

The border effect on Vietnam's trade balance with ASEAN countries



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ARTICLE INFO

Article history:

Received 14 July 2024

Received in revised form

2 November 2024

Accepted 3 November 2024

Keywords:

Trade balance

Border effect

Economic scale

Tariff impact

ASEAN trade

ABSTRACT

This article uses a panel data model, applying both the Fixed Effects Model (FEM) and the Random Effects Model (REM), to analyze how economic scale, tariffs, and geographic location affect Vietnam's trade balance with ASEAN countries. The findings show that the border effect has a stronger influence than other economic factors on Vietnam's trade balance with these countries. Based on these results, the article suggests strategies for the Vietnamese government and export businesses to reduce the trade deficit with ASEAN nations. The aim is to increase the added value of Vietnam's imports and exports within ASEAN, supporting balanced growth in both intra-ASEAN and external trade.

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1. Introduction

In 2015, Vietnam achieved a significant milestone in its international economic integration. This year saw the announcement of the conclusion of negotiations for two major free trade agreements—the Vietnam-European Union Free Trade Agreement and the Trans-Pacific Partnership Agreement. Additionally, the ASEAN Economic Community (AEC) was established by the end of 2015. With a population of approximately 600 million people (about 9% of the global population) and representing 38% of the world's average income, the AEC emerged as a large and promising market. However, it also introduced numerous challenges for businesses in member countries (Nguyen and Bui, 2021).

In the goods sector, although the AEC was officially formed in 2015, efforts toward trade liberalization have been underway since 1999. Between 2005 and 2014, ASEAN progressively enhanced trade liberalization, aligning with tariff reduction commitments made under agreements between ASEAN and external partners. By 2015, over 90% of tariffs within ASEAN had been reduced to 0%, with the remaining tariffs scheduled for further reduction until 2018. By then, the roadmap for trade liberalization in goods among AEC

countries was nearly complete (Albahouth and Tahir, 2024).

Despite these advancements, Vietnam has consistently experienced trade deficits with several ASEAN countries, importing more goods and services than it exports. This trade imbalance can be attributed to various factors, such as differences in industrial structures, production capabilities, and levels of competitiveness.

The trade deficits have both positive and negative implications for Vietnam. On the positive side, they enable the inflow of capital goods and advanced technology necessary for economic growth. However, prolonged trade deficits may strain Vietnam's foreign exchange reserves, affect economic stability, and challenge its long-term financial sustainability (Asada, 2020).

Most research attributes the trade deficit to the nature of import and export structures between Vietnam and ASEAN. Vietnam tends to export semi-processed products while importing industrial machinery and equipment from the region. However, few studies have explored the influence of economic scale and geographical proximity on Vietnam's trade balance with ASEAN. This study aims to examine the financial and geographical factors affecting the trade balance between Vietnam and ASEAN (Aba, 2021).

2. Literature review and empirical studies

There are many different approaches and theories about trade balance. The elasticity approach supports the view that the nominal exchange rate is a determinant of the trade balance. This approach introduces the Marshall-Lerner condition, according to which a devaluation will improve the trade

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<https://doi.org/10.21833/ijaas.2024.11.017>

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balance if the sum of the exchange rate elasticities of exports and imports is greater than 1. However, It should be noted that this condition only ensures that the trade balance will improve at the new equilibrium point but does not ensure that the trade balance gets better or worse during the adjustment process to the equilibrium point. The J curve effect is introduced to study the change over time in the trade balance when devaluing the domestic currency. Accordingly, the trade balance will initially worsen and then improve to a level better than the state before the devaluation.

The multiplier approach applies to a small and open economy, where exports are an exogenous variable. Suppose the trade balance equilibrium is disrupted by an increasing trend in exports, resulting in a trade surplus. The increase in exports raises income, which in turn increases imports through the marginal propensity to import. The rise in imports will offset the initial increase in exports. Whether the trade balance adjusts back to equilibrium depends on how the increase in imports compares to the prior increase in exports.

