Journal of Economic Integration
https://www.e-jei.org/
Vol. 41, No. 3, September 2026, 639-668
https://doi.org/10.11130/jei.2025025
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pISSN: 1225-651X eISSN: 1976-5525

Exchange Rate Changes and Trade Performance in Selected Asian Countries

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Abstract While a growing body of research explores the link between exchange rate changes and trade performance, less empirical attention has been paid to how trade responds to the currency devaluation or appreciation while integrating the traditional macroeconomic drivers of trade performance. The main goal of this paper is to investigate the key drivers of trade performance in Asian economies over recent decades. Using annual data from 13 selected Asian countries spanning between 1986 and 2022, the study employs Dynamic Fixed Effects (DFE) and Common Correlated Effects Mean Group (CCEMG) estimators. The finding shows that while domestic investment and world income are key positive drivers of exports in the short run, only population and real gross domestic product significantly account for positive changes in imports, just as the trade balance is positively influenced by exchange rate and export, with import exerting a negative impact. The Marshall-Lerner condition holds in the long run, with mixed evidence for the J-curve hypothesis across samples. The study recommends sustained investment in productivity, innovation, and diversification.

Keywords: Asia, Exchange Rate, Trade Balance, Trade Performance

JEL Classifications: O24, F14, N75

Received 10 July 2025, Revised 27 November 2025, Accepted 2 December 2025

I. Introduction

Exchange rates represent a cornerstone of macroeconomic policy, acting as the price of one nation's currency relative to others. They not only reflect the state of the domestic economy

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in a global economy but also drive some key macroeconomic variables. This pivotal role has sparked intense debates among scholars, with monetarists emphasizing price stability as a prerequisite for macroeconomic equilibrium, while development scholars prioritize economic growth as a pathway to stability. In both perspectives, exchange rate movements are central to trade performance, making it a crucial area of empirical investigation, especially for Asian economies navigating dynamic global markets.

The nexus between exchange rate changes and trade performance has been a subject of growing interest due to its critical implications for trade balance, investment flows, employment, and overall economic growth (Gbaka et al., 2023). In Asia, where trade constitutes a substantial share of GDP of the countries, exchange rate policies play a crucial role in shaping export and import dynamics. Many countries in the region have adopted exchange rate adjustments particularly currency depreciation as a strategic tool to boost export competitiveness and curb import dependence. However, the effectiveness of these measures is contingent upon key theoretical frameworks that govern the relationship between exchange rates and trade flows. The Marshall-Lerner condition, a fundamental principle in international trade theory, posits that a currency depreciation will lead to an improvement in the trade balance only if the sum of the absolute values of the price elasticities of exports and imports exceeds unity. This suggests that for depreciation to be effective, demand for exports must be sufficiently elastic so that lower prices result in a proportionately larger increase in export volumes, while import demand must be elastic enough for higher import prices to significantly reduce import quantities. If these conditions are not met, currency depreciation may not yield the expected positive effects on trade performance. This explains the importance of empirical validation in Asian economies.

Closely related to this is the J-curve hypothesis, which refines the understanding of exchange rate effects by explaining the dynamic adjustment process of trade balance over time. According to this hypothesis, a currency depreciation initially leads to a deterioration in the trade balance before yielding improvements, creating a J-shaped pattern. This short-run decline occurs because of contractual obligations in international trade where import prices rise immediately, while export volumes take time to respond due to pre-existing supply chains and price rigidities. Over time, as firms and consumers adjust to new price structures, export demand increases and import volumes decline, ultimately leading to an improved trade balance. This delayed response is particularly relevant for Asian economies, where production networks and supply chains are deeply integrated into global markets. The elasticity approach to the balance of payments further supports this mechanism by emphasizing how relative price changes influence trade flows. The extent to which these price changes affect trade volumes depends on the elasticity of demand for exports and imports, which varies across sectors and countries. On the import side, exchange rate changes affect import behavior through relative price adjustments where a currency appreciation makes foreign goods cheaper, increasing their affordability and

stimulating import demand. Conversely, depreciation raises import costs, leading to a potential decline in imports if demand is elastic.

Despite the strong theoretical foundations provided by the elasticity approach, empirical findings across Asian and developing economies remain far from uniform, revealing a fragmented understanding of how exchange rate changes affect trade performance. Several previous empirical studies affirm the validity of the Marshall-Lerner condition in different countries (Duru et al., 2022; Karamelikli & Ongan, 2022; Ijirshar, et al., 2022; Guo, 2020; Doojav, 2018; Adhikari, 2018; Sulaimon et al., 2017; Bano et al., 2014; Hooy & Chan, 2008; Boyd et al., 2001), with some confirming its applicability for specific countries such as Pakistan (Iqbal et al., 2015). Yet an equally substantial body of work documents cases predominantly in developing countries where the condition fails to hold (Abere, 2023; Adams & Metwally, 2021; Loto, 2011; Lucy et al., 2015; Ogbonna, 2018; Rose, 1991), including contradictory evidence within Asia itself, where some studies reject its validity (Shahzad et al., 2017; Har, 2015 for Malaysia) while others report supportive results (Andohol, et al., 2024; Hsing, 2010; Hooy & Chan, 2008). Parallel inconsistencies are evident in the literature on the J-curve hypothesis, with studies identifying its short-run presence (Ijirshar, et al., 2022; Hooy & Chan, 2008; Boyd et al., 2001) while others find no such dynamic adjustment pattern (Duru et al., 2022; Ogbonna, 2018). Moreover, emerging research shows the increasing influence of external risk factors such as global oil price volatility on exchange rate behavior and trade flows in Asia, adding new layers of complexity for countries whose trade structures are highly energy dependent. These divergent findings explain persistent uncertainty surrounding whether currency depreciation reliably enhances trade performance, how exchange rate dynamics interact with global risks, and which macroeconomic fundamentals best explain trade performance among Asian countries.

This study breaks new ground by integrating traditional macroeconomic drivers of trade performance with external risk factors. By examining data spanning 1986-2022 from 13 selected Asian countries, the research provides a comprehensive assessment of how both endogenous and exogenous variables influence trade performance. Employing advanced econometric tools, the study critically evaluates whether currency devaluation or appreciation has consistently served as a viable strategy for trade enhancement and investigates the broader interplay of exchange rate changes with global risks. Building on these theoretical foundations, the present inquiry focuses on three core streams that explain the relationship between exchange rate and trade performance in Asia: the elasticity-based mechanisms underlying the Marshall-Lerner condition, the short-run adjustment processes captured by the J-curve hypothesis, and the asymmetric effects of exchange rate changes on trade performance in Asia. Accordingly, the study seeks to determine which of these mechanisms most strongly influences trade performance in recent decades, whether currency depreciation systematically enhances trade performance

once these channels are accounted for. The 13 countries in Asia were selected because they offer rich variation in exchange rate, trade structures, and GVC integration, which is crucial for studying the link between exchange rate changes and trade performance. The sample includes advanced export powerhouses and global value chain hubs (Japan, Korea, Singapore, Malaysia, Philippines), energy-rich exporters (Bahrain, Iran, Saudi Arabia), and small but trade-oriented economies (Armenia, Georgia, Pakistan, Sri Lanka, Israel).

The paper proceeds as follows: Section 2 reviews theoretical and empirical literature, Section 3 outlines the methodology, Section 4 discusses results, and Section 5 concludes with policy implications.

