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Exchange Rate Volatility and Export Competitiveness in Southeast Asian Manufacturing Markets

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Abstract

Exchange-rate volatility is often linked to export performance, yet its relationship with manufacturing export competitiveness may depend on persistent structural differences across economies. This study examines the dynamic relationship between exchange-rate volatility and manufacturing export competitiveness in Indonesia, Malaysia, Thailand, Viet Nam, the Philippines, and Singapore during 2010–2023. Manufacturing export competitiveness is measured as manufactures exports as a share of merchandise exports, while exchange-rate volatility is calculated using the three-year rolling standard deviation of annual log exchange-rate changes. A balanced panel of 84 country-year observations is analyzed using pooled dynamic ordinary least squares, country fixed effects, and country-and-year fixed effects with HC3 robust standard errors, supported by first-difference and leave-one-country-out robustness tests. The results show strong persistence in manufacturing export structure, while exchange-rate volatility has a negative but statistically imprecise association in the preferred country-and-year fixed-effects specification. Annual exchange-rate changes likewise show no statistically precise relationship with manufacturing export competitiveness. Considerable cross-country heterogeneity is observed, with Viet Nam and the Philippines recording the largest increases in manufacturing export shares. The findings indicate that manufacturing export competitiveness is more closely associated with persistent production capabilities, investment, technology, and global value-chain integration than with short-term currency fluctuations. These results highlight the importance of combining exchange-rate risk management with longer-term industrial development policies.

Keywords: *ASEAN, Exchange-Rate Volatility, Export Competitiveness, Manufacturing Exports, Southeast Asia.*

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INTRODUCTION

Manufacturing exports occupy a central position in Southeast Asia's development model because the region combines large domestic markets, export-processing hubs, electronics clusters, resource-based manufacturing, and dense cross-border production networks. The competitiveness of these activities cannot be inferred from nominal export growth alone, as export structure, technological intensity, imported intermediate inputs, productivity, logistics, market access, and exchange-rate conditions jointly determine whether firms can retain international orders and move toward higher-value activities. Recent evidence shows that participation in global value chains can improve productivity for selected firms in ASEAN developing economies, while manufacturing trade remains differentiated by technological intensity and country specialization (Baek & Urata, 2023). Regional trade statistics further demonstrate the continuing importance of manufactured goods within Southeast Asia's merchandise trade structure, reinforcing the role of manufacturing exports in the region's integration into global markets (ASEAN Secretariat, 2024). Evidence from Indonesia similarly identifies technical efficiency, imported inputs, foreign investment, scale, and labor productivity as important determinants of export performance across low-, medium-, and high-technology manufacturing industries (Handoyo et al., 2024). These structural conditions make a currency-only interpretation of export competitiveness implausible even when exchange-rate movements remain economically salient.

Exchange-rate volatility matters because exporters sign contracts, quote prices, purchase imported inputs, finance working capital, and make investment decisions before future exchange rates are fully known, creating uncertainty that can alter expected profitability and the timing of market participation. Firm-level evidence indicates that exporters incorporate expected exchange-rate movements into pricing decisions, although their ability to adjust prices becomes weaker when uncertainty surrounding future currency conditions increases (Fracasso et al., 2022). Evidence from exporter-level data also suggests that exchange-rate volatility can reduce firms' decisions to enter foreign markets, implying that currency uncertainty may influence the extensive rather than merely the intensive margin of trade (Tunç & Solakoglu, 2025). Research on Chinese exporters further shows that exchange-rate uncertainty can weaken investment responses to demand conditions, linking currency risk with firms' longer-term production and capacity decisions (Zeng et al., 2022). Earlier cross-country evidence demonstrates that the export effects of exchange-rate volatility differ between developing and industrialized economies, indicating that institutional and structural conditions shape the transmission of currency uncertainty into trade performance (Sauer & Bohara, 2001). Currency volatility can therefore influence manufacturing competitiveness through several interconnected channels, including pricing, market entry, investment, imported-input costs, and risk management. The relevant empirical problem is not simply whether volatility reduces exports, but whether annual currency instability is systematically associated with persistent differences in manufacturing-export structure after structural country characteristics and common regional shocks are recognized.

The empirical literature increasingly emphasizes heterogeneity by technology, destination, industry, and exchange-rate regime, challenging interpretations based on a single aggregate volatility coefficient. Panel SVAR evidence shows that export reactions to exchange-rate movements and volatility differ according to technological intensity, suggesting that industries positioned differently within production networks do not absorb currency shocks in the same manner (Aslan & Akpiliç, 2024). Long-run evidence from emerging economies similarly finds that real exchange-rate uncertainty affects technology categories unevenly, with medium-high- and medium-low-technology exports exhibiting differentiated responses rather than a uniform pattern across manufacturing groups (Akpiliç & Aslan, 2024). Sectoral analysis further indicates that real exchange-rate measures constructed around specific manufacturing sectors can explain export performance more effectively than broad aggregate currency indicators when production structures and trading partners vary substantially across industries (Goda et al., 2024). This heterogeneity is particularly consequential for ASEAN because Singapore and Malaysia maintain electronics-intensive export structures, Thailand combines automotive and electronics production, Viet Nam has rapidly deepened manufacturing integration, the Philippines remains strongly connected to electronics production, and Indonesia retains a comparatively important role for resource-linked manufacturing. ASEAN therefore provides an analytically appropriate setting for examining whether exchange-rate volatility has a common structural association with manufacturing export competitiveness or whether its relevance depends on distinct national production configurations.

ASEAN-specific research reinforces the need to distinguish short-run currency risk from persistent export positioning because the region combines integrated production networks with substantially different industrial structures. Evidence from ASEAN-5 manufacturing commodities shows that the effects of exchange-rate volatility differ across short- and long-run horizons and between symmetric and asymmetric specifications, indicating that currency disturbances can operate differently according to their temporal and distributional characteristics (Handoyo et al., 2023). A regional gravity study likewise finds country-specific effects of exchange-rate volatility on bilateral trade and investment rather than a single regional relationship, highlighting the importance of national exposure and trading structures (Wongsamee & Boonanegpat, 2024). Recent ASEAN panel evidence continues to examine exchange-rate volatility jointly with import and export dynamics, suggesting that currency conditions cannot be isolated from the broader trade structure of the region (Salsabila et al., 2026). Earlier Indonesian evidence also identifies destination-specific differences in the relationship between rupiah volatility and exports to Japan and the United States, demonstrating that the consequences of currency instability can vary across external markets (Fitrianti, 2017). At the same time, the regional architecture of trade is changing through RCEP and increasingly interconnected production networks, which can modify the channels through which exchange-rate movements affect exporters. China–ASEAN trade remains strongly connected to machinery and manufactured-goods categories, while

regional production relationships increasingly condition the location and organization of manufacturing activities (Zhai, 2023).

