



## **Factors affecting export turnover of Vietnamese fresh fruits to Asian market**

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### **Abstract**

*This research aims to explore the determinants of export turnover of fresh fruit from Vietnam to the Asian market in the period 2007-2020. The selected market countries are the Asian countries and territories that import the largest fresh fruit from Vietnam. Gravity model is applied to clarify nine factors affecting fruit export turnover, including: the economic size of both Vietnam and the importing country, the economic development gap, geographic distance, fruit acreage, maximum pesticide residue levels, participation in the WTO and free trade agreements, and the climate of importing countries. The two factors of tariff and Vietnam's global competitiveness index do not show statistical significance.*

**Keywords:** fruit export, agricultural market, export turnover.

**JEL Classification:** C21, F13, F14, F15, Q17.

**1. Problem statement**

Trade in goods, particularly fruit and vegetable products, is becoming increasingly popular due to numerous bilateral and multilateral trade agreements aimed at eliminating tariff and non-tariff barriers. Seasonal differences and unfavorable natural conditions lead to a shortage of domestic supply and rising prices, encouraging consumers to look for products from abroad (Buzby, 2001). In addition, fruits are considered essential goods, with consumption rising markedly in recent years (Dias, 2010).

Up to now, the added value of Vietnam’s agricultural exports, including fresh fruits, has remained limited due mainly to poor quality and the predominance of raw exports. In the context of deepening global integration and intensifying international competition, creating sustainable competitive advantages is essential for Vietnam’s fresh fruit industry. Therefore, it is necessary to investigate the factors affecting Vietnam’s fresh fruit exports to identify strategic directions that can enhance competitiveness, expand market access across Asia, and ultimately increase export turnover for this industry.

**2. Research method**

**2.1. Research model and hypothesis**

Based on the works of Nguyen (2017), Tran and Truong (2017), Muhammad *et al.* (2017), Ngo (2016), and taking into account the specific characteristics of Vietnam, the research adapts the basic gravity model developed by Krugman and Maurice (2005) in combination with the expectation hypothesis. Accordingly, the authors rewrote the proposed equation for factors affecting the export turnover of fresh fruit to the Asian market as follows:

$$\ln EXP = \beta_0 + \beta_1 \ln GDP_j + \beta_2 \ln GDP_{vn} + \beta_3 \ln OVR_{vn} - \beta_4 \ln EDIT - \beta_5 \ln DIST + \beta_6 \ln LAND + \beta_7 \ln MRL + \beta_8 FTA + \beta_9 CLI + \beta_{10} \ln TAR + \beta_{11} WTO$$

The variables in the model are described in Table 1 along with the expected impact trends in the research model on Vietnam’s fresh fruit export turnover.

**TABLE 1: Summary of expected signs of independent variables in the proposed model**

| Symbol | Variable description                                       | Expected direction of impact | Calculation/Unit of measurement | Data source |
|--------|--|------------------------------|---------------------------------|-------------|
| EXP    | Vietnam’s fresh fruit export value in the period 2007-2020 |                              | USD                             | UN Comtrade |

|                   |   |   |  |  |
|-------------------|---|---|--|--|
| GDP <sub>j</sub>  | Gross domestic product (size of economy) of importing country         | + | Billion USD  | World Bank                               |
| GDP <sub>vn</sub> | Gross domestic product (size of economy) of Vietnam                   | + | Billion USD  | World Bank                               |
| OVR <sub>vn</sub> | Vietnam's Global Competitiveness Index                                | + | Rate and score on a scale of 1 to 7                                      | World Economic Forum Report              |
| EDIT              | Economic development gap  | - | EDIT = GDPPC <sub>j</sub> - GDPPC <sub>vn</sub><br>Thousand USD          | World Bank                               |
| DIST              | Geographic distance between Vietnam and the importing country         | - | Kilometer (km)   | www.freemaptools.com                     |
| LAND              | Percentage of land area for fruit trees in Vietnam                    | + | LAND = LAND <sub>vn</sub> *LAND <sub>j</sub><br>(%)                      | General Statistics Office and World Bank |
| MRL               | Maximum limits of the pesticide chlorpyrifos in the importing country | - | Mg/kg  | EU MRL database                          |
| FTA               | Free trade agreements   | + | FTA = 1: Has signed FTA<br>FTA = 0: No FTA signed                        | WTO and Integration Center VCCI          |
| CLI               | Climate in importing country  | + | CLI = 1: belongs to tropical climate<br>CLI = 0: not in tropical climate |  |
| TAR               | Import duties on fresh fruit in the importing country                 | - | Percent (%)  | Market Access Map                        |
| WTO               | As a member of WTO  | + | WTO = 1: Member<br>WTO = 0: Not yet a member                             | WTO and Integration Center VCCI          |