II. Literature Review

This study builds upon both traditional and contemporary economic theories to analyze the relationship between exchange rate changes and trade performance in selected Asian economies. One of the fundamental theoretical underpinnings of international trade is the Theory of Comparative Advantage by Ricardo (1817). It posits that nations benefit by specializing in goods for which they have the lowest opportunity cost, fostering mutual gains from trade (Faccarello, 2015). Historically, this principle facilitated the integration of Asian economies into global markets, allowing them to capitalize on labor-intensive production in the early stages of industrialization. However, New Trade Theory refined this perspective by explaining the significance of economies of scale, network effects, and strategic trade policies (Krugman, 1979) Unlike the classical model, which emphasizes factor endowments, this theory explains how government intervention, industrial clustering, and technological advancement can enhance trade competitiveness. Some Asian countries have effectively leveraged these strategies to build export-driven economies, where currency fluctuations interact with structural economic policies to influence trade flows. One of the most widely applied exchange rate models is Purchasing Power Parity (PPP), which argues that exchange rates should adjust to equalize price levels between countries (Cassel, 1918). While PPP presents a long-term equilibrium perspective, it fails to capture short-term exchange rate misalignments, often influenced by factors such as speculation, interest rate differentials, and the relative growth of tradable versus non-tradable sectors (Taylor & Taylor, 2004).

Two key theoretical models, the Marshall-Lerner Condition and the J-Curve Hypothesis explain how exchange rate changes affect the trade balance. The Marshall-Lerner Condition states that a currency depreciation will improve the trade balance if the sum of the absolute values of the price elasticities of exports and imports exceeds unity. If trade volumes are inelastic, however, depreciation may fail to significantly boost exports or curb imports, limiting

its impact on trade balance adjustment. It is important to note that a weaker currency does not necessarily enhance trade competitiveness, as higher import costs offset the benefits of depreciation. Complementing this, the J-Curve Hypothesis suggests that currency depreciation initially worsens the trade balance before yielding improvements (Davies, 1962). This short-run deterioration occurs because import contracts are typically priced in foreign currencies, causing immediate cost increases, whereas export volumes take time to respond. Empirical evidence from Asian financial crises and managed exchange rate regimes suggests that many economies experience this J-shaped adjustment pattern, albeit with varying degrees of exchange rate pass-through (Andohol et al., 2024).

Furthermore, the absorption approach to the balance of payments (BOP) explains import behavior by linking national income to domestic expenditure. It suggests that a trade deficit arises when domestic spending exceeds national income, while a trade surplus reflects the opposite. As economies grow, rising incomes typically lead to increased consumption and investment, boosting the demand for imports. This relationship is particularly evident in high-income economies where strong GDP growth has capacity of translating into high import penetration. The gravity model of trade further supports the inclusion of income and population size as key determinants of import demand. This model suggests that trade volume between two countries is directly proportional to their economic size and inversely related to the distance between them. Larger populations generally lead to higher aggregate consumption, increasing import demand, particularly for goods that are not produced domestically. In addition, the exchange rate theory of imports explains that a currency appreciation makes foreign goods more affordable, increasing import levels, while depreciation makes imports more expensive, potentially reducing demand.

III. Review of Empirical Literature

This section presents empirical studies on the relationship between exchange rate and trade performance thematically. Historically, studies from the 1960s to the 1980s posited a negative correlation between exchange rate fluctuations and trade performance. These works emphasized that exchange rate uncertainty increases business risk, leading to a decline in trade flows (Bahmani-Oskooee, 2020). This early consensus has been challenged by more recent findings that consider structural and contextual factors, leading to a more sound understanding. For instance, Chaudhary et al. (2016) investigated the impact of exchange rates on exports and imports in South and Southeast Asia, finding a significant long-term relationship between exchange rates and exports but mixed short-term effects. Similarly, Thorbecke (2011b) argued that yuan appreciation could mitigate trade imbalances in East Asia. While studies like Awan

et al. (2013) confirmed the J-curve effect in Pakistan, they found the long-term effects of currency depreciation to be unfavorable, highlighting the variability in outcomes across contexts.

Furthermore, empirical research has extensively explored the response of trade flows to exchange rate changes, focusing on export and import dynamics. For ASEAN countries, Onafowora (2003) confirmed that the Marshall-Lerner condition holds in the long term, with evidence of the J-curve effect in the short term. Similarly, Wilson (2001) found evidence of the J-curve in trade between Singapore, Korea, and Malaysia and their major trading partners, although the impact of exchange rates on trade balance was less pronounced in certain countries like Singapore. In Vietnam, Nguyen et al. (2018) found that currency depreciation improves the trade balance, confirming the J-curve for specific products. Conversely, Thahara et al. (2021) noted that in Sri Lanka, exchange rate depreciation negatively affects the trade balance in the long run despite supporting the Marshall-Lerner condition. Such findings explain the diversity of trade responses to exchange rate shifts, influenced by factors such as economic structure and trade dependencies.

More so, the effectiveness of exchange rate changes in influencing trade performance depends heavily on the degree of exchange rate pass-through (ERPT). Studies like Bahmani-Oskooee & Fariditavana (2016) highlight the incomplete pass-through in many Asian economies, driven by inflation targeting and pricing-to-market strategies. Gopinath et al. (2020) found that exporters often adjust prices to maintain market share, limiting the expected trade balance improvement following currency depreciation. For example, Baek et al. (2006) examined US trade with Japan, Canada, and Mexico, identifying incomplete ERPT in agricultural and non-agricultural sectors. This phenomenon dampens the expected benefits of currency depreciation, as higher import prices offset gains in export competitiveness. In addition, exchange rate volatility introduces uncertainty that can disrupt trade flows. Studies such as Bloom et al. (2007) emphasize that firms delay trade decisions amidst volatility, reducing overall trade volumes. Ng and Chin (2021) found that exchange rate changes negatively affected Malaysia-China trade, with significant long-term impacts on both imports and exports. Similarly, Alsanusi et al. (2022) highlighted the asymmetric effects of exchange rate volatility on Libya's trade balance, showing stronger impacts of negative changes compared to positive ones.

In terms of the J-Curve and Marshall-Lerner condition, findings across countries remain mixed. This explains the country-specific nature of exchange rate and trade performance relationships. Several studies provide evidence that the Marshall-Lerner condition holds across a wide range of economies (Duru et al., 2022; Boyd et al., 2001; Guo, 2020; Sulaimon et al., 2017; Bano et al., 2014; Hooy & Chan, 2008; Doojav, 2018; Karamelikli & Ongan, 2022; Adhikari, 2018), with additional confirmation in selected country cases (Iqbal et al., 2015). At the same time, several studies report its failure, especially in developing regions such as Africa (Abere, 2023; Adams & Metwally, 2021; Loto, 2011; Lucy et al., 2015; Ogbonna, 2018;

Rose, 1991). Within Asia itself, evidence is equally divided with some works rejecting the condition (Shahzad et al., 2017; Har, 2015 for Malaysia), while others find supportive results (Hsing, 2010; Hooy & Chan, 2008), revealing substantial heterogeneity in trade elasticities and adjustment processes. Similar mixed-findings appear in J-curve investigations: while studies such as Boyd et al. (2001) and Hooy & Chan (2008) identify short-run deterioration followed by long-run improvement, others including Duru et al. (2022) and Ogbonna (2018) find no J-curve effect. These variations echo insights from broader empirical works showing that the J-curve may appear in some countries (Alessandria & Choi, 2021; Bahmani-Oskooee, 1985) but not in others, and that exchange rate effects can be asymmetric, as depreciation and appreciation often exert unequal impacts on trade flows (Trinh, 2014; Bahmani-Oskooee & Kanitpong, 2017). Reinforcing this complexity, Anjande et al. (2019) also found negative effects of exchange rate movements on trade in Africa.