Manufacturing competitiveness consequently reflects not only currency conditions but also the evolving architecture of regional integration, production specialization, and global value chains. Network evidence identifies non-random structural relationships within RCEP manufacturing trade, indicating that national export performance is partly conditioned by each economy's position within the wider regional production system (Zhu et al., 2024). Research on international industrial transfer likewise shows that changes in manufacturing location across RCEP economies can reshape countries' structural positions within global value chains (Zhang et al., 2024). Simulations of RCEP and CPTPP further suggest that preferential integration can alter manufacturing global value chains over time, potentially modifying the exposure of exporters to exchange-rate shocks (Chen et al., 2025). Evidence from other emerging manufacturing economies reinforces this problem, as disaggregated Indian manufacturing exports exhibit mixed short- and long-run responses to exchange-rate volatility across product groups (Jyoti & Bhatt, 2024). The broader literature therefore remains fragmented because estimated relationships depend substantially on volatility measurement, sectoral aggregation, geography, data frequency, and empirical specification, leaving limited clarity about whether currency instability has a persistent association with broader structural manufacturing competitiveness (Lal et al., 2023).

This study focuses on six ASEAN economies—Indonesia, Malaysia, Thailand, Viet Nam, the Philippines, and Singapore—that represent major manufacturing-export systems and provide comparable longitudinal observations for the selected indicators. Export competitiveness is proxied by manufactures exports as a percentage of merchandise exports, a structural indicator that captures the weight of manufactured products within a country's goods-export basket rather than directly measuring price competitiveness or firm-level productivity. This boundary is important because a higher manufacturing-export share may reflect specialization, imported-input processing, electronics concentration, multinational production, or resource-linked industrial structures as well as underlying productive efficiency. The exchange-rate measure captures annual currency conditions through the official exchange rate expressed in local currency units per U.S. dollar, while volatility is incorporated to represent instability rather than the level of the exchange rate itself. The study positions itself at the intersection of exchange-rate economics and structural export competitiveness by examining whether annual currency volatility contributes to differences in manufacturing-export shares after accounting for persistence, country heterogeneity, and common temporal effects. Empirically, the analysis develops dynamic panel specifications in which manufacturing-export competitiveness depends on its own lag, exchange-rate volatility, and contemporaneous exchange-rate changes, followed by country and year effects and robustness assessments through first-difference and leave-one-country-out estimations. The objective is to determine whether exchange-rate volatility has a persistent and independently identifiable relationship with manufacturing export competitiveness in ASEAN-6, while recognizing that export structures evolve through slower-moving industrial capabilities and regional production arrangements rather than through annual currency movements alone. The study contributes theoretically by connecting exchange-rate uncertainty with a structural conception of export competitiveness that incorporates persistence, heterogeneous industrial capabilities, and regional production integration, and contributes methodologically by combining a dynamic panel framework with specification and stability checks that distinguish short-term currency movements from more persistent cross-country differences.

RESEARCH METHODS

This study employs an empirical quantitative research design using a dynamic panel econometric approach to examine the relationship between exchange-rate volatility and manufacturing export competitiveness across six Southeast Asian economies: Indonesia, Malaysia, Thailand, Viet Nam, the Philippines, and Singapore. The study population comprises Southeast Asian economies with comparable annual data, while the purposive sample consists of the six economies with continuous observations for the principal indicators during 2010–2023, producing a balanced panel of 84 country-year observations. Manufacturing export competitiveness is operationalized as manufactures exports as a percentage of merchandise exports, representing the structural weight of manufactured products in each country's merchandise-export basket rather than firm-level productivity or direct price

competitiveness (World Bank, 2026a). The exchange-rate measure is derived from the official exchange rate in local currency units per U.S. dollar, with annual exchange-rate changes calculated as 100 times the logarithmic difference of the period-average exchange rate, such that positive values indicate domestic-currency depreciation (World Bank, 2026b). Exchange-rate volatility is measured as the three-year rolling standard deviation of annual logarithmic exchange-rate changes, with observations beginning before 2010 retained only to construct the initial rolling window, while the lagged dependent variable captures persistence in national manufacturing-export structures. This operationalization follows the broader empirical literature showing that exchange-rate volatility can generate differentiated effects across manufacturing commodities and country contexts and that volatility measurement should be aligned with the temporal structure of the available data (Handoyo et al., 2023).

Table 1. Variable Construction and Data Sources

Variable	Operational Definition	Unit	Period	Primary Source
Manufacturing export competitiveness	Manufactures exports / merchandise exports	%	2010–2023	World Bank WDI / UN Comtrade
Exchange-rate change	$100 \times \Delta\ln(\text{LCU per USD})$	% log change	2009–2023	World Bank WDI / IMF IFS
FX volatility	3-year rolling standard deviation of annual log exchange-rate change	Percentage points	2011–2023	Author calculation
Lagged competitiveness	One-year lag of manufacturing export share	%	2011–2023	Author calculation
First difference	Annual change in manufacturing export share and volatility	Percentage points	2012–2023	Author calculation

The econometric analysis begins with a pooled dynamic ordinary least squares specification and progressively introduces country fixed effects and two-way country–year effects to distinguish the aggregate association from relationships conditional on time-invariant national characteristics and common temporal shocks. The baseline model is specified as:

$$EC_{it} = \alpha + \rho EC_{i,t-1} + \beta Vol_{it} + \gamma \Delta FX_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Where ECdenotes manufacturing export competitiveness, Volrepresents three-year exchange-rate volatility, ΔFXdenotes the annual exchange-rate change, $\mu_i$captures country-specific effects, and $\lambda_t$captures year effects. Heteroskedasticity-consistent HC3 standard errors are used because the cross-sectional dimension contains only six countries, making inference based on a very small number of country clusters potentially unstable, while coefficient estimates are interpreted as conditional associations rather than causal effects. Dynamic panel GMM is not selected as the principal estimator because the limited cross-sectional dimension can create finite-sample concerns and excessive instrument use, particularly when the number of countries is small relative to the available time observations (Arellano & Bond, 1991). Robustness is assessed through a first-difference specification and leave-one-country-out estimations of the country-and-year-effects model, allowing the analysis to examine whether the relationship persists after removing time-invariant country components and whether the estimated volatility coefficient is disproportionately influenced by any single economy. The interpretation emphasizes coefficient direction, magnitude, specification stability, and sensitivity across alternative estimations, reflecting evidence that exchange-rate responses differ according to technological intensity and national export structures rather than following a uniform pattern across economies (Aslan & Akpiliç, 2024).