Note: +: positive correlation; -: negative correlation. Except for dummy variables (FTA, WTO, CLI), variables will be taken as natural logarithms.

Source: Authors' own compilation (2021).

This study analyzes the determinants of Vietnam's fresh fruit export turnover to 14 Asian markets<sup>1</sup>, including China, which comprises the countries and territories with the most significant shares of imports from 2017 to 2020. Due to its size and population, China's economic indicators - GDP, development gap, and fresh fruit import turnover - are substantially larger than those of the other 13 countries mentioned in the study. The authors estimate two versions of the gravity model: Model 1, which includes all 14 markets, and Model 2, which excludes China. This comparison allows for an evaluation of how China's presence affects the determinants of Vietnam's fresh fruit exports.

Among the 14 markets examined, most have signed FTAs with Vietnam through bilateral or ASEAN frameworks, including China, Japan, South Korea, Thailand, Malaysia, Singapore, India, and Lao PDR. Other markets, such as Russia, Hong Kong, and Greece, participate through broader regional agreements (EAEU, ASEAN-HKFTA, EVFTA). By contrast, the UAE and Saudi Arabia have not established direct FTAs with Vietnam, which could potentially affect tariff levels and trade facilitation. With respect to multilateral commitments (the WTO), all 14 countries/territories are official members, ensuring their responsibility to comply with global trade rules.

## 2.2. Data

The study employs panel data covering Vietnam's fresh fruit exports to 14 Asian partners over the period 2007-2020, yielding a total of 196 observations. Data sources are summarized in Table 1. Table 2 presents the descriptive statistical results of the variables used in the analysis.

TABLE 2: Descriptive statistics of variables in the model

| Variable name | Medium    | Standard deviation | Skewness | Kurtosis | Minimum value | Maximum value |
|---------------|-----------|--------------------|----------|----------|---------------|---------------|
| EXP           | 108,829.7 | 405,042.800        | -0.541   | 5.156    | 24            | 2,850,882     |
| GDPj          | 1,609.644 | 2,721.451          | -0.505   | 4.015    | 5.444         | 14,280        |
| GDPvn         | 174.848   | 60.482             | -0.43    | 2.05     | 77.414        | 271.158       |
| OVERvn        | 4.186     | 0.114              | -0.116   | 1.55     | 4.010         | 4.356         |

<sup>1</sup> Greece is not actually an Asian country while Egypt and Russia are countries that have only part of their territory in Asia.

|      |            |            |        |        |           |            |
|------|------------|------------|--------|--------|-----------|------------|
| EDIT | 19,416.190 | 17,482.760 | -1.149 | 3.324  | 29.322    | 62,925.432 |
| DIST | 5,812.778  | 2,890.145  | -0.254 | 1.853  | 2,040.260 | 11,754.130 |
| LAND | 0.566      | 0.928      | -0.006 | 2.287  | 0.011     | 4.116      |
| MRL  | 0.226      | 0.332      | 0.345  | 1.658  | 0.010     | 1          |
| FTA  | 0.714      | 0.453      | -0.949 | 1.9    | 0         | 1          |
| CLI  | 0.786      | 0.411      | -1.393 | 2.939  | 0         | 1          |
| TAR  | 5.382      | 10.883     | 2.458  | 9.059  | 0         | 51.690     |
| WTO  | 0.929      | 0.258      | -3.328 | 12.077 | 0         | 1          |

*Note:* Total number of observations is 196.

