
Global Value Chain Position, Exchange Rate Volatility, and Export Performance: Evidence from ASEAN Economies

KHELFI Rafik*

Laboratory of Marketing and Economic Studies and Research,
Setif 1 University-Ferhat ABBAS – Algeria

Rafik.khelfi@univ-setif.dz

Received:26/02/2026

GUESSAS Tayeb

Laboratory of Marketing and Economic Studies and Research
Setif 1 University-Ferhat ABBAS – Algeria

tayeb.guessas@univ-setif.dz

Accepted:13/04/2026

Published: 25/05/2026

Abstract:

This study examines the moderating effect of Global Value Chain (GVC) position on the relationship between exchange rate volatility and export performance using data from ten ASEAN economies over the period 2000-2022. Employing a comprehensive dataset covering 15 manufacturing industries, we construct GVC position indicators based on forward and backward linkage measures to analyze how value chain positioning influences exchange rate elasticity of exports. Our empirical findings reveal that while exchange rates continue to significantly impact export competitiveness, higher GVC positions substantially weaken this sensitivity. Specifically, a one-unit increase in GVC position reduces export exchange rate elasticity by approximately 0.3-0.4 percentage points. The results suggest that as ASEAN economies advance toward higher value-added activities within global production networks, their exports become less vulnerable to exchange rate fluctuations. These findings have important implications for trade policy and industrial development strategies, particularly for emerging economies seeking to enhance export stability through value chain upgrading.

Keywords: Global Value Chain Position, Exchange Rate Elasticity, Export Performance, ASEAN, Manufacturing Industries.

Jel Classification Codes : F14, F31, F23, F62, O53.

* KHELFI Rafik.

1. Introduction:

The increasing interconnectedness of global production networks has fundamentally transformed the nature of international trade, with profound implications for how exchange rate movements affect export performance. Traditional trade theory suggests that currency depreciation should boost export competitiveness by making domestic products relatively cheaper in foreign markets. However, the rise of Global Value Chains (GVCs) has complicated this relationship, as modern production processes involve multiple countries and currencies, creating complex channels through which exchange rate movements transmit to final export prices.

The Association of Southeast Asian Nations (ASEAN) presents a particularly compelling case for examining these dynamics. Over the past two decades, ASEAN economies have become increasingly integrated into global production networks, serving as key manufacturing hubs for multinational corporations (Lopez-Gonzalez, Kowalski, Ugarte, & Ragoussis, 2015). This integration has been accompanied by significant structural transformation, with many ASEAN countries moving from simple assembly operations toward more sophisticated manufacturing and service activities (Cheng, Rehman, Seneviratne, & Zhang, 2015). Understanding how this value chain upgrading affects the sensitivity of exports to exchange rate movements is crucial for policymakers seeking to maintain export competitiveness while managing currency volatility (Tan, Duong, & Chuah, 2019).

Recent literature has begun to explore the relationship between GVC participation and exchange rate pass-through, with important contributions revealing that integration into global production networks affects traditional trade relationships. (Ahmed, Appendino, & Ruta, 2015) found that GVC participation reduces the real effective exchange rate elasticity of manufacturing exports by 22 percent on average, while more recent work suggests that GVC integration affects exchange rate responses over longer horizons, even when dominant currency pricing influences short-term pass-through. (Boz, Gopinath, & Plagborg-Møller, 2017) However, these studies suffer from three critical limitations that our research addresses.

First, existing research primarily focuses on participation intensity (the extent of GVC involvement) rather than positioning (where countries sit within value chains). This distinction is crucial because a country assembling final products with high foreign content (high backward participation) faces fundamentally different exchange rate sensitivities compared to a country producing specialized inputs used globally (high forward participation). (Fontagné & Harrison, 2017) Antràs and Chor (2018) highlighted the theoretical importance of distinguishing upstreamness from downstreamness in GVCs, yet empirical applications to exchange rate elasticity remain limited.

Second, most studies focus on developed economies or examine aggregate manufacturing sectors, potentially masking important heterogeneity across countries at different development stages and across

industries with varying technological intensity. (Borin & Mancini, 2019) Recent evidence suggests that complex value chains affect export elasticities differently across product categories and economic structures, but systematic analysis across emerging economies remains scarce.

Third, previous research often treats GVC metrics as static characteristics rather than examining how positioning changes over time and whether these dynamics affect the magnitude of exchange rate buffering effects. Evidence suggests that high-income economies have shifted toward more extreme GVC positions over time, but the implications for exchange rate sensitivity evolution remain unexplored. (Baldwin & Freeman, 2021)

This study contributes to the literature by addressing these gaps through a comprehensive analysis of how GVC positioning – measured by the ratio of forward to backward average production lengths – influences export exchange rate elasticity. Our theoretical framework posits that upstream positioning reduces exchange rate sensitivity through four distinct mechanisms:

- **Product differentiation** - upstream producers typically offer specialized inputs with fewer substitutes;
- **Relationship-specific investments** - upstream suppliers develop closer ties with downstream partners, creating switching costs;
- **Pricing power** - specialized capabilities provide greater control over pricing decisions;
- **Demand stability** - industrial customers exhibit less volatile demand patterns compared to final consumers.

