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## Article

# The factors affecting Vietnam's canned tuna exports

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## DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

# The factors affecting Vietnam's canned tuna exports

Nguyen Hong Nga<sup>1,2</sup> and Le Thi Xoan<sup>1,2\*</sup>

**Abstract:** In this study, we used the gravity model to identify factors affecting Vietnam's tuna exports to major import markets, including the United States, Canada, Japan and European countries, and then to find the solutions with sufficient scientific and practical basis to promote the development of the tuna export industry in the future. This research's results show that an increase in factors including domestic tuna production, exchange rates, population of the importing country and geographical distance leads to increase the scale of Vietnam's tuna exports, with the exchange rate playing the most important role, while the import

### ABOUT THE AUTHORS



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Nguyen Hong Nga is a PhD in Economics and Organization built in Russian Federation. Currently, I am a lecturer at the University of Economics and Law, Ho Chi Minh City National University. My research interests in economics, development economics and economic policies. Le Thi Xoan is a Ph.D. Candidate in Economics at University of Economics and Law, Vietnam National University Ho Chi Minh City/VNU-HCM. Currently, I am a lecturer at the Ho Chi Minh University of Natural Resources and Environment. My research interests in the economics and economic policies.

### PUBLIC INTEREST STATEMENT

**Purpose:** This study was conducted with the aim of identifying factors affecting Vietnam's tuna exports to markets including the United States, Canada, Japan and European countries, from that find the solutions to promote the development of tuna export industry for Vietnam in the coming time.

**Design/methodology/approach:** This study using gravity model to identify factors affecting Vietnam's tuna exports to import markets. Factors affecting Vietnam's tuna exports are estimated through a random effects model (REM).

**Findings:** Research results show that an increase in factors including domestic tuna production, exchange rate and population of the importing country and geographical distance leads to an increase in export turnover, in which the exchange rate factor has the strongest impact, and the import tax rates is the biggest barrier. The factors including GDP per capita of the importing country and the signing of a free trade agreement between Vietnam and partner countries do not affect the level of tuna trade.

**Value:** From the research results, it can be inferred that in order to sustainably develop the tuna export industry, Vietnam needs to well control domestic tuna resources, avoiding depletion and illegal exploitation and undeclared, focusing on improving product quality, actively researching the market and paying attention to trade promotion policies, expanding and making better use of trade relationships with importing countries is important issues that the Vietnamese side needs to do in the next time.

tax rate is the significant barrier that reduces Vietnam's tuna exports. In order to develop the tuna export sustainably in the future, Vietnam must maintain tight control over the domestic tuna resources, avoid overexploitation, and instead focus on enhancing product quality. Furthermore, it is critical to focus on satisfying the conditions of commitments in signed free trade agreements, actively analyzing the market and paying attention to trade promotion policies, growing trade connections with importing countries.

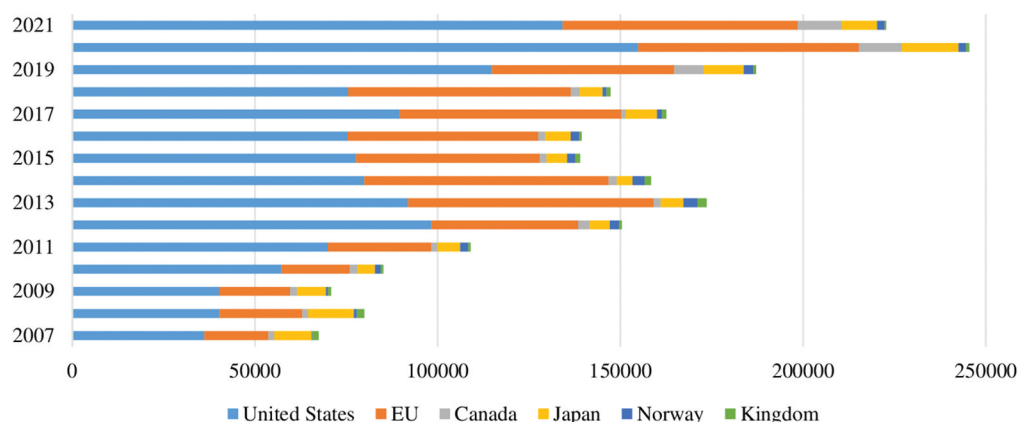
**Subjects:** Development Studies; Development Policy; Economics and Development; Sustainable Development; Economics; Industry & Industrial Studies