The monetary approach suggests that a trade balance imbalance reflects a mismatch between the supply and demand for money in the money market. Specifically, any monetary imbalance affects the total expenditure on goods and services. An excess supply of money leads to consumption exceeding income. Conversely, an excess demand for money results in consumption falling below income. This impact will be transmitted to the trade balance.

The expenditure approach considers both the income effect and the price effect of devaluation, unlike the elasticity approach. This theory suggests that a trade deficit means spending more than the income (output produced by the country).

To (2022) studied the factors affecting Vietnam's trade balance during the period 1997-2015 based on the estimation of a constrained VECM (Vector Error Correction Model). The results show that greater openness worsens the trade balance. A high initial value of net foreign assets (NFA) will lead to a decrease in the trade balance in the long term. Financial system development helps improve the trade balance, while higher average income may worsen it. The real effective exchange rate (REER) does not have a strong correlation with the trade balance. An increase in FDI may increase the trend of trade deficits in Vietnam. Financial liberalization is found to contribute to the improvement of the trade balance in the long term.

Alam et al. (2023) utilized the Global Vector Autoregression (GVAR) model to examine how macroeconomic shocks from major trading partners, particularly China, affect the trade balance of ASEAN countries. Their study highlights that shocks to China's GDP and trade volume significantly impact the economies of its trading partners in the ASEAN region. The findings suggest that, in the long term, the depreciation of the Chinese Yuan (CNY) leads to a trade balance surplus for China and select ASEAN nations while causing a deterioration in the trade

balance of countries more reliant on Chinese imports.

Duasa (2007) investigated the short- and long-term relationships between the trade balance, real exchange rates, income, and money supply in Malaysia. The study includes income and money variables to explore the monetary and absorption approaches to the balance of payments, in addition to the traditional elasticity approach using exchange rates. Utilizing the bound testing approach to cointegration and error correction models within an autoregressive distributed lag (ARDL) framework, the research examines whether a long-term equilibrium relationship exists between the trade balance and its determinants. Furthermore, variance decompositions (VDC) and impulse response functions (IRF) are simulated for additional insights. The results reveal a long-term relationship between the trade balance and the income and money supply variables, but not with the real exchange rate. The findings also indicate that the Marshall-Lerner condition does not hold in the long term for Malaysia, suggesting that policy considerations should focus on the absorption and monetary approaches to the trade balance and balance of payments.

Alessandria et al. (2017) analyzed China's growth and integration in trade and finance using a two-country DSGE model with dynamic exporting, pricing-to-market, incomplete financial markets, and aggregate shocks. They examine the impact of changes in technology, trade costs, and preferences on China's trade flows, export participation, real exchange rate, and growth from 1990 to 2014. The study finds a significant decline in bilateral trade barriers, which persisted but were not permanent, with a gradual reduction phase. Since the Great Recession, bilateral barriers have stabilized at low levels, although barriers to Chinese imports have increased relative to exports. Trade stagnation since 2011 is attributed to the completion of past trade reforms, not new barriers or slowed integration. Trade is projected to decline by almost 1 percent annually starting in 2017. Changes in trade barriers significantly influenced China's trade balance and foreign asset accumulation, accounting for 70 percent of the foreign assets accumulated by 2014. These changes also increased ROW consumption by 11.9 percent and employment by 0.6 percent while reducing ROW output by less than 1 percent relative to 1990.

Hai and Thang (2017) used a stochastic gravity model to assess Vietnam's trade efficiency with its main partners from 1995 to 2015. They found that Vietnam's actual trade was significantly below potential efficiency levels and was influenced by natural and man-made trade barriers. Results show exports are more efficient than imports. Vietnam's AFTA membership generally enhances trade efficiency, while tariffs and domestic currency devaluation hinder it. They suggest Vietnam should join more FTAs and remove man-made barriers to enhance trade efficiency.