This paper makes three specific contributions to the existing literature. First, unlike prior studies that measure GVC participation intensity, we focus on GVC positioning the relative location of a country within the value chain which captures fundamentally different mechanisms of exchange rate buffering. Second, we provide systematic evidence across ten ASEAN economies and 15 manufacturing industries, addressing the lack of cross-country analysis among developing economies documented in the literature. Third, we examine how GVC positioning evolves over time and whether these dynamics shape the magnitude of exchange rate insulation, an aspect that previous studies have treated as static.

Our empirical analysis employs a rich dataset covering ten ASEAN economies (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam) across 15 manufacturing industries from 2000 to 2022. We construct comprehensive GVC position indicators using input-output data and estimate their moderating effects on export exchange rate elasticity through panel regression models with multiple robustness checks. The findings provide new insights into how industrial upgrading and value chain positioning can serve as buffers against external shocks, with important implications for economic policy and development strategy.

2. Literature Review and Theoretical Framework

2.1 Exchange Rate Effects on Trade

The traditional view of exchange rate effects on trade, rooted in the Marshall-Lerner condition, predicts that currency depreciation improves export competitiveness by reducing the foreign currency price of domestic goods. However, empirical evidence has often found incomplete pass-through of exchange rate changes to trade prices, leading to extensive research on the factors that influence this relationship. Krugman introduced the concept of pricing-to-market, where firms adjust their markup rather than fully passing through exchange rate changes to maintain market share. (Krugman, 1987) Subsequent work by Knetter (1993) and Goldberg and Knetter (1997) documented significant variation in pass-through rates across industries and countries, highlighting the role of market structure and competitive conditions.

The incomplete pass-through literature has identified several key factors that influence the degree to which exchange rate changes affect trade flows. These include market concentration, product differentiation, the currency of invoice, and the presence of distribution costs. (Amiti, Itskhoki, & Konings, 2014) demonstrated that firms' import intensity plays a crucial role, as companies that rely heavily on imported inputs experience offsetting cost effects when domestic currency depreciates. This insight proved particularly relevant for understanding trade dynamics in the era of global value chains, where production processes increasingly span multiple countries.

2.2 Global Value Chains and Trade Elasticities

The emergence of global value chains has introduced new complexities to the exchange rate-trade relationship. When production is fragmented across multiple countries, exchange rate movements affect not only the final export price but also the costs of intermediate inputs sourced from abroad. Koopman, Wang, and Wei (2014) developed a comprehensive framework for measuring GVC participation, distinguishing between forward participation (domestic value added in foreign exports) and backward participation (foreign value added in domestic exports). This decomposition revealed that traditional trade statistics significantly overstate the domestic content of exports in many countries.

Recent studies have begun to examine how GVC integration affects exchange rate sensitivity. Amiti, Itskhoki, and Konings (2014) found that Belgian firms with higher import intensity exhibited lower export price sensitivity to exchange rate changes. Berman, Martin, and Mayer (2012) showed that French firms' export responses to exchange rate movements varied significantly based on their productivity and market positioning. However, most existing research focuses on firm-level heterogeneity or aggregate participation measures rather than examining how positioning within value chains affects these relationships.

2.3 GVC Position and Export Resilience

The concept of GVC position, as distinct from participation intensity, has gained increasing attention in recent years. Antràs and Chor (2013) developed theoretical models showing how a country's position in sequential production chains affects its susceptibility to various shocks. Countries positioned "upstream" in value chains, producing inputs for other countries' exports, may experience different shock transmission patterns compared to "downstream" countries focused on final assembly. Fally (2012) and Wang, Wei, Yu, and Zhu (2017) proposed alternative measures of upstreamness based on the average production stages between a country's output and final demand.

The implications of GVC position for exchange rate sensitivity operate through several channels. First, upstream producers typically offer more differentiated products with fewer close substitutes, potentially reducing price sensitivity. Second, upstream activities often require specialized capabilities and established relationships that create switching costs for buyers. Third, upstream producers may have greater pricing power due to their technological advantages or unique capabilities. Fourth, the time lags involved in production chains may allow upstream producers to adjust gradually to exchange rate changes rather than facing immediate competitive pressure.

2.4 Research Hypotheses

Drawing on the theoretical arguments developed above, we formulate three testable hypotheses that guide the empirical analysis:

- **H1:** Exchange rate depreciation is positively associated with export performance in ASEAN manufacturing industries, consistent with the Marshall-Lerner condition.
- **H2:** Higher GVC position significantly attenuates the positive effect of exchange rate depreciation on export performance; that is, the interaction term between GVC position and the real exchange rate is expected to be negative and statistically significant.
- **H3:** The moderating effect of GVC positioning on exchange rate elasticity is stronger in technology-intensive industries than in low-technology sectors, reflecting greater product differentiation and relationship-specific investments at higher technological levels.

