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Article

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Cogent Economics & Finance

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Suggested Citation: Nga, Nguyen Hong; An, Pham Hoang; Loan, Vo Thi Kim; Cuong, Tran Quoc Khanh (2024) : Impact of exchange rate changes on export-import dynamics in Vietnam, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 12, Iss. 1, pp. 1-19, https://doi.org/10.1080/23322039.2024.2409415

This Version is available at:
https://hdl.handle.net/10419/321614

Cogent Economics & Finance

ISSN: 2332-2039 (Online) Journal homepage: www.tandfonline.com/journals/oaef20

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To cite this article: Nguyen Hong Nga, Pham Hoang An, Vo Thi Kim Loan & Tran Quoc Khanh Cuong (2024) Impact of exchange rate changes on export-import dynamics in Vietnam, Cogent Economics & Finance, 12:1, 2409415, DOI: 10.1080/23322039.2024.2409415

To link to this article: https://doi.org/10.1080/23322039.2024.2409415

Published online: 03 Oct 2024.

COGENT ECONOMICS & FINANCE
2024, VOL. 12, NO. 1, 2409415
https://doi.org/10.1080/23322039.2024.2409415

GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

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Impact of exchange rate changes on export-import dynamics in Vietnam

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ABSTRACT

This study examines the impact of exchange rate changes on Vietnam's export-import dynamics during a transitioning exchange rate regime. Utilizing the Autoregressive Distributed Lag (ARDL) model, our findings indicate that global income and import levels are crucial in bolstering exports, assuming other variables remain constant. Additionally, we uncover that the real effective exchange rate (REER) and money supply significantly influence import patterns, with a central exchange rate mechanism enhancing export volumes by approximately 0.14% compared to a fixed peg system. The Nonlinear ARDL (NARDL) analysis further reveals the long-term asymmetric impacts of REER on trade. By applying a threshold model, we also explore the effects of global income and import volumes on export structural changes, as well as the influence of money supply and REER on import adjustments. The research concludes with policy suggestions to aid Vietnam's economic growth and trade sustainability within its exchange rate framework.

IMPACT STATEMENT

This study employs advanced econometric methods, incorporating the import variable to better explain changes in Vietnam's exports. The findings underscore the crucial role of imports and global income in shaping Vietnam's export performance, while the exchange rate has an insignificant impact. These findings provide useful advice for policymakers to improve trade balance strategies and support economic growth, especially in a fast-changing global economy.

ARTICLE HISTORY
Received 16 April 2024
Revised 18 July 2024
Accepted 20 September 2024

KEYWORDS
Exchange rate regime; export; import; threshold; NARDL

JEL CLASSIFICATIONS
C22; C24; F10; F41

SUBJECTS
Economics and Development; Economics; Finance

1. Introduction

As a small and open economy, Vietnam has heavily relied on exports and imports. The dynamics of its economic growth play a critical role in shaping the trade balance, as they are influenced by not only domestic factors but also the economic growth of its trading partners and, significantly, the exchange rate of the Vietnamese currency (VND). Empirical exchange rate and trade balance studies have yielded divergent outcomes, revealing a complex relationship. While Rose and Yellen (1989) fail to establish a significant link between the exchange rate and the trade balance, Bahmani-Oskooee and Fariditavana (2016) discover a connection between them when studying the US and its major trading partners. Omer et al. (2023) present evidence that the devaluation of the local currency promotes Pakistan's exports. However, Bostan et al. (2018) indicate a decrease in Romanian exports following the local currency devaluation. On the other hand, currency devaluation can also lead to inflation (Cooper, 2019).

This study is motivated by analyzing how changes in exchange rates impact exports and imports in Vietnam. By examining different exchange rate regimes—crawling bands, fixed peg, and central rate

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mechanisms—this paper offers a unique perspective on their effects on trade. Previous empirical studies show mixed results on the exchange rate-trade balance relationship, pushing the need for a nuanced approach to understanding this complex dynamic. Additionally, identifying factors that change the structure of imports and exports is crucial for a deeper understanding of what influences Vietnam's trade patterns. Therefore, a comprehensive study of the impact of exchange rate fluctuations on imports and exports is crucial for a country like Vietnam, which aims to improve exports while controlling inflation. The outcomes will assist policymakers in determining the most appropriate exchange rate policy.

Aligned with its pursuit of economic development, the State Bank of Vietnam (SBV) has accorded importance to maintaining monetary stability. This commitment manifested in implementing the crawling band's mechanism in 2008. Subsequently, in 2012, the SBV decided a transition to the conventional fixed peg arrangement mechanism. Nonetheless, the end of 2015 was marked by fluctuations in the exchange rate, urging Vietnam to switch to the central exchange rate mechanism in 2016. This transition was motivated by the twin objectives of curtailing speculative activities within the foreign exchange market and fostering stability in inflation. Between 2017 and 2022, the Vietnamese Dong (VND) exchange rate showed minor fluctuations. There were slight increases in 2017 (1.6%) and 2020 (0.073%) relative to the end of the previous year, while 2021 saw a surprising rise of 1.3% despite a stronger US Dollar trend. However, due to a change in the Federal Reserve's interest rate policy, the VND depreciated by about 3.5% against the US Dollar by the end of 2022. Despite these changes, the VND's value remains relatively lower than other strong global currencies. Therefore, adopting the central exchange rate mechanism has stabilized the VND exchange rate as depicted in Figure 1.

Figure 1 illustrates Vietnam's export and import values spanning from 2009:1 to 2022:12. Both exports and imports have a consistently upward trend, with exports growing faster than imports. Export values increased at an average monthly rate of 1.21%, while imports grew by 1.18% monthly. These trends led Vietnam to shift from a trade deficit in 2009 to a trade surplus by 2016. Despite a stable VND exchange rate, the steady growth of exports and imports indicates that exchange rate fluctuations might have a limited impact on the country's trade patterns. Furthermore, it is noteworthy that both import and export patterns in Vietnam exhibit a striking similarity, mirroring the prevailing economic circumstances. It is important to note the significant overlap between the imported goods used as inputs for export production (Hoang, 2016), highlighting the intertwined nature of Vietnam's import and export activities.

Moreover, there was a notable instance when both exports and imports experienced a substantial increase, deviating significantly from the previous period's metrics. Consequently, we employed the Bai-Perron method to allow the data itself to determine the specific date of structural change. The findings indicate that import structural changes took place in February 2012 and August 2016, while export

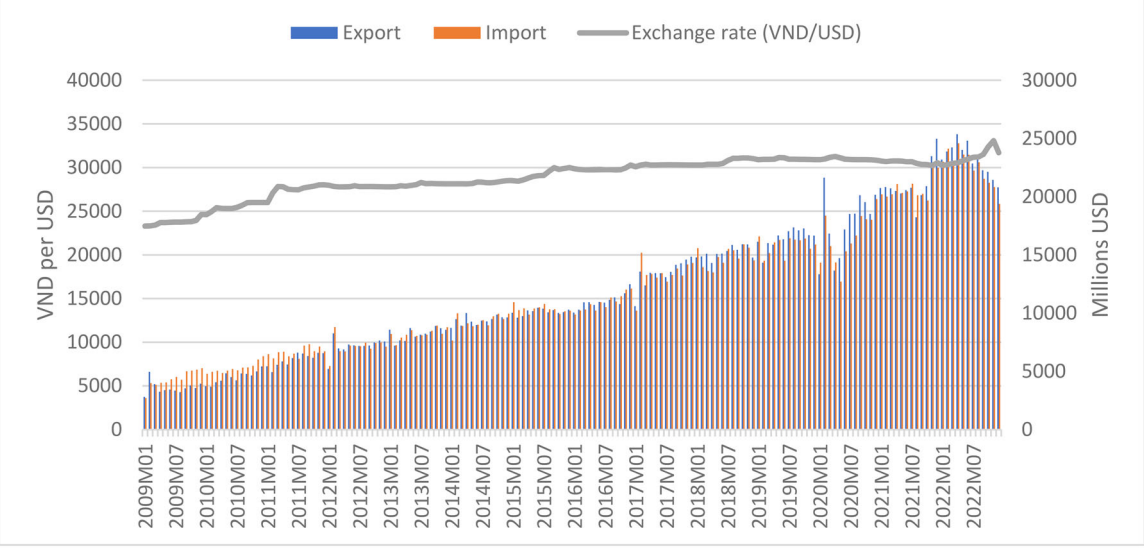

Figure 1. The VND/USD exchange rate and Vietnam's exports and imports from January 2009 to December 2022. Source: Global Economic Monitor – GEM.