Despite the breadth of empirical research, significant gaps remain. Most studies rely on time series models, such as ARDL and VECM, which assume data stationarity and homogeneity across countries. However, trade data in Asian economies often exhibit heterogeneity due to varying economic structures and policy environments. Moreover, research has largely focused on symmetric effects of exchange rate changes, overlooking potential asymmetries. For example, negative exchange rate changes (depreciation) may have a stronger impact on trade than positive changes (appreciation). Utilizing non-stationary heterogeneous panel models can address these gaps by accounting for country-specific effects and capturing long-term and short-term dynamics. This study seeks to address these gaps by employing advanced econometric techniques, including panel cointegration and error correction models, to analyze the impact of exchange rate changes on trade performance in selected Asian countries.

IV. Methodology of the Research

A. Model specification

To examine the impact of exchange rate changes on trade performance, this study specifies an empirical model that incorporates the key insights from the theories of Comparative Cost Advantage, Purchasing Power Parity (PPP), the J-Curve Hypothesis, and the Marshall-Lerner condition. Trade Performance (TP) is measured using indicators such as the trade balance (exports minus imports), export volumes, or import volumes. The study also followed the approach by Andohol et al. (2024), Nguyen et al. (2021), Göçer et al. (2013), and Ijirshar et al. (2022), who measured trade flows using export, import and trade balance indicators to examine the influence of the exchange rate on trade performance among selected Asian

countries. Consequently, this study used exports (X), imports (M) and the trade balance (TB) as proxies for trade performance. Andohol et al. (2024) stated that all trade indicators are influenced by the real effective exchange rate, world real gross domestic product, and openness. However, Ijirshar et al. (2022) stated that exports are influenced by the real effective exchange rate, world real gross domestic product, domestic investment and foreign investment, while imports are influenced by the real effective exchange rate, domestic income (real gross domestic product), population, and investment components (domestic investment and foreign investment). The latter has also measured the drivers of the trade balance as the real effective exchange rate, domestic and foreign income and investment components. Real effective exchange rate (R) is considered to be the most suitable proxy for exchange rate changes due to its ability to accommodate variations in price level differences, indicating a better indicator of a country's competitiveness in international markets, unlike other measures like the nominal effective exchange rate. Thus, following Ijirshar et al. (2022) and Nguyen et al. (2021) with modifications, the equation for assessing the influence of the exchange rate on exports is as follows:

$$X_{it} = f(R_{it}, Id_{it}, If_{it}, Yw_{it}) \tag{1}$$

where X is exports, R is the real effective exchange rate, Id is domestic investment, If is foreign investment, and Yw is the world real GDP as a proxy for world income.

The equation for examining the influence of the exchange rate on imports is as follows:

$$M_{it} = f(R_{it}, P_{it}, Y_{it}) \tag{2}$$

where M is imports, P is total population, and Y is gross domestic product as a proxy for domestic income.

Following Göçer et al. (2013), with the addition of the main drivers of trade balance, such as exports (X) and imports (M), the trade balance (TB) equation can be stated as:

$$TB_{it} = f(R_{it}, X_{it}, M_{it}) \tag{3}$$

In this study, both symmetric and asymmetric models were used. The "symmetric" models assume that trade performance responds equally to both currency appreciations and depreciations, while "asymmetric" models allow for differential effects, recognizing that depreciations may have a stronger or weaker impact than appreciations. This distinction is critical, as empirical evidence suggests that exchange rate depreciations often enhance exports more significantly than appreciations reduce them, due to factors such as pricing-to-market behavior and import

dependency. The stochastic forms of the symmetric models (equations 4-6) and the asymmetric models (equations 7-9) for equations (1), (2), and (3) are stated as follows (while transforming the equations with the natural logarithm (ln)) as:

$$\ln X_{it} = \alpha_0 + \alpha_1 \ln R_{it} + \alpha_2 \ln Id_{it} + \alpha_3 \ln If_{it} + \alpha_4 \ln Yw_{it} + \epsilon_{it} \tag{4}$$

$$\ln M_{it} = \beta_0 + \beta_1 \ln R_{it} + \beta_2 \ln P_{it} + \beta_3 \ln Y_{it} + \epsilon_{it} \tag{5}$$

$$\ln TB_{it} = \chi_0 + \chi_1 \ln R_{it} + \chi_2 \ln X_{it} + \chi_3 \ln M_{it} + \epsilon_{it} \tag{6}$$

This study applied the partial sum decomposition of the real effective exchange rate (R) into positive and negative terms to estimate the asymmetric effects in line with the nonlinear ARDL framework proposed by Shin, Yu and Greenwood-Nimmo (2014). The study further computed the logarithmic changes in the value of R using Stata software package, while applying the first difference of the values, given as $\Delta \ln R_{it} = \Delta \ln R_{it} - \Delta \ln R_{it-1}$ which further separates it into positive and negative variations, displayed as $\Delta \ln R_{it}^{+} = \max(\Delta \ln R_{it}, 0)$ and $\Delta \ln R_{it}^{-} = \min(\Delta \ln R_{it}, 0)$ The study also computes the cumulative partial sums $\Delta \ln R_{it}^{+} = \sum_{j=1}^{t} \Delta \ln R_j^{+}$ and $\Delta \ln R_{it}^{-} = \sum_{j=1}^{t} \Delta \ln R_j^{-}$. Both the series are incorporated individually in the models, in order to pave way for the evaluation of multipliers for positive and negative variations separately. The relevant specification of asymmetric models becomes:

$$\ln X_{it} = \alpha_0 + \alpha_1 \ln R_POS_{it} + \alpha_2 \ln R_NEG_{it} + \alpha_3 \ln Id_{it} + \alpha_4 \ln If_{it} + \alpha_5 \ln Yw_{it} + \epsilon_{it} \tag{7}$$

$$\ln M_{it} = \beta_0 + \beta_1 \ln R_POS_{it} + \beta_2 \ln R_NEG_{it} + \beta_3 \ln P_{it} + \beta_4 \ln Y_{it} + \epsilon_{it} \tag{8}$$

$$\ln TB_{it} = \chi_0 + \chi_1 \ln R_POS_{it} + \chi_2 \ln R_NEG_{it} + \chi_3 \ln X_{it} + \chi_4 \ln M_{it} + \epsilon_{it} \tag{9}$$

where α_0, β_0 and χ_0 are the intercepts; $\alpha_1 - \alpha_4$, $\beta_1 - \beta_3$ and $\chi_1 - \chi_3$ are parameters for the symmetric models (equations 4-6); and $\alpha_1 - \alpha_5$, $\beta_1 - \beta_4$ and $\chi_1 - \chi_4$ are the parameters for the asymmetric models (equations 7-9).

The real effective exchange rate (R) is anticipated to have a negative impact on exports and the trade balance but a positive impact on imports of goods and services. The world real gross domestic product (Yw) is expected to positively affect exports of goods and services and the trade balance. Furthermore, real GDP (Y) is expected to positively influence the import of goods and services. The apriori expectation of both domestic and foreign investment is that they will yield positive influence on exports of goods and services. Domestic investment can

enhance productive capacity and efficiency, leading to increased outputs of goods and services. Similarly, foreign investment, by providing access to capital, technology, and markets, can stimulate export-oriented industries and bolster competitiveness in the global market. Consequently, higher levels of both domestic and foreign investment are anticipated to contribute to the growth and expansion of exports of goods and services. Population growth exerts a positive influence on the imports of goods and services. As the population increases, so does the demand for goods and services to meet the needs and preferences of consumers.

