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DIFFERENTIAL IMPACTS OF EXCHANGE RATE FLUCTUATIONS ON TRADE BALANCE AND ECONOMIC OUTPUT

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Abstract

This study investigates the asymmetric influences of exchange rate fluctuations on trade performance and economic growth within eight of ASEAN's largest economies over a comprehensive period spanning from 1970 to 2019. Employing the non-linear autoregressive distributed lag (NARDL) methodology, the empirical analysis confirms a long-term equilibrium relationship among exchange rates, trade dynamics, and output trajectories. The findings reveal distinct short-term and long-term responses to currency movements across countries. While ASEAN experienced short-term trade and output boosts from both currency appreciation and depreciation, Singapore witnessed the opposite. Indonesia and Malaysia exhibited improved short-term trade and growth following currency appreciation, but long-term trends favored depreciation. Cambodia and Vietnam displayed similar patterns, except for a marginally negative short-term trade impact from currency depreciation. Overall, the study indicates that both currency appreciation and depreciation have adverse effects on long-term trade balances across most ASEAN nations, although depreciation often stimulates short-term trade. Similarly, currency depreciation tends to positively influence short-term growth, whereas appreciation generally has a negative impact. Based on these results, the study concludes with policy recommendations tailored to the continent's specific economic conditions.

Keywords: Exchange Rate Fluctuations, Trade Performance, Economic Growth, ASEAN, NARDL (Non-Linear Autoregressive Distributed Lag), Long-Term Relationship.

INTRODUCTION

The economies of Southeast Asian countries (ASEAN) have experienced significant development over the past two decades, characterized by stable GDP growth, dynamic trade balances, and increasing foreign direct investment (FDI) inflows. However, exchange rate changes have been one of the most significant factors in determining trade balances and output growth in ASEAN countries. Therefore, it is important to understand how exchange rate changes affect trade balances and output growth in each country.

In an open economy, exchange rates are considered one of the most important prices, as many business, investment, and policy decisions are influenced by them (Khim et al., 2003). The study of exchange rates has been a major area of economic research for decades.

This research has experienced tremendous growth, especially in the post-Bretton Woods era, when foreign exchange rates became highly volatile after introducing the floating exchange rate regime in 1973.

The relationship between exchange rate and trade balance is one of the research areas that attracts the attention of researchers. The trade balance elasticity model introduced by Krueger (1983) has shown a theoretical relationship between the two variables.

Empirically, the effect of exchange rate on trade balance has been assessed through various studies, to provide valuable inputs to policymakers regarding the effectiveness of exchange rate policies, such as devaluation-based adjustment policies influenced by nominal exchange rate, in balancing a country's foreign trade (Greenwood, 1984; Himarios, 1989; Rose and Yellen, 1989; Bahmani-Oskooee, 1991; Mahdavi and Sohrabian, 1993; Arize, 1994; Buluswar et al., 1996; Rahman and Mustafa, 1996; Rahman et al., 1997; Wei, 1999; Baharumshah, 2001; Bahmani-Oskooee, 2001). In theory, changes in the real exchange rate are assumed to occur due to the depreciation (appreciation) of the nominal exchange rate (Himarios, 1989; Bahmani-Oskooee, 2001), which has a direct impact on the trade balance.

Bahmani-Oskooee (2001) specifically notes that to gain international competitiveness and improve the trade balance, a country may devalue or allow its currency to depreciate. With devaluation or depreciation, exports become relatively cheaper, thus increasing, and imports become relatively more expensive, thus decreasing, ultimately improving the trade balance.

However, many economists believe there is a short-term phenomenon known as the "J-curve" effect in trade balance movements, where the trade balance will experience an initial decline before eventually improving. This time-course adjustment is generally explained by the existence of contracts in international trade, specifically export contracts written in domestic currency and import contracts written in foreign currency. As a result, after a devaluation or depreciation of a country's exchange rate, the price effect kicks in faster than the volume effect.

Therefore, a non-linear autoregressive distributed leg (NARDL) cointegration approach developed by Shin et al. was used to conduct further research. (2014). ARDL was originally developed by Pesaran and Shin (1999), and further exploration was carried out by Pesaran et al. (2001). The results of these explorations allowed for an analysis of the situation in each of the selected countries.

However, non-linear ARDL is considered more appropriate as it allows for the decomposition of the variable of interest, the official exchange rate, into its depreciation component as well as its appreciation component. Related to the joint analysis of the non-linearity of the variables and non-stationarity, as well as being able to detect short-term and long-term asymmetric effects, this method can adjust to analyze these things.

For example, here are some parallel studies, such as Dellate and Lopez-Villavicencio (2012), who used the method for exchange rate pass-through, while Katrakilidis & Trachanas (2012) study used it as a determination of housing price changes.

This study attempts to investigate whether exchange rate changes have a significant and direct impact on the trade balance of ASEAN-8 countries (Indonesia, Malaysia, Singapore, Thailand, Philippines, Brunei, Vietnam, and Cambodia). The economies of ASEAN countries are proxied by stable GDP growth, dynamic trade balance, and increasing FDI inflows. However, changes in currency exchange can have asymmetric effects on trade balance and output growth. For example, research by Pham Thu Anh Thi et al. (2023) shows that changes in currency exchange can lead to significant changes in inflation and trade balance in ASEAN-5 countries.

Therefore, it is important to understand how currency exchange changes affect trade balance and output growth in each country. The structure of this study consists of

several sections, namely the literature review presented in section 2, section 3 presents and discusses the analytical framework, section 4 discusses the results, and section 5 presents the conclusions.

LITERATURE REVIEW

Topics related to the effects of exchange rate depreciation have been widely discussed and have received scientific attention in the empirical literature. For example, in the scale of developed countries, a study by Ali and Anwar (2011) found that the existence of induced currency depreciation has a greater impact on the supply side.

In addition, this study also found and explained that the occurrence of inflation is often caused by the depreciation of the currency; it is also the reason for the increase in the trade balance and the decline in output, especially for the selected developed countries. Nouira et al. (2011) used a sample of 52 developed countries and had conditions where exchange rate policy was proactive for economic growth and the manufacturing sector. From this study, it was found that devaluation was carried out by several developed countries to increase the manufacturing industry between 1991 and 2005. Meanwhile, some studies focus more on one region, for example, the study by Nasir et al. (2015), which analyzes the relationship between tourism and economic growth in Andalusia between 2005 and 2012. This study also considers the impact of the exchange rate on growth in Andalusia. The results concluded that tourism positively and significantly contributed to GDP growth, and exchange rate shocks reduced economic growth. Meanwhile, in 2017, Nasir et al. focused on the relationship between FDI, exchange rates, and aggregate demand from 1992 to 2013, which in this study also focused on BRICS economies. The results show that exchange rate shocks are directly affected by FDI flows and household consumption. In addition, Divakaran and Gireeshkumar (2014) focused on research using the Japanese economy as a sample. The results found that the increase in exports, the country's economic growth, and the products produced could be more competitive in the international market due to the depreciation of the yen.