*Source:* Authors' calculations.

### 3. Results and discussion

#### 3.1. Results of regression model of factors affecting Vietnam's fresh fruit export turnover

The study evaluates the impact of factors on Vietnam's fresh fruit exports using multiple estimation methods, including Pooled OLS, Fixed Effects (FEM), and Random Effects (REM). However, the presence of heteroscedasticity reduces the statistical reliability of these variables. Therefore, the author performed a remedy using the Feasible Generalized Least Squares (FGLS) method, which produces consistent estimates even in the existence of autocorrelation and heteroscedasticity (Hoechle, 2007; Hill *et al.*, 2011). Table 3 reports the final estimation results of the two models using the FGLS method, with standard deviation values presented in parentheses.

**TABLE 3: FGLS regression results on determinants of Vietnam's fresh fruit export turnover**

| <b>Variable</b>      | <b>Model 1</b><br>(including China) | <b>Model 2</b><br>(excluding China) |
|----------------------|-------------------------------------|-------------------------------------|
| GDP <sub>j</sub>     | 0.6842***                           | 0.3293***                           |
|                      | (0.0451)                            | (0.0942)                            |
| ln GDP <sub>vn</sub> | 1,5166***                           | 1,7302***                           |
|                      | (0.1099)                            | (0.1273)                            |

|                        |             |             |
|------------------------|-------------|-------------|
| lnOVRvn                | 1,4419      | 2.0435      |
|                        | (1.4858)    | (1.6757)    |
| lnEDIST                | 0.1555***   | 0.1736***   |
|                        | (0.0442)    | (0.0433)    |
| lnDIST                 | 1,4007***   | 1,3069***   |
|                        | (0.0776)    | (0.0901)    |
| lnLAND                 | 0.0782**    | 0.1184***   |
|                        | (0.0360)    | (0.0354)    |
| lnMRL                  | -0.0987***  | -0.0632*    |
|                        | (0.0284)    | (0.0352)    |
| FTA                    | 0.8897***   | 0.7748***   |
|                        | (0.2090)    | (0.2003)    |
| CLI                    | 1,1227***   | 0.2559      |
|                        | (0.1877)    | (0.2691)    |
| lnTAR                  | 0.0001      | 0.0058      |
|                        | (0.0077)    | (0.0075)    |
| WTO                    | -0.7481***  | -0.8437***  |
|                        | (0.1903)    | (0.1822)    |
| constant               | -18,6322*** | -16.8039*** |
|                        | (2,2427)    | (2.5876)    |
| Number of observations | 196         | 182         |
| R-squared              | 0.7447      | 0.6299      |

Note: \*\*\*, \*\*, \* correspond to significance levels of 1%, 5%, 10% respectively.  
Standard deviation values in parentheses.

Source: Author's calculations.

According to the results in Table 3, up to 74.47% of the variation in Vietnam's fresh fruit export turnover is explained by factors included in Model 1. The competitiveness index and import tariff rate are not statistically significant in this model.

In Model 2, which excludes China, three variables are not statistically significant, including the competitiveness index, import tariff rate, and the climate of the importing country.

### 3.2. Discussion

#### a) Vietnam GDP

Vietnam's GDP ( $GDP_{vn}$ ) exerts a positive impact on Vietnam's fresh fruit export turnover. Specifically, a 1% increase in Vietnam's GDP leads to an average increase of 1.5166% in fruit exports, holding other factors constant. As the scale of Vietnam's economy increases, production capacity rises, enabling greater export opportunities. Meanwhile, foreign exchange earnings provide resources for investing in infrastructure, agricultural varieties, techniques, and technology that enhance export turnover. Such developments, in turn, facilitate the expansion of bilateral trade.