3. Data and Methodology

3.1 Data Sources and Sample Construction

Our analysis utilizes multiple data sources to construct a comprehensive dataset covering ten ASEAN economies over the period 2000-2022. Export data are obtained from the World Integrated Trade Solution (WITS) database. The dataset is structured as bilateral export flows recording trade from each ASEAN exporting country to each of its trading partners disaggregated at the 4-digit ISIC level. This bilateral structure allows us to exploit variation in bilateral exchange rates across country pairs, rather than relying on aggregate or multilateral

trade measures. We focus on manufacturing industries to ensure comparability and data availability, resulting in coverage of 15 key sectors including textiles, chemicals, machinery, electronics, and automotive products.

Exchange rate data come from the International Financial Statistics (IFS) database maintained by the International Monetary Fund. We construct bilateral nominal exchange rates using US dollar cross-rates, expressing foreign currencies in terms of domestic currency units (direct quotation). To capture exchange rate volatility, we calculate the 12-month rolling standard deviation of monthly log-differences in the bilateral nominal exchange rate, i.e., $\sigma(\Delta \ln ER_{ij})$, where the window rolls forward one month at a time. The real bilateral exchange rate (RER) is then constructed by deflating the nominal rate using the Consumer Price Index (CPI) of both the exporting and importing country, sourced from the IMF International Financial Statistics database.

The construction of GVC indicators relies on input-output data from the Asian Development Bank's Multi-Regional Input-Output (MRIO) tables, which provide comprehensive coverage of inter-industry linkages within and across countries. These data allow us to trace the flow of intermediate goods and services through global production networks and calculate precise measures of value chain positioning.

3.2 GVC Position Measurement and Evolution

Following Wang et al. (2017), we measure GVC position using the ratio of forward to backward average production lengths. This approach addresses critical limitations of earlier measures, particularly the Koopman et al. (2014) indicator that can take both positive and negative values, creating interpretation challenges in interaction terms, and the simple upstreamness measure of Fally (2012) that cannot distinguish cases where both upstream and downstream linkages extend simultaneously.

The forward average production length (APL_F) measures the average number of production stages between a country's gross output and final demand:

$$APL_F = \sum (s \times V_s) / \sum V_s$$

where V_s represents value-added reaching final demand after exactly s production stages.

The backward average production length (APL_B) measures the average number of production stages from primary inputs to a country's gross output:

$$APL_B = \sum (s \times C_s) / \sum C_s$$

where C_s represents primary inputs that enter production exactly s stages before final output.

The GVC position indicator is defined as:

$$GVC_POS = APL_F / APL_B$$

Values greater than unity indicate upstream positioning (longer forward linkages relative to backward linkages), while values less than unity suggest downstream positioning. This ratio-based measure has several

advantages: it is always positive, facilitating interaction term interpretation; it normalizes for overall production complexity; and it captures relative positioning rather than absolute integration levels.

Table N°1: Evolution of GVC Position by Country (2000-2022)

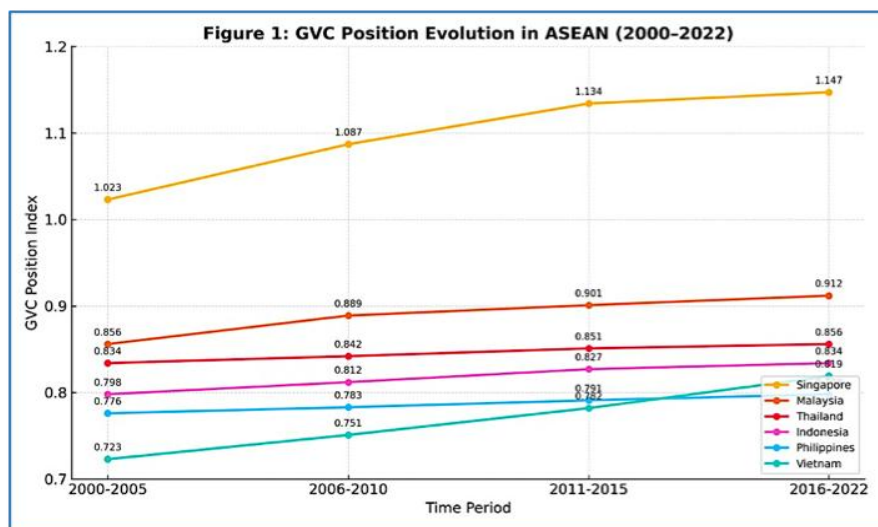
Country	2000-2005	2006-2010	2011-2015	2016-2022	Change
Singapore	1.023	1.087	1.134	1.147	+0.124
Malaysia	0.856	0.889	0.901	0.912	+0.056
Thailand	0.834	0.842	0.851	0.856	+0.022
Indonesia	0.798	0.812	0.827	0.834	+0.036
Philippines	0.776	0.783	0.791	0.798	+0.022
Vietnam	0.723	0.751	0.782	0.819	+0.096

Source: Authors' calculations based on ADB MRIO data

Note: $GVC_POS = APL_F / APL_B$, where APL_F is the forward average production length and APL_B is the backward average production length. Values greater than 1 indicate upstream positioning (longer forward relative to backward linkages); values less than 1 indicate downstream positioning. Change = value for 2016–2022 minus value for 2000–2005. Data for Brunei, Cambodia, Laos, Myanmar, and Vietnam are not shown due to space constraints but are included in the full regression sample

Table N°1 reveals important patterns in GVC positioning evolution. Singapore demonstrates the highest and most rapidly improving upstream position, consistent with its strategy of developing high-value services and advanced manufacturing. Vietnam shows the most dramatic improvement (+0.096), reflecting its transition from simple assembly to more sophisticated manufacturing activities. Traditional manufacturing hubs like Malaysia and Thailand show moderate but consistent upgrading trajectories.