The research conducted continues by Nasir and Simpson (2018), who aim to be able to calculate the Brexit epoch and show that sterling depreciation affects inflation and the UK trade balance between January 1989 and September 2016 substantially. Furthermore, Nasir et al. (2018) conducted similar research focusing on studying the relationship between oil price shocks and BRICS economies between 1978 Q2 and 2017 Q2. From the results obtained, it is suggested that GDP, inflation, and trade balance are adversely affected by oil price shocks. Nasir and Jackson (2019) focused their research on trade surplus and deficit economies from 2001 Q1 to 2016 Q1. Using the structural vector autoregressive method, they found that current account balances for surplus and deficit countries are affected by exchange rate misalignment from equilibrium. While within the scope of the UK, Nasir and Vo (2020), using monthly data from October 1976 to September 2017 and the TVSVAR method, found evidence for a J-curve for the UK and found the result that the worsening of the trade balance in Canada is caused by effective exchange rate shocks. It is also found that the trade balance deterioration with effective exchange rate volatility is real in New Zealand.

Moreover, Bahmani-Oskooee and Nasir (2020), by considering the use of a sample of 68 trade industries between the UK and the US, showed that the pound-dollar rate has

a short-term asymmetric effect in almost all industries from January 1996 to April 2018. The results of Nasir and Leung (2021) using quarterly data from 1994 Q1 to 2018 Q1 for the US based on non-linear ARDL concluded that between the exchange rate and the US trade balance, there is an asymmetric relationship both in the short and long term. In addition, it is also found that the trade balance is affected by productivity and fiscal discipline.

Bahmani-Oskooee et al. (2021), focusing on 67 industries trading between the US and the UK using the ARDL and NARDL methods, found that in terms of the ARDL method, only nine industries out of 22 US exporting industries to the UK experienced long-term effects of volatility. There are also consequences in 18 sectors and long-run implications in 15 industries on the UK-US export side. In addition, using the NARDL method, it is found that in the short run, the volatility effect is asymmetric across 43 exporting industries from the UK and 41 from the US. 24 industries are exporting from the U.S. to the U.K. and 33 industries exporting to the U.S. In addition, it is found that the short-run asymmetric effects may persist into the long-run asymmetric effects.

In terms of developing countries, the study of Fang et al. (2005) used a sample of Singapore, Indonesia, Japan, Korea, Malaysia, Thailand, Taiwan, and the Philippines. It was found that export activities are driven by the depreciation of the exchange rate, while the reduction of exports that can balance the positive impact is due to the risk or variability of the exchange rate. The results also found that exports in the six selected countries had a zero-net effect on exports in Thailand and Korea. Mamun et al. (2013), focusing on the Bangladesh region, found that a depreciating exchange rate was able to increase the price level and output in Bangladesh. Mengistu and Lee (2014) analyzed currency depreciation conditions in 8 Asian industrial economies and found that depreciation improves the trade balance as well as that currency depreciation can reduce trade in a sample of 14 selected Asian economies. On the other hand, a study focusing on non-financial sector companies in India found it in a study by Cheung and Sengupta (2013), where it was proven that in 2000 and 2010, Indian exports significantly responded negatively to currency appreciation. Compared to firms with large export shares, firms with smaller export shares respond significantly more to exchange rate volatility.

According to Datta (2014), currency depreciation can influence and affect improving the trade balance in India. While in Ghana, Nyeadi et al. (2014) found that in 1990 and 2012, the exchange rate had no impact on Ghana's exports. Li et al. (2015) argued in their study that there was high exchange rate pass-through into foreign currency prices as well as reduced export market participation in Chinese firms due to the appreciation of the local currency. A different regional focus is presented by Paudel and Burke (2015), who focus on Nepal between 1980 and 2010. Using a gravity model, it is asserted that the decline in the country's exports to the mita market is attributable to currency appreciation. Cherop and Changwony's (2014) study, focusing on a sample of smallholder tea factories in Kenya, found that there was a correlation between the exchange rate and the amount of tea sold by smallholders. While Hoony et al. (2015) mentioned that currency depreciation was positively significant, it increased ASEAN's total exports to China, and exports of goods and technology responded more to the RMB depreciation.

Patel and Mah (2018), focusing on South Africa, assessed that there was a link between economic growth and the exchange rate between 1980 and 2015. Using

VECM, it was found that a negative exchange rate is a condition that is affected by shocks to economic growth and exports. Research related to this topic is growing, and finally, the expansion of the sample tested using several countries in Africa was carried out by Lawal et al. (2022), who found that there is a permanent and temporary causal relationship between economic growth and agriculture, trade, remittances, and exchange rates between 1980 and 2018.

Based on the literature, most of them mostly use wild frameworks, hence the need for this study. Po & Huang (2008) note that linear models, it is inadequate to have short-term effects. Bildirici and Turkamen (2015) emphasize that, rather than symmetric models, asymmetric frameworks can have greater explanatory power to interpret results. Anoruo (2011) emphasizes the inefficiency of the linear framework in evaluating asymmetric regressor measures over time. Based on the weaknesses of the linear model, Shin et al. (2014) developed the ARDL method. This method has been widely used in existing studies such as Bahmani-Oskooee and Nasir (2020), Bahmani-Oskooee et al. (2018), Mesagan et al. (2021b), Bahmani-Oskooee et al. (2021), and Nasir & Leung (2021). With Bahmani-Oskooee and Nasir (2020), Nasir & Leung (2021), and Bahmani-Oskooee et al. (2021), which focus on developed countries such as the UK and the US, there is also research by Bahmani-Oskooee et al. (2018), which focuses on Turkey, and Mesagan et al. (2021b), which focuses on Nigeria. This can show that it can be innovative if this research is carried out with a focus on developing regions such as Africa.