Hiratsuka et al. (2008) employed a probit regression empirical model to evaluate the extent to which businesses utilize the benefits of existing Free Trade Agreements (FTAs) in ASEAN. Their findings reveal that the proportion of enterprises taking advantage of FTAs in ASEAN is relatively low despite minimal restrictions on origin standards regulation within ASEAN. This is attributed to the high administrative costs and inefficiency of administrative procedures, particularly in Malaysia, the Philippines, and Vietnam. Furthermore, the study indicates that firms with larger labor forces are more likely to use FTAs, suggesting that the benefits of existing FTAs are not uniformly distributed. Additionally, the utilization of FTAs within ASEAN appears to be industry-specific: While the textile and garment industry effectively leverages FTAs, industries such as electrical, electronic, and precision machinery do not, with only substantial reductions in preferential tax rates encouraging their use of FTAs.

Kawai and Wignaraja (2007) utilized the CGE model through global trade analysis to assess the impact of five FTA scenarios in East Asia: (1) ASEAN + China FTA, (2) ASEAN + Korea FTA, (3) ASEAN + Japan FTA, (4) ASEAN+3 FTA, and (5) ASEAN+6 FTA. Their analysis reveals that two East Asian-scale FTA scenarios, ASEAN+3 and ASEAN+6, offer greater benefits to global economic income than any of the ASEAN+1 FTA scenarios, with ASEAN+6 exerting a stronger influence than ASEAN+3. The anticipated income changes for ASEAN member countries in 2017 under the ASEAN+6 scenario are substantial: Thailand (12.8%), Vietnam (7.6%), Malaysia (6.3%), and Singapore (5.4%).

Similarly, Itakura (2013), using the CGE model and GTAP database, analyzed the impact of the ASEAN+1 free trade area, the free trade area between Japan, China, Korea, and RCEP. This study considers not only tariff reductions but also the effects of services trade liberalization and trade facilitation. The simulation results indicate that RCEP significantly enhances the benefits for member countries compared to the ASEAN+1 free trade areas. Moreover, the liberalization of trade in services and the development of trade support services bring notable benefits to member countries, especially to low-income economies within ASEAN.

Over the past years, several studies have explored the effects of border barriers from various perspectives. Nitsch (2000) provided insights into how national borders affect trade within the European Union, revealing that while EU membership has reduced border effects, trade barriers persist due to differences in tariffs and regulations. He and Wang (2019) extended the analysis to cross-border e-commerce among ASEAN countries, showing that although e-commerce can mitigate some traditional barriers, factors such as tax regulations and logistics continue to influence transactions. Capello et al. (2018) focused on cross-border regions in Europe and found that although regional policies may lessen border effects, these

barriers remain significant in areas close to the borders. Medeiros et al. (2021) investigated the impact of the COVID-19 pandemic and found that lockdown measures have exacerbated border effects, complicating cross-border trade and introducing new challenges. Finally, Coughlin and Novy (2021) examined how spatial aggregation affects the estimation of border effects, indicating that adjusting the spatial analysis level is crucial for a more accurate understanding of border impacts. These studies collectively demonstrate that border effects continue to influence trade, albeit to varying degrees, depending on the region, research area, and period.

The intertemporal approach can be seen as an extension of the expenditure approach, adding the assumption that saving and investment decisions take the future into account. The intertemporal approach also considers relative prices as a determinant of saving and investment. It can be regarded as a modern combination of the elasticity and expenditure approaches. This model shows that fluctuations in the current account (or trade balance) reflect factors affecting consumption, saving, and national investment over time.

Each approach attempts to explain fluctuations in the trade balance from different causes; however, they all face some weaknesses. The elasticity approach primarily studies the short-term impact of exchange rate changes on the trade balance due to its partial equilibrium nature. The monetary approach relies on the strong assumption that spending results from adjustments in the supply and demand for money. The multiplier approach and the expenditure approach do not account for the price effect of devaluation. The intertemporal approach lacks consensus on the economic agents involved.