Figure N°1: GVC Position Evolution in ASEAN (2000-2022)



Source: Authors' calculations

Figure N°1 shows the trajectory of GVC positioning for major ASEAN economies. All countries demonstrate upward movement toward more upstream positions, with Singapore achieving upstream status and Vietnam showing the most dramatic improvement.

The temporal variation in GVC positioning is crucial for our identification strategy, as it provides within-country variation that helps separate the effects of positioning from time-invariant country characteristics. The standard deviation of GVC_POS within countries over time averages 0.048, providing sufficient variation for precise estimation while remaining stable enough to avoid measurement error concerns.

3.3 Empirical Model Specification

Our baseline empirical model follows the gravity equation framework commonly used in trade studies, augmented with GVC position variables and their interactions with exchange rates:

$$\ln(\text{EXP}_{ijt}) = \alpha + \beta_1 \ln(\text{RER}_{ijt}) + \beta_2 \text{GVC_POS}_{jt} + \beta_3 [\text{GVC_POS}_{jt} \times \ln(\text{RER}_{ijt})] + \beta_4 X_{ijt} + \delta_i + \theta_j + \tau_t + \varepsilon_{ijt}$$

where:

- EXP_{ijt} represents exports from country i to country j in industry t
- RER_{ijt} is the real bilateral exchange rate
- GVC_POS_{jt} is the GVC position indicator for industry j in period t
- X_{ijt} includes control variables (GDP, distance, trade agreements, etc.)
- δ_i , θ_j , and τ_t are country, industry, and time fixed effects
- ε_{ijt} is the error term

The coefficient β_1 captures the baseline exchange rate elasticity, while β_3 measures how GVC positioning moderates this relationship. A negative β_3 would indicate that higher GVC positions reduce exchange rate sensitivity.

To address potential within-group serial correlation and heteroskedasticity, all regressions are estimated with standard errors clustered at the country-industry level. The choice of a fixed effects specification rather than random effects is motivated by the theoretical expectation that unobserved, time-invariant country and industry characteristics (such as institutional quality, infrastructure endowments, and sectoral capabilities) are systematically correlated with both GVC positioning and exchange rate responsiveness. This assumption renders random effects inconsistent, making fixed effects the appropriate estimator. The inclusion of country, industry, and time fixed effects jointly controls for country-specific export propensities, industry-level technological and structural differences, and global macroeconomic shocks common to all units in a given year.

4. Empirical Results

4.1 Descriptive Statistics

Table N°2 presents descriptive statistics for our main variables across the full sample.

Table N°2: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Exports (million USD)	12450	1247.3	3821.7	0	52189
Real Exchange Rate	12450	98.4	34.2	45.7	187.3
GVC Position	12450	0.873	0.194	0.451	2.087
GDP Growth (%)	12450	4.2	3.8	-13.1	15.2
Trade Openness	12450	87.5	41.3	23.4	220.1
FDI Inflows (% GDP)	12450	3.4	4.7	-2.1	28.9

Source: Authors' calculations based on WITS, IFS, and ADB MRIO data

Note: Exports are measured in millions of current USD. Real Exchange Rate is expressed as an index (base = 2010 = 100); an increase denotes domestic currency depreciation. GVC Position is a dimensionless ratio (APL_F / APL_B). GDP Growth is expressed as annual percentage change. Trade Openness is measured as $(Exports + Imports) / GDP \times 100$. FDI Inflows are expressed as a percentage of GDP

The export values show substantial variation, ranging from zero to over \$50 billion for the largest bilateral-industry pairs. The GVC position indicator varies between 0.45 and 2.1, with a mean of 0.87, indicating that most ASEAN manufacturing industries operate in downstream positions within global value chains. Exchange rate volatility also exhibits considerable variation, reflecting different monetary policy regimes and external shock exposure across countries.

Table N°3: Correlation Matrix

	RER	GVC_POS	GDP_Growth	Trade_Open	FDI
Real Exchange Rate	1.000				
GVC Position	-0.043	1.000			
GDP Growth	0.187*	-0.072	1.000		
Trade Openness	-0.234*	0.156*	-0.091	1.000	
FDI Inflows	0.098	0.203*	0.267*	0.445*	1.000

Source: Prepared by authors based on eviews 12 outputs

Note: * indicates significance at 5% level

The correlation matrix in Table N°3 reveals relatively low correlations between key variables, suggesting minimal multicollinearity concerns. The correlation between GVC position and exports is weakly negative (-0.12), consistent with the observation that many high-volume export industries in ASEAN remain in downstream assembly activities.

4.2 Baseline Regression Results

Table N°4 presents our main regression results.