Furthermore, a study by Truong & Vo (2023), which focuses on analyzing the asymmetric effect that the exchange rate has on the trade balance in Vietnam from January 2020 to June 2020, using data in the form of monthly trade balance, industrial production index, exchange rate, and foreign investment series and using the non-linear ARDL approach and Error Correction Model (ECM) method as a support for data analysis, found that using the ARDL approach, it was found that there was an asymmetric effect caused by the exchange rate on the trade balance both in the short and long term. This illustrates that a decrease in the exchange rate has a different effect on the trade balance than an increase in the exchange rate of the same size. In the short run, a 1% increase in the exchange rate (USD/VND) is associated with a declining trade balance, while when the VND appreciates, it does not have any effect on the trade balance. Meanwhile, in the long run, a 1% increase results in an improvement in the trade balance. Unlike the short term, in the long term, when the VND appreciates, there is no effect. In addition, the results obtained from ECM show that 89.07% of the imbalance from the previous month converged and corrected back to equilibrium in the current month in the long run.

Jiang & Liu (2022), in their study, also discussed the impact of exchange rate changes on the trade balance, specifically for the Chinese region and its main trading partners. Using the NARDL model, it was found that there is a non-linear asymmetric effect on the exchange rate trade balance. In particular, it is explained that the effect exerted when the exchange rate appreciates on the Sino-U.S. trade balance is more significant than depreciation. The domestic trade balance can be improved by the devaluation of the domestic currency. However, the opposite effect occurs in the case of Sino-Japan and the Euro, where the trade balance becomes worse when the currency depreciates. This is not much different from the study of Hussain et al. (2019), which focuses on examining the asymmetric effects of exchange rate fluctuations on GDP in Pakistan. By using the ARDL and NARDL approaches, Whereas with the ARDL

approach, the results show a loss of cointegration relationship when the symmetry assumption is considered. While the NARDL approach found that a weak currency hurts GDP, a strong currency adds growth. From the asymmetric side, it is added information that there is an asymmetric impact of the exchange rate on GDP growth in Pakistan both in the short run, long run, and adjustment.

Research that focuses on the Indian region is also conducted in the study of Iqbal et al. (2023). This study aims to analyze and explore the asymmetric effects of exchange rate misalignment on economic growth in India. The results indicated in the symmetric approach indicate that there is a negative effect of exchange rate misalignment on economic growth in India. Meanwhile, using the non-linear ARDL approach, it was found that there was significant evidence supporting the asymmetric effect. On the other hand, the results of this study are interesting when it is also found that India's economic growth can be driven by undervaluation, while the negative effects that tend to be given come from overvaluation. So it can be concluded from the results of the study that an undervalued exchange rate in the short term can provide economic relief, and a market-based equilibrium exchange rate is considered to have a very important role in economic growth, such as in India.

Wang, Y. (2022), who also analyzes the long-term asymmetric effects originating from bilateral exchange rates, says there is an imbalance in US trade with China. In addition, this study also aims to investigate whether or not the effects given are the same under China's fixed and managed floating exchange rate system. By using the ARDL approach to conduct further analysis related to the use of data from 1994Q1 to 2005Q1 (China's fixed exchange rate system), then under the floating exchange rate conditions managed by China by selecting 2005Q3 to 2021Q3, all data used from 1994Q1 to 2021Q3. Then it was found that, by using the Chow test, the structured breakpoint was in the 2005Q3 period. Where the unequal effects are given by the bilateral exchange rate on the US trade deficit with China under different exchange rate systems. In the long term, it also shows that there are results. Where the depreciation of the Chinese currency does not significantly affect the US trade balance with China.

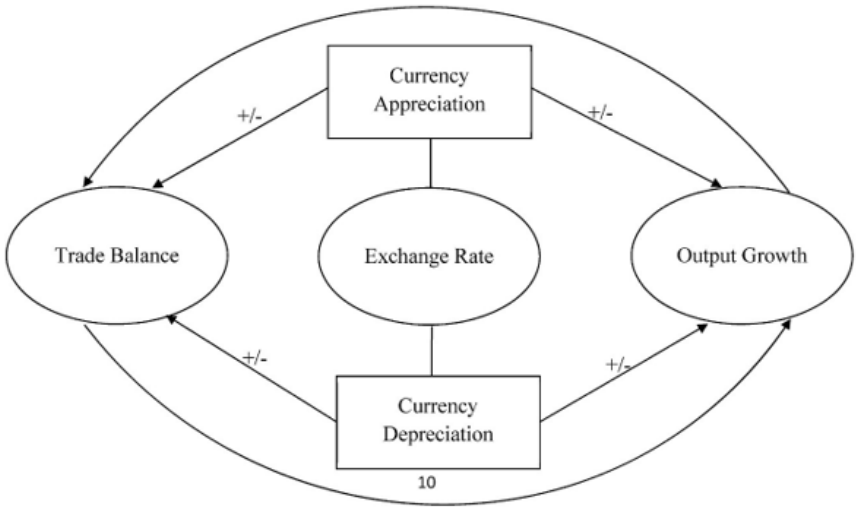

Fig 1: Conceptual framework of exchange rate asymmetric, trade and output growth

TRENDS, METHODOLOGY, AND THEORETICAL BASE

Stylized FactD

The relationship between currency fluctuations and the economic performance of ASEAN nations is complex and multifaceted, as illustrated in Figure 1. A nation's currency appreciation or depreciation can exert both positive and negative influences on its trade balance and overall output growth.

As Mei et al. (2020) posit, a strengthening currency typically reduces a country's trade surplus by making its exports less competitive in global markets. Conversely, a depreciating currency can stimulate exports by lowering the relative prices of domestic goods compared to foreign alternatives.

However, the impact of exchange rate movements on trade and growth is not straightforward. The positive and negative signs associated with currency appreciation and depreciation in Figure 1 emphasize this duality.

For import-dependent developing ASEAN economies, currency appreciation can pose significant challenges to economic growth. The rising cost of exports can offset potential benefits derived from cheaper imported inputs for the manufacturing sector. This dynamic, as highlighted by Hodge (2015), can hinder export expansion and constrain overall economic growth.

Nevertheless, under specific conditions, currency appreciation can positively impact the trade balance and economic growth. If the cost reductions associated with imported inputs lead to increased domestic production and import substitution, the trade balance can improve. This scenario, supported by Delatte and L´opez-Villavicencio (2012), can subsequently drive economic expansion. Moreover, a stronger currency can render the services of foreign workers more affordable, potentially boosting long-term growth, enhancing productivity, and improving the trade balance, as argued by Eregha and Mesagan (2017).

A stronger currency can negatively impact trade and economic output by encouraging consumers to buy foreign goods over domestic products. This harms local businesses, mirroring the "Dutch disease" phenomenon where a strong currency undermines local industries. While currency appreciation can potentially lower production costs, its detrimental effect on imports often outweighs this benefit.

