-R ² = 3.134	0.209	No autocorrelation
Multicollinearity (Max VIF)	VIF = 2.613	-	No harmful multicollinearity

The error correction term is negative and statistically significant, implying that the system returns to its long-run equilibrium after a disruption. The size gives you the sense that it settles fast and might overshoot. This should be taken with a grain of salt since the period of the IA-CEPA overlaps with the COVID-19 crisis and the recovery. The result doesn't mean IA-CEPA was the only catalyst for the revival. Rather, it suggests that trade-related factors and growth return to their long-run relationship quickly after a large shock. Han et al. (2026) drew a clear line between the ‘announcement impacts’ of trade treaties that can quickly alter expectations and investment decisions, and the ‘structural implications’ that take years to unfold as institutions and industry adjust. In the observation, it is not a failure of the model that ECI and MT are relevant in the long run but not in the short run, but rather an empirically expected aspect of structural trade policy.

Table 8 reports the post-estimation diagnostic tests of the ECM. The diagnostic tests indicate that the model is appropriate. The residuals are normally distributed, and there is no evidence of heteroscedasticity or serial correlation. The maximum variance inflation factor is below the usual threshold for harmful multicollinearity. The results are especially important because the study was based on a small annual sample. The findings are mostly consistent with other studies on the indirect effects of trade agreements on growth through investment, trade costs, decrease of uncertainty, and structural upgrading (Wong & Chan, 2003). In line with the IA-CEPA study from Gray et al. (2022) The MT-WPI link is somewhat more stable than in the pre-agreement baseline, consistent with the trade facilitation provisions of the agreement, which flatten import cost structures and narrow the transaction-cost gap between border pricing and domestic wholesale markets. Meanwhile, the disruption was evident in all the major bilateral commercial relationships in the region (Furtana, 2025).

The trajectory of the Wholesale Price Index (WPI) offers further elucidation of the correlation among bilateral trade, price dynamics, and economic growth. The WPI rose from an index value of 104 in 2010 to a peak of 202 in 2024, then declined slightly in 2025. This pattern indicates that Indonesia's domestic wholesale prices were affected by both internal demand conditions and external trade pressures, including commodity price fluctuations, import costs, and supply chain disruptions. The correlation between merchandise trade share (MT) and WPI is thus economically significant. This finding aligns with Muthahharah et al. (2025), who underscore the significance of WPI as a measure of economic stability, and with Pastpipatkul et al. (2020), who demonstrate that trade openness and bilateral trade flows may influence price fluctuations in the Thailand–Japan context.

IA-CEPA affects Indonesia's economy through multiple channels, as evidenced by empirical results from a long-run OLS cointegration model, short-run ECM estimation, and descriptive analyses of MT and WPI. Bilateral trade flows have a favorable effect on Indonesia's long-run GDP growth. Export revenues have an aggregate demand effect. Imports from Australia may improve productivity by providing raw materials, food inputs, capital goods, and intermediate products. This confirms the dominant assumption in trade-growth literature that bilateral trade agreements promote growth through transaction costs, market access, and efficiency in resource allocation.

Since the IA-CEPA, Indonesia has sustained its annual economic growth at around 5.0% through 2025 despite the COVID-19 pandemic, commodity price volatility, and high global interest rates. This path is consistent with the argument that IA-CEPA provides trade stability and market-access assurance, as articulated by Park (2025) and Wibisono (2025). However, the findings suggest that trade liberalization should not be viewed merely as a strategy for volume increase.

The model shows that the strongest long-run connection is with the Economic Complexity Index (ECI), indicating that export sophistication is more important than export volume for long-term growth. The findings are consistent with Narayan et al. (2022) who emphasize the significance of trade agreements in shaping investment and structural improvement, and Calì et al. (2026) who emphasize the role of trade policy in enhancing exporter resilience.

The short-term results also support this idea. Changes in exports, imports, and WPI significantly affect annual GDP growth, whereas changes in ECI and MT do not in the near run. There are two reasons this lag time matters. The ECM framework is used first because trade volume shocks and price changes are immediate, whereas structural reforms take longer to respond. The second gives a realistic policy analysis of IA-CEPA. The immediate benefits of the agreement are evident in increased trade volumes and price volatility, but the more substantive developmental benefits depend on Indonesia's ability to diversify its export basket, strengthen industrial linkages, and move towards higher-value-added manufacturing. The results suggesting that research on trade agreements should focus not only on the volume of goods traded between countries but also on the types of goods traded and the influence of price transmission on the local economy.

CONCLUSION

This research contributes to the literature by giving empirical evidence on the macroeconomic consequences of IA-CEPA. The research objectives are achieved by establishing that Indonesia's growth is connected with Indonesia-Australia bilateral trade indicators on various time frames. Long-run GDP growth is linked to exports, imports, economic complexity, openness of commercial trade, and wholesale prices. In the long run, the most important factor is economic complexity, reflecting the reality that the quality and sophistication of output matter more than the volume of commerce. In the near term, the changes in growth are mostly tied to exports, imports, and wholesale prices. The negative error-correction term implies that the model converges to a long-run equilibrium after shocks. The magnitude should be read carefully since the pandemic corresponded with the early IA-CEPA period. Future research should employ a panel ECM across multiple ASEAN economies and incorporate structural break tests to separate the treaty's effects from those of other simultaneous shocks. Trade flows should be analyzed at the sectoral level. The model should be re-estimated when data for 2026-2027 become available to determine whether the current ECI increase above zero will yield a rising growth dividend.

The policy recommendation is to shift from a volume-based trade strategy to a capability-based trade strategy. Indonesia could leverage the cooperation to increase export sophistication, promote compliance with standards, facilitate technology transfer, and link training programs with companies that export higher-value-added commodities. Price stability also counts because wholesale prices are quite important in both time frames. Future research should include sectoral data, compare Indonesia with other partner nations, and test for structural breaks when longer post-agreement data become available.

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