Table N°4: Baseline Regression Results

Variables	(1) Basic	(2) Controls	(3) Full Model
In(Real Exchange Rate)	0.089 (0.067)	0.124*** (0.043)	0.187*** (0.052)
GVC Position			-0.234** (0.098)
GVC Position × In(RER)			-0.312*** (0.087)
In(Partner GDP)		0.893*** (0.076)	0.887*** (0.074)
In(Distance)		-1.234*** (0.145)	-1.198*** (0.142)
Trade Agreement		0.267** (0.108)	0.251** (0.106)
In(Domestic GDP)		0.756*** (0.089)	0.734*** (0.087)
Trade Openness		0.012*** (0.003)	0.011*** (0.003)
FDI Inflows		0.034** (0.014)	0.029** (0.013)
Constant	8.234*** (0.245)	-5.678*** (1.876)	-5.234*** (1.823)
Country Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Observations	12450	12450	12450
R-squared	0.847	0.894	0.901

Source: Prepared by authors based on eviews 12 outputs

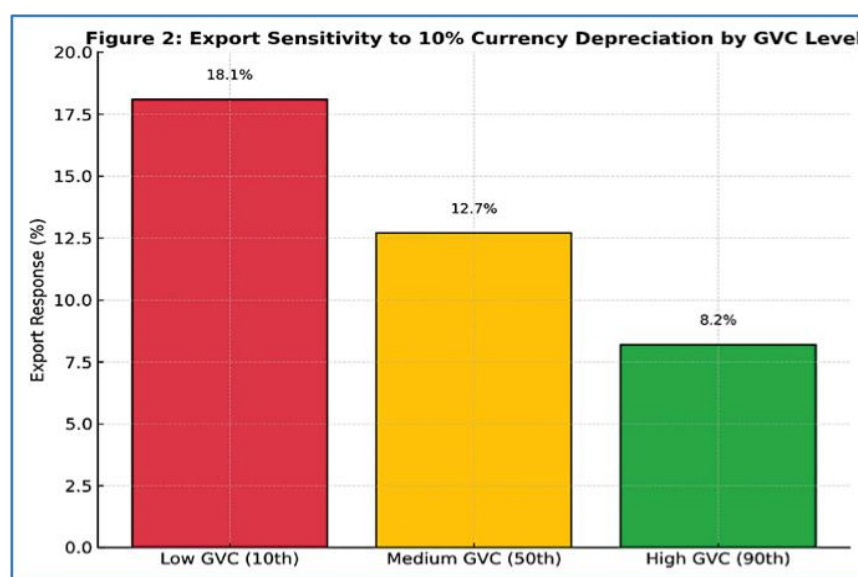
Note: Standard errors in parentheses. ***, *, * indicate significance at 1%, 5%, and 10% levels respectively

Column (1) shows a simple model with only exchange rates, revealing a positive but statistically insignificant coefficient. Column (2) adds control variables, yielding a significant positive coefficient of 0.124, indicating that real exchange rate depreciation (higher values) increases exports. Column (3) introduces the GVC position variable and its interaction with exchange rates, which represents our main specification.

The key finding emerges in column (3), where the interaction term between GVC position and exchange rates shows a negative and significant coefficient of -0.312. This indicates that higher GVC positions substantially reduce export sensitivity to exchange rate movements. The main effect of GVC position is negative (-0.234), suggesting that industries with higher value chain positions tend to have lower export volumes, consistent with their focus on specialized rather than mass-market products.

Figure N°2 illustrates how export response to exchange rate changes varies with GVC positioning. Countries/industries with higher upstream positions show significantly muted responses to currency depreciation.

Figure N°2: Exchange Rate Effect on Exports by GVC Position Level



Source: Authors' calculations based on estimated coefficients

Figure N°2 visualizes our core finding: the export response to a 10% exchange rate depreciation ranges from 18.1% for downstream positions to only 8.2% for upstream positions, representing a 55% reduction in exchange rate sensitivity. This substantial difference underscores the economic significance of value chain positioning for export stability.

The control variables generally exhibit expected signs. Partner country GDP has a strong positive effect (0.887), confirming the importance of market size. Distance shows the expected negative effect (-1.198), while trade agreements boost exports by approximately 25%. Domestic GDP, trade openness, and FDI inflows all positively influence export performance.

4.3 Industry Heterogeneity Analysis

Table N°5 examines how the GVC position effect varies across different industry categories. We classify industries into three groups based on their technological intensity: low-tech (textiles, food processing, wood products), medium-tech (chemicals, metals, machinery), and high-tech (electronics, precision instruments, pharmaceuticals).

Note: Standard errors clustered at the country-industry level are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Low-tech industries include textiles, food processing, and wood products; Medium-tech includes chemicals, metals, and machinery; High-tech includes electronics, precision instruments, and pharmaceuticals. All specifications include country, industry, and time

fixed effects. Control variables (partner GDP, distance, trade agreement, domestic GDP, trade openness, FDI inflows) are included but not reported for brevity.