The regression coefficient of Vietnam's GDP is the largest among the nine coefficients of the independent variables. This positive impact suggests that the growth potential of the fruit industry increases alongside national economic growth as larger resources can be primarily poured into processing technology, post-harvest preservation, new varieties and cultivars, cultivation techniques, and soil regeneration. These investments boost both output volume and quality consistency, thereby strengthening Vietnam's capacity to meet export demand.

In Model 2, the regression coefficient of Vietnam's GDP exhibits the same positive impact trend as in Model 1, but with a higher magnitude. This finding highlights the stronger role of Vietnam's domestic economic growth as an internal driver of fresh fruit exports. In particular, this role implies that as GDP increases, agricultural investment expands, thereby enhancing export capacity.

This result is consistent with the research's initial hypothesis and previous empirical findings (Ngo, 2016; Muhammad *et al.*, 2017; Nguyen, 2017).

*b) GDP of importing country*

GDP of importing country ( $GDP_j$ ) exerts a positive impact on Vietnam's fresh fruit export turnover. Specifically, a 1% increase in the GDP of an importing country raises Vietnam's fruit export turnover by an average of 0.6842%, holding other factors constant. Larger economic scales enhance purchasing power and demand for imported goods, including fresh fruits for both production and consumption. Vietnam's major fruit import partners, such as Singapore, Hong Kong, Russia, Japan, and South Korea, are developed economies with extensive trade capacity. In these markets, the quality of life and health issues are of most significant concern. Public awareness campaigns that highlight the health benefits of fruits, along with the recognized importance of fruits and vegetables in daily meals, have stimulated consumer spending on these products. As fruit has long been considered an essential food indispensable in daily meals in most countries, the demand for fresh fruit consumption continues to rise, thereby contributing to the growth of Vietnam's fresh fruit export turnover.

In Model 2, the regression coefficient of the importing country's GDP remains positive. Still, it is smaller than in Model 1, indicating that the economic size of the partner country exerts a weaker effect on Vietnam's export turnover when China is excluded (less than half the impact observed in Model 1). Given China's population of over one billion people, its GDP is disproportionately larger than that of other markets, which explains the difference in economic size. These results suggest that Vietnam should prioritize strengthening its own production capacity and economic growth, as these factors exert a more substantial influence on fruit export turnover than the economic scale of importing countries.

The findings are consistent with the research hypothesis and with the results of previous studies by Braha (2017), Bhattacharya (2019), and Nguyen (2017). However, these findings are contrary to the study of Ngo (2016) on rice. Product characteristics could explain this discrepancy: Vietnam mainly exports rice in raw form, while fast-growing economies often require higher-quality rice imports.

*c) Gap in economic development level*

The regression coefficient of the model shows that the economic development gap ( $EDIST$ ) exerts a positive impact on Vietnam's trade flows with partner countries. Specifically, a 1% increase in this gap leads to a 0.1555% rise in Vietnam's fresh fruit export turnover, assuming other factors remain unchanged.

The economic development gap between Vietnam and its trading partners is measured by the difference in per capita income between the two countries. The more economically developed a country is, the greater its emphasis on health, leading to higher consumption of health-related products such as fruits and vegetables. This pattern is evidenced by numerous health and nutrition campaigns implemented across countries, such as the Roots and Fruits Campaign, the Have A Plant® Nation Campaign, the International Year of Fruits and Vegetables, and World Food Safety Day.

In Model 2, the regression coefficient of the EDIST variable remains positive and larger than in Model 1. A 1% increase in the development gap corresponds to a 0.1736% rise in Vietnam's fruit export turnover, assuming other factors remain unchanged. This result more clearly reflects Vietnam's growing trade linkages with developed Asian economies other than China. The finding suggests substantial potential for expanding Vietnam's fresh fruit exports, with the remaining 13 markets serving as promising partners. Research by Liang *et al.* (2021) agrees with the view that China's participation promotes more agricultural exports. However, since 2015, the export value of fresh fruit has decreased even as export volume has increased (Ministry of Agriculture and Rural Development, 2020). Liang *et al.* (2021), therefore, recommended diversifying towards markets comparable to China in scale and development level, such as the U.S. and Australia.