**Keywords:** factors affecting to exports; Tuna; Vietnam

### 1. Introduction

Vietnam is a Southeast Asian country with a 3,260 - kilometer long coastline and a 1 million square—kilometer exclusive economic zone on the East Sea. This is a developing country with a low middle-class income. According to the statistics of the World Bank in 2021, Vietnam's GDP per capita at current rates is only 3756 USD. However, Vietnam is a very open economy with an important and advantageous geographical location for trade development. Vietnam is also one of the 10 largest seafood exporters in the world, with tuna being the item with the highest trade value among current seafood exports. According to the Vietnam Association of Seafood Exporters and Producers (VASEP), the total value of Vietnam's tuna exports reached \$733 million in 2021, accounting for 21.56% of the total seafood export value, of which the tuna export value with code 160,414 reached more than 280 million USD, accounting for 8.24% of total seafood export value. In the period 2007 – 2021, Vietnam's canned tuna is mainly exported to markets including the US, EU and some other main exporting countries such as Canada, UK, Norway accounting for more than 70% the total of canned tuna export value of this country, in which exports to the US, EU and Canada have increased rapidly in recent years (Figure 1). Currently, Vietnam is a viable country to grow tuna fisheries due to its long coastline and climate in the East Sea which is totally subtropical monsoon, suitable for tuna fishing (Nguyen et al., 2022). The Vietnamese tuna sector also contributes significantly to rural employment and regional economic growth through foreign income (Nguyen & Jolly, 2018). The majority of Vietnam's exported tuna comes from the waters of the Central provinces, with the majority is concentrated in three provinces: Binh Dinh, Phu Yen and Khanh Hoa, then raw tuna is transported to over 200 processing and export facilities, concentrated in Binh Dinh, Phu Yen, Khanh Hoa, Ho Chi Minh City and Binh Duong provinces of Vietnam. The majority of Vietnam's tuna processing and export facilities have modest and medium capacities; nevertheless, Vietnam now has access to modern seafood

Figure 1. Source: ITC.



processing equipment, keeping up with the global development trend. Until recently, Vietnam has had the world's largest processing and export sector.

Although it has an important position and has many economic and social contributions, but according to the assessment of the Vietnam Ministry of Industry and Commerce and the Vietnam Tuna Association believe that the tuna industry in the past time in general has been weak and has faced to many difficulties and challenges, lead to results that are not commensurate with the existing potential. In recent years, Vietnam has continuously increased its tuna fishing force, the fishing effort has exceeded the sustainable catch, and the catch needs to be reduced in order to achieve optimal levels of production and harvest (Nguyen & Tran, 2023). In the fishing field, the boats are still primarily of limited capacity, the technology of catching and preserving tuna is also primarily of the traditional manner, while the duration of each trip is relatively long, reducing the quality of tuna post-harvest when landing is reduced. In addition, Vietnam's fishery personnel have insufficient credentials, making it difficult to apply the modern technology in production (Nguyen & Jolly, 2018). In terms of tuna fishing organization, the fishermen primarily operate independently and on a small scale, with little connection and coordination in production. In order to increase competitiveness and boost export growth, the tuna fishery in Vietnam must continue to improve efficiency via scale and mixed efficiency (Nguyen & Jolly, 2018). In the export industry, processing firms continue to confront numerous challenges in exporting tuna, including a lack of raw materials for processing and export, a high percentage of workers abandoning jobs owing to poor wages, and market volatility. The key challenges are increased product quality requirements and increasingly severe competition. To increase efficiency and operate sustainably in the future, Vietnam's tuna sector will require timely reform measures (T. V. et al)

About the methodology, the gravity model first proposed by (Tinbergen, 1962) is considered the most successful and applied model when studying the factors affecting the flow of trade between countries, among them, most of studies use panel data because it has a larger sample size than cross-sectional and time-series data, so which can increase the accuracy of the regression estimates (Kimsanova & Herzfeld, 2022; Masood et al., 2023, 2023). In this study, we also apply the gravity model to quantify the influence of factors on the trade flow of canned tuna, code 160,414 of Vietnamese tuna to major importing countries during the period 2007 – 2021, including the United States, Canada, Japan and 16 importing countries in the European region to determine which factors determine the scale of Vietnam's canned tuna exports to other countries, including Which factors are important and why? Finally, we anticipate that there will be sufficient scientific and practical basis to propose some solutions to boost growth in the future based on the elements that govern the extent of Vietnam's canned tuna exports.