Therefore, in this study, the author focuses on examining the economic factors affecting Vietnam's trade balance with ASEAN countries, including Gross Domestic Product, tariffs, Liner Shipping Connectivity, and the border effect based on the following arguments:

- Gross domestic product has a significant impact on a country's export and import volumes through the following mechanisms: GDP growth often accompanies an increase in consumption and production demand. When a country's economy grows strongly (GDP increases), domestic demand for goods and services can rise sharply. This encourages domestic businesses to develop and creates a demand for raw materials, machinery, and goods from other exporting countries. GDP growth also usually comes with enhanced competitiveness of a country's goods and services in the international market. When the economy is robust, businesses can invest in improving product quality, increasing labor productivity, and enhancing production technology. This helps increase the competitiveness of export goods in the international market and boosts export volumes. With GDP growth, domestic consumption demand also increases, which can lead to increased imports

of goods that the country cannot produce sufficiently to meet domestic needs. Therefore, GDP growth can lead to an increase in a country's import volumes. Thus, GDP growth can affect overall trade by increasing the value of exports or imports. This fluctuation can alter the country's trade balance. In summary, GDP has a substantial impact on a country's export and import volumes through factors such as economic growth, consumption and production demand, and international competitiveness. These factors are closely related to the balance of a country's trade.

- Tariffs have a significant impact on a country's trade balance through the following mechanisms: Tariffs are fees that importers must pay when bringing goods from abroad into the country. When high tariffs are applied, the cost of imports increases due to these fees, which can reduce the volume of goods imported from other countries. As a result, the trade balance may improve with a lower quantity of imported goods, or it may even lead to a gradual reduction in the trade deficit. Tariffs can be applied to protect domestic production by making imported goods more expensive than domestic goods. In this case, domestic businesses may gain a competitive advantage and reduce their dependence on imported goods. This can lead to an improved trade balance by decreasing the need to import goods from other countries. When high tariffs are imposed on imported goods, their prices may increase. This can encourage consumers and domestic businesses to use and produce local products instead of importing. As a result, increased domestic production and consumption can help improve the trade balance by reducing dependence on imported goods. If a country imposes high tariffs on goods imported from trade partners, those countries may retaliate by imposing retaliatory tariffs on exports from the first country. This can lead to a trade war and cause fluctuations in the trade balances of the countries involved. In summary, tariffs have a significant impact on a country's trade balance by affecting the volume of imported goods, encouraging domestic production, and potentially leading to trade retaliation from other countries.
- Liner shipping connectivity of a country has a significant impact on its trade balance through the following mechanisms: The transportation capacity of a country directly affects the cost and time of transporting goods. If a country has an efficient logistics system and developed transportation infrastructure (such as seaports, airports, and road and rail systems), transportation costs will be lower and shipping times shorter. This reduces the overall costs for businesses when importing and exporting goods, helping to improve the trade balance by making the country's goods more competitive in the international market. Liner Shipping Connectivity also determines a country's

ability to access export markets. If a country can easily transport goods to major consumption markets globally, domestic businesses will have more opportunities to expand their export markets. This can lead to increased export volumes and an improved trade balance. Liner Shipping Connectivity also enables a country to participate in global supply chains. The ability to quickly and efficiently transport goods across different countries and regions increases the flexibility of businesses and production systems. This can help reduce production costs and promote international trade growth, balancing the trade balance by either increasing exports or reducing imports, depending on the situation. Liner Shipping Connectivity is a fundamental factor in developing international trade. A country with good transportation connectivity often has a greater competitive advantage in attracting foreign investment and expanding export markets. This can lead to economic growth and an improved trade balance. In summary, a country's Liner Shipping Connectivity has a profound impact on its trade balance by reducing transportation costs, enhancing market access, expanding global supply chains, and providing a foundation for international trade development. These factors positively affect the ability to increase exports and manage a country's trade balance.