structural changes occurred in February 2014 and September 2017. This approach, confirmed by the Wald test, emphasizes the evolving nature of Vietnam's trade balance[1].

This study addresses a notable research gap: the overlooked causes behind the change in Vietnam's import-export structure due to exchange rate fluctuations. Failing to address this problem can lead to ineffective policy decisions, hindering Vietnam's economic growth and trade sustainability.

To tackle this issue, the study utilizes the threshold method. Furthermore, it applies the Autoregressive Distributed Lag (ARDL) approach to investigate the impact of exchange rate fluctuations on Vietnam's trade, specifically its imports and exports. It also uses the Nonlinear ARDL (NARDL) technique to determine if changes in the REER have a symmetrical or asymmetrical effect on trade flows.

After reviewing the existing literature, we recognized the need for further research. To address this, we developed and tested the following hypotheses: For exports, we hypothesize that the REER is insignificant for export volumes (H1a), the Industrial Production Index of the World (IIPW) positively influences export volumes (H1b), and import volumes (M) are crucial in boosting exports (H1c) due to Vietnam's reliance on imported inputs for production. On the import side, we hypothesize that the REER negatively affects import volumes (H2a), an increase in the money supply (M2) leads to higher import volumes (H2b), and the Industrial Production of Vietnam (IIPVN) positively influences import volumes (H2c).

The empirical outcomes of this study yield noteworthy insights: primarily, the global GDP emerges as the determinant exerting a substantial influence on the exports from Vietnam. At the same time, Vietnam's money supply is a prominent factor shaping the import dynamics. Moreover, the exchange rate is solely significant in the import model and insignificant in the export model. Notably, the study reveals that transitioning to a central exchange rate mechanism results in a considerable enhancement of export volumes, exceeding the impact of the conventional fixed peg arrangement mechanism by more than 0.14%. The findings of this research make a significant contribution to the understanding of the literature.

The organization of the study is as follows: Section 2 provides an overview of the theoretical framework and empirical studies, Section 3 outlines the methodologies and the dataset, Section 4 presents the obtained results, and Section 5 offers concluding remarks along with policy implications.

2. Theoretical framework and empirical studies

2.1. Theories on the exchange rate and trade volumes

Exports and imports are crucial elements of a nation's trade balance, making the study of trade balance changes essential for understanding these components. The concept of the Price–specie flow mechanism, introduced by the Scottish economist David Hume, serves as a foundational theoretical model for analyzing trade balance dynamics. Historically, research has developed along three primary methodologies to evaluate the influence of different factors on the trade balance: the Elasticity Approach, the Absorption Approach, and the Monetary Approach. These approaches offer diverse perspectives on how trade balances respond to various economic conditions and policies.

The Elasticity approach, alternatively known as the Bickerdike-Robinson-Metzler model (BRM), centers around the notion that alterations in relative price levels induce substitution effects in both production and consumption due to changes in exchange rates. Consequently, the BRM model postulates that shifts in the exchange rate yield varying effects on the trade balance contingent upon the elasticity of goods' supply and demand as well as the value of imported and exported goods. Within this framework, the elasticity approach underscores the potential enhancement of a nation's trade balance by devaluing its domestic currency. In such a scenario, the influence of the exchange rate increases the price of imported commodities, subsequently reducing the volume of imports. Conversely, the lowered price of exported goods stimulates heightened domestic production and export activities, consequently improving the trade balance. Nonetheless, it is essential to acknowledge that there exist instances where currency depreciation may adversely impact the trade balance.

The Marshall–Lerner (ML) condition, a subset of the BRM framework, is prominent in assessing trade elasticity. This condition critically addresses the circumstances under which a real domestic currency depreciation improves the trade balance. Conclusively, the ML condition posits that a real depreciation

of the local currency will enhance the trade balance if the cumulative value of the absolute elasticities of both exports and imports surpass unity. Notably, the Marshall-Lerner theorem has undergone extensive investigation, supported by numerous scholarly publications. Nonetheless, the study of Magee (1973) observed a deterioration in the United States trade balance after the devaluation of the USD in 1971 and an improvement in the long run, known as the J curve. Therefore, the Marshall–Lerner condition encounters a limitation in its failure to elucidate the phenomenon wherein the trade balance experiences a short-term deficit following the devaluation of the domestic currency.

Akbostanci (2004) clarifies the rationale behind the short-term deterioration of the trade balance. His explanation indicates the prevalent contractual agreements between exporters and importers that precede currency depreciation. Consequently, in the aftermath of devaluation, there is minimal alteration in the volume of exports and imports. However, the currency's depreciation makes imported goods more expensive in terms of domestic currency. Furthermore, due to the challenge of changing consumption behavior in the short run, the price elasticity of consumer demand remains low or perpetuates a steady demand for goods. In essence, the price effect takes precedence over the quantity effect in the short term, leading to an increase in import volume while export volume remains relatively constant. Consequently, the trade balance witnesses a deficit in the short run. In the long run, consumers adapt their purchasing behavior, and importers renegotiate prices, thereby facilitating a shift wherein the quantity effect is more significant than the price effect, culminating in an improved trade balance.

The absorption approach, an outgrowth of the Keynesian[2] model introduced by Alexander (1952), emphasizes the pivotal role of the national output in the context of the trade balance. This perspective posits that the trade balance is the disparity between goods production and goods consumption by domestic residents. If the real Gross Domestic Product (GDP) surpasses the domestic consumption or absorption (A), the surplus in remaining products will be exported, thereby yielding a trade surplus. Conversely, when absorption exceeds the real GDP, the outcome will be a trade deficit (Malimi, 2013). Furthermore, the absorption approach establishes a noteworthy connection with domestic currency devaluation. For instance, if the real GDP is less than the potential GDP, a domestic currency depreciation can augment exports (provided that the elasticity conditions are fulfilled) because the untapped resources can be used to boost the GDP to a level equivalent to the potential GDP. However, when real GDP equals potential GDP, a devaluation of the domestic currency to enhance the trade balance may not yield the intended outcomes. In such a scenario, the consequence of such trade balance improvement efforts could be inflation (Ali et al., 2014).

In the late 1950s, a novel monetary policy approach emerged, underscoring the vital role of the discrepancy between money demand and money supply in shaping exchange rates and trade balances (Duasa, 2007). The impact of money supply on exchange rates depends on the exchange rate mechanism that the country applies.

Under a fixed exchange rate mechanism, changes in the domestic money supply do not affect the exchange rate. When the demand for money outpaces the quantity the central bank supplies. The shortage of money is compensated by foreign currency inflows, facilitated by the export of commodities, thereby improving the trade balance. Conversely, if the central bank's money supply surpasses the existing money demand, the surplus money will find its way out of the country, causing a decline in the trade balance.