Conversely, a weaker currency can boost exports and economic growth, but only if the country has sufficient production capacity. Otherwise, it can lead to slower growth and trade deficits. Developing nations are particularly vulnerable to the negative consequences of exchange rate fluctuations due to their limited production capabilities.

H01: Exchange rate depreciation insignificantly impacts trade balance and output growth.

H02: Exchange rate appreciation insignificantly affects trade balance and output growth

Table 1 presents a comparative analysis of foreign exchange policies implemented by selected ASEAN nations and their subsequent economic implications. Brunei Darussalam, for instance, maintained a currency board arrangement from 2020 to 2023, with the Brunei dollar still pegged to the Singapore dollar at par.

This arrangement has provided Brunei with macroeconomic stability and low inflation over the years. This devaluation adversely affected the Sudanese economy, as evidenced by a substantial decline in the trade balance and GDP growth rate. While Singapore and Brunei Darussalam, both pegged to the US dollar, experienced currency depreciation from 2020 to 2023 due to factors such as regional economic slowdown and the strengthening of the US dollar, the implications for their trade balances diverged.

Brunei Darussalam witnessed an improvement in its trade balance, primarily driven by increased oil exports. In contrast, Singapore's trade balance was more influenced by global supply chain disruptions and a decline in electronics exports, leading to a more muted response to the currency depreciation. These contrasting outcomes highlight the complex interplay between exchange rates, commodity prices, and global economic conditions in shaping trade balances.

Malaysia, another country with a floating exchange rate, witnessed a depreciation of the Egyptian Pound but concurrently achieved an improved trade balance and accelerated GDP growth.

Brunei Darussalam, on the other hand, employed a currency board arrangement system, leading to Brunei Dollar depreciation and a deteriorating trade balance, although GDP growth eventually rebounded. Algeria's managed floating exchange rate system caused a decline in the value of its currency and a reduction in the trade deficit, but GDP growth slowed considerably.

The findings suggest a complex relationship between exchange rate fluctuations and economic performance. While currency depreciation can positively impact trade balances in some cases, as seen in Angola and Egypt, it may also hinder economic growth if a country lacks a robust domestic production base.

This aligns with the observations of Eregha & Mesagan (2017), Mei et al. (2020), Lawal et al. (2022), and Mesagan et al. (2018a,b), who emphasized the importance of domestic production capacity in mitigating the negative consequences of currency depreciation.

Table 1: Exchange rate policy and economic outlook for selected ASEAN countries

Countries	Official exchange rate/1$		Trade balance		GDP growth rate		Current exchange rate policies
	2020	2023	2020	2023	2020	2023	
Brunei	1.37	1.34	110.29	136.56	1.13	1.40	Currency Board System
Cambodia	40,92.78	4,110.65	123.99	113.53	-3.09	5.39	managed floating
Indonesia	14.582.20	15.236.88	32.97	41.31	-2.06	5.04	managed floating
Malaysia	4.20	4.56	116.78	131.84	-5.45	3.68	managed floating
Philipina	49.62	55.63	58.16	67.39	-9.51	5.54	managed floating
Singapore	1.38	1.34	331.69	311.24	-3.86	1.075	managed floating Exchange Rate
Thailand	31.29	34.80	97.80	129.15	-6.05	1.88	Floating Exchange Rate
Vietnam	23,208.36	23,787.31	163.24	172.61	2.86	5.04	managed float

Authors' compilation from the World Development Indicators (2020)

Theoretical Base

This study is grounded in the Marshall-Lerner (ML) hypothesis and the Keynesian open economy model. The ML hypothesis posits that a country can influence its trade balance through exchange rate manipulation, contingent on the price elasticity of demand for imports and exports, as proposed by Marshall (1923).

As underscored by Bahmani-Oskooee et al. (2016) and Dong (2017), the ML condition stipulates that a trade balance improvement follows currency depreciation when the combined elasticity of imports and exports exceeds unity.

Conversely, a trade deficit emerges when this sum is less than one. The underlying principle is that a weaker currency curbs imports, boosts exports, and stimulates domestic production, ultimately enhancing the trade balance and economic growth.

In contrast, currency appreciation tends to increase imports while reducing exports and domestic production, leading to a wider trade deficit and contracted economic growth (Mesagan et al., 2018a,b; Mei et al., 2020; Lawal et al., 2022).

The Keynesian open economy model corroborates this view, asserting that currency depreciation stimulates exports and redirects spending away from imports (Mesagan et al., 2019; Yildirim & Ivrendi, 2016).

This, in turn, propels domestic aggregate demand and economic expansion. In alignment with this perspective, Mesagan et al. (2021), Nasir & Leung (2021), and Lawal et al. (2022) contend that a depreciated currency empowers domestic export-oriented sectors to enhance competitiveness, leading to increased production, improved trade balances, and higher output.

Data

This research adopts a multivariate approach to examine eight of ASEAN economies, selected based on their substantial GDP and regional trade influence. These countries—Indonesia, Malaysia, Singapore, Thailand, Philipines, Brunai Darusallam, Vietnam, Cambodia—collectively account for over two-thirds of the continent's GDP, as highlighted by Mesagan et al. (2020).

Consequently, the study's findings are expected to serve as a predictive model for ASEAN economic trends. Data for this analysis were sourced from the World Development Indicators (WDI, 2020).

The exchange rate is defined as the official conversion rate between each country's currency and the US dollar. Trade balance is calculated as the net difference between imports and exports relative to GDP.

GDP growth represents the annual increase in the production of goods and services, while foreign direct investment is quantified as the inflow of foreign capital as a percentage of GDP. Through regression analysis, output growth and trade balance are modeled as functions of the real official exchange rate and additional control variables for the selected countries.

Model and Estimation Approach

Building upon the theoretical framework and empirical research conducted by Bahmani Oskooee et al. (2018), Bahmani-Oskooee and Nasir (2020), Nasir & Leung

(2021), Mesagan et al. (2021b), and Bahmani-Oskooee et al. (2021), the following multiple linear models are proposed.