- The border effect is a phenomenon where trade and economic activities are influenced by the existence of national borders, even though the distance between trade points may not be significant. This effect can impact a country's trade balance in several ways: National borders can reduce the level of trade between countries due to factors such as tariffs, customs regulations, non-tariff barriers, transportation costs, and differences in language and culture. This can decrease exports and imports, directly affecting the trade balance. Legal regulations and administrative procedures related to borders can increase transaction costs for businesses. These costs may include import taxes, international transportation costs, and costs for complying with different safety and quality regulations. Increased transaction costs can reduce the competitiveness of export goods, leading to a decrease in exports and a deterioration of the trade balance. Countries with shared borders can form free trade areas or economic unions to reduce trade barriers and optimize production costs. This can improve the trade balance by enhancing economic cooperation and increasing intra-regional exports. National borders can influence the investment decisions of multinational companies. Companies may choose to invest directly in a country to avoid trade barriers, which can lead to increased exports from that country and an improved trade balance. In summary, the border effect can significantly impact a country's trade balance by reducing cross-border trade, increasing transaction costs, creating special economic areas, influencing investment decisions,

and changing trade policies. The specific impact may vary depending on the country and its specific economic context.

3. Econometric model

The empirical model of interest is expressed as:

$$TB_{ij} = \alpha_0 + \alpha_1 GDP_i + \alpha_2 GDP_j + \alpha_3 TRF_i + \alpha_4 TRF_j + \alpha_5 LSCI_i + \alpha_6 LSCI_j + \alpha_7 BE_{ij} + e_{ij}$$

where, TB_{ij} denotes the trade balance between Vietnam (j) and ASEAN countries (i). The model includes GDP measures (Gross Domestic Product) for Vietnam (j) and ASEAN countries (i), TRF (tariff

rates), LSCI (liner shipping connectivity index), and BE (border effect on Vietnam's trade with ASEAN).

The research variables, their definitions, and associated hypotheses are summarized in Table 1.

Panel data methodology is employed for model estimation, utilizing both cross-sectional and time series components. This approach allows for robust parameter estimation and facilitates the analysis of changes over time and across different groups, leveraging the unique characteristics of each unit (country) in the dataset. Two prominent panel data techniques, Fixed Effects Model (FEM) and Random Effects Model (REM), are utilized to account for individual unit effects and differences across units, respectively.

Table 1: Description of research variables and hypotheses

Variable	Variable interpretation and unit	Research hypothesis	Data source
Trade	Trade balance (export/import ratio, USD thousand)		UN Comtrade
GDP	Gross domestic product (USD)	+/-	World Bank
TRF	Tariff rate (mean, %)	+/-	World Bank
LSCI	Liner shipping connectivity index (normalized index)	+/-	World Bank
BE	Border effect (1 for shared border, 0 otherwise)	+/-	

4. Empirical results and discussion

4.1. Estimation by regression model using least squares method

The empirical analysis begins by estimating the factors that influence Vietnam's trade balance with ASEAN countries using the pooled ordinary least squares (POOL OLS) regression model. This method provides an initial understanding of the relationships between the dependent variable (trade balance) and the key independent variables, including GDP, tariff rates, liner shipping connectivity, and border effects. As shown in Table 2, the estimation results highlight the significant role of the border effect (BE) on Vietnam's trade balance, while other variables, such as GDP and tariff rates,

show limited statistical significance. However, diagnostic tests reveal potential issues with multicollinearity and autocorrelation, suggesting the need for more robust estimation methods to ensure reliable results.

To assess the level of multicollinearity in the linear regression model, the study continues to perform the Variance Inflation Factor (VIF) test. Multicollinearity occurs when independent variables in the model are highly correlated with each other, which can reduce the accuracy of coefficient estimates and increase their variance. The results of the VIF test measure the degree of multicollinearity among the independent variables in the POOL OLS model, as shown in Table 3.