In a floating exchange rate mechanism, increasing the money supply by the central bank leads to a depreciation of the domestic currency. This depreciation boosts exports, reduces imports, and enhances the trade balance.

For a managed floating exchange rate mechanism, exchange rate changes are influenced by both market forces (as in a floating exchange rate mechanism) and central bank interventions (as in a fixed exchange rate mechanism). This flexible combination allows for a range of options in exchange rate management based on the country's economic objectives and policies.

2.2. Empirical studies on the exchange rate and trade volume

The impact of the exchange rate on the trade balance is an exciting subject within the realm of international trade. Research endeavors span from developing to developed nations. Findings exhibit

diversity owing to factors like the country under study, the analysis period, research methodologies employed, etc. Empirical studies have led to the emergence of four primary categories.

Firstly, investigations employing panel data, such as Wang et al. (2012) observe that while the real appreciation of RMB decreases China's trade balance in only three of the eighteen trading partners, it increases the trade balance in five of those partners. Hunegnaw and Kim (2017) reveal a positive correlation between the exchange rate and the trade balance in West African nations. Aslan et al. (2021) employ a panel Structural Vector Autoregression (SVAR) model to investigate the influence of real exchange rate fluctuations on the exports of 21 emerging markets. Their findings suggest that there is no definitive evidence to support that shocks to the real exchange rate have a significant impact on the volume of exports. Similarly, the empirical research by Felipe et al. (2024) finds no relationship between the real exchange rate and the trade balance in European countries from 1995 to 2019.

However, Poon and Hooy (2013) present a contrasting perspective. They reveal a negative impact of exchange rate volatility on trade, particularly with a time lag. Notably, an observation highlighted in the work of Poon and Hooy (2013) pertains to the positive impact of exchange rate volatility on the trade balance of Organization of Islamic Cooperation (OIC) countries governed by floating exchange rate regimes. On the other hand, Wu et al. (2013) indicate that China's trade balance experiences an increasing surplus condition due to the stable exchange rate mechanism of the Yuan. Hence, it is evident that the trade balance is not solely on the exchange rate but is also on different nations' distinct exchange rate mechanisms.

Secondly, studies employ time series data to explore the interplay between exchange rates and trade balance across nations with substantial trading relationships. The studies by Rose and Yellen (1989), alongside Ho et al. (2023), suggest that a depreciation of the local currency fails to bolster the trade balance. However, the research of Dong (2017) utilizes the Vector Error Correction Model (VECM) to discern the Marshall-Lerner condition between the United States and the G7 countries. With the threshold model, Hsu and Chiang (2011) discover how exchange rate volatility affects United States exports. The empirical results indicate that volatility diminishes export activity to comparatively affluent partner nations, while conversely, it bolsters exportation to relatively less wealthy partner countries. Further exploration by Doudou et al. (2022) unveils a threshold associated with the Dinar exchange rate that significantly influenced Tunisia's trade balance with 17 principal trading partners from 1986 to 2016. In essence, the studies above underline the role of research methodologies in shaping conclusions regarding the impact of exchange rates on trade balance.

Pesaran et al. (2001) introduce the advanced methodology Autoregressive Distributed Lag (ARDL), numerous investigations have employed this technique to establish the connection between exchange rates and trade balance. Arora et al. (2003) examine the bilateral trade dynamics between India and its trading partners from 1977 to 1998. Within India's seven significant trading partners, four nations (Australia, Germany, Italy, and Japan) exhibit a long-term influence when the Rupee is undervalued. Conversely, in the context of the United States, a depreciation of the Rupee deteriorates the trade balance deficit. A 1% devaluation of the Rupee culminates in a trade balance deficit of 2.98%. Other studies also demonstrate the existence of Marshall-Lerner conditions such as Narayan (2006), and Thanh et al. (2020).

Shin et al. (2014) introduce the non-linear autoregressive distribution lag (NARDL) approach, which extends the ARDL method. Afterward, Bahmani-Oskooee and Fariditavana (2016) investigate the J-cure between the United States and its six main trading partners. The results support that the ARDL reveals evidence of J-curve in 3 partner nations, while the NARDL approach uncovers J-curve effects in 5 countries. Further empirical research, such as those conducted by Bahmani-Oskooee et al. (2016), and Nusair (2017), prove the superiority of the NARDL method, exhibiting a broader scope of trading partners influenced by exchange rate fluctuations in comparison to the ARDL method. Consequently, the assumption of a linear relationship between exchange rates and trade balances causes the concept of the J curve to be inconclusive within the realm of research.

Thirdly, several researchers delve into a nation's exchange rate's influence on its global counterparts. Matesanz and Fugarolas (2009) comprehensively examine the correlation between the trade balance and exchange rate in the context of Argentina, spanning from 1962 to 2005. They adopt a cointegration approach in conjunction with a VECM to explore this dynamic. Their findings support a robust

connection between the depreciation of the domestic currency and the enhancement of Argentina's trade balance, manifesting the presence of the Marshall-Lerner condition in the Argentine context. Further research also affirmative this positive impact of local currency devaluation on the trade balance. For instance, Hsing (2015) observes the J-curve phenomenon in Japan, Doojav (2018) uncovers a similar trend in Mongolia, and Gürtler (2019) observes analogous patterns in the Czech Republic. On the contrary, Shahbaz et al. (2012) present empirical evidence establishing a negative correlation between the exchange rate and Pakistan's trade balance over the long term. Specifically, their findings suggest that a 1% devaluation of the local currency leads to a reduction of 0.7677% in Pakistan's trade balance.

Lastly, a notable trend is examining the distinct effects of exchange rates on exports and imports. Thorbecke and Kato (2012) illustrate that a 1% Yen depreciation heightens Japan's exports to 17 key trading partners by 0.9%. Similarly, Omer et al. (2023) depict that local currency devaluation has the potential to stimulate Pakistan's exports. However, a contrasting perspective is put forth by Upadhyaya et al. (2020), who demonstrate that exchange rate volatility negatively correlates with the exports of ASEAN 5 countries. Furthermore, Iossifov and Fei (2019) support that the lira devaluation fails to have any impact on Turkish exports. Additionally, Köse and Aslan (2020) establish that Turkish exports hinge more significantly on the partner country's income than the exchange rate. This finding aligns with Sohrabji's (2024) study on India, which shows that exports depend more on foreign income than on changes in exchange rates.

This assertion aligns with research by Asteriou et al. (2016), Sweidan (2013), and Iossifov and Fei (2019). Furthermore, investigations by Khachatryan and Grigoryan (2020), and Sweidan (2013) emphasize that the influence of exchange rate on exports in developing countries is limited, owing to the so-called "Dutch disease." This phenomenon emerges when developing countries experience inflows of remittances, strengthening their domestic currency and raising the cost of living and the expenses associated with exporting goods.

In parallel to its impact on exports, Sweidan (2013) provides empirical evidence that the exchange rate holds statistical significance in the short term, yet loses its statistical significance in the long term concerning imports to Jordan. This result is similar to the findings of Andohol et al. (2024) for three East Asian countries. Sohrabji (2024), Omer et al. (2023), and Bostan et al. (2018) support the decrease in import volume following a devaluation of the domestic currency. Contrarily, Iossifov and Fei (2019) posit a divergent narrative, asserting that Lira devaluation increases imports for Turkey. Noteworthy in this context is the role played by the Turkish GDP in shaping import patterns. Specifically, a 1% elevation in GDP precipitates a corresponding 1.15% expansion in imports, thereby emphasizing the complicated interdependence between economic growth and import activities.