## 2. Theory and literature review

The gravity model in international trade was first proposed by Jan Tinbergen in 1962 and it is widely applied in empirical studies to measure the influence of factors on trade flows between countries. Tinbergen argues that the level of trade follow between two countries is directly proportional to the economic size of the two countries (measured in GNP or GDP), and inversely proportional to the geographical distance between the two countries. Accordingly, this model is represented by Tinbegen as follows:

$$F_{AB} = G * \frac{M_A * M_B}{D_{AB}} \quad (1)$$

Where  $F_{AB}$  is the level of trade,  $M_A$ ,  $M_B$  are the size of each economy (measured by GNP or GDP),  $D_{AB}$  is the geographical distance between the two countries, and  $G$  is a constant,  $\varepsilon$  is the residual in the model.

The equation (1) is transformed into log-linear form so that it conforms to the usual regression analysis and can be written as equation (2)

$$\ln(F_{AB}) = \beta \ln(M_A) + \beta \ln(M_B) - \beta \ln(D_{AB}) + \varepsilon \quad (2)$$

The gravity model proposed by Tinbergen (1962) is a simple shape model to measure the impact of factors on trade flows between countries. In the context of growing international trade, international cooperation has also been expanded and trade exchanges between countries have also become more complicated, resulting in many factors affecting the flow of goods between countries, especially in terms of trade policy. Stemming from this requirement, so far there have been many studies to extend the gravity model by adding new factors to the model, in which the model was developed by (Anderson & van Wincoop, 2003) by including adding the multilateral barrier variable and dummy variables were evaluated as the most successful. Up to now, the extended gravity model has been widely applied in research and discovered many new factors that affect the flow of trade between countries.

In 2008, Erdem & Nazlioglu studied the factors affecting Turkish agricultural exports to the EU in the period 1996 – 2004 showed that Turkish GDP and the GDP of the importing country, the population of the importing country, and the population of the importing country, number of Turkish living in the importing country, the signing of the EU—Turkey Customs Union Agreement between Turkey and the importing country and the trading position of the importing country (the importing country is a Mediterranean country or non-Mediterranean country) has a positive impact on Turkish agricultural exports to the EU. The geographical distance and the total area of agricultural arable land of the EU have the opposite effect (Erdem & Nazlioglu, 2008).

In 2015, Hidayati & Masyhuri studied the factors affecting Indonesia's tuna exports to the Japanese market and showed that the volume of domestic tuna supply, tuna export price, exchange rate and legal factors has a positive effected on Indonesian tuna exports in this market (Hidayati et al., 2015).

The study by (Irshad et al., 2018) on the Pakistani rice export industry in the world market concluded that the common border of Pakistan and the importing country, WTO membership and FTA has a positive impact on Pakistani' rice exports. Also in the same year (Irshad et al., 2018), studied the factors affecting bilateral trade between Pakistan and China, once again affirming that the common border and the signing of free trade agreements that have an positive effect on trade between the two countries. There are also the other factors such as the common religion between the two countries, the common language used, the trade openness (Trade value/GDP) of the exporting country and also of the importing country, the product of the GDP of the two countries, and the geographical distance and the product of the two countries' inflation rates also affect Pakistan's exports to China.

Moreover, the study of (Pratiwi, 2021) once again confirms that the membership of WTO and FTA of Indonesia and the importing country has a positive impact on Indonesia's palm oil exports to importing countries. In addition, the author also verified that the import non-tariff policy of the partners has a positive and very strong impact on Indonesia's palm oil exports. In the same year, the study by (Tadesse & Abafita, 2021) on the factors affecting the global coffee trade of the 18 largest coffee exporters showed that basic variables such as GDP and population of exporters, GDP of importers are believed to be important determinants of coffee trade. In addition, the authors found cultural factors such as colonial link, common colonizer, common language, common border, exporter exchange rate, importer exchange rate, land area of exporter are also the factors have positive impact to the trade value. Furthermore, the factors including the tariffs, the global financial crisis and geographical distance have a negative impact on Indonesia's coffee exports, while the signing of a trade agreement between the two countries were found to have no

significant impact on trade of coffee. In the study by (Malau et al., 2022) on the Indonesian paper trade flow in the world market found that Indonesia's comparative advantage in paper products (measured as a measure of by the RCA index) has a positive effect on paper exports, while the trade policy of the importing country (trade barriers) has a negative effect.