Table 2: Estimation results by regression model using least squares method (POOL OLS)

TB	Coef.	SE	t	P>|t|	Beta
GDP _i	7.84e-14	1.78e-12	0.04	0.965	.0086507
GDP _j	8.53e-13	7.72e-12	0.11	0.912	.0325473
TRF _i	-.0428649	.0616388	-0.70	0.488	-.0630086
TRF _j	.0333908	.1899466	0.18	0.861	0.861
LSCI _i	.000411	.0082534	0.05	0.960	0.960
LSCI _j	-.0206013	.0410915	-0.50	0.617	0.617
BE _{ij}	3.159548	1.30971	2.41	0.017	.4207808
_cons	2.07005	2.418808	0.86	0.394	

TB: Trade balance; Coef.: Coefficient; SE: standard error; t: T-statistic; P>|t|: P-value (probability of observing the statistic under the null hypothesis); Beta: Standardized coefficient; _cons: Constant term

Table 3: The results of the VIF test

Variable	VIF	1/VIF
GDP _j	13.00	0.076894
LSCI _j	13.00	0.076905
GDP _i	5.79	0.172594
BE _{ij}	4.56	0.219275
TRF _j	3.74	0.267084
LSCI _i	1.98	0.504534
TRF _i	1.23	0.812642

VIF: Variance inflation factor; GDP_j: Gross domestic product of Vietnam; LSCI_j: Liner shipping connectivity index of Vietnam; GDP_i: Gross domestic product of ASEAN countries; BE_{ij}: Border effect; TRF_j: Tariff rate in Vietnam; LSCI_i: Liner shipping connectivity index of ASEAN countries; TRF_i: Tariff rate in ASEAN countries

The high VIF values (above 10) indicate a strong correlation between the variables GDP_j and LSCI_j.

This suggests high multicollinearity between Vietnam's GDP and its Liner Shipping Connectivity

Index, potentially undermining the reliability of their respective estimates. Other VIF values such as GDP_i , BE_{ij} , TRF_j , $LSCI_i$, and TRF_i are reasonably low, with VIFs under 5, indicating no significant issues of multicollinearity for these variables.

To test the hypothesis of heteroskedasticity, the study continues to conduct the White test. The results of the White test indicate insufficient evidence to reject the hypothesis of heteroskedasticity in the POOL OLS model ($p=0.8765$). This suggests that the errors with non-constant variance across panel units are not a significant issue in the POOL OLS model.

Finally, to test for the presence of autocorrelation in the model panel data, the study conducted the Wooldridge test. The results of the Wooldridge test indicate the presence of first-order autocorrelation in your panel data ($p=0.0000$). This suggests that the errors in the POOL OLS model exhibit a tendency to be autocorrelated over time, which could affect the accuracy of parameter estimates. In summary, these results indicate that the POOL OLS regression model

has some issues that need addressing. Specifically, there are concerns regarding autocorrelation and multicollinearity among certain key variables. To improve the model, the paper will apply methods such as the FEM to control for unit-specific fixed effects and reduce multicollinearity or the REM to address autocorrelation in the data.

4.2. Estimation according to fixed effects and random effects models

The fixed-effects regression results in Table 4 suggest that factors such as the Liner Shipping Connectivity Index of ASEAN countries play a significant role in influencing the trade balance, while other factors like GDP and tariff rates do not show significant effects in this fixed-effects model. The presence of a high intra-class correlation coefficient (ρ) suggests that individual-specific factors have a substantial impact on the trade balance within the panel data context.

Table 4: Estimation results FEM

TB	Coef.	SE	t	P>|t|	[95% Conf. interval]	
GDP_i	6.16e-13	2.69e-12	0.23	0.819	-4.72e-12	5.95e-12
GDP_j	-4.57e-12	7.88e-12	-0.58	0.563	-2.02e-11	1.10e-11
TRF_i	-.1028845	.2139691	-0.48	0.632	-.5267555	.3209866
TRF_j	.1374608	.1800139	0.76	0.447	-.2191453	.4940669
$LSCI_i$	.1438634	.0454048	3.17	0.002	.0539168	.23381
$LSCI_j$	-.0194628	.0380842	-0.51	0.610	-.0949074	.0559818
BE_{ij}	0 (omitted)					
_cons	-2.600853	2.79551	0.354	-8.138737	2.937031	2.937031

The results of the REM model in Table 5 indicate that the estimated coefficients for variables such as GDP_i , GDP_j , TRF_i , TRF_j , $LSCI_i$, and $LSCI_j$ are not statistically significant ($P > 0.05$), suggesting that they do not have a significant impact on the dependent variable-the trade balance between Vietnam and ASEAN countries. The BE variable has

an estimated coefficient of 3.428195, with a 95% confidence interval ranging from 0.189 to 6.667, and is statistically significant with $P=0.038$. This implies that the border effect has a significant impact on the dependent variable- the trade balance between Vietnam and ASEAN countries.