RESULTS AND DISCUSSION

Manufacturing Export Structure and Divergence across ASEAN-6

ASEAN-6 economies participate in an increasingly integrated regional production system, yet their manufacturing export structures remain markedly differentiated across countries. The mean manufacturing-export share during 2010–2023 ranges from approximately 42% in Indonesia to nearly 80% in Viet Nam, with the Philippines also approaching four-fifths, while Thailand, Singapore, and Malaysia occupy an intermediate-to-high position. These differences indicate that regional production integration has not produced a uniform export structure because economies have developed distinct combinations of industrial capabilities, foreign investment, technological specialization, and resource-based activities. Evidence from ASEAN–European Union manufacturing trade similarly identifies substantial cross-country differences in technological intensity and the composition of higher-value manufacturing exports (Navarro Zapata et al., 2023). The persistence of these differences matters for the interpretation of exchange-rate effects because identical currency movements can operate through substantially different production and export structures. Manufacturing export competitiveness is consequently better approached as a structural outcome in which short-term macroeconomic conditions interact with accumulated productive capabilities.

Table 3. Carbon Disclosure Quality by Firm and Year

Economy	Panel Years	Obs.	Manufacturing Share 2010	Manufacturing Share 2023	Mean Share	Mean FX Volatility
Indonesia	2010-2023	14	37.0	44.7	41.8	5.03
Malaysia	2010-2023	14	67.0	68.4	66.5	5.28
Thailand	2010-2023	14	72.5	73.0	73.3	3.64
Vietnam	2010-2023	14	64.0	85.0	78.8	1.37
Philippines	2010-2023	14	56.3	79.5	77.4	3.33
Singapore	2010-2023	14	71.3	74.0	72.5	3.11

Table 2 highlights substantial structural variation across the ASEAN-6 economies despite their identical 14-year observation period. Indonesia records the lowest mean manufacturing share at 41.8%, whereas Viet Nam reaches 78.8% and the Philippines 77.4%, while Malaysia, Thailand, and Singapore maintain comparatively higher and more stable positions. The contrast between Viet Nam's high manufacturing share and low mean FX volatility of 1.37 is particularly notable, whereas Malaysia combines a relatively high manufacturing share with the highest mean volatility of 5.28. Such differences reflect the heterogeneous effects of global value-chain participation and productivity across ASEAN economies (Baek & Urata, 2023). The structural variation indicates that manufacturing export competitiveness cannot be treated as homogeneous across the region when assessing exchange-rate conditions.

The strongest structural changes occur in Viet Nam and the Philippines, whose manufacturing export shares increase from 64.0% to 85.0% and from 56.3% to 79.5%, respectively, while Indonesia rises more moderately from 37.0% to 44.7% and the remaining economies show relatively limited changes. These divergent trajectories are consistent with differences in industrial relocation, export-platform investment, technology specialization, and supply-chain integration. Evidence from the RCEP manufacturing trade network shows that differentiated production relationships can generate uneven patterns of integration and structural upgrading across participating economies (Zhu et al., 2024). At the regional level, the unweighted manufacturing export share increases from 61.35% in 2010 to 72.50% in 2020 before reaching 70.77% in 2023, reflecting changes associated with production-network expansion, the COVID-19 disruption, and subsequent normalization. The resilience of Asian manufacturing exports under changing competitive conditions further illustrates the importance of technology and production structure in shaping export performance (Kato, 2022). These patterns support the inclusion of lagged manufacturing export share in the dynamic model because export composition exhibits substantial persistence alongside considerable cross-country divergence.

Table 3. Country-Level Descriptive Statistics, 2010-2023

Economy	Mean Manufacturing Share	SD Manufacturing Share	Mean FX Volatility	SD FX Volatility	Mean Annual FX Change
Indonesia	41.77	4.36	5.03	3.05	2.72
Malaysia	66.48	3.77	5.28	2.26	1.85
Thailand	73.34	1.77	3.64	1.45	0.10
Vietnam	78.78	8.11	1.37	1.22	2.08
Philippines	77.39	8.80	3.33	2.19	1.11
Singapore	72.51	3.53	3.11	1.33	-0.56

Table 3 further demonstrates that manufacturing export structure and exchange-rate conditions do not follow a common regional pattern. Viet Nam combines the highest mean manufacturing share of 78.78% with the lowest mean volatility of 1.37, whereas Indonesia combines the lowest manufacturing share of 41.77% with comparatively high volatility of 5.03. The Philippines exhibits a high average manufacturing share of 77.39% alongside the largest standard deviation in manufacturing share at 8.80, indicating substantial structural movement over time. Thailand, in contrast, records a much smaller manufacturing-share standard deviation of 1.77, suggesting considerably greater stability in its aggregate export composition. Product-level evidence from ASEAN also shows that competitiveness can differ significantly across commodities within individual national export structures, making aggregate indicators insufficient for identifying all dimensions of export performance (Nikensari et al., 2024). These descriptive differences indicate that the manufacturing-export share captures an important structural dimension of competitiveness but does not by itself establish the productivity, technological, or value-added mechanisms generating that competitiveness.



Figure 1. Manufacturing Export Share across ASEAN-6, 2010-2023

Indonesia's comparatively low manufacturing-export share should not be interpreted as uniformly weak manufacturing export performance because the indicator measures the composition of merchandise exports rather than productivity within individual industries. The country's substantial commodity-export base can reduce the manufacturing proportion mechanically even when selected manufacturing sectors maintain significant international competitiveness. Indonesian evidence shows that export performance varies across low-, medium-, and high-technology manufacturing industries and is associated with technical efficiency, imported inputs, foreign direct investment, scale, and labor productivity (Handoyo et al., 2024). Related evidence for Indonesian rubber exports indicates that infrastructure, market size, foreign investment, and scale affect both intensive and extensive export margins, reinforcing the importance of production-side and market-access conditions (Handoyo et al., 2023). The aggregate manufacturing share should consequently be interpreted as a structural

competitiveness proxy rather than a direct ranking of firm productivity or technological sophistication. This interpretation also explains why substantial differences in the indicator can coexist with competitive export positions in particular manufacturing or resource-processing segments.

Trade-policy conditions provide an additional layer through which these structural differences are reproduced and potentially transformed. Expanding China–ASEAN trade has increased opportunities in machinery, transport equipment, and other manufactured products, although trade potential differs according to bilateral market characteristics, geographical distance, exchange rates, and institutional conditions (Zhai, 2023). Sector-specific evidence on India–ASEAN trade likewise identifies machinery, chemicals, base metals, and plastics as important areas in which export competitiveness can vary across destination markets (Dawani & Pareek, 2024). Manufacturing competitiveness is therefore embedded in production capabilities, market access, and cross-border partner networks rather than determined by currency conditions in isolation. Regional trade agreements can further modify these relationships by influencing sourcing patterns, market access, and the organization of manufacturing global value chains across participating economies (Chen et al., 2025). The ASEAN-6 evidence consequently points to a manufacturing export structure characterized by persistent country heterogeneity, substantial differences in structural change, and distinct positions within regional production networks, providing the empirical basis for examining exchange-rate volatility as one component of this broader competitiveness environment.