In the Vietnamese context, Trinh (2014) employs the ARDL methodology to investigate the influence of exchange rates on the trade balance between Vietnam and its 17 significant trading partners. The empirical findings suggest that when the local currency's value (VND) decreases, the trade balance becomes more damaging in the first four quarters. However, by the fifth quarter, there is an improvement in the trade balance, suggesting the presence of a J-curve phenomenon. The research by Truong and Vo (2023) using the NARDL method also confirms the existence of the J-curve phenomenon in Vietnam. Coinciding with this trend, a series of studies also emphasize the favorable correlation between exchange rates and the trade balance in Vietnam. Noteworthy among these contributions are the works of Phong and Van (2017), Ho et al. (2021), and Dong et al. (2022). Phong and Van (2017) notably include the money supply variable (M2) in the analysis. The results suggest that M2 positively influences the trade balance in the short term but negatively impacts the long term. In contrast, Phan and Jeong (2015) reveal that a 1% decrease in the value of the VND leads to a trade balance deficit of around 3.11%. Furthermore, their analysis highlights the intricate interplay of domestic and foreign GDP variations in shaping trade balance volume. Nga et al. (2024) find that exchange rate volatility positively impacts exports but does not affect imports.

Exports in a country are influenced by the income levels and exchange rates of its trade partners, whereas imports depend on the country's income and exchange rates. In the context of a developing economy like Vietnam, where exports largely consist of processed and assembled goods, there is a heavy reliance on the import of foreign goods. Previous studies have primarily focused on individual methodologies to analyze trade balance impacts, such as the elasticity approach (Shahbaz et al., 2012), a

combination of elasticity and monetary approaches (Phong & Van, 2017), or elasticity alongside absorption approaches (Bahmani-Oskooee et al., 2016). This research adopts a comprehensive approach by integrating all three methodologies to assess the fluctuations in Vietnam's imports and exports, underscoring the vital role of imports in enhancing exports in a developing country that is a recipient of foreign direct investment. Ultimately, this research contributes to the existing literature by shedding light on the underlying factors behind the structure shifts in the export-import patterns.

3. The methodologies and the dataset

3.1. The methodology

The models for analyzing imports and exports between Vietnam and the international market follow the framework z. This approach recognizes that Vietnamese exports are driven by the Real Effective Exchange Rate (REER), the world's real income, and the import of Vietnam. Consequently, the structure of the export model is designed to reflect these relationships.

$$X = \alpha_0 + \alpha_1 REER + \alpha_2 Y^* + \alpha_3 M + \varepsilon_t \quad (1)$$

Where X is the volume of exports; REER is the real effective exchange rate; Y^* is the real income of the rest of the world, and M stands for import volume.

Both sides of the Equation (1) are log form.

Import is included as an explanatory variable in Equation (1) because this is consistent with the economic structure of Vietnam. The country's export sector relies heavily on imported raw materials and intermediate goods, making imports a crucial component in understanding export dynamics. Including imports allows us to capture the interdependency between these variables, providing a more accurate representation of the economic reality.

Besides, this study also emphasizes changes in Vietnam's exchange rate mechanism. Consequently, we introduce two dummy variables denoted as D1 and D2. D1 takes the value of 1 from January 2009 to December 2011 (representing the crawling band's mechanism), while D2 takes the value of 1 from January 2012 to December 2015 (indicating the conventional fixed peg arrangement mechanism). The base category has a value of 0, representing the central rate mechanism. Adding two dummy variables into the Equation (1) resulting in the following equation:

$$X = \alpha_0 + \alpha_1 REER + \alpha_2 Y^* + \alpha_3 M + \alpha_4 D_1 + \alpha_5 D_2 + \varepsilon_t \quad (2)$$

The coefficients specified in Equation (2) are utilized to assess the long-term scenario. Consequently, the ARDL approach, introduced by Pesaran et al. (2001), examines short- and long-term changes.

$$\begin{aligned} \Delta X_t = \alpha + \sum_{j=0}^{n} \beta_j \Delta X_{t-j} + \sum_{j=0}^{n} \pi_j \Delta REER_{t-j} + \sum_{j=0}^{n} \delta_j \Delta Y^*_{t-1} + \sum_{j=0}^{n} \varphi_j \Delta M_{t-1} + \sum_{j=0}^{n} \mu_j \Delta D1_{t-j} \\ + \sum_{j=0}^{n} \eta_j \Delta D2_{t-j} + \theta_1 X_{t-1} + \theta_2 REER_{t-1} + \theta_3 Y^*_{t-1} + \theta_4 M_{t-1} + \theta_5 D_1 + \theta_6 D_2 + \varepsilon_t \end{aligned} \quad (3)$$

Furthermore, the objective of this paper examine whether the impact of the REER on the trade balance follows a symmetrical pattern or not. To achieve this objective, two supplementary variables are introduced: "POS," which signifies the depreciation of the REER, and "NEG," denoting the appreciation of the REER. These variables are defined as follows:

$$\begin{aligned} POS_t = \sum_{j=1}^{t} \Delta REER_j^+ = \sum_{j=1}^{t} \max(\Delta REER_j, 0) \\ NEG_t = \sum_{j=1}^{t} \Delta REER_j^- = \sum_{j=1}^{t} \min(\Delta REER_j, 0) \end{aligned} \quad (4)$$

Subsequently, building upon the methodology established by Shin et al. (2014), the formulations for "POS" and "NEG" were inserted in place of the "REER" term within Equation (3), resulting in the following equation:

$$\Delta X_t = \alpha + \sum_{j=0}^{n}\beta_j \Delta X_{t-j} + \sum_{j=0}^{n}\pi_j^{+}\Delta POS_{t-j} + \sum_{j=0}^{n}\pi_j^{-}\Delta NEG_{t-j} + \sum_{j=0}^{n}\delta_j \Delta Y_{t-1}^{*} + \sum_{j=0}^{n}\varphi_j \Delta M_{t-j} + \sum_{j=0}^{n}\mu_j \Delta D1_{t-j} + \sum_{j=0}^{n}\eta_j \Delta D2_{t-j} + \theta_1 X_{t-1} + \theta_2^{+} POS_{t-1} + \theta_3^{-} NEG_{t-1} + \theta_4 Y_{t-1}^{*} + \theta_5 M_{t-1} + \theta_6 D_1 + \theta_7 D_2 + \varepsilon_t \quad (5)$$

The NARDL approach facilitates assessing whether variations in the REER exert symmetric or asymmetric effects on exports. Symmetry is indicated when the impacts of "POS" and "NEG" are equivalent, while asymmetry arises when they differ. The final step is to determine the asymmetry for both the short and long run using the standard Wald test. The null hypothesis of the short run is $\sum_{j=0}^{n}\pi_j^{+} = \sum_{j=0}^{n}\pi_j^{-}$ while the long run is $-\frac{\theta_2^{+}}{\theta_1} = -\frac{\theta_3^{-}}{\theta_1}$.

Besides, Arize et al. (2017) highlight a notable advantage of the NARDL method compared to other ones: its capability to provide distinct estimation coefficients for both short-run and long-run effects. Moreover, the ARDL model can incorporate variable cointegration either at a level, I(0), or at the first difference, I(1). This implies the flexibility and applicability of the NARDL method in capturing diverse dynamics.