The research results are consistent with Ngo (2016), but contrast with those of Tran and Truong (2017), Duong (2019), who found that a larger economic gap is associated with lower export turnover. However, in Le (2015), this variable is not statistically significant.

#### *d) Geographic distance*

Geographic distance (*DIST*) between Vietnam and importing countries exhibits a positive impact. Specifically, a 1% increase in geographic distance corresponds to a 1.4007% rise in fruit export turnover, assuming other factors remain constant. The regression coefficient of +1.4007 is the second largest among all independent variables.

This trend can be attributed to the unfavorable natural conditions in distant importing countries. Countries such as Israel, the United Arab Emirates, and Saudi Arabia import tropical fruits from Vietnam because they have limited suitable agricultural land. Similarly, Malaysia and Singapore lack an extensive river system for irrigation, while Japan and

South Korea frequently experience severe consequences of natural disasters. These unfavorable conditions make such countries more dependent on imports to meet domestic fruit demand.

In Model 2, the regression coefficient of the distance variable remains positive, but is smaller than in Model 1. Specifically, a 1% increase in distance leads to a 1.3069% rise in Vietnam's export turnover, assuming other factors remain unchanged. China, which shares a border with Vietnam, benefits from geographic proximity that facilitates faster and higher-volume trade in fresh fruits.

These findings are consistent with Braha (2017) and Kiani *et al.* (2018), who also found a positive effect of shared borders on export turnover. Compared to Model 1, the regression coefficient in Model 2 reflects more accurately the impact of geographic distance on fresh fruit export turnover in Vietnam. However, the positive relationship observed here contrasts with the initial hypothesis and aligns with the research results of Tran and Truong (2017). Meanwhile, other studies, such as Potelwa (2016), Yatsenko (2017), Do (2019), Duong (2019), report a negative impact of geographic distance on export turnover.

*e) Maximum residue limit*

Maximum residue limits (*MRL*) have a negative impact on Vietnam's fresh fruit export value. Specifically, a 1% increase in *MRLs* reduces export turnover by 0.0987%, assuming other factors remain unchanged. Along with tariffs, *MRLs* are considered one of the non-tariff barriers that need special attention because it directly affects product quality and consumer health. Importing countries carefully evaluate this factor before allowing market entry, posing substantial challenges for exporters, particularly Vietnam, where the agricultural sector still relies heavily on chemicals such as pesticides and plant protection drugs.

In Model 2, the regression coefficient of the *MRL* variable has an opposite effect and a lower value than in Model 1. Specifically, a 1% increase in the chlorpyrifos residue limit leads to a decrease of 0.0632% in Vietnam's export turnover, assuming other factors remain unchanged. The statistical significance of the *MRL* variable in Model 2 is not as strong as in Model 1 (with a confidence level of 90%). Although China has strengthened its food safety regulations through Order 248 and Order 249 (effective from January 1, 2021), which impose stricter requirements on food import and export management (Zhang and Zhou,

2021), MRL standards remain relatively limited in scope and moderate in stringency (approximately 0.01-1%) for many fruit items.

These results are consistent with the theoretical and empirical findings of Chen *et al.* (2016), Wei *et al.* (2012), and Nguyen (2017).

*f) Area of land for growing fruit trees*

Based on the regression results, the area of land for fruit cultivation (*LAND*) has a positive impact on export turnover at a statistical significance level of 5%. A 1% increase in fruit-growing area raises the export turnover by 0.0782 %, holding other factors constant.

An increase in the fruit-growing area of Vietnam and its importing partners, driven primarily by Vietnam's cultivated areas, creates more favorable conditions for fruit production and export expansion. As the cultivated area expands, production scales up, output rises, and export supply increases, thereby reducing the demand for fruit imports. The government has supported the rise in Vietnam's fruit-growing area. Specifically, in the key fruit-growing area of the Mekong Delta, agricultural development has been restructured toward an "aquaculture - fruit - rice" model, replacing the traditional "rice - aquaculture - fruit" structure (Ministry of Agriculture and Rural Development, 2020). The total national fruit-growing area exceeded 1.1 million hectares, an increase of 86.2 thousand hectares compared to 2019, with robust expansion of large-scale orchards in the northern midland and mountainous regions of Son La and Bac Giang provinces (Ministry of Agriculture and Rural Development, 2020). Although the increase is moderate, it reflects the motivation for businesses to increase fruit exports to other countries.