Exchange-Rate Volatility Regimes and Country Heterogeneity

Exchange-rate volatility exhibits substantial heterogeneity across the ASEAN-6 economies, and its cross-country ordering does not correspond directly to the structure of manufacturing exports. Malaysia records the highest mean volatility at 5.28, followed closely by Indonesia at 5.03, whereas Viet Nam records the lowest value at 1.37, with Thailand, the Philippines, and Singapore occupying intermediate positions. These differences indicate that exchange-rate conditions are shaped by country-specific monetary frameworks, exchange-rate management practices, capital-flow dynamics, and episodes of appreciation or depreciation rather than by manufacturing orientation alone. The contrast is particularly important because economies with relatively high manufacturing shares can operate under markedly different currency-volatility environments. Evidence for ASEAN indicates that the relationships among exchange-rate volatility, bilateral trade, and investment vary across countries, reflecting differences in macroeconomic structures and external exposure (Wongsamee & Boonanegpat, 2024). The regional evidence thus calls for volatility to be interpreted as a heterogeneous macroeconomic condition rather than as a uniform ASEAN-wide shock.

Table 4. Selected Regional Annual Means

Year	Manufacturing Export Share (%)	FX Volatility	Annual FX Log Change (%)
2011	58.97	6.02	-2.75
2013	65.15	4.09	2.14
2015	70.90	3.49	8.11
2017	70.00	4.39	1.32
2019	71.70	2.63	-0.33
2021	72.07	2.18	-0.99
2022	70.02	3.92	5.69
2023	70.77	3.78	1.05

Table 4 shows that regional volatility did not move monotonically with the manufacturing export share, reinforcing the distinction between short- to medium-term currency instability and longer-term export restructuring. Average volatility declined from 6.02 in 2011 to 2.18 in 2021 before increasing to 3.92 in 2022 and remaining elevated at 3.78 in 2023. Over the same selected years, the manufacturing export share generally increased from 58.97% in 2011 to above 70% after 2015, although it declined temporarily in 2022 before recovering in 2023. The simultaneous movement of these indicators suggests that changes in manufacturing specialization can continue during periods of both relatively stable and relatively unstable currencies. This pattern is consistent with evidence that ASEAN

manufacturing exports are influenced by broader production-network and external-demand conditions, while exchange-rate effects can vary according to commodity and sector characteristics (Handoyo et al., 2023). Regional averages consequently conceal substantial country-level differences in the timing and intensity of exchange-rate transmission.

The most pronounced volatility episodes further demonstrate that currency instability is concentrated in particular country-year combinations rather than distributed uniformly across the panel. Indonesia experienced its highest volatility in 2011–2012, Malaysia recorded particularly elevated volatility during 2015–2017, and the Philippines registered a prominent episode in 2022. These episodes were accompanied by different movements in manufacturing export shares, indicating that high volatility did not generate a common export response across the ASEAN-6. Malaysia's 2015 volatility peak coincided with an annual exchange-rate depreciation of 17.87%, while Indonesia's 2011 peak occurred alongside an annual appreciation of 3.49%, illustrating that volatility is not synonymous with depreciation. The distinction is relevant because exporters can respond differently to expected and unexpected currency movements depending on imported-input requirements, pricing practices, and industry characteristics (Jyoti & Bhatt, 2024). Exchange-rate volatility should consequently be separated analytically from the direction of annual exchange-rate change.

Table 5. Country-Specific Correlations with Manufacturing Export Share

Economy	Correlation with FX Volatility	Correlation with Annual FX Change	N
Indonesia	-0.703	-0.182	13
Malaysia	0.088	0.025	13
Thailand	-0.466	0.174	13
Vietnam	-0.310	-0.594	13
Philippines	-0.579	0.391	13
Singapore	-0.386	0.339	13

Table 5 indicates that the association between manufacturing export share and exchange-rate volatility is negative in five of the six economies, while Malaysia displays an almost zero positive correlation of 0.088. Indonesia records the strongest negative correlation at -0.703, followed by the Philippines at -0.579 and Thailand at -0.466, whereas the relationship is weaker in Singapore and Viet Nam. These coefficients are descriptive and combine structural trends with annual cyclical movements, so they cannot be interpreted as country-specific causal effects. The comparatively weak relationship in Malaysia also demonstrates that a high average volatility level does not mechanically correspond to a lower manufacturing export share. Research on emerging economies similarly finds that the effects of exchange-rate uncertainty differ across technology classifications and depend on the structure of export production (Akpiliç & Aslan, 2024). The heterogeneity in Table 5 therefore provides an empirical basis for moving beyond a single regional elasticity of manufacturing exports to currency instability.

Table 6. Highest Observed Exchange-Rate Volatility Episodes

Economy	Year	3-Year FX Volatility	Annual FX Change (%)
Indonesia	2011	10.33	-3.49
Indonesia	2012	10.16	6.75
Malaysia	2015	8.73	17.87
Malaysia	2016	7.65	5.72
Malaysia	2017	7.64	3.79
Indonesia	2016	7.51	-0.61
Malaysia	2011	7.49	-5.10
Philippines	2022	7.49	10.09
Indonesia	2013	7.33	10.72
Indonesia	2017	7.01	0.55

Table 6 highlights the concentration of extreme volatility in Indonesia and Malaysia, with the Philippines entering the highest-volatility group through its 2022 episode. The manufacturing shares recorded during these episodes vary considerably, from 33.6% in Indonesia in 2011 to 79.4% in the Philippines in 2022, showing that volatility occurs across very different stages of manufacturing specialization. Indonesia's two largest volatility observations were associated with relatively low manufacturing shares, but its later 2016 and 2017 episodes occurred when the manufacturing share had risen substantially. Malaysia maintained a comparatively high manufacturing share throughout its 2015–2017 volatility episode, providing a clear example of why contemporaneous currency instability cannot be treated as an automatic determinant of export structure. Similar country- and sector-specific differences have been documented in ASEAN manufacturing exports, where the effects of exchange-rate volatility vary across commodities and adjustment horizons (Handoyo et al., 2023). The episode-level evidence thus supports a framework in which currency volatility interacts with pre-existing industrial structures rather than independently determining them.