Table 5: Estimated results by REM

Trade	Coef.	SE	t	P>|t|	[95% Conf. interval]	
GDP_i	7.84e-14	1.78e-12	0.04	0.965	-3.41e-12	3.57e-12
GDP_j	8.53e-13	7.72e-12	0.11	0.912	-1.43e-11	1.60e-11
TRF_i	-.0428649	.0616388	-0.70	0.487	-.1636747	.0779448
TRF_j	.0333908	.1899466	0.18	0.860	-.3388977	.4056793
$LSCI_i$	.000411	.0082534	0.05	0.960	-.0157652	.0165873
$LSCI_j$	-16131.94	32062.97	-0.50	0.615	-78974.2	46710.33
BE_{ij}	3.159548	1.30971	2.41	0.016	.5925629	5.726532
_cons	2.07005	2.418808	0.86	0.392	-2.670727	6.810827

The Hausman test was performed to determine whether to use the FEM or the Random Effects Model (REM), with the result ($Prob = 0.0690$) greater than 0.05, favoring the REM model. However, a heteroscedasticity test for the REM model showed $Prob = 0.0359$, indicating the presence of

heteroscedasticity, while an autocorrelation test revealed $Prob = 0.0000$, confirming autocorrelation. To address these issues, the Generalized Least Squares (GLS) model was applied, and the results are summarized in Table 6.

Table 6: Estimated results according to the GLS model

TB	Coef.	SE	t	P>|t|	95% Conf. interval	
GDP_i	-4.90e-13	1.15e-12	-0.43	0.670	-2.74e-12	1.76e-12
GDP_j	5.90e-13	2.22e-12	0.27	0.790	-3.76e-12	4.94e-12
TRF_i	-.0189386	.0369716	-0.51	0.608	-.0914015	.0535243
TRF_j	-.040652	.0541277	-0.75	0.453	-.1467404	.0654363
$LSCI_i$	-.0010275	.0066263	-0.16	0.877	-.0140148	.0119599
$LSCI_j$	-.0083098	.0087392	-0.95	0.342	-.0254383	.0088187
BE_{ij}	3.592167	1.092125	3.29	0.001	1.451642	5.732692
_cons	1.632843	.8581171	1.90	0.057	-.0490361	3.314721

Based on the results from the GLS model in Table 6, it is evident that the Border Effect (BE) has a significant and positive impact on Vietnam's trade balance with ASEAN countries. Specifically, the coefficient for BE_{ij} is 3.592167 with a p-value of 0.001, indicating that the border effect not only has an impact but a substantial one on the trade balance. The positive coefficient suggests that reducing trade barriers or enhancing economic and trade connectivity between Vietnam and ASEAN countries improves Vietnam's trade balance. In other words, decreasing geographical distance or improving trade conditions between countries can increase Vietnam's exports and enhance its trade balance.

Conversely, other factors in the model—such as Vietnam's Gross Domestic Product (GDP_i) and that of partner countries (GDP_j), tariffs and trade barriers of Vietnam (TRF_i) and those of partner countries (TRF_j), and the Logistics Performance Index (LSCI_i) and (LSCI_j)—do not show significant effects on the trade balance. These variables lack statistical significance (with p-values greater than 0.05), indicating that, within the current dataset, these factors do not have a substantial impact on the trade balance.