In Model 2, the regression coefficient of the fruit growing area variable has a positive impact and a higher value than in Model 1. At the same time, the statistical significance of the area variable is stronger than in Model 1, significant at the 1% level. Given China's vast size, where fruit-growing land accounts for 1 - 1.5% of total agricultural land, its inclusion affects the outcome of this variable. Thus, the regression results in Model 2 (excluding China) more clearly reflect the change in fresh fruit export turnover. As Vietnam's fruit-growing area increases, the supply of raw materials becomes more abundant, creating a driving force for businesses to be more proactive in sourcing and managing these materials.

The research results are consistent with the initial hypothesis and align with previous research by Erdem and Nazlioglu (2008) and Tran and Truong (2017). Meanwhile, Ngo (2016) reported a negative relationship between agricultural land area and Vietnam's agricultural export turnover. This negative relationship is attributed to urban expansion, which reduces Vietnam's farmland, while agricultural land in importing countries continues to increase.

*g) Competitiveness and import taxes*

As import tariffs on fresh fruit (*TAR*) rise, consumers tend to purchase domestic fruits at cheaper prices, which negatively affects the export turnover of the exporting country. Nguyen (2017) pointed out that tariff measures in importing countries exert a negative impact on Vietnam's agricultural export turnover. Malhotra and Stoyanov (2008) explained the effect of this factor on Canada's agricultural trade. The results showed that Canada's benefits from tariff reduction programs were insignificant. Studies by Lehman (2007), Wei *et al.* (2012), and Muhammad *et al.* (2017) also exhibited the negative impact of import taxes on export activities. Since Vietnam acceded to the WTO in 2006, the country has proactively expanded trade relations, which have lowered import duties on Vietnamese goods. Therefore, the data of this study are entirely consistent with Vietnam's current trade context for fresh fruit and other export products.

Global competitiveness (*OVR<sub>vn</sub>*) reflects a country's competitiveness, calculated and ranked according to 12 criteria, including institutional environment, macroeconomic stability, technological readiness, infrastructure, health and primary education, higher education and training, labor market, goods market efficiency, financial market development, market size, business dynamism, and innovation (World Economic Forum, 2021). Greene (2013) indicated that the competitiveness index of importing countries negatively affects trade activities with exporting countries. Specifically, low scores in institutions and infrastructure hinder imports and constrain the export performance of partner countries. In contrast, Duong (2019) found that Vietnam's competitiveness index positively affects export turnover, reflecting improvements in institutional factors and market size. However, Vietnam continues to lag in technological readiness, business dynamism, and innovation. Therefore, Vietnam's global competitiveness index is not statistically significant in this model.

#### *h) Free trade agreement dummy variable*

The dummy variable free trade agreement (*FTA*) is statistically significant and positively associated with Vietnam's fresh fruit export turnover. Specifically, exports to countries with FTAs are 143.389% higher than those to non-FTA partners, holding other factors constant. The signing of free trade agreements, therefore, leads to significant growth in trade between Vietnam and importing countries.

In Model 2, the FTA variable remains positive but exhibits a smaller magnitude than in Model 1. The decline in export value in Model 2 reflects the lost benefits due to the exclusion of China. The ASEAN-China FTA constitutes the world's largest trading bloc by population and the third largest by nominal GDP, significantly contributing to regional export growth. However, without China, the estimated impact of free trade agreements on Vietnam's export turnover represents a more realistic measure of their effect across smaller markets. The results indicate that Vietnam receives fewer benefits from existing FTAs and should prioritize strengthening bilateral trade relationships with countries that import a large proportion of fruit products from Vietnam. Such prioritization includes upgrading FTAs, helping to promote trade between the two countries. Among the 13 countries, four - Israel, the United Arab Emirates, Egypt, and Saudi Arabia - have not yet established bilateral cooperation relations with Vietnam, despite importing approximately USD 50 million worth of fresh fruits. Vietnam should consider expanding exports to markets that already have FTAs in force, or establish cooperative frameworks with Asian countries that import large volumes of fruit but have not yet signed a formal trade agreement.