$y_t = x_i B + \mu_t$ Note: $t = 1$, ……..(1)

Where: y being the dependent variable is specified with respect to the 1 × K vector of explanatory variable xt that also include constant and the disturbance termμ. The 1 × K parameter estimates of our variables of interest is denoted byB. The above model is a long-run equation produced by the OLS or other estimation approaches that reproduce long-run impacts. This study further adapts the multivariate NARDL approach advanced by Shin et al. (2014) because of its inherent ability to handle asymmetric impacts of independent variables and its usefulness in conducting its long- and short-run effects. According to Uzuner et al. (2020), the NARDL approach is "flexible and robust to the spread of coefficients in empirical frameworks considered to be a pestilence in the linear vector error correction or ARDL models. Again, the NARDL is also resilient to variables with different orders of integration (Van Hoang et al., 2016). As presented in Shin et al. (2014), the asymmetric ECM model is stated as:

$$\Delta y_t = \alpha_0 + \varphi y_{t-1} + \beta_1^+ x_{t-1}^+ + \beta_2^- x_{t-1}^- + \sum_{i=1}^{p} \partial_i \Delta y_{t-1} + \sum_{i=1}^{q} \varphi_i^+ \Delta x_{t-1}^+ + \sum_{i=1}^{q} \varphi_i^- \Delta x_{t-1}^- + \epsilon_t$$

The NARDL model is used to estimate both long-run and short-run relationships between the variables

As the time horizon (h) extends indefinitely in equation (4), the cumulative dynamic multipliers (m+h and m-h) converge to their respective long-run coefficients (π+ and π-). These multipliers represent the positive and negative impacts of the independent variables on the dependent variable over time. A positive exchange rate shock indicates currency depreciation, while a negative shock implies currency appreciation. It is anticipated that a stronger currency (appreciation) will lead to increased imports, a deteriorating trade balance, and reduced economic growth. Conversely, a weaker currency (depreciation) is expected to decrease imports, improve the trade balance, and stimulate economic growth.

RESULTS

Descriptive statistics for the study variables across the eight countries are presented in Table 2. Measures of central tendency (mean), dispersion (standard deviation), shape (kurtosis, skewness), and normality (Jarque-Bera test) are reported. It reports the following statistics - mean, standard deviation, maximum, minimum, Kurtosis, skewness and the Jarque-Bera statistic. First, the average value of trade balance to GDP (at higher than 100%) shows that Brunei, Cambodia, Malaysia, Singapore, Thailand and Vietnam have a trade volume slightly higher than the size of her economy. Afterward, countries with trade to GDP marginally higher than 50% is Philippines. We also report the official local currency rate to the USD. Countries with a low average local currency rate to Dollar (standing at a single digit) are Brunei (1.46), Malaysia (3.76), and Singapore (1.46). Also, the average output growth rate ranges from 0.76% to 6.28%, whereas the mean values of FDI to GDP range between 1.96% and 20.99%. Skewness statistics revealed asymmetric distributions for exchange rates, FDI, output growth, and trade balance. Furthermore, kurtosis values indicated leptokurtic distributions for all variables. The Jarque-Bera test confirmed the non-normality of the data series.

Table 2: Summary statistics

Countries	Variables Definition	Mean	Std Dev	Max.	Min.	Skewness	Kurtosis	Jarque-Bera
Brunei	exchange rate (LCU per US$)	1,461	0,179	1,792	1,250	0,708	2,085	2,841
	Foreign direct investment inflows (% of GDP)	2,647	2,171	9,158	-1,753	0,596	5,092	5,796
	GDP growth (annual %)	0,768	2,241	4,398	-2,508	0,032	1,730	1,616
	Official Trade (% of GDP)	106,282	16,188	147,123	85,177	1,428	4,514	10,453
Cambodia	exchange rate (LCU per US$)	4047,453	75,342	4184,917	3840,750	-1,009	4,177	5,461
	Foreign direct investment inflows (% of GDP)	9,618	4,183	14,146	1,751	-0,704	1,989	3,004
	GDP growth (annual %)	6,892	3,362	13,250	-3,096	-1,108	5,168	9,615
	Official Trade (% of GDP)	124,439	9,486	144,615	105,139	0,028	2,602	0,162
Indonesia	exchange rate (LCU per US$)	11275,750	2421,151	15236,880	8421,775	0,386	1,465	2,954
	Foreign direct investment inflows (% of GDP)	1,366	1,393	2,916	-2,757	-1,613	5,099	14,817
	GDP growth (annual %)	4,884	1,635	6,345	-2,066	-3,324	14,910	186,064
	Official Trade (% of GDP)	49,825	10,288	71,437	32,972	0,476	2,440	1,221
Malaysia	exchange rate (LCU per US$)	3,766	0,431	4,561	3,060	-0,071	2,028	0,965
	Foreign direct investment inflows (% of GDP)	3,220	1,306	5,416	0,057	-0,636	3,336	1,730
	GDP growth (annual %)	4,648	3,068	8,859	-5,457	-1,779	6,569	25,399
	Official Trade (% of GDP)	161,740	33,052	220,407	116,788	0,374	1,620	2,463
Philipina	exchange rate (LCU per US$)	48,997	4,444	56,040	42,229	0,035	1,703	1,688
	Foreign direct investment inflows (% of GDP)	4,949	3,429	7,581	-9,518	-3,305	14,490	175,710
	GDP growth (annual %)	1,747	0,800	3,122	0,514	0,029	1,930	1,149
	Official Trade (% of GDP)	70,213	10,736	87,575	55,825	0,366	1,717	2,181
Singapore	exchange rate (LCU per US$)	1,461	0,180	1,792	1,250	0,709	2,085	2,849
	Foreign direct investment inflows (% of GDP)	20,998	6,591	31,621	6,654	-0,515	2,871	1,078
	GDP growth (annual %)	4,765	4,075	14,520	-3,870	0,243	3,124	0,251
	Official Trade (% of GDP)	359,520	36,846	437,327	303,223	0,504	2,423	1,347
Thailand	exchange rate (LCU per US$)	35,245	4,193	44,432	30,492	0,791	2,383	2,883
	Foreign direct investment inflows (% of GDP)	2,534	1,326	4,340	-0,989	-0,724	3,250	2,161
	GDP growth (annual %)	3,307	2,959	7,513	-6,050	-1,139	5,307	10,510
	Official Trade (% of GDP)	125,163	10,202	140,437	97,801	-0,605	3,371	1,600
Vietnam	exchange rate (LCU per US$)	19327,810	3367,937	23787,320	14167,750	-0,150	1,363	2,771
	Foreign direct investment inflows (% of GDP)	4,851	1,543	9,663	3,390	2,016	6,309	27,206
	GDP growth (annual %)	6,283	1,344	8,124	2,554	-1,471	4,939	12,415
	Official Trade (% of GDP)	142,741	22,350	186,676	111,417	0,374	2,103	1,363

Note: Std Dev. is standard deviation; Max. is maximum; Min. denotes minimum; LCU indicates local currency unit; number of observations is 49. ***, ** & * signify significance level at 1%, 5% & 10% respectively.