Likewise, both the ARDL and NARDL methodologies were employed to investigate the influences of the REER for imports, yielding the following equations:

$$\Delta M_t = \alpha + \sum_{j=0}^{n}\beta_j \Delta M_{t-j} + \sum_{j=0}^{n}\pi_j \Delta REER_{t-j} + \sum_{j=0}^{n}\delta_j \Delta Y_{t-1} + \sum_{j=0}^{n}\gamma_j \Delta M2_{t-1}^{*} + \sum_{j=0}^{n}\mu_j \Delta D1_{t-j} + \sum_{j=0}^{n}\eta_j \Delta D2_{t-j} + \theta_1 M_{t-1} + \theta_2 REER_{t-1} + \theta_3 Y_{t-1} + \theta_4 M_2 + \theta_5 D_1 + \theta_6 D_2 + \varepsilon_t \quad (6)$$

$$\Delta M_t = \alpha + \sum_{j=0}^{n}\beta_j \Delta M_{t-j} + \sum_{j=0}^{n}\pi_j^{+}\Delta POS_{t-j} + \sum_{j=0}^{n}\pi_j^{-}\Delta NEG_{t-j} + \sum_{j=0}^{n}\delta_j \Delta Y_{t-1} + \sum_{j=0}^{n}\gamma_j \Delta M2_{t-1}^{*} + \sum_{j=0}^{n}\mu_j \Delta D1_{t-j} + \sum_{j=0}^{n}\eta_j \Delta D2_{t-j} + \theta_1 M_{t-1} + \theta_2^{+} POS_{t-1} + \theta_3^{-} NEG_{t-1} + \theta_4 Y_{t-1} + \theta_5 M_2 + \theta_6 D_1 + \theta_7 D_2 + \varepsilon_t \quad (7)$$

where M is the value of imports, Y is the income of Vietnam, and M2 stands for the money supply of Vietnam.

Finally, the threshold model is applied to identify the factors contributing to two distinct structural shifts observed in the exports and imports curve. The threshold model, which consists of n thresholds and $n+1$ regions, is represented by the subsequent equation:

$$y_t = x_t\beta + z_t\delta_1 I_1(\gamma_1\omega_t) + \ldots + z_t\delta_{n+1} I_{n+1}(\gamma_{n+1}\omega_t) + \varepsilon_t \quad (8)$$

$$y_t = x_t\beta + \sum\nolimits_{j=1}^{n+1} z_t\delta_j I_j(\gamma_j\omega_t) + \varepsilon_t \quad (9)$$

where y_t is the dependent variable; x_t represents independent variables; β is a regional-invariant parameter; and wt is a threshold variable.

$\gamma_1 < \gamma_2 < \ldots < \gamma_n$ are order thresholds. $I_1(\gamma_1\omega_t) = I(\gamma_{j-1} < \omega_t \leq \gamma_j)$ is an indicator for the j^{th} region.

The process of estimating thresholds involved two sequential steps. Initially, the presence of threshold variables within the regression model is established. After that, a threshold estimation is executed to validate the identified threshold variable.

This study employs three distinct analytical methods to address its research objectives. Firstly, the ARDL approach is used to investigate the effect of various independent variables, particularly the exchange rate, on Vietnam's export and import activities. Secondly, the NARDL method is utilized to explore whether changes in the exchange rate have differential impacts on imports and exports, essentially examining the presence of asymmetry in exchange rate effects. Lastly, the threshold analysis method is applied to identify the factors that lead to shifts in the import-export structure of Vietnam. Together, these methods provide a comprehensive analysis of how exchange rates influence Vietnam's trade dynamics, offering insights into the nuanced relationship between exchange rates and trade flows.

3.2. The data

The study utilizes a monthly dataset from the World Bank's Global Economic Monitor (GEM), except for money supply data, which is sourced from the State Bank of Vietnam (SBV). Due to data constraints, the Industrial Production Index (IIP) of Vietnam and the World are adopted as proxy variables for the Vietnamese GDP and the global GDP, respectively. This approach of using the industrial production index as a proxy for income follows the methodology applied in previous research by Köse and Aslan (2020) and Nusair (2017), ensuring consistency and reliability in the analysis despite the constraints on direct data.

The Real Effective Exchange Rate (REER) is calculated as follows:

$$REER_t = 100x\Pi_{i=1}^{N}\left(\frac{e_{it}}{P_{it}/P_t}\right)W^i \tag{10}$$

In which:

e_{it}: the directly quoted value of the local currency against foreign currencies

P_{it}/P_t: the ratio of price indices between the home country and its trading partners

W^i: weight of national currency i

This formula reveals that an increase in the REER signifies the local currency's real depreciation relative to its trading partners' currencies, thereby boosting the competitiveness of Vietnamese exports. On the other hand, a decrease in the REER indicates an appreciation of the Vietnamese Dong (VND), suggesting it has strengthened against the currencies of its trading partners.

All data, apart from the REER and the money supply, have undergone seasonal adjustments and span from January 2009 to December 2022, as detailed in Table 1.

4. The impact of exchange rate on export and import dynamics in Vietnam

4.1. Unit root test

Nonstationary characteristics arise when the mean, variance, or covariance fluctuates over time. Employing such nonstationary series for regression can result in spurious outcomes. Therefore, an essential requirement involves performing stationarity tests. In this context, the Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests were adopted on both levels and the first difference, with outcomes presented in Table 2.

Table 2 describes the ADF and PP tests affirm that variables M2 and IIPVN exhibit stationarity at their levels. On the other hand, variables X, M, and REER demonstrate stationarity after the first difference is applied, and these results hold a high degree of statistical significance at the 1% level.

The application of the Bai-Perron and Wald tests has substantiated the presence of structural breaks in our dataset, necessitating the use of the unit root testing methodology that incorporates these breaks for verifying the stationarity of our time series data (Nga et al., 2022; Nasir, 2021). The outcomes of this testing are reported in Table 3, which presents the Augmented Dickey-Fuller (ADF) breakpoint unit root test results.

Table 3 presents the outcomes of the ADF breakpoint unit root of both Innovational Outlier and Additive Outlier models, and assesses the stationarity of these variables at the levels and the first

Table 1. Variables' definition and sources[3].

Variables	Definition	Source
X	Exports: the value of Vietnam's exports to the rest of the world	GEM
M	Imports: the value of Vietnam's imports from the rest of the world	GEM
REER	Real effective exchange rate	GEM
IIPVN	Vietnam's Industrial Production Price Index	GEM
IIPW	World Industrial Production Price Index	GEM
M2	Vietnam's money supply	SBV

Note. The money supply variable "M2" exhibited gaps in its dataset, specifically in 2011:6, 2011:11, and 2012:3. Consequently, the Time Series Regression with ARIMA Noise (TRAMO) method, acknowledged for its effectiveness in scenarios involving missing time series data (Lan et al., 2019; Nga et al. 2022), was employed to impute these three values. The TRAMO method, as well as the ARDL and Non-ARDL, were conducted using Eviews 12. Meanwhile, Stata 15 was employed for the threshold model analysis.

Table 2. Unit root test for time series variables.

	ADF		PP	
Variable	Level	1st difference	Level	1st difference
X	−1.71	−16.29***	−2.33	−27.70***
M	−2.05	−14.88***	−2.86	−30.03***
REER	−0.41	10.48***	−0.85	−10.05***
M2	−3.41**	−10.44***	−3.75***	−10.40***
IIPVN	−3.70***	−16.70***	−3.52***	−17.15***
IIPW	−1.91	−6.34***	−1.91	12.09***

Note. ***, and ** indicate statistical significance at 1%, and 5% respectively.

Table 3. ADF breakpoint unit root test.