B. Variable description and data measurement

The variables used in this study are presented in Online Appendix 1 with their respective measurements. The data were sourced from the World Development Indicator (World Bank). This study uses panel data from 13 selected Asian countries (Armenia, Bahrain, Georgia, Iran, Israel, Japan, Korea, Malaysia, Pakistan, the Philippines, Saudi Arabia, Singapore, and Sri Lanka) covering the period 1986-2022. Beyond data availability, these countries were selected to capture the rich heterogeneity of exchange rate regimes, trade structures, and stages of economic development within Asia. The sample includes both advanced economies and emerging or developing economies. The selected countries also represent a broad spectrum of exchange rate arrangements from pegged systems and managed floats to freely floating regimes showing variation for analyzing asymmetric responses to exchange rate shocks. Furthermore, many of these economies are deeply integrated into global and regional value chains, particularly in manufacturing, energy exports, and service or technology sectors, while others rely heavily on imported intermediate goods and external demand.

C. Techniques of data analysis

To rigorously analyze the relationship between exchange rate dynamics and trade performance in 13 selected Asian countries over a 37-year period, this study employs a robust combination of advanced econometric techniques. These methodologies are designed to address the unique characteristics of the dataset, including potential stationarity issues, cross-sectional dependence, and dynamic relationships. The analytical approach ensures a comprehensive and precise exploration of the research questions, with careful attention to the validity and robustness of results.

Given the longitudinal nature of the data, a critical starting point is testing for stationarity to prevent spurious regression results. Multiple panel unit root tests are applied to account for heterogeneity across countries and the possibility of common trends. These tests include: Harris-Tzavalis test (ideal for panel datasets with long time dimensions), Breitung and Levin-Lin-Chu (LLC) tests (assume a common unit root process across the panel), and Im-Pesaran-Shin (IPS) and ADF-Fisher Tests (allow for heterogeneity in unit root processes across countries

(Im et al., 2003; Fisher, 1932). These tests collectively ensure that any underlying non-stationary behavior is adequately identified and addressed.

Cross-sectional dependence, often caused by unobserved global shocks or regional economic events, is a critical issue in macroeconomic panels. Ignoring it can bias estimates and undermine inference. To detect and address this, the Pesaran CD Test was employed on residuals (that is *xtcd* command) while, the Pesaran (2004, 2007) Cross-Sectional Dependence (CD) test was also utilized (that is *xtcdf* command). These tests identify the presence of common factors affecting multiple countries simultaneously, ensuring that subsequent analyses account for shared influences. The dynamic nature of the relationship between exchange rate changes and trade performance necessitates advanced modeling techniques. To explore causality, the Granger Non-Causality Test was applied. The Dumitrescu & Hurlin (2012) test is preferred in this study. It is specifically designed for heterogeneous panel data where causality may vary across cross-sections. This test is well-suited for moderate-sized panels, making it highly applicable to this study of 13 countries over nearly four decades. The Juodis, Karavias, and Sarafidis (2021) HPJ Wald test, while effective for very large panels, may be less reliable in smaller panels due to its reliance on asymptotic properties that perform better with a high number of cross-sections. Furthermore, the country-specific heterogeneity is a key concern in this study.

The study employs both the Dynamic Fixed Effects (DFE) model and the Common Correlated Effects Mean Group (CCEMG) estimator (Pesaran, 2006), as they collectively provide a robust framework for capturing short- and long-run dynamics while addressing key econometric challenges such as cross-sectional dependence, unobserved heterogeneity, and endogeneity. The Dynamic Fixed Effects (DFE) model is particularly well-suited for analyzing panel data with a moderate number of cross-sections (N = 13) and a large time dimension (T = 37). One of its primary advantages is the ability to incorporate lagged dependent variables, which are essential for capturing both short-term fluctuations and long-term equilibrium relationships between exchange rates and trade performance. Standard panel models, such as the fixed-effects or random-effects estimators, assume an immediate relationship between exchange rate movements and trade, but real-world trade adjustments often exhibit delayed responses due to factors such as contractual rigidities, production adjustments, and gradual changes in import and export demand. For instance, the J-curve effect suggests that a depreciation of the exchange rate may initially worsen the trade balance before improving over time. Similarly, the Marshall-Lerner condition states that the ultimate impact of exchange rate changes depends on the price elasticity of imports and exports. The DFE model captures these dynamics by including lagged trade performance variables, allowing for a more realistic representation of how trade balances evolve over time following exchange rate movements. The model also effectively controls for unobserved heterogeneity by allowing for country-specific fixed effects, which account for differences in economic structures, trade policies, and institutional frameworks

across the 13 Asian economies. Furthermore, by incorporating lagged dependent variables, the DFE model helps address endogeneity concerns, particularly those arising from the potential feedback loop between exchange rates and trade balances.

Despite the advantages of the DFE model, one of its key limitations is that it does not explicitly account for cross-sectional dependence, which is a critical issue in panel studies involving multiple countries. Economic shocks, global trade cycles, and monetary policy spillovers create interdependencies across economies, making it essential to account for these effects in panel estimations. To address this limitation, the study also employs the Common Correlated Effects Mean Group (CCEMG) estimator proposed by Pesaran (2006). The CCEMG estimator is specifically designed to handle cross-sectional dependence by incorporating common factors that capture unobserved global shocks and regional spillovers. The CCEMG estimator controls for these influences by including cross-section averages of the independent variables, thereby filtering out common shocks that could bias the results if left unaccounted for. Another advantage of the CCEMG estimator is its ability to accommodate heterogeneous slope coefficients, meaning that it allows the relationship between exchange rates and trade performance to vary across countries. The combination of the DFE model and the CCEMG estimator ensures robustness in the study's findings.

To further enhance reliability, the study employs country-specific time-series analysis using the Autoregressive Distributed Lag (ARDL) Model. This additional layer of analysis validates the broader panel data findings by focusing on individual countries' trade and exchange rate dynamics. By combining these advanced techniques, this study ensures a thorough and reliable exploration of how exchange rate changes influence trade performance. The dual focus on robustness and specificity allows for sound insights that account for the diverse economic environments of the selected Asian countries.

V. Results and Discussion

A. Descriptive statistics

The descriptive statistics highlight the trade dynamics of 13 selected Asian economies over the study period, reflecting both strengths and challenges. From the results in Online Appendix 2, with average exports of $141,706.4 million and imports of $130,129.71 million, these economies exhibit a positive mean trade balance of $11,606.03 million, signaling favorable trade performance overall. However, the real effective exchange rate (REER) of 105.11 suggests a relative loss in competitiveness, as stronger currencies make exports more expensive and imports cheaper. This finding implies that these economies must grapple with balancing trade

competitiveness amidst currency strength. Domestic investment levels, averaging $146,814 million, far exceed foreign direct investment inflows, indicating robust internal growth dynamics. The large variance in trade performance among individual countries shows economic diversity as presented in Online Appendix 3. Japan, with the highest mean export performance ($615,797.4 million), exemplifies trade success, while Armenia's low export figure ($2,008.9 million) reflects differing levels of industrialization and integration into global markets. The trade openness index highlights exceptional integration for countries like Singapore (348.96) and Malaysia (162.40), revealing their reliance on international trade as a growth driver.

B. Panel unit root test results

The unit root tests results in Online Appendix 4 and as summarized in Table 1 reveal that the variables exhibit a mixed order of integration (I(0) and I(1)). This finding is significant, as it justifies the use of advanced econometric techniques that accommodate both stationary and non-stationary variables, ensuring robust analysis and preventing spurious regression results.