Stationery Test Result

To assess the stationarity of the variables, the Augmented Dickey-Fuller (ADF) unit root test was applied. Results presented in Table 4 indicate that the series were non-stationary in their level form, regardless of whether a constant or constant with trend was included. However, upon differencing the data once, all series exhibited stationarity at conventional significance levels. Consequently, it was determined that all variables were integrated of order one.

NARDL Bound Test

Long-run cointegration among the variables was examined using the results presented in Table 5. The optimal lag structure for the NARDL model was determined through the Akaike Information Criterion (AIC).

The asymmetric bound F-statistic values for all eight ASEAN countries surpassed the 5% critical upper bound, providing empirical evidence of a non-linear long-run cointegration relationship among the variables. These findings reject the null hypothesis of no cointegration.

Moreover, the NARDL bounds testing confirms the presence of asymmetric long-run linkages between exchange rates, trade balance, and economic growth within the selected ASEAN economies.

Empirical Result

The long-run empirical findings on trade balance and economic growth are detailed in Tables 5 and 6, respectively. As indicated in Table 3, currency depreciation exerted a negative and significant influence on the trade balance of Brunei Darussalam and Singapore in the long run.

Conversely, currency appreciation negatively impacted the trade balance of Cambodia, Malaysia, Indonesia, Thailand, Philippine and Vietnam. However, these effects were not statistically significant for Singapore. While currency appreciation significantly improved the trade balance in Indonesia, Malaysia, and Thailand, its overall impact across the eight nations was less pronounced.

The results collectively suggest that exchange rate fluctuations, regardless of direction, primarily exert adverse effects on the long-run trade balance of the ASEAN countries examined.

Table 3: ADF unit root result

Countries	Series	Level		First difference	
		Constant	Constant with trend	Constant	Constant with trend
Brunai	FDI	—4.0225***	—4.3181***	–	–
	GDP	—8.9034***	—9.2869***	–	–
	EXR	0.6115	—1.9496	—4.4454***	—4.1310**
	TRD	—1.8716	—2.6082	—5.1583***	—5.1353***
Cambodia	FDI	—3.6663***	—3.6052**	–	–
	GDP	—3.8928**	—3.9196**	–	–
	EXR	2.7384	2.1503	—3.1676**	—3.7217**
	TRD	—2.3559	—2.2444	—10.369***	—10.385***
Indonesia	FDI	—3.8526***	—4.0091***	–	–
	GDP	—3.4341***	—4.3082***	–	–
	EXR	2.4415	0.6462	—5.2146***	—5.6940***

	TRD	—2.0632	—2.5375	—5.5677***	—5.5512***
Malaysia	FDI	—4.8744***	—5.1906***	–	–
	GDP	—5.5415***	—5.6967***	–	–
	EXR	0.1257	—2.2997	—6.2424***	—6.2222***
	TRD	—2.2939	—3.2336*	—7.9738***	—7.9446***
Philipina	FDI	—4.0852***	—7.8151***	–	–
	GDP	—3.914***	—4.3778***	–	–
	EXR	—1.7708	—2.1457	—4.5931***	—4.5673***
	TRD	—09197	—2.3549	—7.5563***	—6.0231***
Singapore	FDI	—4.1527***	—4.1109***	–	–
	GDP	—5.5696***	—5.6129***	–	–
	EXR	2.4792	—1.0357	—4.66155***	—5.2028***
	TRD	—2.8075*	—2.7554	—7.7583***	—7.6851***
Thailand	FDI	—3.3670**	—4.3329***	–	–
	GDP	—4.8016***	—4.7598***	–	–
	EXR	0.4422	—2.8666	—5.2754***	—5.3442***
	TRD	—2.0462	—2.2756	—6.7707***	—6.6945***
Vietnam	FDI	—1.1684	—1.9567	—5.5541***	—5.4797***
	GDP	—4.7091***	—4.6523***	–	–
	EXR	2.3447	1.4784	—3.5124**	—3.9221**
	TRD	—1.6860	—1.6732	—6.7651***	—6.6913***

Note: ***, ** & * signify significance level at 1%, 5% & 10% respectively.

Table 4: Non-linear ARDL Bound test results

Country(s)	Test statistics (F-Statistics)		Values
Vietnam	NARDL(trade balance model)		4.4258***
	NARDL(income growth model)		17.468***
Thailand	NARDL(trade balance model)		4.4743***
	NARDL(income growth model)		11.190***
Singapore	NARDL(trade balance model)		4.0880***
	NARDL(income growth model)		6.3022***
Philipina	NARDL(trade balance model)		5.8433***
	NARDL(income growth model)		8.8582***
Malaysia	NARDL(trade balance model)		4.7928***
	NARDL(income growth model)		31.649***
Indonesia	NARDL(trade balance model)		5.3439***
	NARDL(income growth model)		8.7986***
Cambodia	NARDL(trade balance model)		5.0658***
	NARDL(income growth model)		7.1633***
Brunai	NARDL(trade balance model)		4.4905***
[redacted]	NARDL(income growth model)		8.7561***
	Critical bounds values		
Level of significance	**Levels**	**1st difference**	
10%	2.2	3.09	
5%	2.56	3.49	
2.5%	2.88	3.87	
1%	3.29	4.37	

Note: ***, **, and * stand for 1%, 5% and 10% significance levels respectively.

The short-term effects of exchange rate fluctuations on the trade balances and economic growth of the selected ASEAN countries present a complex and nuanced picture.

With regard to trade balances, the findings (Table-5) suggest a counterintuitive relationship between exchange rate movements and trade performance in the short

run. While a depreciation of the local currency typically stimulates exports and improves trade balances, the results indicate that, for most of the examined countries, including Brunei an appreciation of the currency actually led to an enhancement of their trade balances. Conversely, only Singapore experienced a decline in trade balances due to currency appreciation.

Furthermore, the magnitude of these short-term effects is substantial, as evidenced by the statistical significance of the results for most countries at both the 1% and 5% levels. However, when considering the long-term implications, the picture changes dramatically. In the long run, both currency depreciation and appreciation tend to have insignificant negative impacts on trade balances, suggesting that the benefits of exchange rate adjustments for trade are primarily short-lived.

In contrast, currency appreciation generally exerted a negative influence on economic growth, although the magnitude of this effect was relatively small and statistically significant only for Singapore in ASEAN.

Overall, the findings suggest that the short-term dynamics of exchange rate fluctuations and their impact on the ASEAN economies are complex and vary across countries. While currency depreciation can provide some short-term benefits for trade and growth in certain cases, the long-term effects are generally muted.

Moreover, the negative consequences of currency appreciation on economic growth, although not as pronounced as the positive effects of depreciation, highlight the challenges faced by these countries in managing exchange rate volatility.