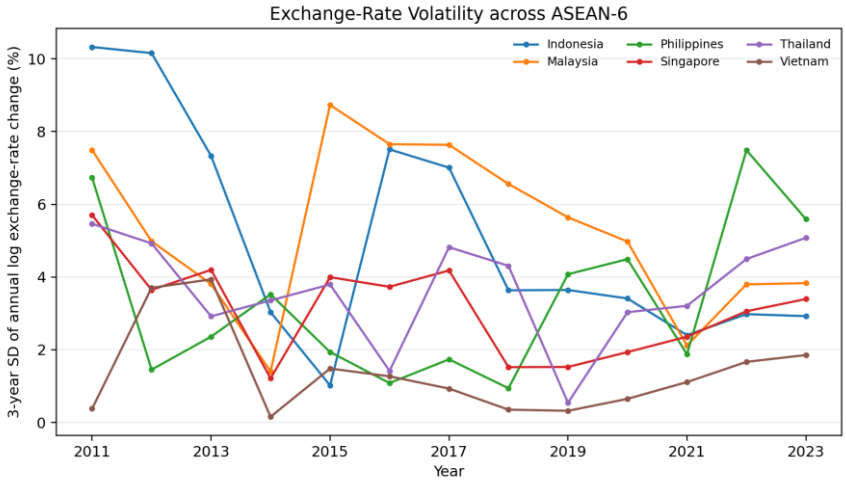


Figure 2. Exchange-Rate Volatility across ASEAN-6

The distinction between volatility and exchange-rate direction is also important for interpreting the annual currency changes reported in Tables 4–6. A depreciation can improve the foreign-currency price competitiveness of domestically produced goods, but it can simultaneously increase the local-currency cost of imported intermediates, machinery, and other production inputs. This trade-off is particularly relevant for ASEAN manufacturing systems that participate intensively in cross-border production networks, where export revenues and imported production costs may respond to the same currency movement. Sectoral evidence indicates that real exchange rates incorporating producer prices, trading partners, and product complexity can provide a more informative representation of manufacturing competitiveness than a single bilateral nominal rate (Goda et al., 2024). Exporters may also adjust their prices partially rather than fully passing exchange-rate movements through to foreign buyers, depending on market power and exchange-rate expectations (Fracasso et al., 2022). The annual official exchange-rate measure used here consequently captures an important but incomplete component of the price environment facing manufacturing exporters.

Evidence from other developing economies reinforces the importance of exposure, sectoral composition, and adjustment horizons in interpreting exchange-rate volatility. Studies of Ethiopia and Kenya report differentiated export responses to exchange-rate instability, while evidence from Bangladesh shows that short-run and longer-run effects can diverge across manufacturing export activity (Urgessa, 2024; Wanzala et al., 2024; Basak et al., 2025). Such findings are relevant to ASEAN because manufacturing exporters differ in their dependence on imported inputs, contract structures, product differentiation, and destination markets. A highly integrated electronics producer, for example, may face a different currency transmission mechanism from a resource-processing manufacturer even when both operate within the same national exchange-rate regime. The ASEAN-6 patterns observed here are consistent with the broader literature showing that exchange-rate volatility does not generate a

uniform export response across industries and countries. This heterogeneity provides the empirical rationale for the dynamic panel analysis in the next section, where persistence, country-specific effects, and common annual shocks are incorporated into the assessment of manufacturing export competitiveness.

Dynamic Relationship between Volatility and Manufacturing Export Competitiveness

The pooled evidence indicates a moderately negative association between exchange-rate volatility and manufacturing export competitiveness, although the relationship becomes substantially weaker once country and time heterogeneity are considered. The Pearson correlation between manufacturing export share and FX volatility is -0.482, while the corresponding Spearman coefficient is -0.502, indicating that the negative association is not driven solely by a linear functional form. By contrast, the relationship between manufacturing export share and annual exchange-rate change is considerably weaker, with the Pearson coefficient equal to -0.196 and the Spearman coefficient equal to -0.097. These descriptive relationships are consistent with the broader literature, which documents considerable variation in the estimated effects of exchange-rate volatility according to model specification, aggregation level, geography, and measurement approach (Lal et al., 2023). The negative pooled association should not be interpreted as evidence that volatility independently reduces manufacturing competitiveness because persistent country characteristics can jointly influence both variables. The dynamic estimates are consequently needed to distinguish cross-country structural differences from within-country changes over time.

Table 7. Pooled Associations between Manufacturing Export Share and Currency Measures

Variable Pair	Statistic	Coefficient	p-value	N
Manufactures share - FX volatility	Pearson	-0.482	<.001	78
Manufactures share - FX change	Pearson	-0.196	0.085	78
Manufactures share - FX volatility	Spearman	-0.502	<.001	78
Manufactures share - FX change	Spearman	-0.097	0.400	78

Table 7 provides an initial indication that volatility has a stronger descriptive relationship with manufacturing export structure than the direction of annual exchange-rate movement. The persistence of the negative volatility correlation across both Pearson and Spearman measures suggests that the basic association is not particularly sensitive to the treatment of rank ordering. Nevertheless, these coefficients pool observations from economies with markedly different manufacturing structures, including Indonesia's relatively low manufacturing share and Viet Nam's substantially higher share. A pooled correlation can consequently capture differences in structural specialization rather than a common response of manufacturing exports to currency instability. This distinction is important because productivity, imported-input dependence, foreign investment, scale, and technological intensity differ across ASEAN manufacturing industries (Handoyo et al., 2024). The dynamic panel models address this issue by controlling for the lagged dependent variable and progressively introducing country and year fixed effects.

The regression results show that manufacturing export competitiveness is highly persistent across the ASEAN-6 panel, while the estimated association with exchange-rate volatility is negative but statistically imprecise. In the pooled dynamic specification, the lagged manufacturing export share has a coefficient of 0.936 ($p < .001$), whereas FX volatility has a coefficient of -0.401 ($p = .121$) and annual FX change has a coefficient of 0.085 ($p = .501$). Introducing country fixed effects reduces the persistence coefficient to 0.626 ($p = .004$), while the volatility coefficient remains negative at -0.451 ($p = .172$). With both country and year fixed effects, the lagged share coefficient falls to 0.482 ($p = .068$), while the volatility coefficient becomes -0.187 ($p = .584$) and the annual FX-change coefficient becomes -0.096 ($p = .534$). The preferred country-and-year-effects specification therefore does not provide statistically precise evidence of an independent association between either currency measure and manufacturing export competitiveness. Its R^2 of 0.977 also indicates that the model explains a very large proportion of the observed variation, with persistence and systematic country-year differences accounting for much of the dependent-variable movement.

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Table 8. Dynamic Panel Estimates for Manufacturing Export Competitiveness

Model	Lagged Share β (SE)	p	FX Volatility β (SE)	p	FX Change β (SE)	p	N	R^2
Pooled dynamic	0.936 (0.046)	<.001	-0.401 (0.258)	0.121	0.085 (0.126)	0.501	78	0.937
Country FE	0.626 (0.218)	0.004	-0.451 (0.330)	0.172	0.081 (0.127)	0.525	78	0.957
Country + year FE	0.482 (0.264)	0.068	-0.187 (0.341)	0.584	-0.096 (0.154)	0.534	78	0.977
First difference	0.030 (0.528)	0.955	-0.204 (0.400)	0.611	-0.029 (0.118)	0.805	72	.359

The progressive reduction in the volatility coefficient from -0.401 in the pooled model to -0.187 in the country-and-year-effects model indicates that part of the raw negative association is related to structural and common temporal variation. The country fixed-effects specification removes time-invariant differences such as persistent production capabilities, while year effects absorb common regional shocks affecting all six economies. This adjustment is substantively important because Singapore, Malaysia, Thailand, Viet Nam, and the Philippines entered the period with manufacturing shares substantially above Indonesia's level, and those differences remained persistent across much of the sample. Research on ASEAN manufacturing similarly identifies productivity, investment, technology, imported inputs, and other production capabilities as important determinants of export performance (Baek & Urata, 2023). The insignificant volatility coefficient in the preferred specification should therefore not be read as evidence that exchange-rate conditions are irrelevant to exporters in every sector. Rather, the result indicates that the aggregate manufacturing-export share does not exhibit a statistically precise common within-country relationship with volatility after persistence and country-year heterogeneity are controlled.