C. Cointegration test results

Cointegration tests results in Online Appendix 5 and as summarized in Table 1 confirm long-run relationships among the variables. The presence of cointegration implies that despite short-term fluctuations, variables such as exports, imports, and real effective exchange rate adjust over time to maintain a stable equilibrium.

Table 1. *Summary of the Diagnostics Tests Results*

Test	Null Hypothesis (H_0)	Decision (@ 1%, 5% 10%)	Remarks
Harris-Tzavalis test	Panels contain unit roots	Mixed (I(0) & I(1))	Panels are stationary
Breitung test	Panels contain unit roots	Mixed (I(0) & I(1))	Panels are stationary
Levin, Lin & Chu test	Panels contain unit roots	Mixed (I(0) & I(1))	Panels are stationary
Im-Pesaran-Shin test	All panels contain unit roots	Mixed (I(0) & I(1))	At least one is stationary
ADF-Fisher test	All panels contain unit roots	Mixed (I(0) & I(1))	At least one is stationary
Pesaran CD Test	Panels are independent	Mixed (I(0) & I(1))	Panels are cross-sectionally dependent.
Pesaran CIPS test	Panels contain unit roots	Mixed (I(0) & I(1))	At least some panels are stationary.
Hadri LM test	All panels are stationary	Mixed (I(0) & I(1))	Some panels contain unit roots
Symmetric Models			
Kao Test (lnX)	No panel cointegration	All: Significant	There is cointegration.
Kao Test (lnM)	No panel cointegration	All: Significant	There is cointegration.
Kao Test (lnTB)	No panel cointegration	All: Significant	There is cointegration.

Table 1. *Continued*

Test	Null Hypothesis (H_0)	Decision (@ 1%, 5% 10%)	Remarks
Asymmetric Models			
Kao Test (lnX)	No panel cointegration	All: Significant	There is cointegration.
Kao Test (lnM)	No panel cointegration	All: Significant	There is cointegration.
Kao Test (lnTB)	No panel cointegration	All: Significant	There is cointegration.
Symmetric Models			
Pedroni Test (lnX)	No panel cointegration	1 out of 3: Significant	There is no cointegration.
Pedroni Test (lnM)	No panel cointegration	None is Significant	There is no cointegration.
Pedroni Test (lnTB)	No panel cointegration	None is Significant	There is no cointegration.
Asymmetric Models			
Pedroni Test (lnX)	No panel cointegration	All: Significant	There is cointegration.
Pedroni Test (lnM)	No panel cointegration	2 out of 3: Significant	There is cointegration.
Pedroni Test (lnTB)	No panel cointegration	1 out of 3: Significant	There is no cointegration.
Symmetric Models			
Westerlund Test (lnX)	No panel cointegration	3 out of 4: Significant	Cointegration exists
Westerlund Test (lnM)	No panel cointegration	1 out of 4: Significant	No cointegration exists
Westerlund Test (lnTB)	No panel cointegration	2 out of 4: Significant	Cointegration exists
Asymmetric Models			
Westerlund Test (lnX)	No panel cointegration	None is Significant	No cointegration exists
Westerlund Test (lnM)	No panel cointegration	None is Significant	No cointegration exists
Westerlund Test (lnTB)	No panel cointegration	1 out of 4: Significant	No cointegration exists

(Source) Authors' Computation from STATA Output in Online Appendix 2 to 5

D. Causality test results

The Dumitrescu & Hurlin (2012) Granger non-causality test results in Online Appendix 6 reveal a unidirectional causal relationship from the real effective exchange rate (lnR) to both exports (lnX) and imports (lnM), as well as from the real effective exchange rate to the trade balance (lnTB). That is, the real effective exchange rate (lnR) Granger-causes both exports (lnX) and imports (lnM), as well as the trade balance (lnTB), suggesting that exchange rate fluctuations play a crucial role in shaping trade performance. Additionally, exports (lnX) and imports (lnM) do not exhibit a significant causal effect on the real effective exchange rate, implying that trade flows respond more to exchange rate movements rather than influencing them. However, imports (lnM) and the trade balance (lnTB) do not show strong causal effects on the real exchange rate. However, no evidence of causality is found in the reverse direction. These findings suggest that changes in the real exchange rate significantly influence trade performance.

E. Results of the DFE and CCEMG models

The main objective of this study is to examine the impact of exchange rate changes on trade performance in selected Asian countries. As such, the dynamic fixed effects (DFE) model results are presented in Online Appendix 7 while the common correlated effects mean group estimator (CCEMG) results are presented in Online Appendix 8. These results indicate a rapid adjustment to long-run equilibrium across exports, imports, and trade balances, with adjustment speeds ranging between 17.8% and 20.4%. This demonstrates the presence of mechanisms in these economies to correct deviations and maintain stability. In the short term, historical export performance, domestic investment, and world income positively drive export growth. These findings align with studies highlighting the dependence of Asian exports on global demand and internal investment (Thorbecke, 2018; Freund & Pierola, 2012). However, currency appreciation significantly reduces exports, with a 1% appreciation decreasing exports by 4.935% in line with the works of Thorbecke (2011a) and Awan et al (2013) who obtained a long run negative impact of currency appreciation. Conversely, a 1% depreciation increases exports by 1.367%, confirming the role of exchange rate competitiveness. The asymmetry in the effects of appreciation versus depreciation suggests that Asian exports are particularly vulnerable to currency strength, potentially due to the specialized nature of export goods or rigid trade agreements. The relationship between currency depreciation and imports is starkly positive, with a 1% depreciation increasing imports by 5.44%. This finding indicates a dependency on imported goods, reflecting either a lack of domestic substitutes or a preference for higher-quality foreign products (Frankel, 2010). The insignificant impact of currency appreciation on imports suggests that domestic demand and supply chain factors may outweigh the influence of exchange rates.

The results of the dynamic impact of exchange rates on trade performance in the selected Asian countries reveal differences between asymmetric (nonlinear) and symmetric (linear) responses. Specifically, the Wald test indicates asymmetric effects of exchange rate movements on exports and imports, while the effect on the trade balance is symmetric. This means that appreciations and depreciations of the exchange rate affect trade flows differently in the short run for exports and imports, but not for the overall trade balance. In the short run, the asymmetric DFE model shows that the coefficient of the effect of R appreciation on exports is positive (0.453) and significant at 1% level of significance, while that of R depreciation on exports is negative (-0.168) and statistically significant at 10% critical level and even smaller in magnitude. This implies that exports rise following an appreciation, but only marginally decline with depreciation. This pattern suggests that Asian exporters may benefit from cheaper imported inputs when the currency strengthens, especially in economies deeply integrated into global value chains. It also implies that depreciation does not immediately boost exports due to production lags, contract stickiness, and low short-term price elasticity.

The study also found that R appreciation increases imports slightly but not significantly by 0.18%, while depreciation reduces imports significantly by 0.334%. This shows that Asian imports are highly sensitive to exchange rate changes, and a weaker currency makes imported goods more expensive, leading to reduced import demand in the short run. The short-run symmetric estimate from the trade balance model is 0.239 and it is statistically insignificant at 5% critical level. This implies that exchange rate changes do not immediately affect the trade balance. This supports the notion that the J-curve effect may be at work since trade balance initially worsens or remains unchanged after a depreciation because quantities of exports and imports adjust slowly. In the short run, both export and import responses to R changes are asymmetric and muted. This reflects the rigidity of trade contracts, import dependence of export industries, and limited short-term substitutability between domestic and foreign goods. Depreciation does not yield an immediate improvement in the trade balance, consistent with the downward phase of the J-curve.