	Innovational outlier		Additive outlier	
Variable	Level	First difference	Level	First difference
X	−2.31	−22.86***	−2.23	−23.39***
M	−2.96	−23.86***	−2.83	−24.12***
REER	−3.52	−11.47***	−3.59	−11.56***
M2	−4.72**	−12.34***	−2.61	−12.44***
IIPVN	−4.79**	−19.72***	−4.56**	−19.75***
IIPW	−5.71***	−15.33***	−2.90	−12.32***

***, and ** indicate statistical significance at 1%, and 5% respectively.

Table 4. Optimal lag for the export and import models.

Model	Optimal lag	LR	FPE	AIC	SC	HQ
Export	2	3	2	2	1	2
Import	2	3	2	2	1	1

Note. LR: Sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion; SC: Schwarz information criterion, and (HQ): Hannan-Quinn information criterion.

difference. The findings reveal that X, M, and REER stationarity at the first difference, achieving statistical significance at the 1% level under both scenarios. This indicates that these variables, after adjusting for structural breaks, do not possess unit roots when differences are taken, suggesting their stationarity at this level of analysis. Additionally, M2 and IIPW exhibit stationarity at their levels under the Innovational Outlier scenario but require differencing to achieve stationarity under the Additive Outlier model. In contrast, IIPVN demonstrates stationarity at its level in both scenarios, indicating that this variable is stable over time, highlighting its stability over time despite structural adjustments.

Overall, the ADF breakpoint unit root tests demonstrate that all variables examined become stationary, whether at their original levels or after first differencing, once structural breaks are factored in. This stationarity is crucial for ensuring the reliability of further econometric analysis, as it confirms that the study's variables exhibit stable, non-random patterns.

4.2. Optimal lag length criteria

As none of the variables exhibit stationarity at the second difference, the next step involves selecting the most suitable lag length to mitigate residual correlation. To achieve this goal, five distinct criteria were employed to assess the optimal lag. Strikingly, all criteria yielded consistent outcomes. Consequently, the lag length for the model was determined based on the criterion endorsed by the majority of the selection criteria. In cases where a dominant criterion is absent, the Akaike information criterion (AIC) is prioritized, following prior research such as Nga et al. (2022), and Khachatryan & Grigoryan (2020).

Table 4 outlines the optimal lag for five criteria. The selection of the second lag is appropriate for the export model, as it aligns with the preferences of the FPE, AIC, and HQ criteria. In the case of the import model, the AIC and FPE criteria selected the second lag, whereas the SC and HQ criteria favored the first lag. Consequently, the second lag, as indicated by the AIC criterion, is the optimal lag for the import model, following the preceding considerations.

Table 5. Results from the estimation using the ARDL method.

Part 1: Short-run estimation results

Export: ARDL(1, 0, 2, 1, 2, 0)				Import: ARDL(2, 0, 1, 1, 2, 1)			
Lag	0	1	2	Lag	0	1	2
c	−10.96***			c	−0.31		
ΔX		0.52***		ΔM		0.31***	0.20**
$\Delta REER$	−0.10			$\Delta REER$	−0.45**		
$\Delta IIPW$	1.65***	−2.31***	1.09***	$\Delta IIPVN$	0.28***	−0.26**	
$\Delta M2$	0.69***	−0.27***		$\Delta M2$	−0.34	0.79**	
$\Delta D1$	0.03	−0.17**	0.07	$\Delta D1$	0.27***	−0.48***	0.25***
$\Delta D2$	−0.00			$\Delta D2$	0.12**		

Part 2: Long-run estimation results

Export model		Import model	
c	−23.02	c	−0.65
REER	−0.22	REER	−0.92**
IIPW	0.90**	IIPVN	0.03
M	0.88***	M2	0.89***
D1	−0.14**	D1	0.09
D2	−0.00	D2	0.06

Part 3: Diagnostic statistics

	F-bound test	ECM_{t-1}	Serial correlation	Heteroscedas-ticity	CUSUM	CUSUMQ
Export model	11.70***	−0.48***	2.23	16.90	Stable	Unstable
Import model	7.86***	−0.49***	0.76	18.07	Stable	Stable

Note. ***, and ** indicate statistical significance at 1%, and 5% respectively.

4.3. Linear Autoregressive Distributed lag model

The ARDL is conducted to quantify both the short-term and long-term effects of independent variables on exports and imports. The outcomes are presented in Table 5.

Table 5 illustrates the outcomes derived from ARDL models, including three parts. In part 1, the export model highlights the statistical significance of variables such as IIPW, M, and D1 (conventional fixed peg arrangement) as influential factors. Specifically, when considering a lag of 2 periods, the coefficient for IIPW stands at 1.09. This implies that a 1% rise in the world's GDP corresponds to an increase of 1.09% in exports, holding other variables constant (c.p). Additionally, the coefficient of variable D1 is −0.17 at a lag of 2. This suggests that the shift from the conventional fixed peg arrangement mechanism to the central rate mechanism led to a 0.17% rise in exports (c.p).

In the long term, variables IIPW, M, and D1 continue statistical significance within the export model. Specifically, other things equal, an augmentation of the world GDP by 1% corresponds to a rise of 0.9% in exports in Vietnam, implying that hypothesis H1b is accepted. An increase in IIPW indicates higher global demand for raw materials, intermediate goods, and finished products, boosting Vietnam's export volumes due to its integration into global supply chains. This finding aligns with the theory and studies conducted by Thorbecke and Kato (2012) for Japan, Köse and Aslan (2020) for Turkey, and Khachatryan and Grigoryan (2020) for Armenia. Furthermore, the analysis reveals that the coefficient for imports (M) stands at 0.88, indicating that a 1% increase in imports leads to a 0.88% rise in exports, holding other factors constant, supporting hypothesis H1c. Many countries, including Vietnam, rely on imported raw materials, intermediate goods, and capital equipment for domestic production, which are used to produce export goods. This integration enhances the quality and competitiveness of export goods. This finding is consistent with Omer et al. (2023) research on Pakistan, echoes insights from Vietnamese economic analysts such as Hoang (2016), and matches current trends. Furthermore, data from the General Statistics Office of Vietnam show that in 2023, only 6.2% of imports were consumed domestically within Vietnam, emphasizing the country's reliance on imported goods for export production. Lastly, the coefficient of D1 bears a negative value of −0.14. This implies that the central rate mechanism contributes to a higher export volume by more than 0.14% compared to the conventional fixed peg arrangement mechanism. In contrast, the insignificance of REER, indicating the acceptance of hypothesis H1a, aligns

with studies involving developing nations. According to elasticity theory, devaluation of the domestic currency increases exports when foreign demand for goods is elastic. However, most of Vietnam's export products are reexports or labor-intensive goods, with prices already relatively cheap compared to competitors. Thus, further price reductions do not significantly affect demand. This pattern is observable in the works of Iossifov and Fei (2019), Köse and Aslan (2020), and Khachatryan and Grigoryan (2020). In these contexts, the prevalent identification of the "Dutch disease" phenomenon has been underscored as a causal factor. Notably, this phenomenon, attributed to resource-rich nations receiving substantial remittances, affects Vietnam similarly. In addition, most of Vietnam's exported goods are labor-intensive, making their prices relatively cheap compared to competitors. Therefore, when the domestic currency depreciates and makes Vietnamese goods cheaper, it does not significantly impact the foreign demand elasticity for these goods.

The results derived from the import model exhibit significance across all variables in the short-term analysis. Specifically, the findings indicate that a 1% devaluation of the domestic currency would reduce imports by 0.45%, (c.p). Furthermore, an increase of 1% in the money supply surges imports volume by 0.79%, (c.p). Additionally, both D1 and D2 exhibit positive coefficients of 0.25 at lag 3 and 0.12 respectively. This suggests that the application of the central rate mechanism leads to a decrease in import volume, by 0.25% compared to the Crawling Bands Mechanism, and by 0.12% compared to the Fixed Peg Arrangement Mechanism.