The aggregate specification may also conceal technology-specific and industry-specific transmission mechanisms that are visible in more disaggregated export data. Evidence from emerging economies shows that exchange-rate uncertainty can affect technology-intensive export categories differently, while ASEAN manufacturing industries differ in their exposure to global value chains and imported production inputs (Akpiliç & Aslan, 2024; Aslan & Akpiliç, 2024). The present dependent variable deliberately aggregates manufacturing exports relative to merchandise exports, providing a harmonized measure for cross-country comparison but reducing the ability to identify product-level adjustment. This measurement choice helps explain why a statistically weak aggregate coefficient can coexist with meaningful exchange-rate effects for particular firms, industries, or destination markets. Exporters integrated into regional production networks may face simultaneous revenue gains from depreciation and cost increases through imported intermediates, machinery, and components. The resulting offsetting mechanisms make a single ASEAN-wide elasticity difficult to establish from aggregate manufacturing shares alone.

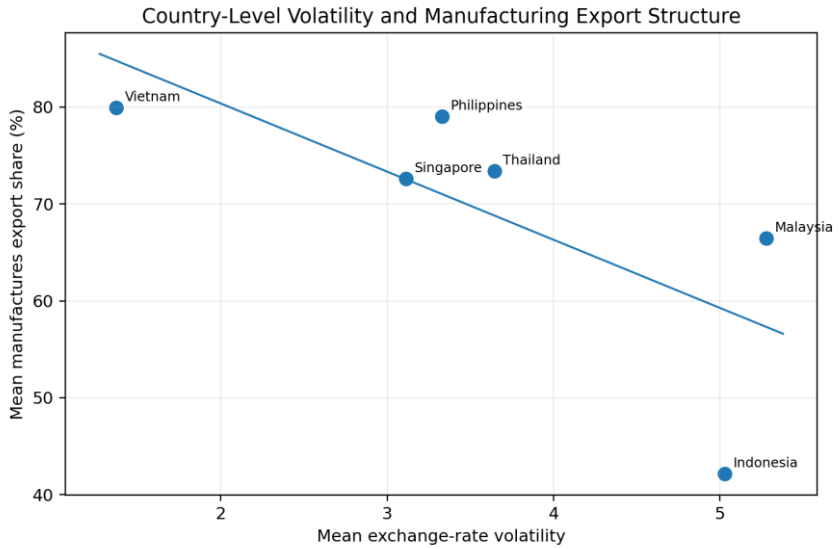


Figure 3. Country-Level Volatility and Manufacturing Export Structure

The absence of a robust positive coefficient for annual depreciation also suggests that currency weakening does not automatically translate into stronger manufacturing export competitiveness in the measured aggregate. Exchange-rate changes can influence export prices, investment decisions, input costs, and market-entry conditions through different channels operating at different horizons. Evidence from Chinese exporters shows that exchange-rate uncertainty can affect investment responses, while firm-level research indicates that volatility can influence decisions about entering export markets (Zeng et al., 2022; Tunç & Solakoglu, 2025). These mechanisms imply that exporters may respond to currency instability by adjusting investment, prices, sourcing arrangements, or market participation rather than immediately changing the overall manufacturing share of merchandise exports. The dynamic results are consistent with an interpretation in which manufacturing export structure is primarily persistent and institutionally embedded, while exchange-rate volatility constitutes one component of the broader operating environment. Within the ASEAN-6 sample, the evidence thus supports a cautious conclusion: exchange-rate volatility shows a negative descriptive association with manufacturing export competitiveness, but its independent relationship becomes statistically imprecise after dynamic persistence, country heterogeneity, and common annual effects are taken into account.

Robustness, Structural Interpretation, and Policy Implications

The robustness analysis reinforces the distinction between persistent manufacturing structure and short-term exchange-rate movements. In the first-difference specification, the coefficient on changes in FX volatility is -0.204 ($p = .611$), while the coefficient on current exchange-rate change is -0.029 ($p = .805$), and the lagged change in manufacturing export share is statistically insignificant. These results indicate that year-to-year changes in currency conditions are not systematically associated with contemporaneous changes in the manufacturing export share within the available ASEAN-6 sample. The contrast with the high persistence observed in the level models suggests that manufacturing export composition changes through processes that extend beyond annual currency fluctuations. Investment, industrial relocation, supply-chain reconfiguration, technological upgrading, and changes in production capacity can operate over substantially longer horizons. The robustness evidence therefore supports interpreting exchange-rate volatility as part of the competitiveness environment rather than as a statistically dominant determinant of aggregate manufacturing export structure.

The leave-one-country-out analysis provides an additional assessment of whether the preferred result is driven disproportionately by any single ASEAN-6 economy. Excluding Indonesia, Malaysia, Singapore, Thailand, or Viet Nam leaves the estimated volatility coefficient negative, ranging from -0.205 to -0.392, but none of these estimates is statistically significant. Excluding the Philippines changes the coefficient to +0.180 ($p = .113$), although the associated confidence interval still includes zero. The sign reversal indicates that individual economies can influence the estimated direction because the panel contains only six countries and their manufacturing trajectories differ considerably.

Such sensitivity is consistent with evidence that exchange-rate effects vary according to country characteristics, manufacturing commodities, and adjustment mechanisms rather than following a uniform regional pattern (Wongsamee & Boonanegpat, 2024). The robustness results consequently do not establish a universal numerical elasticity of ASEAN manufacturing competitiveness with respect to exchange-rate volatility.

Table 9. Leave-One-Country-Out Sensitivity of the Volatility Coefficient

Excluded Economy	Volatility β	SE	p-value	95% CI
Indonesia	-0.205	0.456	0.654	[-1.099, 0.689]
Malaysia	-0.392	0.498	0.432	[-1.368, 0.584]
Philippines	+0.180	0.114	0.113	[-0.043, 0.404]
Singapore	-0.206	0.365	0.572	[-0.922, 0.509]
Thailand	-0.241	0.366	0.512	[-0.959, 0.478]
Vietnam	-0.233	0.367	0.524	[-0.952, 0.485]

The endpoint comparison offers a complementary structural perspective because manufacturing export shares changed very differently across the six economies over 2010–2023. Viet Nam recorded a 21.0-percentage-point increase, while the Philippines recorded the largest increase at 23.2 percentage points, despite both economies experiencing different levels of exchange-rate volatility. Indonesia increased by 7.7 percentage points despite having one of the highest average volatility levels, whereas Malaysia and Thailand recorded changes of only 1.4 and 0.5 percentage points, respectively. Singapore experienced a modest 2.7-percentage-point increase while maintaining comparatively moderate volatility. These patterns indicate that currency stability may facilitate planning and cost management, but stability alone does not determine whether an economy substantially upgrades its manufacturing export structure. Evidence on RCEP production networks and global value-chain participation similarly emphasizes industrial linkages, production capabilities, and network positioning as important components of manufacturing development (Zhu et al., 2024).