These results imply that policymakers in ASEAN countries need to carefully consider the potential short-term and long-term implications of exchange rate fluctuations when formulating economic policies. A deep understanding of the underlying factors driving these relationships is essential for designing effective strategies to mitigate adverse effects and maximize the benefits of exchange rate movements.

Diagnostic examination and structural stability test

Several diagnostic tests were conducted to validate the structural NARDL models, as shown in the lower sections of the short- and long-run estimation results in Tables 5 and 6. The diagnostic tests include checks for serial correlation, heteroskedasticity, normality, and functional form, as indicated in the tables.

Specifically, the Breusch-Godfrey LM test for serial correlation, the LM test for normality, the ARCH test for heteroskedasticity, and the Ramsey-Reset functional form test all support the presence of an asymmetric relationship in the model.

This is because the error terms are normally distributed and exhibit no serial correlation at the 5% significance level. Additionally, the functional form results confirm the correct specification of the models.

Furthermore, the stability of the NARDL models is verified using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) methods applied to the recursive residuals. For the model to be considered stable, the lower and upper bounds should remain within the blue lines, as outlined by Brown et al. (1975). The CUSUM and CUSUMSQ results for both models across all samples are illustrated in Fig. 2(a and b) – 9(a-b).

Table 5: Non-linear ARDL estimation results of exchange rate asymmetric and trade balance

	Brunei	Cambodia	Indonesia	Malaysia	Philipina	Singapore	Thailand	Vietnam
Asymmetric ARDL (long-run coefficients)								
EXR+	—0.1696*	—0.9405*	—4.5756*	0.0570	—3.4258***	—0.2086*	—0.3553*	1.6821
	(0.0929)	(0.5014)	(2.7423)	(0.1285)	(1.0741)	(0.1026)	(1.7758)	(1.6375)
EXR–	—0.4490	—7.9694**	1.9886	1.0462*	—9.0981***	—0.8747	—2.5135	41.520
	(0.4529)	(3.9004)	(18.497)	(0.5671)	(1.6667)	(0.8911)	(3.6010)	(29.773)
GDP	1.1735*	0.7134	—1.8450	—1.8144	—0.3125	2.5353***	3.9650**	2.4247
	(0.6940)	(0.5990)	(1.6354)	(1.1119)	(0.4718)	(0.8397)	(1.6396)	(1.5813)
FDI	17.966***	3.0102***	4.1263**	10.378***	0.5848	8.3291**	0.1520	5.0930**
	(4.3288)	(0.5586)	(1.8147)	(3.2023)	(1.4613)	(3.5318)	(1.8328)	(2.3806)
Constant	42.135***	89.389***	60.204***	59.600***	40.434***	16.539**	39.012***	9.4506
	(4..3561)	(4.4148)	(10.786)	(5.4649)	(4.5605)	(5.5216)	(5.0401)	(8.4432)
Asymmetric ARDL (short-run coefficients)								
Δ(TRD(-1))	0.6153***	0.4172**	0.8832***	0.4839***	0.5081***	—0.2561**	0.7529***	0.8224***
	(0.0930)	(0.1550)	(0.1575)	(0.1155)	(0.1457)	(0.1168)	(0.0876)	(0.0761)
Δ(EXR+)	0.4903**	—0.5117**	1.7433**	0.3988**	1.8624	—0.0430	4.1324***	0.2987
	(0.1384)	(0.2509)	(0.8281)	(0.1583)	(1.8550)	(0.0607)	(1.0599)	(0.2230)
Δ(EXR+(-1))	—0.1556**	0.1957	—0.4276	—0.1276	3.0619*	0.2838***	2.8705***	–
	(0.2105)	(0.3961)	(1.3374)	(0.1541)	(1.7873)	(0.0709)	(0.8680)	
Δ(EXR–)	—1.1861*	—6.9139*	—2.074*	—0.8157	—4.4753***	—0.3986	0.6211**	7.3727**
	(0.6687)	(3.6006)	(1.197)	(0.5130)	(1.4619)	(0.3789)	(0.2941)	(3.2987)
Δ(EXR–(-1))	1.0134	–	2.135	1.1244	–	–	–	–
	(0.6488)		(1.545)	(0.8775)				
Δ(GDP)	0.1597	0.6189	—0.5690	—0.0476	—0.1537	0.4015**	0.9797***	0.3791***
	(0.1757)	(0.6015)	(0.4165)	(0.3426)	(0.2150)	(0.1847)	(0.2171)	(0.0935)
Δ(GDP (-1))	0.2917*	–	–	1.1318***	–	—0.5943**	–	—0.1903*
	(0.1560)			(0.2463)		(0.2278)		(0.0954)
Δ(FDI)	4.0530***	1.6267***	1.2725**	2.3604*	0.2877	—0.6508	0.0376	—0.6828
	(1.4017)	(0.4601)	(0.5267)	(1.1660)	(0.7183)	(0.7970)	(0.4549)	(0.6489)
Δ(FDI(-1))	2.8579**	0.9848**	–	2.9953**	–	—3.5458***	–	1.5871*
	(1.4112)	(0.4698)		(1.1982)		(0.9944)		(0.8141)
ECT(-1)	—0.3847***	—0.8676***	—0.3084***	—0.5161***	—0.4918***	—0.4557***	—0.2471***	—0.1776***
	(0.0701)	(0.1560)	(0.0584)	(0.0803)	(0.1130)	(0.0743)	(0.0421)	(0.0364)
Adjusted R2	0.8153	0.5426	0.4480	0.6091	0.5640	0.5543	0.5966	0.4913
F-Statistics	23.554***	10.327***	14.073***	10.445***	41.831***	8.3074***	35.638***	27.540***

Durbin-Watson	1.7415	2.1054	2.0814	1.6675	1.8686	2.1388	1.8030	2.0266
Diagnostic test results								
Serial correlation	1.9474	2.5537	0.3710	0.8137	0.4683	0.5602	0.6289	0.6134
	(0.1578)	(0.0670)	(0.6928)	(0.4542)	(0.6298)	(0.7557)	(0.5389)	(0.5474)
Normality test	4.4708	2.1034	0.0997	0.9107	5.6193	1.1756	0.2877	1.1975
	(0.1070)	(0.2103)	(0.9514)	(0.6342)	(0.0602)	(0.3239)	(0.8660)	(0.5495)
Heteroskedasticity	0.4166	0.5466	1.8077	0.5449	1.4396	1.1063	1.7356	0.4818
	(0.9180)	(0.8566)	(0.1008)	(0.8912)	(0.2185)	(0.3932)	(0.1299)	(0.8772)
Functional form	1.5609	0.1762	0.6202	0.2970	0.4763	0.7716	0.5770	0.3388
	(0.1273)	(0.8612)	(0.5392)	(0.7688)	(0.6367)	(0.4468)	(0.5674)	(0.7368)