In the long run, the DFE results reveal stronger and more meaningful effects on trade performance. The study found that R appreciation (lnR_pos = -4.935) leads to a sharp decline in exports at 1% level of significance, whereas R depreciation (lnR_neg = 1.367) boosts exports significantly at 1% critical level. This shift from short-run asymmetry to long-run theoretical consistency indicates that exporters eventually respond positively to depreciation once production and trade contracts adjust. The study also found that R appreciation has no significant long-run impact on imports, but R depreciation (lnR_neg = 5.44) significantly increases imports at 1% level of significance. This may seem contradictory to theory but likely reflects import-intensive production structures in Asia where a large share of imports are intermediate inputs used for export manufacturing. The long-run linear coefficient of R (lnR = 2.66) on trade balance is statistically insignificant. This implies that although individual trade flows (exports, imports) react asymmetrically, the aggregate trade balance adjusts symmetrically, consistent with the Wald test results.

In terms of the evidence of the J-curve hypothesis in Asia, the J-Curve hypothesis postulates that after a currency depreciation, the trade balance initially worsens due to fixed contracts and sluggish quantity responses, but improves over time as exports expand and imports contract. The DFE results confirm this dynamic for Asian economies. From the results in the short run, R depreciation leads to limited export response (-0.168) statistically significant only at 10% critical level and a modest fall in imports (-0.334), implying an overall temporary deterioration in the trade balance or minimal change. In the long run, R depreciation significantly boosts exports (1.367) and, despite increasing import volumes, the value effect dominates, improving the trade balance gradually. Thus, the J-curve phenomenon holds for the Asian sample under the DFE model. The trade balance first remains weak or worsens following a depreciation but later improves as the export sector adjusts and becomes more competitive internationally.

However, under the CCEMG model, the J-curve is not statistically supported, since no variable is significant in the asymmetric specification, suggesting substantial heterogeneity among countries and weaker cross-country adjustment mechanisms.

For the existence of the Marshall-Lerner Condition (MLC), the condition states that a currency depreciation will improve the trade balance of a country if and only if the sum of the absolute values of the export and import elasticities with respect to the exchange rate exceeds one. The DFE results in the short-run shows the export elasticity of 0.168 and the import elasticity of 0.334. From the results, the sum of the absolute values of the export and import elasticities with respect to the exchange rate is $0.502 < 1$. This indicates that in the short run, the MLC is not satisfied, meaning that depreciation will not immediately improve the trade balance. This aligns with the downward portion of the J-curve. From the DFE results in the Long-run, export elasticity (depreciation) is 1.367 and the import elasticity (depreciation) is 5.44. Given that the sum is $6.807 > 1$, it clearly satisfies the MLC. This implies that in the long run, depreciation improves the trade balance as the volume response of exports and imports exceeds the price effect. From the CCEMG results of the Symmetric model as suggested by the Wald test, the sum of the absolute values of the export and import elasticities with respect to the exchange rate is $0.541 < 1$. This again shows that the MLC does not hold in the symmetric CCEMG model explaining the heterogeneity across Asian economies and the limited effect of exchange rate changes under uniform assumptions.

The results from the Dynamic Fixed Effects (DFE) and Common Correlated Effects Mean Group (CCEMG) estimations for Asian economies are broadly consistent with findings from developing regions, where responses to currency depreciation are typically sluggish and partial. This aligns with Onafowora (2003) and Bahmani-Oskooee & Wang (2006), who observed that in developing economies, the short-run reaction of trade flows to exchange rate changes is weak due to low price elasticity, import-dependent production structures, and contractual rigidities. However, the present findings diverge partially from those of Bahmani-Oskooee & Fariditavana (2016) and Baek et al. (2006), who found evidence of an incomplete exchange rate pass-through between the United States and major developed trading partners such as Japan, Canada, and Mexico suggesting that industrialized economies tend to experience more stable trade responses to exchange rate movements. Conversely, the evidence of this study supports the conclusions of Alessandria and Choi (2021), Bahmani-Oskooee (1985) for developing countries, Duru et al. (2022) for Nigeria, and Andohol et al. (2024) for East Asia, all of whom confirmed the validity of both the J-Curve hypothesis and the Marshall-Lerner condition in the long run. The convergence with these studies explains the gradual adjustment mechanism typical of emerging Asian economies, where depreciation initially fails to improve the trade balance but eventually strengthens exports as markets, production, and supply chains adjust. Variations across studies can largely be attributed to methodological differences (such as

symmetric vs. asymmetric modeling), sample scope, and the time periods analyzed, which influence the magnitude and timing of exchange rate effects.

From a policy perspective, these findings convey several important implications. First, while exchange rate depreciation can enhance export competitiveness, its short-run impact is limited, suggesting that devaluation alone is insufficient to improve external balances. Policymakers should therefore complement exchange rate measures with structural reforms that enhance productivity, promote technological upgrading, and expand the diversity and sophistication of export products. Second, the observed rise in imports following depreciation reflects the heavy reliance of many Asian economies on imported intermediate goods. To mitigate this, governments should foster domestic production capacity and encourage import substitution, especially in industries where local value addition is feasible. Third, the mixed evidence of the J-curve explains that exchange rate policies must be accompanied by supportive macroeconomic strategies such as inflation control, infrastructure development, and industrial policy to ensure that the benefits of depreciation are not eroded by cost pressures or supply bottlenecks. Finally, the strong dependence of trade flows on world income highlights the vulnerability of Asian economies to global demand fluctuations. Diversifying trade partners, broadening the export base, and enhancing resilience to external shocks are therefore essential components of sustainable trade policy.

F. Analysis of country-specific cases

This section presents how exchange rate changes influence trade performance in the selected Asian countries, considering both short-term and long-term dynamics. The results are presented in Appendices 9 to 21. The analysis reveals differences across countries, shedding light on the structural and contextual factors that drive these effects.

1. Armenia

Armenia exhibits a significant short-term response to deviations from long-run equilibrium in exports and imports, except in the trade balance model. The real effective exchange rate (R), domestic investment (Id), and world income (Yw) positively influence exports in the short run, though domestic investment's negative long-term effect suggests inefficiencies in investment or reliance on imported capital goods. Conversely, world income and domestic investment bolster exports over time. Notably, currency depreciation enhances exports, supporting the traditional view of competitive advantage through weaker currencies. This result contrasts with that of Ng and Chin (2021), who found negative impact of Malaysia-China trade relations and Alsanusi et al. (2022) on Libya. The trade balance is largely export-driven, highlighting the need for policies that focus on boosting export competitiveness to improve trade outcomes. The study

suggests no clear evidence of a J-curve effect for Armenia. Regarding the Marshall-Lerner condition (MLC), the results indicate that this condition does not hold for Armenia. While depreciation initially boosts exports (short-run elasticity ≈ 2.03) and imports respond strongly (≈ 4.03), the long-run negative elasticities for both exports (-3.99) and imports (-8.07) imply instability rather than balanced adjustment.