These findings align with the research hypothesis and are consistent with previous research by Ngo (2016), Muhammad *et al.* (2017), and Bathathu (2019).

#### *i) Importing country climate dummy*

Imported country climate (*CLI*) is statistically significant and positive in Model 1. Countries with tropical climates import 207.106% more fresh fruit from Vietnam than non-tropical countries, assuming other factors remain constant. However, in Model 2 (excluding China), this variable is not statistically significant. This difference is primarily explained by China's dominant role as a major importer, its large population, and strong demand for tropical fruit from Vietnam. Vietnam can cultivate a wide range of fruit varieties suited to warm conditions due to its tropical monsoon climate zone. Tropical fruits have a fresher and

more refreshing flavor than those cultivated outside the suitable climate zone. Therefore, demand for tropical fruits is particularly high in countries such as Japan, South Korea, Russia, and especially China, markets with potential for expansion. Such high demand explains why the climate variable in Model 1 has a significant impact on exports. In Model 2, the exclusion of the Chinese market, combined with the relatively small import volumes of the remaining countries and their climatic similarities to China, renders the climate variable statistically insignificant.

These findings align with the research hypothesis and are consistent with previous research by Nazlioglu and Edem (2008), Delelegne (2014), Asseng (2015), and Scheelbeek *et al.* (2020).

*k) WTO membership dummy variable*

The regression coefficient of the WTO variable, although statistically significant at the 1% level in both models, is not as positive as expected. Specifically, Vietnam's fresh fruit exports to WTO member countries are less than those to non-member countries.

WTO membership opens up valuable opportunities for Vietnam to expand market access and promote domestic products internationally; however, it also presents significant challenges. Specifically, under the Most-Favored-Nation (MFN) principle, WTO members extend equal trade preferences to one another. Therefore, fruit imports from Vietnam and competing exporters such as Thailand or Japan are treated similarly across Asian markets. Excluding China, Vietnam faces greater competition from other WTO member countries. Such competition explains why Vietnam chooses to export more to this familiar neighboring market while seeking to exploit advantages from other countries.

The regression results diverge from the author's expectations and from previous studies, including Ngo (2016) and Le (2017).

#### **4. Conclusion and research limitations**

With data collected from 14 countries in 14 years from 2007 to 2020, the research finds that economic scale, economic distance, land area for perennial crops, and participation in bilateral and multilateral trade agreements significantly promote Vietnam's fresh fruit exports. Among the 11 variables included in the model, Vietnam's GDP exerts the most potent positive effect. In contrast, non-tariff barriers such as the maximum residue limits (MRLs) on pesticides demonstrate a negative impact on export performance.

Although this study acknowledges the importance of the results, some limitations should be noted.

First, the research solution only analyzes the export trend of fresh fruit from a macro-economic perspective, without incorporating the interaction between internal and external factors that influence the export capacity of this item to a specific country. As a result, the research results may have limited practical applicability for individual exporters. Future research should therefore extend the analysis to the micro level to provide more actionable insights for export enterprises.

Second, the dataset covers 14 countries over the 2007-2020 period, which remains representative, but does not fully capture the diversity of the potential Asian market. Other countries in the region also have strong import potential, which should be included in future analyses to broaden market coverage and increase the reliability of the findings.

Third, the study considers only one pesticide indicator: the regulation of maximum residue limit for chlorpyrifos. Meanwhile, regulations on MRLs in countries are rapidly evolving, covering a wide range of substances. Future research should incorporate a more comprehensive set of MRL variables applicable to fresh fruit products.

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