Thus, based on the original research of Tinbergen (1962), until recently, studies to expand the model have identified many factors that affect trade flows between countries. With the rapid development of international trade, the level of competition between countries is also increasing, technology is becoming more and more modern, and the problems related to import and export activities have also become more complicated. Resources that are an exporter's absolute or comparative advantage can today be simply replicated or substituted. Exporters seek to change from conventional competition based on absolute or comparative advantages to competition based on trade processes between countries in order to survive and thrive. Therefore, recent studies have mentioned many factors related to policies and institutions in the micro environment or the macro environment of the industry when considering their influence on exports, such as as Industry Management Policy (Hidayati et al., 2015); exchange rate (Dhiman, 2020; Obeng et al., 2023); import tax (Abafita & Tadesse, 2021; Masood et al., 2023); Non-tariff trade barriers (Katsikeas et al., 1996); Free trade (Masood et al., 2023; Obeng et al., 2023); or factors on the supply of export and demand of import such as the GDP of the importer (Natale et al., 2015; Obeng et al., 2023), GDP of the exporter (AO. Kuik et al., 2019; Obeng et al., 2023), population of importer (Hassan Khayat & McMillan, 2019; Obeng et al., 2023), labor productivity of the exporter (Bernard et al., 2007; Dhiman & Sharma, 2019; Hung et al., 2004), production cost (Dhiman & Sharma, 2017). Some of recent studies have also discovered many interesting factors, which have been proven to affect trade flows between countries, such as the level of importer corruption (Abidin et al., 2013; Obeng et al., 2023); exporter corruption (Obeng et al., 2023), Gross value added (Assoua et al., 2022; Kimsanova & Herzfeld, 2022); common border (Abafita & Tadesse, 2021; Irshad et al., 2018), common language (Lombardi et al., 2016; Masood et al., 2023).

### 3. Methodology and data

#### 3.1. Methodology

Previous studies on this topic indicates that the exchange rate is a factor that many studies consider and confirm that this is an important factor affecting to the export (Abafita & Tadesse, 2021; Obeng et al., 2023). In fact that, the increase in the exchange rate of the exporting country will make the export price of that country less than before compared to other countries' exports. This improves the competitiveness of the exporting country's goods, leading to an increase in exports. However, there are many opposing views, and studies demonstrate that the exchange rate has no effect on exports (Assoua et al., 2022), while others show that an increase in the exchange rate leads to a fall in exports (Abidin et al., 2013) Considering that the State Bank of Vietnam did not deliberately weaken the local currency to encourage export growth in Vietnam during the research period. In order to achieve the goals of foreign currency supply and demand, to stabilize the foreign exchange market as well as to achieve the goal of economic growth, the State Bank of Vietnam has repeatedly adjusted the exchange rate, in general Vietnam's exchange rate. To know the reality in Vietnam, how the change of exchange rate affects the tuna export industry there are several swings and an upward tendency over this time period. To understand the realities in Vietnam and how changes in the currency rate effect the tuna export sector, we propose the following research hypothesis:

**H1:** The exchange rate has affected to the Vietnam' export of tuna

In addition to the exchange rate, trade barriers and the openness of the economy are also confirmed by many studies to affect exports, especially in the context of rapid development of science and technology. White the absolute advantage in productive resources of exporters can be easily imitated or replaced, at this time trade regulations are an important tool for countries to



coordinate import and export activities, in which many studies show that tariffs have an effect on exports (Abafita & Tadesse, 2021; Kimsanova & Herzfeld, 2022; Masood et al., 2023) and the signing of free trade agreements between the exporter and importer also affects the flow of trade between them (Masood et al., 2023; Obeng et al., 2023).

In the European market, Vietnam has signed the EVFTA with member countries since August 2020. The signing of this agreement helps Vietnam enjoy a preferential tariff policy of 0% for the volume of 11,500 tons of canned tuna per year when exported to this market. In the Canada and Japan markets, Vietnam has signed the CPTPP agreement since 2019, and Vietnam's tuna code 160,414 has been exempted from tax when exporting to these two markets since the CPTPP agreement took effect. In the United States market, Vietnam has not signed any free trade agreements. Although free trade agreements provide reduced tariffs, they also impose numerous severe rules on exporters, such as food hygiene and safety, provenance of goods, and labor safety.