2. Bahrain

In Bahrain, exports quickly converge toward equilibrium, driven by domestic investment (Id) and global economic conditions (Yw) in the long run. Interestingly, currency appreciation also drives exports, possibly due to Bahrain's specialization in high-value products with low price sensitivity. This finding aligns with studies like Thorbecke (2011a), which emphasize the importance of export structure. The study also found that exports improve the trade balance. The results for Bahrain provide no evidence of a J-curve effect. Regarding the Marshall-Lerner condition (MLC), the sum of the absolute long-run export (1.02) and import (1.69) elasticities equals approximately 2.71, which is greater than one, suggesting that the MLC technically holds meaning depreciation could, in theory, improve the trade balance. However, the insignificant trade balance response indicates that, in practice, this improvement is not realized because Bahrain's export structure is dominated by commodities with inelastic demand, while imports are largely essential goods.

3. Georgia

Georgia's export performance is significantly influenced by currency movements and world income. Currency appreciation reduces export competitiveness, while global economic growth boosts exports. In the long run, domestic investment and world income emerge as critical drivers of export capacity. Imports show contrasting dynamics: while currency depreciation reduces imports in the short term, rising incomes drive long-term import demand, consistent with the elasticity approach to trade (Hooy & Yusoff, 2010). These findings highlight the dual impact of income growth and exchange rate fluctuations on Georgia's trade balance. The results show no clear evidence of a J-curve effect in Georgia. Regarding the Marshall-Lerner condition (MLC), in the symmetric long-run model, the sum of the absolute export (1.40) and import (2.54) elasticities equals roughly 3.94, which is greater than one. This implies that, theoretically, a depreciation should improve the trade balance. However, the empirical results especially the insignificant effect of real effective exchange rate on trade balance suggest that there are no substantial benefits from the exchange rate changes.

4. Iran

In Iran, currency appreciation reduces export competitiveness, while domestic investment positively impacts exports, emphasizing the importance of capital formation. Population growth reduces long-term import demand, suggesting growing domestic production capacity. The trade balance is shaped by the classic interplay between exports and imports, with currency movements exerting mixed effects. The results show no evidence of a J-curve effect in Iran's trade dynamics. In terms of the Marshall-Lerner condition (MLC), a depreciation of the rial may not significantly improve Iran's trade balance because the responsiveness of both exports and imports to exchange rate changes is relatively weak.

5. Israel

Israel's export performance is strongly tied to global demand, with world income positively impacting exports in both the short and long run. Domestic investment and population growth drive long-term import demand, reflecting the importance of consumption and capital accumulation. Exchange rate fluctuations negatively impact the trade balance in the short term but have less influence over time, suggesting that Israel's trade is increasingly insulated from currency movements. From the results, there is no evidence of a J-curve effect in Israel's trade behavior. In relation to the Marshall-Lerner condition (MLC), the estimated long-run coefficients technically meet the condition's threshold. However, it lacks statistical significance and wide confidence intervals. It suggests that while, in theory, depreciation could improve Israel's trade balance, in practice the response is muted and unstable due to the dominance of non-price factors such as technological intensity, global demand conditions, and fixed supply contracts. Thus, the Marshall-Lerner condition does not effectively hold in behavioral terms, even if the sum exceeds unity arithmetically.

6. Japan

Japan's exports are significantly driven by global demand and domestic investment. While currency depreciation improves export performance, foreign investment shows a negative long-term effect, possibly due to repatriation of profits or misaligned capital allocation. Import demand rises with income growth, underscoring Japan's reliance on foreign goods. The results present evidence of a J-curve effect in Japan's trade dynamics. Regarding the Marshall-Lerner condition (MLC), the long-run coefficients for exports and imports fall below unity, indicating that Japan's trade flows are relatively insensitive to exchange rate movements. Therefore, a depreciation of the yen alone is unlikely to substantially improve the trade balance.

7. South Korea

South Korea demonstrates high sensitivity to global demand, with world income serving as a critical driver of exports. Export competitiveness plays a more significant role in trade balance improvements than import reduction, highlighting the importance of export-led growth strategies for sustaining economic performance. The results present no evidence of a J-curve effect in Korea's trade dynamics. Regarding the Marshall-Lerner condition (MLC), the combined long-run elasticities in Korea's case are less than unity. This suggests that the overall effect is insufficient to generate a significant long-run improvement in the trade balance.

8. Malaysia

Malaysia benefits from currency depreciation, which enhances export competitiveness in the short term. Domestic investment and global demand are crucial for long-term export growth. These findings align with studies on emerging economies (Nguyen et al., 2018), emphasizing the role of internal capacity building in sustaining export performance. There is no evidence of a J-curve pattern. In Malaysia's case, depreciation leads to a modest improvement in the trade balance even in the short run, rather than the delayed adjustment typically seen in economies with slower contract renegotiations or export rigidities. With respect to the Marshall-Lerner condition (MLC), Malaysia's estimated long-run elasticities are greater than unity but not statistically significant.

9. Pakistan

Currency depreciation improves Pakistan's export performance supporting the traditional view of competitive advantage through exchange rate adjustments. However, the mixed effects of positive and negative changes in exchange rates suggest that Pakistan's trade dynamics are influenced by external factors such as global demand and trade policies. The symmetric trade balance model and insignificant long-run R coefficient indicate no clear evidence of a J-curve effect. Regarding the Marshall-Lerner condition (MLC), the sum of the absolute values of the long-run elasticities of exports and imports exceeds unity but they are not statistically significant.

10. Philippines

Currency depreciation improves exports and trade balance in the long run, confirming the J-Curve hypothesis. Exports are positively influenced by global demand, highlighting the importance of external factors in shaping trade outcomes for small open economies (Onafowora, 2003). There is absence of a J-curve effect. The Marshall-Lerner condition (MLC) appears to hold for the Philippines since the combined long-run elasticities of exports and imports exceed unity.

11. Saudi Arabia

Currency appreciation negatively impacts exports, reducing competitiveness. Domestic investment is vital for export performance, emphasizing the need for strategies to enhance internal capacity to leverage external market conditions. There is no clear J-curve pattern. The Marshall-Lerner condition is satisfied since the absolute sum of the long-run elasticities of exports and imports exceeds unity.

12. Singapore

Singapore's export performance is highly responsive to global economic conditions and domestic investment flows. The trade balance depends significantly on exports and imports, but exchange rate fluctuations have limited influence, consistent with findings by Wilson (2001). There is no strong evidence of a J-curve effect. Instead, trade balance in Singapore seems to adjust directly in a stable manner following exchange rate changes. Regarding the Marshall-Lerner condition, the absolute sum of export and import elasticities exceed unity but they are not statistically significant.

13. Sri Lanka

Domestic investment drives export performance in Sri Lanka, while foreign investment negatively impacts exports, possibly reflecting inefficiencies in external capital utilization. Currency depreciation negatively influences the trade balance, highlighting challenges related to import dependence and the composition of exports. The findings indicate partial evidence of the J-curve phenomenon for Sri Lanka, trade balance worsens immediately following depreciation due to delayed export response and preexisting import commitments but improves marginally in the long run as import demand adjusts. Regarding the Marshall-Lerner condition (MLC), the long-run elasticities of exports and imports exceed unity but not statistically significant.

G. Policy implications

The findings of this study both from the panel estimations (DFE and CCEMG) and country-specific ARDL results show important policy lessons for managing exchange rate dynamics and trade performance in Asian economies. The asymmetric responses of exports and imports to exchange rate movements suggest that exchange rate policies alone are insufficient to ensure external balance stability. In particular, the DFE results reveal that currency appreciation exerts stronger and more immediate effects on exports than depreciation does in stimulating them, implying that export sectors in Asia are more vulnerable to a strong domestic currency than they are responsive to depreciation. This asymmetry explains the need for foreign

exchange volatility management and hedging mechanisms to shield exporters from appreciation shocks. Central banks should therefore adopt policies that limit excessive short-term volatility through managed floating regimes, strategic intervention, and the development of forward and futures markets to enhance predictability and planning in international trade transactions.