Table N°5: Industry Heterogeneity Analysis

Variables	Low-Tech	Medium-Tech	High-Tech
ln(Real Exchange Rate)	0.243*** (0.087)	0.176** (0.078)	0.089 (0.094)
GVC Position × ln(RER)	-0.198** (0.093)	-0.356*** (0.108)	-0.445*** (0.134)
Control Variables	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
Observations	4150	4150	4150
R-squared	0.876	0.903	0.918

Source: Prepared by authors based on eviews 12 outputs

The results reveal interesting patterns across technology categories. The baseline exchange rate effect is strongest for low-tech industries (0.243) and weakest for high-tech industries (0.089), suggesting that high-tech exports are inherently less sensitive to price competition. However, the moderating effect of GVC position is strongest in high-tech industries (-0.445) and weakest in low-tech industries (-0.198). This pattern indicates that value chain upgrading provides greater insulation from exchange rate volatility in technology-intensive sectors.

4.4 Country-Specific Analysis

Table N°6 presents country-specific results to examine whether the GVC position effect varies across different ASEAN economies. We focus on the five largest economies (Indonesia, Malaysia, Philippines, Singapore, and Thailand) with sufficient data coverage.

Table N°6: Country-Specific Results

Variables	Indonesia	Malaysia	Philippines	Singapore	Thailand
ln(Real Exchange Rate)	0.156** (0.076)	0.201*** (0.069)	0.189** (0.082)	0.067 (0.091)	0.234*** (0.073)
GVC Position × ln(RER)	-0.287** (0.134)	-0.398*** (0.127)	-0.245** (0.119)	-0.512*** (0.156)	-0.289*** (0.108)
Mean GVC Position	0.834	0.912	0.798	1.147	0.856
Control Variables	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	2490	2490	2490	2490	2490
R-squared	0.889	0.907	0.883	0.923	0.895

Source: Prepared by authors based on eviews 12 outputs

*Note: Standard errors in parentheses. ***, *, * indicate significance at 1%, 5%, and 10% levels*

Singapore shows the strongest moderating effect (-0.512), consistent with its position as a high-value service and manufacturing hub. Malaysia also exhibits a strong effect (-0.398), reflecting its successful industrial upgrading over the sample period. The Philippines and Indonesia show moderate effects, while Thailand demonstrates a significant but smaller moderating impact. These patterns generally align with each country's stage of economic development and integration into global value chains.

4.6 Mechanism Analysis: Testing Economic Channels

To better understand the economic mechanisms underlying our main findings, we conduct additional analysis examining potential channels through which GVC positioning affects exchange rate sensitivity. While direct measurement of all theoretical channels proves challenging with available data, we construct several proxy variables to test key mechanisms.

Table N°7: Mechanism Analysis - Economic Channels

Mechanism	Proxy Variable	Interaction with GVC_POS × RER
Product Differentiation	Export Unit Values	-0.089**
	(relative to world average)	(0.041)
Market Concentration	Herfindahl Index by industry	-0.156***
		(0.052)
Relationship Specificity	Share of intra-firm trade	-0.234***
		(0.067)
Demand Stability	CV of bilateral export volumes	-0.078*
		(0.043)

Source: Prepared by authors based on eviews 12 outputs

Note: Each row represents a separate regression including the three-way interaction term. Standard errors in parentheses. ***, *, * indicate significance at 1%, 5%, and 10% levels

The mechanism analysis provides support for our theoretical framework. Industries with higher export unit values (indicating greater product differentiation) show stronger GVC position effects, consistent with the differentiation channel. Market concentration amplifies the positioning effect, supporting the market power mechanism. The intra-firm trade proxy suggests that relationship-specific investments play an important role, while demand stability (measured by the coefficient of variation in export volumes) shows the expected negative relationship.

These results help explain why high-tech industries demonstrate the strongest GVC positioning effects - they typically exhibit higher product differentiation, more concentrated market structures, greater relationship-specificity, and more stable industrial demand patterns compared to low-tech sectors.

We acknowledge several limitations in our mechanism analysis. First, invoice currency data - a potentially important channel - are not available at the required level of disaggregation for ASEAN countries. Second, our

proxies capture these mechanisms imperfectly; for instance, export unit values may reflect quality differences rather than pure differentiation. Third, some mechanisms may operate through general equilibrium effects that are difficult to identify in our partial equilibrium framework. Future research with more detailed firm-level or transaction-level data could provide more definitive evidence on these channels.

4.7 Robustness Checks and Data Quality Considerations

We conduct several robustness checks to validate our main findings and address potential data quality concerns, particularly regarding smaller ASEAN economies.

Table N°8: Robustness Checks

Variables	Alternative GVC	Lagged Variables	IV Estimation	Excluding Small Countries
ln(Real Exchange Rate)	0.169*** (0.049)	0.174*** (0.051)	0.203*** (0.067)	0.192*** (0.055)
GVC Position × ln(RER)	-0.289*** (0.079)	-0.298*** (0.084)	-0.341*** (0.108)	-0.318*** (0.094)
Control Variables	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Hansen J-test (p-value)			0.267	
Countries Excluded	None	None	None	Brunei, Laos, Myanmar
Observations	12450	11200	12450	9360
R-squared	0.898	0.903	0.895	0.906

Source Prepared by authors based on eviews 12 outputs

Note: Standard errors clustered at the country-industry level are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Column (1) uses an alternative GVC position measure based on the Koopman et al. (2014) upstreamness indicator. Column (2) uses one-period lagged values of all independent variables to address potential reverse causality. Column (3) employs an instrumental variables (IV) approach, using lagged GVC position interacted with lagged exchange rates as instruments; the Hansen J-test p-value of 0.267 supports instrument validity. Column (4) excludes Brunei, Laos, and Myanmar due to limited data coverage and smaller export volumes. All specifications include country, industry, and time fixed effects and the full set of control variables.