This suggests that although variables such as GDP, tariffs, and logistics performance are crucial in international trade studies, the border effect appears to play a more significant role in influencing the trade balance in this context. To enhance the trade balance, Vietnam should focus on reducing trade barriers and improving connectivity with ASEAN countries. Policies aimed at fostering greater economic and trade cooperation are likely to yield substantial benefits in enhancing Vietnam's trade balance.

5. Conclusion and policy implications

The research results indicate that the Border Effect may have a positive impact on the trade balance between Vietnam and ASEAN countries. This finding is quite consistent with reality because countries with shared borders often have lower transportation costs due to shorter distances and better transportation infrastructure. Deliveries across borders are usually faster than those by sea or air, helping to minimize waiting times and storage costs. Countries with shared borders often have close cultural and social relationships, which enhances trust and business cooperation between enterprises. Proximity in language and customs helps reduce communication and understanding barriers, creating favorable conditions for business. Neighboring countries often have interconnected supply chains and production areas, which optimize production costs and enhance economic efficiency. Border regions frequently experience rich exchanges of resources and agricultural products due to favorable geographical and natural conditions.

The trade balance between Vietnam and its ASEAN neighbors, who share a border between Cambodia, Laos, and Thailand, reflects a dynamic

and varied economic relationship. With Cambodia, Vietnam generally maintains a trade surplus by exporting textiles, processed foods, and construction materials while importing primarily rice and agricultural products. This positive trade balance is supported by trade agreements that reduce tariffs and barriers, facilitating smoother exports from Vietnam. Similarly, Vietnam has a trade surplus with Laos, exporting machinery, electronics, and construction materials while importing mainly agricultural products and minerals from Laos. This surplus is bolstered by joint infrastructure projects and economic cooperation. However, trade with Thailand can lead to a trade deficit in some years, as imports of machinery, chemicals, and automobiles from Thailand may exceed exports of textiles and processed foods. Trade agreements within the ASEAN framework and differences in production capabilities influence this trade balance. To improve the trade balance, Vietnam needs to continue investing in infrastructure, reduce transaction costs, and implement effective trade policies. Enhancing export product quality, negotiating new trade agreements, and addressing regulatory challenges is crucial for optimizing the trade balance with its ASEAN neighbors.

Based on research, several policy implications can help Vietnam reduce its trade deficit with ASEAN countries. First, strengthening and expanding Free Trade Agreements (FTAs) with ASEAN members is crucial for lowering both tariffs and non-tariff barriers, thereby improving market access and trade balance. Establishing joint economic zones at borders can further facilitate trade by streamlining regulations and reducing bureaucratic obstacles. Enhancing transportation infrastructure, including roads, railways, seaports, and airports, will improve logistics efficiency, lower costs, and bolster Vietnam's export competitiveness. Increasing the efficiency of the logistics system through advanced technologies and better warehousing practices will also help reduce transportation costs and delivery times. Promoting investment in high-value-added industries will enable Vietnam to move up the value chain, diversifying its export base and enhancing product quality. Fostering technological cooperation with ASEAN countries can improve production capacities and innovation, contributing to higher-quality exports. Strengthening supply chain linkages with ASEAN businesses will optimize operations and reduce costs, benefiting both production and pricing strategies. Creating industrial parks and export processing zones connected with ASEAN countries will optimize production costs and improve economic efficiency by providing necessary infrastructure and regulatory support.

Investing in the education and training of a highly skilled workforce will meet the demands of modern industries and enhance productivity. Additionally, enhancing training cooperation and personnel exchanges with ASEAN countries will facilitate knowledge transfer and the adoption of advanced management practices. Conducting trade fairs,

exhibitions, and promotional activities in ASEAN markets will increase the visibility of Vietnamese products while leveraging modern marketing channels and social media to effectively reach regional consumers. Simplifying administrative procedures and reducing legal barriers will create a more favorable export environment, and implementing financial, credit, and insurance support policies will help manage risks and enhance competitiveness.

By adopting these measures, Vietnam can improve its trade balance with ASEAN, minimize the trade deficit, and strengthen the competitiveness of its products and services in the regional market.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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