Table 10. Manufacturing Export Share: 2010–2023 Endpoint Change

Economy	2010 (%)	2023 (%)	Change (pp)	Mean FX volatility
Indonesia	37.0	44.7	+7.7	5.03
Malaysia	67.0	68.4	+1.4	5.28
Thailand	72.5	73.0	+0.5	3.64
Vietnam	64.0	85.0	+21.0	1.37
Philippines	56.3	79.5	+23.2	3.33
Singapore	71.3	74.0	+2.7	3.11

The policy implications follow from the distinction between currency-risk management and the deeper determinants of manufacturing competitiveness. Monetary authorities and financial regulators can support exporters through measures that reduce avoidable currency instability, improve foreign-exchange liquidity, strengthen hedging access, and increase transparency around currency-risk management. Industrial and trade policies operate through a different but complementary channel by improving technology adoption, logistics infrastructure, customs efficiency, industrial standards, supplier capabilities, and workforce skills. This distinction is particularly relevant for ASEAN economies whose manufacturing sectors participate in increasingly interconnected regional production networks (Navarro Zapata et al., 2023). Regional trade arrangements can further influence competitiveness by reducing trade frictions and expanding access to production networks, although their effects depend on the distribution of production capabilities across participating economies (Chen et al., 2025). A policy framework that treats exchange-rate stability as one enabling condition, rather than as a substitute for industrial upgrading, is more consistent with the empirical patterns observed in the panel.

Measurement considerations also qualify the interpretation of the estimated relationships. The manufacturing export share can increase because manufacturing exports expand, because non-manufacturing exports contract, or because the composition of merchandise trade shifts toward assembly-oriented production. It does not directly measure domestic value added, product quality, technological sophistication, firm productivity, profitability, or market share at the product level. Product-level evidence from ASEAN demonstrates that export competitiveness can vary substantially across commodities even within the same national market (Nikensari et al., 2024). Future research could therefore combine manufacturing export shares with revealed comparative advantage, domestic value-added indicators, productivity measures, bilateral real exchange rates, and product-complexity measures to identify more specific transmission mechanisms. The present specification also faces limitations associated with annual frequency, the use of bilateral official LCU/USD exchange rates, the three-year rolling volatility measure, and the small cross-sectional dimension of six economies. These limitations mean that the results are most appropriately interpreted as conditional associations within the ASEAN-6 panel rather than as causal estimates of the effect of exchange-rate volatility on manufacturing export competitiveness.

CONCLUSION

The analysis of ASEAN-6 manufacturing export competitiveness over 2010–2023 demonstrates substantial persistence and structural heterogeneity across Indonesia, Malaysia, Thailand, Viet Nam, the Philippines, and Singapore. Manufacturing export shares differed markedly across economies, with Viet Nam and the Philippines recording the largest endpoint increases, while Malaysia, Thailand, and Singapore exhibited comparatively stable structures. Exchange-rate volatility also varied considerably, with Malaysia and Indonesia recording the highest average volatility and Viet Nam the lowest. The pooled results show a negative association between exchange-rate volatility and manufacturing export share, but this relationship becomes statistically imprecise after controlling for country-specific and year-specific effects. The dynamic specifications consistently indicate that past manufacturing export structure is more persistent than annual changes in exchange-rate conditions. The findings suggest that aggregate manufacturing export competitiveness is shaped primarily by structural characteristics that evolve over longer horizons rather than by short-term currency volatility alone.

The robustness results further confirm that changes in exchange-rate volatility and annual exchange-rate movements do not exhibit statistically precise relationships with changes in manufacturing export competitiveness within the observed panel. Leave-one-country-out estimations produce different coefficient magnitudes and, in one specification, a change in sign, reinforcing the importance of country heterogeneity and the limited cross-sectional dimension of the ASEAN-6 sample. The evidence does not imply that exchange-rate conditions are irrelevant to exporters, since currency movements can influence pricing, imported-input costs, investment decisions, and participation in global value chains through different mechanisms. Rather, their aggregate effect on the manufacturing export share appears conditional on production capabilities, technology, investment, supply-chain integration, and broader trade conditions. Policy responses should consequently combine appropriate exchange-rate risk management with longer-term measures supporting industrial upgrading, productivity, infrastructure, and regional production-network integration. Future research can strengthen the analysis by incorporating product-level competitiveness, domestic value added, productivity, bilateral real exchange rates, and more disaggregated sectoral data.

REFERENCES

Akpiliç, F., & Aslan, C. (2024). The impact of real exchange rate uncertainty on exports by technology classification in emerging economies. *International Economics and Economic Policy, 21*(4), 907–931. https://doi.org/10.1007/s10368-024-00626-8

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58*(2), 277–297. https://doi.org/10.2307/2297968

ASEAN Secretariat. (2024). *ASEAN statistical yearbook 2024*. ASEAN Secretariat. https://www.aseanstats.org/publication/asyb-2024/

Aslan, C., & Akpiliç, F. (2024). Do the export reactions to exchange rate and exchange rate volatility differ depending on technology intensity? New evidences from the panel SVAR analysis. *Empirical Economics, 66*(4), 1587–1631. https://doi.org/10.1007/s00181-023-02497-5

Baek, Y., & Urata, S. (2023). Does global value chain participation improve firm productivity? A study of selected ASEAN developing countries. *Asian Economic Journal, 37*(2), 232–260. https://doi.org/10.1111/asej.12304

Basak, T., Rahman, A., Sadekin, M. N., & Ali, K. S. (2025). Evaluating the effects of exchange rate volatility on knitwear export performance to assess economic growth in Bangladesh. *Discover Sustainability, 6*, 556. https://doi.org/10.1007/s43621-025-01385-5

Chen, G., Zhou, J., Liu, C., Liu, F., Zhang, C., & Su, Y. (2025). The impact of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership and Regional Comprehensive Economic Partnership on the global value chain of manufacturing. *Sustainability, 17*(17), 8074. https://doi.org/10.3390/su17178074

Dawani, C., & Pareek, D. (2024). Analysing India's export competitiveness in ASEAN economies: Insights from Viner's trade creation model. *Journal of Asian Economic Integration, 6*(1). https://doi.org/10.1177/26316846241232832

Fitrianti, 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

Fracasso, A., Secchi, A., & Tomasi, C. (2022). Export pricing and exchange rate expectations under uncertainty. *Journal of Comparative Economics, 50*(1), 135–152. https://doi.org/10.1016/j.jce.2021.07.001