Variables Dependent Variables: Trade Balance (TRD)

Note: ***, **, and * stand for 1%, 5% and 10% significance levels respectively

DISCUSSION AND FINDING

The study initially confirms the presence of an asymmetric relationship between exchange rates, trade balance, and output growth, supporting previous research by Datta (2014), Divakaran and Gireeshkumar (2014), and Hooy et al. (2015), among others. In the short run, the findings show that both currency appreciation and depreciation positively influence ASEAN's trade balance and output growth, while they negatively impact output and trade in Singapore. For Indonesia and Thailand, exchange rate depreciation boosts trade and output in the short term, whereas appreciation leads to a decline in these indicators in the long term. A similar pattern is observed in Cambodia and Vietnam, except that the adverse effect of exchange rate depreciation on the trade balance is insignificant in both the short and long term. The results also reveal that in ASEAN, both appreciation and depreciation of the currency contribute to trade and output growth in the short run, contrasting with Malaysia, Philippine, and Brunei, where currency depreciation hampers trade and output. This difference is attributed to ASEAN's enhanced local production, which allows it to benefit more from exchange rate fluctuations compared to Nigeria. These findings are consistent with Divakaran & Gireeshkumar (2014), who found that the depreciation of the Yen improved Japan's exports and economic growth.

Datta (2014) observed that currency depreciation benefited India's trade balance, a finding consistent with Hooy et al. (2015), who noted that depreciation significantly boosts ASEAN's exports to China. The results for this research reflect its status as the most diversified, industrialized, and technologically advanced economy in ASEAN, as supported by Invest (2020). In contrast, Indonesia's economic vulnerability is tied to its heavy dependence on resource exports.

In Brunei, exchange rate asymmetries negatively affect long-term trade balance and growth, indicating that fluctuations in the Algerian Dinar are detrimental to the country's long-term trade and productivity. Similarly, Malaysia experiences adverse long-term growth effects due to exchange rate asymmetries, although currency asymmetries positively impact its trade balance.

For most countries in the sample, currency depreciation has a significant negative effect on long-term trade balance, while currency appreciation generally does not significantly impact trade. Therefore, in the long run, we can reject the hypothesis that currency depreciation does not significantly affect trade, but we accept the hypothesis that currency appreciation does not significantly influence trade at the 1%, 5%, and 10% significance levels. However, the short-run impacts are significant for the selected ASEAN countries. The adverse long-run effects imply that ASEAN nations, being import-dependent, do not gain substantial benefits from exchange rate asymmetries. This finding aligns with Paudel and Burke (2015) and Nasir & Jackson (2019), who reported that exchange rate misalignment significantly hindered the current account balance in several countries, although it contradicts Bahmani-Oskooee et al. (2018), who found that Lira appreciation and depreciation boosted domestic production in Turkey.

The significant reduction in ASEAN's trade due to currency depreciation supports the findings of Mesagan et al. (2021b), who reported that depreciation worsened productivity in both the capital market and financial sectors. It also agrees with Nasir & Simpson (2018), who found that Sterling depreciation adversely affected the trade balance in the United Kingdom. The negative impact of currency appreciation on ASEAN's long-term trade is consistent with the findings of Hodge (2015), Mesagan et al. (2018a), and Mei et al. (2020), who reported that exchange rate appreciation reduces local sector productivity.

The largely insignificant effect of exchange rate asymmetries on long-term output growth in ASEAN underscores the continent's low industrial productivity and reliance on primary exports. Currency appreciation makes local exports more expensive, and the low productivity combined with the higher cost of imported manufactured inputs offsets potential benefits from currency depreciation. This finding echoes Eegha & Mesagan (2017) regarding energy-dependent ASEAN countries and Charles et al. (2018), who attributed this scenario to a lack of export diversification. It also aligns with Mesagan et al. (2021a), who found that exchange rate movements hampered Nigeria's manufacturing sector performance. The asymmetric effects on both trade and growth are consistent with the findings of Bahmani-Oskooee & Nasir (2020) and Bahmani-Oskooee et al. (2021), who identified an asymmetric relationship between exchange rate volatility and trade balance. Similarly, Nasir & Leung (2021) confirmed the presence of both short- and long-run asymmetries between exchange rates and trade balance. Regarding the hypothesis testing, we can accept the null hypothesis that currency appreciation and depreciation do not significantly impact long-term output growth at the 1%, 5%, and 10% significance levels. As with trade balance, the short-run impacts are significant for most of the selected ASEAN countries at lag 1. Compared to developed countries, the long-run result is due to the limited contribution of ASEAN primary exports to the global market, resulting in less substantial benefits from exchange rate movements for the continent.

CONCLUSION

The existing literature has typically explored the relationship between exchange rates and output growth, or trade and output growth, using linear cointegration methods. This study advances previous research by applying the newly developed Nonlinear Autoregressive Distributed Lag (NARDL) model to assess how currency appreciation and depreciation impact trade balance and output growth in select ASEAN countries. The findings reveal that in ASEAN, both exchange rate appreciation and depreciation positively influence these indicators in the short run. In Indonesia, however, both positive and negative shifts in exchange rates have a detrimental effect on trade balance and output growth.

For Brunei and Malaysia, exchange rate appreciation boosts short-term trade and growth, while depreciation negatively impacts long-term trade and growth. Similar outcomes were observed in Cambodia and Vietnam, though the adverse effect of currency depreciation on trade balance was not statistically significant in either the short or long term. The results for Singapore, Brunei, and Vietnam showed mixed impacts of currency fluctuations on these indicators. The study concludes that the effects of currency appreciation and depreciation on trade balance and output growth are asymmetric across the continent.

The findings suggest that considering these asymmetries is crucial for understanding the factors influencing trade and output growth. To combat economic recessions and sustain growth, ASEAN countries should focus on enhancing their capacity to export manufactured goods rather than primary goods. This shift could improve their trade balances and stabilize exchange rates, thereby fostering trade surpluses and domestic output growth. ASEAN leaders are encouraged to invest significantly in key productive sectors like manufacturing and to promote intra-ASEAN trade to create economic linkages and enhance overall economic growth. Additionally, further studies could explore how exchange rate asymmetries affect other macroeconomic factors to help ASEAN nations develop more resilient economic recovery models.

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