All of these issues might have a detrimental impact on exports if the exporting country is not prepared to respond. As a result, many studies show that the signing of trade agreements between two countries has no effect on the level of trade between them if the signing of these trade agreements does not bring opportunities or significant barriers to import and export activities between them (Tadesse & Abafita, 2021).

To test for Vietnam's tuna export industry, we propose the following two research hypotheses:

**H2:** Import tax rates affect Vietnam's tuna exports.

**H3:** The signing of the free trade agreement between Vietnam and the importing country has an impact on Vietnam's tuna exports to those countries.

Additionally, several of studies show that the scale of domestic production is a factor affecting exports (Kumar & Siddharthan, 1994; Parlakgul & Selekler-Goksen, 2018). In tuna export industry, a high and increased of tuna resources that can be exploited domestically will help that country maintain a large scale of processing and export industry, non or less dependent on imported tuna raw materials. This can reduce transportation costs and ensure good quality control of tuna raw materials. Moreover, localization theory tells that the exporters can create their own market, which will reduce transaction costs, lead to increase the competitiveness and expand of their export scale (Fillis, 2001; Jones & Coviello, 2005; Whitelock, 2002). Vietnam also has advantages in marine resources, such as tuna. In the period 2007 – 2021, Vietnam exploited 82,836 tons of tuna/year, the catch increased by 6.27%/year on average. Currently, the world's largest tuna exporting countries such as Thailand, Ecuador, China, Spain, etc are the countries with the advantage of large domestic tuna resources, providing raw materials for the processing and exporting industry. Therefore, we propose the fourth research hypothesis as follows:

**H4:** The volume of domestically caught tuna affects the value of Vietnam's tuna exports.

Furthermore, an increase in the population of the importing country usually lead to an increase in demand for goods, including imported goods (Hassan Khayat & McMillan, 2019; Obeng et al., 2023). This is only true if imported products remain suited to the tastes of consumers in the import market over time and can compete with the same products of competitors as well as substitutable goods. Otherwise, this effect will happen in reverse, this shows that the exporter's products are gradually not matching the expectations of customers in the import market, the competitiveness is decreasing, so the ability exports decrease despite of the population of the importer are increasing (Assoua et al., 2022; Tadesse & Abafita, 2021). In the period 2007 – 2021, Vietnam's tuna exported to the United States market increased by an average of 9.83% per year,



the Canada and European markets increased by an average 15.55% and 9.17% respectively, but decreased by an average 0.29%/year in the Japan market.

We expect that an increase in the population of the importing country will lead to an increase in the demand for tuna imports from Vietnam, so our fifth hypothesis is proposed as follows:

**H5:** The population of the importing country has an effect on Vietnam's tuna exports

Geographic distance is a fundamental factor in the gravity model first proposed by Tinbergen (1962). Tinbergen argues that the level of trade between two countries is inversely proportional to the geographical distance between the two countries. Long distance is detrimental to exporters because it incurs additional costs, and many subsequent studies have also verified that geographical distance has a negative effect on exports (Masood et al., 2023; Obeng et al., 2023). However, there are some markets that are further away but have more favorable export conditions than the nearby markets. As a result, several research demonstrate that geographical distance has little effect on exports (Hidayati et al., 2015; Malau et al., 2022). We suggest the following sixth study hypothesis to examine this issue for Vietnam's tuna export industry:

**H6:** Geographical distance affects Vietnam's tuna exports.

According to economic theory, the demand for goods and services depends on the income of the consumer. When the consumers have increases in income, it's usually lead to purchasing power for goods increases, including imported goods. Therefore, some empirical studies have shown that the GDP per capita of the importing country affects the level of trade flows with the exporting country (Abidin et al., 2013; Hassan Khayat & McMillan, 2019). However, we anticipate that the relationship between the importing country's economic level and the scale of exports will vary depending on the product. Increased income often leads to increased purchasing power if the things are required and of excellent quality. However, rising income will diminish purchasing power for non-essential goods, especially if they are of low quality, because consumers can now afford to acquire better quality goods. Therefore, we propose the seventh research hypothesis as follows:

**H7:** GDP per capita of importers have an effect on Vietnam's tuna exports.

Thus, we propose a model to estimate the factors affecting Vietnam's tuna exports in import markets including the US, Canada, Japan and European countries as follows:

$$\text{LnEX}_{ijt} = \beta_0 + \beta_1 \ln Q_{vt} + \beta_2 \ln \text{POP}_{jt} + \beta_3 \ln D_{vj} + \beta_4 \ln \text{EXC}_{vt} + \beta_5 \ln T_{jvt} + \beta_6 \text{FTA}_{t} + \beta_7 \text{GDP}_{cjt} + \varepsilon \quad (3)$$

Where:  $\beta_0$  is the intercept coefficient of the model;

$\varepsilon$  is the error;  $\ln$ : natural logarithm;

$\beta_1, \beta_2, \dots, \beta_7$  are regression coefficients.

Regarding the econometric method used for panel data, up to now, there are many studies have been interested with several ways to do it (Anderson & van Wincoop, 2003; Krisztin et al., 2015; Rahman et al., 2019). In general, many empirical studies use common Ordinary Least Squares (OLS) estimators, Fixed Effects Models (FEM) and Random Effects Model (REM) to determine the influence of factors on trade flows between countries (Cevik, 2022; Chaudhary et al., 2018; Sejdini & Kraja, 2014; Zhang & Wang, 2015). In this study, we choose the best model among three models OLS, FEM and REM to determine the factors affecting the trade flow of tuna from Vietnam to importing countries. Then perform post-model tests to check for model errors if any (error variance

phenomenon, autocorrelation phenomenon between variables in the model and cross-dependency phenomenon between variables). Finally, we find a way to fix this error by using the appropriate method for each specific case.

### 3.2. Data

This study uses panel data of 285 observations for 19 importing countries for the period 2007–2021. These are the main and regular export markets of Vietnam during the research period, accounting for over 70% of Vietnam’s total tuna export value during this period. The study time and space were chosen with the aim of maximizing the size of the sample size and the data that could be collected as fully as possible to ensure the accuracy of the regression results. The data and sources of data are described in Table 1

### 4. Results and discussion

Perform the Hausman test to test the hypothesis  $H_0$ : there is no correlation between the independent variable and random error, the result gives the coefficient  $pvalue = 0.5502 > \alpha = 0.05$ , thus accepting the hypothesis  $H_0$  (Table 2). This conclusion is consistent with the assumptions of the REM model, so in this case, the estimate by the REM model will be better than the FEM model. Next, perform the Breusch—Pagan Lagrangian multiplier test to test the random effect in the model. The result gives the coefficient  $pvalue = 0.000 < \alpha = 0.05$ . Thus, it is concluded that random effects exist in the model, consistent with the assumption of the REM model. This shows that the estimation by the REM model is better than the OLS model. Thus, in this case study, using the REM model to estimate the impact of independent variables on the dependent variable will be more optimal than the FEM and OLS models.

We also perform the necessary tests to detect errors in the regression model. Firstly, the Pesaran test results show that the coefficient  $pvalue = 0.5862 > \alpha = 0.05$ , concluding that there is no cross-dependence between variables in the model. Secondly, perform the Wooldridge test to test the correlation between variables in the model. The result gives the coefficient  $pvalue = 0.0206 < \alpha =$

**Table 1. Description of variables, expected sign and sources of data**

Variable	Explain	Expected sign	Source of data
$EX_{ijt}$	Vietnam ‘s tuna export turnover to the importer in year t (thoudsand of dolars)	Dependent variable	International trade center (ITC)
$Q_{vt}$	The volume of tuna caught of Vietnam in year t	Positive	Vietnam ‘s Fisheries Department
$POP_{jt}$	Population of the importing country year t (people)	Positive	World Bank
$D_{vj}$	Distand from Viet Nam to importer (km)	Negative	World Bank
$EXC_{vt}$	Exchange Rate of Vietnam ese in year t (VND/USD)	Positive	World Bank
$T_{jvt}$	Tuna import tax rate for Vietnam in year t	Negative	International trade center
$GDP_{cjt}$	GDP per capita of the importing country	Positive/Negative	World Bank
$FTA_t$	Dummy variable, if Vietnam and the importer have signed an FTA, the value will be 1, the rest will be 0	Positive/Negative	WTO