Goda, T., Torres García, A., & Larrahondo, C. (2024). Real exchange rates and manufacturing exports in emerging economies: The role of sectoral heterogeneity and product complexity. *Review of World Economics, 160*, 1057–1082. https://doi.org/10.1007/s10290-023-00523-3

Handoyo, R. D., Alfani, S. P., Ibrahim, K. H., Sarmidi, T., & Haryanto, T. (2023). Exchange rate volatility and manufacturing commodity exports in ASEAN-5: A symmetric and asymmetric approach. *Heliyon, 9*(2), e13067. https://doi.org/10.1016/j.heliyon.2023.e13067

Handoyo, R. D., Ibrahim, K. H., Rahmawati, Y., Faadhillah, F., Ogawa, K., Kusumawardani, D., See, K. F., Kumaran, V. V., & Gulati, R. (2024). Determinants of exports performance: Evidence from Indonesian low-, medium-, and high-technology manufacturing industries. *PLOS ONE, 19*(1), e0296431. https://doi.org/10.1371/journal.pone.0296431

Handoyo, R. D., Ibrahim, K. H., Wahyuni, T., Muhammad, F. R., & Baraya, A.-A. S. (2023). Trade margins of rubber exporters: The case of Indonesia. *PLOS ONE, 18*(11), e0292160. https://doi.org/10.1371/journal.pone.0292160

Jyoti, & Bhatt, K. N. (2024). Effect of exchange rate volatility on exports: An empirical analysis of disaggregated data of the Indian manufacturing sector. *Arthaniti: Journal of Economic Theory and Practice, 23*(2), 244–268. https://doi.org/10.1177/09767479221117320

Kato, A. (2022). Trade competition between ASEAN, China, and India: The post-trade war and COVID-19 scenario. *Global Journal of Emerging Market Economies, 14*(2), 163–184. https://doi.org/10.1177/09749101211073376

Lal, M., Kumar, S., Pandey, D. K., Rai, V. K., & Lim, W. M. (2023). Exchange rate volatility and international trade. *Journal of Business Research, 170*, 114156. https://doi.org/10.1016/j.jbusres.2023.114156

Navarro Zapata, A., Arrazola, M., & de Hevia, J. (2023). Technological intensity in manufacturing trade between ASEAN and the EU: Challenges and opportunities. *Asia Europe Journal, 21*, 23–42. https://doi.org/10.1007/s10308-023-00661-1

Nikensari, S. I., Qisthina, N., Yuniarti, P., & Wong, S. Y. (2024). Export competitiveness of Indonesia to ASEAN market for three leading commodities. *E3S Web of Conferences, 568*, 04024. https://doi.org/10.1051/e3sconf/202456804024

Olamide, E., Ogujiuba, K., & Maredza, A. (2022). Exchange rate volatility, inflation and economic growth in developing countries: Panel data approach for SADC. *Economies, 10*(3), 67. https://doi.org/10.3390/economies10030067

Permana, B. L. D. I., Suharno, & Rifin, A. (2022). The exchange rate volatility impact on agricultural trade: An evidence from Indonesian pepper export. *Jurnal Manajemen dan Agribisnis, 19*(1), 12. https://doi.org/10.17358/jma.19.1.12

Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics, 71*(1), 135–158. https://doi.org/10.1111/j.1468-0084.2008.00542.x

Salsabila, A. P., Ekawati, E., & Rahman, T. (2026). Exchange rate volatility, import, and export performance in five ASEAN countries: A panel data analysis from an Islamic economic perspective (2000–2024). *Ad-Deenar: Jurnal Ekonomi dan Bisnis Islam, 10*(1). https://doi.org/10.30868/ad.v10i01.9509

Sauer, C., & Bohara, A. K. (2001). Exchange rate volatility and exports: Regional differences between developing and industrialized countries. *Review of International Economics, 9*(1), 133–152. https://doi.org/10.1111/1467-9396.00269

Sein, P., & Sah, A. N. (2025). Export dynamics, exchange rate volatility, and economic stability: Evidence from Asia-Pacific economies. *Humanities and Social Sciences Communications, 12*, 808. https://doi.org/10.1057/s41599-025-05099-x

Tunç, C., & Solakoglu, M. N. (2025). Exchange rate volatility and firms' export decisions: Evidence from Exporter Dynamics Database. *Open Economies Review, 36*(2), 651–677. https://doi.org/10.1007/s11079-024-09775-4

Urgessa, O. (2024). Effects of real effective exchange rate volatility on export earnings in Ethiopia: Symmetric and asymmetric effect analysis. *Heliyon, 10*(1), e23529. https://doi.org/10.1016/j.heliyon.2023.e23529

Wanzala, R. W., Marwa, N., & Nanziri Lwanga, E. (2024). Impact of exchange rate volatility on coffee export in Kenya. *Cogent Economics & Finance, 12*(1). https://doi.org/10.1080/23322039.2024.2330447

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics, 126*(1), 25–51. https://doi.org/10.1016/j.jeconom.2004.02.005

Wongsamee, K., & Boonanegpat, S. (2024). Exchange rate volatility, bilateral trade, and investment in Association of Southeast Asian Nations from 2000 to 2021. *Open Journal of Business and Management, 12*, 3485–3497. https://doi.org/10.4236/ojbm.2024.125174

World Bank. (2026a). *Manufactures exports (% of merchandise exports), indicator TX.VAL.MANF.ZS.UN*. World Development Indicators. https://data.worldbank.org/indicator/TX.VAL.MANF.ZS.UN

World Bank. (2026b). *Official exchange rate (LCU per US$, period average), indicator PA.NUS.FCRF*. World Development Indicators. https://data.worldbank.org/indicator/PA.NUS.FCRF

World Trade Organization. (2024). *World trade statistical review 2024*. World Trade Organization. https://www.wto.org/english/res_e/statis_e/wts2024_e/wts2024_e.pdf

Zeng, T., Zhao, W., & Liu, Z. (2022). Investment response to exchange rate uncertainty: Evidence from Chinese exporters. *International Review of Economics & Finance, 80*, 488–505. https://doi.org/10.1016/j.iref.2022.02.015

Zhai, H. (2023). Evaluation of China-ASEAN trade status and trade potential: An empirical study based on a gravity model. *PLOS ONE, 18*(9), e0290897. https://doi.org/10.1371/journal.pone.0290897

Zhang, Y., Lee, J., Qiao, M., & Kou, M. (2024). Influence of international industrial transfer on the structural power of global value chain: Empirical evidence from manufacturing in RCEP countries. *PLOS ONE, 19*(3), e0291973. https://doi.org/10.1371/journal.pone.0291973

Zhu, N., Wang, Y., Yang, S., Lyu, L., Gong, K., Huang, X., & Huang, S. (2024). Structure characteristics and formation mechanism of the RCEP manufacturing trade network: An ERGM analysis. *Physica A: Statistical Mechanics and its Applications, 635*, 129488. https://doi.org/10.1016/j.physa.2023.129488