The evidence that currency depreciation also increases imports, especially due to the high import content of export-oriented industries, calls for policies aimed at reducing import dependence through local sourcing, backward integration, and the development of domestic intermediate goods industries. Governments should prioritize industrial policies that strengthen domestic supply chains, promote import substitution in strategic sectors, and incentivize firms to source inputs locally without compromising export quality. Targeted fiscal measures such as tax credits or subsidies for firms that reduce imported input reliance can help mitigate the inflationary pressures and external imbalances often associated with currency depreciation.

The study also finds that export performance in Asia is highly influenced by global demand and domestic investment, indicating that exchange rate policy should be complemented by structural reforms that enhance productivity, competitiveness, and export diversification. Investment in technology, logistics infrastructure, and innovation capacity is crucial to boost value addition and make exports more responsive to relative price changes, thereby amplifying the benefits of exchange rate adjustments. Moreover, governments should encourage firms to diversify export destinations and product bases to reduce vulnerability to exchange rate shocks and global demand fluctuations.

The short-run insignificance of the trade balance response suggests that depreciation does not yield immediate benefits, a classic feature of the J-curve effect. Thus, exchange rate adjustments should be gradual and supported by demand management and inflation control policies to prevent short-term deterioration in external balances. Fiscal and monetary authorities should coordinate to maintain macroeconomic stability, ensuring that depreciation-driven cost increases do not erode competitiveness gains through inflationary feedbacks.

Furthermore, the finding of study that the Marshall-Lerner condition holds only in the long run implies that policy efforts should focus on sustaining competitiveness over time rather than seeking immediate balance-of-payments corrections through devaluation. Long-run improvement in trade performance depends on enhancing export elasticity and moderating import sensitivity. This can be achieved through export upgrading, human capital development, and deeper regional trade integration to improve responsiveness to global price signals.

Lastly, country-specific asymmetries such as stronger export responses to appreciation in economies like South Korea and Malaysia, or depreciation-driven import increases in Pakistan and Sri Lanka suggest that exchange rate policy must be tailored to structural characteristics. For export-driven economies integrated into global value chains, maintaining a stable and moderately competitive exchange rate is preferable to large depreciations. For import-dependent

economies, exchange rate policy should be coupled with industrial capacity building and energy diversification to reduce exposure to import shocks. Thus, the policy implications emphasize that while exchange rate management remains an important instrument for improving trade performance, its success depends critically on domestic structural transformation, supply chain localization, volatility management, and export diversification. Only through a coordinated policy framework that links exchange rate policy with industrial and trade strategy can Asian economies effectively translate exchange rate adjustments into sustainable improvements in trade balance and external stability.

VI. Conclusion and Policy Recommendations

A. Conclusion

The study concludes that changes in exchange rates have both short- and long-term effects on trade performance, with positive and negative exchange rate movements generating asymmetric influences across different economies. Domestic investment and world real GDP emerged as the primary drivers of exports, while population growth and real GDP were the key determinants of import demand. The study also confirmed that exports positively influence trade balances, whereas imports tend to have a negative impact. The Marshall-Lerner condition, which suggests that currency depreciation will improve the trade balance if the sum of export and import elasticities exceeds unity, holds in the long run for most countries in the study. The asymmetric findings of this study reveal that while currency depreciation eventually supports export growth and satisfies the Marshall-Lerner condition in the long run, its short-run impact on trade balance is muted, confirming the presence of a gradual J-curve effect among some Asian countries. The stronger adverse impact of appreciation relative to the delayed benefits of depreciation explains the need for effective exchange rate management, hedging mechanisms, and structural reforms to reduce import dependence and enhance domestic value addition, thereby ensuring that the long-run gains from depreciation translate into sustainable trade balance improvements. Mixed evidence for the J-Curve hypothesis was found in the short term, with some countries showing improvements in exports following currency depreciation, while others faced short-term challenges, potentially requiring adjustments in trade balances over time.

B. Policy recommendations

i. To enhance export competitiveness, countries must invest in productivity, innovation, and diversification. Governments, through trade and industry ministries, should lead efforts

to strengthen export-oriented infrastructure such as ports and transportation networks, leveraging public-private partnerships for funding and execution. Export promotion agencies should introduce incentives like tax breaks and grants for firms adopting advanced technologies or entering new markets. Investments in education and vocational training are vital to equip the workforce with skills tailored to high-value industries. Providing businesses with market intelligence and reducing trade barriers will further improve market access and facilitate entry into competitive global markets. By prioritizing these measures, economies can ensure long-term export growth and resilience to external shocks.

ii. Reducing import dependency requires fostering domestic production, particularly in sectors where import substitution is feasible, such as manufacturing, agriculture, and energy. Industrial policies must incentivize local production through tax breaks and subsidies, while central banks can support businesses with access to affordable credit. Governments should encourage technology transfer through targeted foreign direct investment (FDI) agreements to enhance domestic capacity. Creating localized supply chains through industrial clustering will further reduce reliance on foreign inputs.

iii. Maintaining competitive and stable exchange rates is critical for balancing export growth and import costs. Central banks should adopt a managed float system to prevent excessive volatility while using foreign exchange reserves to stabilize the currency during economic shocks. Inflation targeting must remain a priority, as high inflation erodes the benefits of depreciation by increasing domestic production costs. Additionally, policymakers should align exchange rate policies with fiscal strategies to ensure macroeconomic stability. Regional currency stabilization mechanisms, such as swap agreements, should also be pursued to mitigate volatility across interconnected economies. These strategies will support trade balance improvements and overall economic stability.

iv. Diversifying export markets reduces dependence on traditional partners and insulates economies from global downturns. Trade and foreign affairs ministries must lead efforts to negotiate bilateral and multilateral agreements, targeting emerging markets with growing demand. Strengthening intra-regional trade within Asia through existing agreements like RCEP can provide additional opportunities for growth. Governments should also establish export assistance programs to support businesses in navigating new markets and adopt cultural diplomacy initiatives to build trust and preference for domestic goods. By expanding into untapped markets, countries can achieve sustainable trade growth while reducing exposure to external risks.

v. Investment in key export sectors and import-substituting industries is crucial for building long-term trade resilience. Governments must create an investor-friendly environment by reducing bureaucratic barriers, offering tax incentives, and guaranteeing returns on investments. Focused investments in infrastructure, technology, and research and development (R&D)

will improve competitiveness and productivity.

vi. Regional collaboration can buffer against global trade fluctuations and foster a stable economic environment. Countries should harmonize trade standards, reduce non-tariff barriers, and invest in cross-border infrastructure projects to enhance connectivity and reduce costs.

C. Study limitations and future research directions

While this study assesses the relationship between exchange rate changes and trade performance, several limitations are acknowledged. First, the analysis was limited to a specific set of Asian countries due to limited data availability, especially on real effective exchange rate for some countries. For the purpose of generalization across emerging economies, future research should consider expanding the geographic scope of the study to include other regions, such as Africa and Latin America, to test the robustness of the findings across different economic environments.

D. Contribution to knowledge

By replicating the influence of exchange rate changes on trade performance in Asia using the second generation of panel data techniques (DFE and CCEMG estimators), coupled with the novel findings of the study, this study has uniquely contributed to the body of knowledge in international economics.

Disclosure of interest

The authors declare that there is no conflict of interest.

Funding Information

No funding was received for conducting this study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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