In the long-term context, the import model identifies two statistically significant variables, namely REER and money supply, at the significance levels of 5% and 1%, respectively. This means that hypotheses H2a and H2b are accepted. Specifically, an increase of 1% in REER is associated with a reduction of 0.92% in imports. This result aligns with the elasticity theory. When REER increases, indicating a depreciation of the domestic currency, the cost of imported goods rises. Higher import prices reduce demand for these goods as consumers and businesses cut back on imports or seek cheaper domestic alternatives. This observation aligns with the conclusions of Omer et al. (2023) in their study on Pakistan. Similarly, the finding that an increase in the money supply (M2) leads to higher import volumes indicates that more money available in the economy gives consumers and businesses greater liquidity and spending power, which increases demand for imported goods. Specifically, a 1% growth in money supply corresponds to an increase in imports by 0.82%. The observed link between the money supply increase and import rise leads to a trade balance deterioration, which corroborates the outcomes research of Phong and Van (2017) on Vietnam. The coefficient of IIPVN is insignificant, implying that hypothesis H2c is rejected. This suggests that import volumes are likely driven by other factors, such as consumer preferences, global market conditions, or the necessity of specific raw materials and intermediate goods, which remain stable regardless of Vietnamese income. This finding is consistent with the export model results, which indicate that Vietnam's exports largely depend on its imports. This result aligns with the research by Asteriou et al. (2016) for Indonesia.

Interestingly, the shift in the exchange rate mechanism does not exert any influence on import values. This can be explained by the nominal exchange rate remaining an anchor closely controlled by SBV. The nominal exchange rate, at times, remains fixed or pegged to the USD over prolonged periods (Pham et al., 2022). As a result, the transition in the exchange rate regime does not demonstrate a significant long-term effect on import levels. In summation, the variables IIPW and imports impact the exports of Vietnam, while REER and money supply influence imports in the long run. The limited impact of REER on exports might be attributed to the assumption of a symmetric REER.

Finally, part 3 presents the diagnostic statistics results for the ARDL in both the export and import models. The F-bound test surpasses the critical bound indicating cointegration for the equation. The Error Correction Model (ECM) exhibits a negative coefficient at the 1% significance level, suggesting a long-term connection between the independent and dependent variables. Subsequently, various tests are employed to assess the model's robustness. The Breusch–Godfrey serial correlation LM test examines serial correlation with the null hypothesis that no serial correlation exists. The observed value of ObsR-squared being 2.23 or the probability being 0.321, exceeding 5%, led to accepting the null hypothesis, indicating no serial correlation in the export model. Similarly, the Breusch-Pagan-Godfrey test detects heteroskedasticity, the null hypothesis assuming homoskedasticity. The value of ObsR-squared at 16.90 or a probability of 0.11, larger than 5%. Consequently, the null hypothesis was accepted, affirming the

Table 6. Results from the estimation using the NARDL method.

Part 1: Short-run estimation results

Export model: NARDL (1, 1, 1, 2, 2, 1, 0)				Import model: NARDL (2, 0, 0, 1, 1, 2, 0)			
Lags	0	1	2		0	1	2
C	−9.62			C	−0.90		
ΔX	0.36***			ΔM		0.30***	0.18***
ΔPOS	−0.82	1.21		ΔPOS	−0.27		
ΔNEG	1.18	−1.91***		ΔNEG	−0.54**		
$\Delta IIPW$	1.45***	−1.83***	0.85***	$\Delta IIPVN$	0.28***	−0.28***	
ΔM	0.62***	−0.31***	−0.10**	$\Delta M2$	−0.39	0.76**	
$\Delta D1$	0.09	−0.13***		$\Delta D1$	0.28***	−0.48***	0.24***
$\Delta D2$	0.02			$\Delta D2$	0.12**	−0.09	

Part 2: Long-run estimation results

Export model		Import model	
C	−14.9	C	−1.76
POS	0.61***	POS	−0.52
NEG	−1.12***	NEG	−1.05***
IIPW	0.74**	IIPVN	−8.18E-05
M	0.31**	M2	0.72***
D1	−0.06	D1	0.08
D2	0.04	D2	0.05

Part 3: Diagnostic statistics

	F-bound test	$ECMt_{-1}$	Serial correlation	Heteroscedas-ticity	CUSUM	CUSUMQ
Export model	16.28***	−0.64***	2.01	16.93	Stable	Unstable
Import model	6.96***	−0.51***	0.73	1.72	Stable	Stable

Note. ***, and ** indicate statistical significance at 1%, and 5% respectively.

absence of heteroskedasticity in the export model. These conclusions extend to the import model as well.

The Cumulative Sum of Recursive Residuals (CUSUM) and CUSUM of Squares Test (CUSUMQ) are combined to assess parameter stability. The results indicate parameter stability in the export model based on CUMSUM, while both CUMSUM and CUSUMQ indicate parameter stability in the import model. To summarize, all models satisfy the test criteria (except for CUSUMQ in the export model), affirming their validity and robustness.

4.4 Non-Linear Autoregressive Distributed lag model

To analyze the disproportionate effects of the REER coefficient in both the short and long terms, the NARDL approach was employed. The results are presented in Table 6.

Table 6 highlights the influence of the REER on both imports and exports across short and long timeframes. Similar to the ARDL method, all models meet the test criteria, except for CUSUM in the export model, confirming their robustness and stability. Notably, both POS and NEG exhibit distinct values in the short and long terms.

In the import model, following the guidance of Bahmani-Oskooee and Fariditavana (2016), we determine the asymmetry under these conditions. According to their suggestions, a variable demonstrates asymmetry if the depreciation (POS) or the appreciation (NEG) component displays significant statistical, while the other does not. The POS exhibits statistical insignificance in our model, whereas the NEG is significant. This finding indicates that the REER demonstrates asymmetry in both the short and long terms for the imports.

In the export model, POS has a positive value (0.61) while NEG has a negative value (−1.12). This indicates that depreciating the domestic currency helps increase exports, whereas increasing the domestic currency value reduces Vietnamese exports. This result is consistent with the economic theory of elasticity and aligns with the findings of Kwasi Obeng (2018) for Ghana.

Next, we employ the Wald test to verify the accuracy of the asymmetry effect of the REER on exports. The outcomes are presented in Table 7.

Table 7. Wald test for symmetric the real effective exchange rate on the export model.

	Test statistic	Value	Probability
Short run	F-statistic	3.31	0.07
Long run		39.04	0.00

Table 8. The LM test for threshold regression.

Model	Variable	LM test for no threshold	Bootstrap *p*-value
Export model	REER	16.50	0.00
	IIPW	14.83	0.00
	M	30.81	0.00
Import model	REER	30.32	0.00
	IIPVN	17.55	0.00
	M2	25.51	0.00

Table 9. Threshold value and time change for the export and import models.

Model	Variable	Order	Threshold value	Time occurs
Export model	REER	1	4.6854	05/2012
	IIPW	1	27.9104	07/2010
		2	28.1225	07/2017
	M	1	8.8580	12/2009
		2	9.2293	01/2014
Import model	REER	1	4.6678	02/2012
		2	4.8507	10/2019
	IIPVN	1	22.1828	11/2016
	M2	1	14.8031	01/2012
		2	16.1909	03/2020

Table 7 shows that the short and long-run F-statistics are statistically significant at the 10% significance level. This result implies rejecting the null hypothesis. Hence, the REER is asymmetric in the export model in both the short and long run. To sum up, REER demonstrates asymmetry in both export and import models.