0.05. This result shows that there is a correlation between the variables in the model. Thirdly, the results of the Breusch and Pagan Lagrangian multiplier test give the coefficient  $\text{Prob} = 0.0000 < \alpha = 0.05$ , so the model has the phenomenon of variable error variance. To overcome the deviations of the estimation results through the REM model, we use the Generalized Least Squares (GLS) estimation method because this method can handle the heteroscedasticity and the autocorrelation in regression models for panel data (Wooldridge, 2002, 2010). The results are as shown in Table 2:

The results of gravity model analysis show that the factors that affect Vietnam's tuna exports to import markets are as follows:

Firstly, the increase of the population of the importing country causes the demand for tuna imports from Vietnam to increase, increasing exports to Vietnam. This result shows that Vietnam's exported tuna is in line with the tastes of consumers in the import market. According to the product life cycle theory, this result shows that Vietnam's exported tuna products are in the development stage and are increasingly being accepted by clients, with numerous opportunities to raise the scale of export in the future.

Secondly, the devaluation of the local currency VND, reflected in the increase in the exchange rate, has the effect of stimulating tuna exports.

This is the factor that has the strongest impact on Vietnam's tuna exports during the study period.

This is the factor that has the most positive and strongest impact on Vietnam's tuna exports during the research period, specifically, when the exchange rate increases by 1%, Vietnam's tuna

**Table 2. Results of estimating the influence of factors on Vietnam's tuna exports**

Variable	OLS	FEM	GLS (REM)
LnPOPjt	.7001927* [14.31]	-.7708182 [-0.68]	.7001927* [14.47]
lnEXCvt	1.544012*** [1.67]	1.395924** [2.00]	1.544012*** [1.68]
Tvj	-2.555284* [5.59]	-3.63261 [1.22]	-2.555284* [-5.65]
lnQvt	.5610726*** [1.82]	.724698* [3.10]	.5610726*** [1.84]
LnGDPpjt	.0891659 [1.25]	-1.366871*** [-1.85]	.0891659 [1.27]
LnDvj	.7545631* [2.65]	(omitted)	.7545631* [2.68]
FTAt	.0393885 [0.41]	.0963342 [1.32]	.0393885 [0.41]
cons	-10.82088* [-3.42]	9.363211 [0.97]	-10.82088* [-3.46]
R-Squared	0.5432	0.1535	0.5414
Hausman test	0.5502		
Breusch and Pagan Lagrangian multiplier test	0.0000		
Wooldridge test	0.0206		
Pesaran's test	0.5862		

Note: t statistics in parentheses; \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$

Source: Authors' research results.

exports increase by 1.544012%. With the developing country in general such as Vietnam, the exchange rate often has much fluctuates, which is usually increased. Considering the period 2007 – 2021, the exchange rate of Vietnam continuously increased every year, and following this trend, the exchange rate may be still be one of the factors that have an important influence on Vietnam's tuna export industry.

Thirdly, the volume of domestically caught tuna has a positive impact on tuna exports. This is easy to understand because the domestic catches of tuna provide raw materials for processing and export. This research demonstrates that increasing domestic tuna fishing can improve the size of exports. However, this cannot be sustained in the long run because Vietnam's tuna fishing effort has currently above the sustainable exploitation level, and fishing intensity must be decreased to ensure sustainable development.

Fourthly, the import tax rate has a negative impact on Vietnam's tuna exports. Table 2 also shows that this is the factor that has the strongest impact on tuna exports. When the tax rate increases to 1%, Vietnam's tuna export scale will decrease to 2.235583%. Currently, in the US and European markets (except Norway), Vietnam's tuna exports are still at a disadvantage in terms of tariffs. Particularly in the EU area, Vietnam is exempt from import tax within the output of 11,500 tons per year. However, since 2018, Vietnam's tuna exports to the EU have all exceeded this production, indicating that the EVFTA agreement's preferential tax policy has had no effect on increasing the export of this type of tuna from Vietnam. However, thanks to the CPTPP agreement's favorable tax rate of 0%, Vietnam has several opportunities to grow exports to Japan and Canada.