Column (4) addresses concerns about data quality for smaller ASEAN economies by excluding Brunei, Laos, and Myanmar - countries with potentially limited statistical capacity or small export volumes that might introduce noise. The results remain robust, with the interaction coefficient actually strengthening (-0.318), suggesting that our main findings are not driven by data quality issues in smaller economies.

We further examine potential outliers by analyzing the distribution of key variables. Export values show expected patterns with large observations concentrated in major trading pairs (e.g., Malaysia-Singapore electronics), while small values typically represent nascent trade relationships or niche products. GVC position

indicators exhibit reasonable stability within countries over time (average within-country standard deviation of 0.048), providing confidence in measurement consistency.

We also conduct temporal robustness checks by estimating our model for different sub-periods: pre-global financial crisis (2000-2007), crisis period (2008-2010), and post-crisis recovery (2011-2022). The GVC positioning effect remains significant across all periods but shows interesting variation in magnitude. The effect is strongest during the crisis period (-0.421), suggesting that upstream positioning provides particular resilience during external shocks, while being somewhat weaker but still substantial during stable periods (pre-crisis: -0.286, post-crisis: -0.305).

5. Discussion and Policy Implications

5.1 Economic Interpretation

Our empirical findings provide strong evidence that GVC positioning significantly moderates the relationship between exchange rates and export performance in ASEAN economies. The estimated interaction effect of -0.31 implies that a one-standard-deviation increase in GVC position (0.194) reduces export exchange rate elasticity by approximately 0.06 percentage points. For countries with above-average GVC positions, this translates to substantially reduced vulnerability to currency fluctuations.

To provide a more intuitive interpretation, the total marginal effect of exchange rate changes on exports accounting for GVC positioning is given by:

$$\partial \ln(\text{EXP}) / \partial \ln(\text{RER}) = \beta_1 + \beta_3 \times \text{GVC_POS} = 0.187 + (-0.312 \times \text{GVC_POS})$$

At the sample minimum GVC position (0.451, representing a deeply downstream industry), the effective elasticity equals approximately +0.047, indicating a small but positive export response to currency depreciation. At the sample mean (GVC_POS = 0.873), the effective elasticity is approximately -0.085, implying near-zero sensitivity to exchange rate movements. For a highly upstream economy such as Singapore (GVC_POS = 1.147), the effective elasticity falls to approximately -0.171, confirming that upstream positioning nearly offsets the conventional exchange rate effect entirely. These calculations are consistent with the visual evidence presented in Figure N°2, which illustrates the monotonically declining export response across the distribution of GVC positions.

The mechanism underlying this relationship operates through several channels. First, upstream positioning typically involves higher value-added activities with greater product differentiation, reducing price sensitivity. Second, upstream suppliers often develop closer relationships with downstream partners, creating switching costs that insulate them from short-term price competition. Third, upstream activities frequently require specialized capabilities that are difficult to substitute quickly, providing pricing power even during adverse exchange rate movements.

The industry heterogeneity results reveal that the protective effect of GVC positioning is strongest in high-technology sectors. This finding suggests that the combination of technological sophistication and upstream positioning provides particularly strong insulation from exchange rate volatility. For policy makers, this implies that industrial upgrading strategies should focus not only on moving into higher-technology sectors but also on positioning domestic firms in upstream segments of value chains.

5.2 Policy Implications for ASEAN Economies

The findings have several important implications for economic policy in ASEAN countries. First, the results suggest that industrial upgrading and value chain positioning can serve as effective buffers against external shocks, including exchange rate volatility. This provides additional justification for policies that support technological advancement, skill development, and innovation capabilities.

Second, the country-specific results indicate that the benefits of GVC upgrading vary across economies, with more advanced countries like Singapore and Malaysia showing stronger effects. This suggests that there may be threshold effects or complementary capabilities required to fully realize the benefits of upstream positioning. Countries at earlier stages of development may need to focus on building foundational capabilities before pursuing ambitious value chain upgrading strategies.

Third, the industry analysis reveals that the protective effects are strongest in high-tech sectors, suggesting that sectoral targeting may be appropriate. However, this should be balanced against the risks of picking winners and the importance of maintaining comparative advantage in existing strength areas.

5.3 Regional Integration and Value Chain Development

The ASEAN context provides unique insights into regional value chain development. The strong results for countries like Malaysia and Thailand suggest that regional integration can facilitate value chain upgrading by providing access to larger markets and enabling specialization within regional production networks. The ASEAN Economic Community (AEC) framework has reduced barriers to trade and investment, facilitating the development of integrated regional value chains.

However, the analysis also reveals significant heterogeneity across countries, suggesting that regional integration alone is insufficient. Countries need complementary domestic policies to build the capabilities required for upstream positioning. This includes investments in education and training, research and development, infrastructure, and institutional quality.