4.5 Threshold model

Finally, the threshold model elucidates the import and export structure changes. The application of the threshold regression unfolded in two steps: (i) to determine the linearity of the model, and (ii) to identify the threshold value. The assessment of the threshold regression model was guided by the following hypotheses:

Ho: The regression model does not meet the existing threshold.

H1: The regression model meets the existing threshold.

Table 8 displays the results of the LM test conducted for both the export and import models. All of the bootstrap *p*-values are below the significance level of 5%. Consequently, the null hypothesis is rejected, indicating that the models establish the threshold. As all the models exhibit nonlinearity, the subsequent procedure involves determining the threshold value and investigating the specific variable responsible for inducing alterations in the import and export structures.

As indicated in Table 9, concerning the export model, the REER has a value of 4.6854 in May 2012, signifying that REER cannot clarify the shifts in the export structure. Meanwhile, the IIPW manifests two thresholds. The second threshold, observed at a value of 28.1225 in July 2017, indicates that IIPW accounts for the changes in export structure occurring in September 2017. Similarly, the import volume reflects two thresholds, with the second threshold identified at a value of 9.2293 in January 2014, preceding the alteration in export structure by one month. These observations highlight the role of imports and IIPW in explaining shifts in export structure at the first and the second time. This conclusion is supported by the ARDL model, which emphasizes the statistical significance of IIPW and imports, while REER lacks statistical significance in the context of exports. Shifting the focus to the import model, the

REER has a value of 4.6678 in February 2012, while the M2 stands at 14.8031 in January 2012. These observations spotlight the influence of REER and M2 in clarifying the shifts in import structure, specifically in February 2012. In this analytical landscape, it's important to note the absence of explanatory variables that explain the shifts within the second import structure, marking attention for further exploration.

In summary, the ARDL model sheds light on long-term export volume influenced by the world's GDP, imports, and the conventional fixed peg arrangement mechanism. Import volume, on the other hand, is affected by the REER and the money supply. The NARDL model underscores the REER's asymmetrical impact on exports and imports. Furthermore, the threshold model demonstrates that the first structural change in exports is explained by imports, while the second change in export structure is elucidated by the IIPW. In the context of the import model, the first structural change is clarified by the REER and money supply. These findings contribute to understanding the dynamics shaping Vietnam's export and import performance.

5. Conclusion and policy implication

Being one of the world's prominent open economies with a strong focus on exports, Vietnam heavily relies on its export activities. The exchange rate plays a pivotal role in enhancing exports and moderating imports. Nevertheless, the analysis reveals that while the REER significantly influences imports, it has an insignificant impact on exports. This asymmetry highlights the complex relationship between exchange rates and trade flows.

The significant import reduction following REER devaluation indicates that exchange rate policies can effectively manage import levels. This finding suggests that controlled devaluations can help reduce imports and support domestic industries by reducing competition from imported goods. Moreover, the money supply emerges as an additional determinant exerting influence on imports in the long run;

The insignificant effect of REER on exports suggests that Vietnam's export sector is less sensitive to exchange rate fluctuations. This could be due to the heavy reliance on imported intermediate goods for export production. Policymakers should focus on enhancing the value-added components of exports and reducing the dependence on imported inputs to improve export performance sustainably. Furthermore, the export volume is shaped by factors such as the IIPW, the import volume, and the central exchange rate mechanism.

Based on the findings of this study, several policy recommendations can be put forward in shaping an effective trade strategy:

For Exports: Given that the REER does not exhibit a significant impact on exports, policymakers are advised to avoid considering VND devaluation as a means to bolster export performance. Instead, the focus should shift toward economic restructuring. A strategic approach involves minimizing the practice of importing goods for reprocessing and subsequent export. The government could channel efforts into bolstering supporting industries and export-oriented production, utilizing domestic resources effectively. This proactive approach aligns with the imperative of sustainable and value-added export growth.

For Imports: Firstly, the State Bank of Vietnam (SBV) can utilize exchange rate policies, such as the controlled devaluation of the VND, to manage imports. However, it is imperative to exercise caution due to the potential for retaliation from trading partners, including the risk of being labeled a currency manipulator. Secondly, the money supply emerges as a critical determinant of Vietnamese imports. Hence, it becomes crucial to regulate the pace of money supply growth. By doing so, not only can imports be curbed, but this approach also serves as an effective mechanism to rein in inflationary pressures.

In summation, these policy implications, derived from empirical insights, offer an effective strategy for policymakers to navigate the complicated trade landscape of Vietnam. By shifting the focus towards sustainable economic restructuring for exports and employing a calibrated approach to exchange rate and

monetary policy for imports, Vietnam can effectively exploit its economic potential and position itself strategically in the global trade arena.

Despite the valuable insights provided, this research has limitations. The data used in this study is aggregated, not commodity-level data. This could introduce aggregate bias and obscure sector-specific trade dynamics. This limitation underscores the need for more granular data, such as commodity-level data, to capture the nuanced impacts of exchange rate changes on industries and trading relationships. Future research should incorporate more recent and detailed data sets to enhance the accuracy and relevance of the findings.

Notes

1. Please see appendix 1 for more details.
2. The Absorption Approach begins with the equation: $Y = C + I + G + X - M$ (1). Where Y is real GDP; C: Consumer spending; G: Government spending; I: Investment spending; X: Export; M: Import. Let A be the total domestic expenditure or absorption with $A = C + I + G$. The equation (1) is rewritten as $Y = A + (X - M)$ Or $Y - A = X - M$.
3. The data that support the findings of this study are openly available in Mendeley at http://doi.org/10.17632/2z9gxryd5j.1.

Acknowledgments

We also thank Dr. Chris Jones and 2 anonymous reviewers of Cogent Economics & Finance for their valuable feedback, which has tremendously improved the quality of this paper.

Disclosure statement

No potential conflict of interest was reported by the authors.

Author contributions

Nguyen Hong Nga: Conception, methodology, and analysis, writing draft and discussion; revising and editing the intellectual. Pham Hoang An: Literature review, writing draft and discussion, revising and editing the intellectual contents. Vo Thi Kim Loan: Literature review, writing draft and discussion, revising and editing the intellectual contents. Tran Quoc Khanh Cuong: Conception, methodology, data management, and analysis, writing draft and discussion; revising and editing the intellectual. All authors have reviewed the results and approved the final version of the manuscript. We also agree to be accountable for all aspects of the work.

Funding

This research is funded by the University of Economics and Law, Vietnam National University Ho Chi Minh City/ VNU-HCM.

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Data availability statement

Data is available in the public repository. The authors confirm that all data underlying the findings are fully available without restriction.

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Appendix 1.

Bai – Perron test for structural break.

Variables	F statistics	Break day
Export	132.28	2014M02, 2017M09
Import	394.05	2012M02, 2016M08

The Bai-Perron test revealed that structural changes in imports happened in February 2012 and August 2016. Similarly, changes in the structure of exports were detected in February 2014 and September 2017. To further verify these findings, we applied the Wald test, which confirmed the structural shifts in both the export and import variables.

Wald test for structural break.

Variables	Break day	Probability
Export	2014M02, 2017M09	0.08
Import	2012M02, 2016M08	0.00

The Wald test is based on the following pair of hypotheses:

H_0: there is no structural change

H_1: there is a structural change

Because the Chi-square probability falls below 10% for both the export and import models, we reject the null hypothesis (H0), confirming that structural changes have indeed occurred in both export and import variables.