Fifthly, the research results show that the relationship between geographical distance and Vietnam's tuna export scale is in the same direction. This relationship is contrary to the original foundational research of Tinbergen (1962) and many subsequent empirical studies (Masood et al., 2023; Obeng et al., 2023). Among the 19 Vietnam tuna export markets considered in this study, the US is the largest export market, is also the most remote market and has a high level of fluctuation in export value. In the period 2007 – 2021, Vietnam's tuna exports to the US also grow quite rapidly, with an average growth rate of 9.83%/year. Following that is the Canadian market, which has the second greatest geographical distance to Vietnam and is the fourth largest export market among the 19 markets evaluated. In the period 2007 – 2021, Vietnam's tuna exports to Canada grow very quickly, with an average increase of 15.55%/year. Next, the markets in the EU region such as Italy, Spain, Belgium, Netherlands, which are all markets with longer geographical distances but have greater export value and very high export growth during the period compared to other markets. In general, the scale of Vietnam's tuna exports to distant markets was larger than that to near markets, and also had a faster export growth rate during the research period. Obviously, near geographical distance is still a favorable factor for exporters, however, in order to increase the scale of trade between the two countries, other factors may be more important than the geographical distance such as trade policies between the two countries, the consumer tastes in the importing country, the level of competition in the import market, etc. Therefore, in this study, the results of estimating the gravity model show that the geographical distance has a positive relationship with the export scale.

Thus, hypotheses H1, H2, H4, H5 and H7 are consistent with the research results.

The remaining parameters, such as the signing of a free trade agreement between Vietnam and the importing country and the import country's GDP per capita, had no effect on Vietnam's tuna exports during the research period. Thus, the income of consumers in the import market is not an important factor determining the level of tuna trade. In addition, Vietnam has not been able to take significant advantage of the opportunities brought about by the signing of free trade agreements, typically the two EVFTA agreements signed between Vietnam and 14 of the 16 countries in the European region and the CPTPP agreement signed between Vietnam, Japan and Canada. Although the signing of these agreements has brought the opportunity to enjoy preferential tariff

rates for Vietnam. However, there are challenges from strict regulations on imported products in these agreements that participating parties must meet, these are barriers to export. According to the opinion of the Ministry of Industry and Trade of Vietnam as well as the market analysts, Vietnam has not taken significant advantage of the opportunities brought by the signing of free trade agreements in recent times to promote exports, and the results of this study once again proves that statement.

## 5. Conclusion

This study uses the gravity model to identify factors affecting Vietnam's tuna exports to 19 main importing countries during the research period. The results show that factors including the scale of domestic tuna production, exchange rate, population of the importing country and geographical distance have a positive impact on the scale of export value, while Import tax rates are the huge barrier, in which the exchange rate factor and import tax rate factor have the strongest impact. Research results also show that the signing of a free trade agreement between Vietnam and the importing country has not had a significant impact on tuna trade flows between the two sides because Vietnam has not taken significant advantage of opportunities from This signing is to increase exports. Furthermore, the income factor of consumers in the importing country does not have a significant impact. This study once again shows the role of supply factors as well as the exchange rate factor and the trade barriers for exports, which are factors that the previous empirical studies believe that so important in determining the export scale. The research results also show that in order to sustainably develop the tuna export industry, in the coming time, Vietnam needs to reduce fishing efforts and instead focus on improving the quality of mining and processing as well as focus on meeting the agreed requirements has signed in the free trade agreements. Furthermore, this government must make efforts to reform fisheries in general, notably investing in infrastructure building to fulfill the needs of supporting fisheries and re-planning the fishing fleet in accordance with current directions. In terms of production organization, strong coordination between participating parties is required, as is limiting output to a small scale and intermittently improving efficiency. In terms of fisheries management policies, increased vigilance is required in protecting aquatic resources and combatting illicit and uncontrolled fishing. Long term, Vietnam must strive for responsible fishing and sustainable growth.

Although the gravity model is very commonly used to determine factors affecting the level of trade between countries, applying the gravity model with secondary data is difficult fully quantify the factors affecting the export value. We believe that factors such as consumer preferences and tastes, the level of competition in the market or the political and cultural relationship between the exporting country and the importing country are very important factors determining the level of trade between them. Cross-sectional data will be better relevant for assessing the influence of these factors on the volume of commerce between countries at this time. And, in order to decide which elements are vital to examine, market research and consumer behavior study in the importing country are required. Therefore, we recommend that future studies can expand the research direction to determine the factors and their level of influence on the level of trade exchange between countries.

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### Supplemental data

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