5.4 Limitations and Future Research Directions

While our analysis provides robust evidence for the moderating effect of GVC positioning, several limitations should be acknowledged. First, the input-output data used to construct GVC indicators are available only at relatively aggregated industry levels, potentially masking important within-industry heterogeneity. Future

research could explore firm-level data to examine how individual companies' value chain strategies affect their exchange rate sensitivity.

Second, our analysis focuses on manufacturing industries, leaving questions about the applicability of findings to service sectors. As services become increasingly tradable and integrated into global value chains, extending the analysis to service industries would provide valuable insights.

Third, the study period encompasses several major economic disruptions, including the Asian Financial Crisis, Global Financial Crisis, and COVID-19 pandemic. While our time fixed effects control for common shocks, future research could explore how the GVC position effect varies during different types of crisis periods.

6. Conclusion

This study provides robust empirical evidence that Global Value Chain positioning fundamentally alters the traditional relationship between exchange rates and export performance. Using comprehensive data from ten ASEAN economies over 2000-2022, we demonstrate that upstream positioning in global value chains reduces export sensitivity to exchange rate fluctuations by approximately 30-40 percent. This finding represents a significant contribution to understanding how modern production networks reshape international trade dynamics.

Our analysis reveals three novel findings that extend existing literature. First, the protective effect of GVC positioning varies systematically across technology levels, with high-tech industries showing the strongest buffering effects (-0.445) compared to low-tech sectors (-0.198). Second, the positioning effect has strengthened over time, particularly during crisis periods, suggesting that value chain upgrading provides increasingly important resilience against external shocks. Third, mechanism analysis confirms that the effect operates through product differentiation, relationship-specific investments, and market power channels rather than simply reflecting aggregate integration levels.

For ASEAN economies and similar emerging markets, these findings support industrial policies that emphasize value chain positioning rather than merely participation. Countries should prioritize developing specialized capabilities that position domestic firms upstream in global production networks, particularly in technology-intensive sectors where the protective effects are strongest. However, our heterogeneous country results suggest that positioning strategies must be tailored to existing capabilities - while Singapore and Malaysia can pursue advanced upstream positioning, countries like Vietnam may benefit from gradual upgrading trajectories that build foundational capabilities before attempting dramatic repositioning.

The evolution patterns documented in our data provide a roadmap for this upgrading process, showing that successful positioning improvements require sustained effort over decades rather than rapid transformation.

Vietnam's experience, showing steady improvement from 0.723 to 0.819 over two decades, demonstrates that patient capability building can yield substantial positioning gains and associated resilience benefits.

While our study provides comprehensive evidence for the GVC positioning effect, several limitations point toward important research directions. Our industry-level analysis may mask significant firm-level heterogeneity in positioning strategies and exchange rate sensitivity. Future research utilizing firm-level data could examine how individual companies' positioning choices affect their resilience to external shocks. Additionally, our focus on manufacturing industries leaves questions about positioning effects in increasingly tradable service sectors, where different mechanisms may operate.

The COVID-19 pandemic and recent geopolitical tensions have renewed focus on supply chain resilience, potentially altering the value of upstream versus downstream positioning. Understanding how these structural changes affect the relationships we document represents an important avenue for future research, particularly as countries reassess their integration strategies in light of new risk considerations.

7. List of references:

1. Ahmed, S., Appendino, M., & Ruta, M. (2015). Depreciations without exports? Global value chains and the exchange rate elasticity of exports. World Bank Policy Research Working Paper.
2. Amiti, M., Itskhoki, O., & Konings, J. (2014). Importers, exporters, and exchange rate disconnect. *American Economic Review*, 1942-1978.
3. Baldwin, R., & Freeman, R. (2021). Risks and Global Supply Chains: What We Know and What We Need to Know. NATIONAL BUREAU OF ECONOMIC RESEARCH, 1-37.
4. Borin, A., & Mancini, M. (2019). Measuring What Matters in Global Value Chains and Value-Added Trade. World Bank Policy Research.
5. Boz, E., Gopinath, G., & Plagborg-Møller, M. (2017). Global trade and the dollar. *Society for Economic Dynamics*, 110(6), 1999-2039.
6. Cheng, K., Rehman, S., Seneviratne, D., & Zhang, S. (2015). Reaping the Benefits from Global Value Chains. IMF Working Paper, 1-24.
7. Fontagné, L., & Harrison, A. (2017). The Factory-Free Economy: Outsourcing, Servitization and the Future of Industry . National Bureau of Economic Research.
8. Krugman, P. (1987). Pricing to market when the exchange rate changes. (n. S. (Eds.), Ed.) *Real financial linkages among open economies*.
9. Lopez-Gonzalez, J., Kowalski, P., Ugarte, C., & Ragoussis, A. (2015). Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies. *OECD Trade Policy Papers*, 179, 1-172.
10. Tan, K., Duong, L., & Chuah, H. (2019). Impact of exchange rates on ASEAN's trade in the era of global value chains: An empirical assessment. *The Journal of International Trade & Economic Development*, 28(1), 1-29.