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Competitiveness of Vietnam's Canned Tuna Export in the US and EU Market[1]

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Competitividad de las exportaciones de atún enlatado de Vietnam en el mercado de EE.UU. y la UE
Competitividade das exportações de atum em conserva do Vietname mercado dos EUA e da UE

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This study examines the competitiveness and determinants of Vietnam's canned tuna export competitiveness in the US and EU markets. The results show that Vietnam has strong and increasing competitiveness, driven by factors such as improvements in product quality, abundant domestic tuna resources, a highly open economy, inflation in both exporting and importing countries that are favorable to exports and appropriateness in the choice of export markets. In addition, recent fisheries law policy adjustments have positively impacted exports, but it is uncertain yet. In contrast, challenges in import tariffs, product quality restrictions, and the European yellow card have hindered competitiveness.

Este estudio examina la competitividad y los determinantes de la competitividad de las exportaciones de atún enlatado de Vietnam en los mercados de Estados Unidos y la Unión Europea. Los resultados muestran que Vietnam tiene una competitividad fuerte y creciente, impulsada por factores como las mejoras en la calidad del producto, los abundantes recursos nacionales de atún, una economía altamente abierta, la inflación tanto en los países exportadores como en los importadores que son favorables a las exportaciones y la idoneidad en la elección de los mercados de exportación. Además, los recientes ajustes de la política de la legislación pesquera han tenido un impacto positivo en las exportaciones, pero aún es incierto. Por el contrario, los desafíos en los aranceles de importación, las restricciones a la calidad del producto y la tarjeta amarilla europea han obstaculizado la competitividad.

Este estudo examina a competitividade e os determinantes da competitividade das exportações de atum enlatado do Vietname nos mercados dos EUA e da UE. Os resultados mostram que o Vietname tem uma competitividade forte e crescente, impulsionada por factores como melhorias na qualidade do produto, abundantes recursos nacionais de atum, uma economia altamente aberta, inflação tanto nos países exportadores como importadores que são favoráveis às exportações e adequação na escolha dos mercados de exportação. Além disso, os recentes ajustamentos na política das pescas impactaram positivamente as exportações, mas ainda é incerto. Em contraste, os desafios nas tarifas de importação, as restrições de qualidade dos produtos e o cartão amarelo europeu prejudicaram a competitividade.

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1. Introduction

As global economic integration deepens, the competitiveness of individual economies and their business environments is crucial for economic, political, and social progress (Ruzekova, 2020). The rapid growth of international trade has highlighted export competitiveness as a key factor in achieving global competitiveness (Dhiman et al., 2020; Gnangnon, 2019). International economic organizations recognize national competitiveness as essential for both global economic stability and deeper international integration (Voinescu, 2015).In this competitive landscape, countries are implementing new regulations and policies at multilateral and bilateral levels while refining macro- and microeconomic strategies to safeguard their interests. Consequently, export competitiveness has gained significant attention from businesses, industries, nations, policymakers, and researchers (Voinescu, 2015). Although systematic research on competitiveness began relatively late (Henricsson, 2004; Porter, 1990), studies on export competitiveness have increased over the past three decades. Nevertheless, comprehensive assessments of the methods and factors influencing export competitiveness remain limited (Paul, 2021), leading to ongoing debates regarding the best approaches to measure and analyze competitiveness from both business and national perspectives (Ruzekova, 2020).

Vietnam is a developing economy with a high degree of openness, where exports play a significant role in GDP, accounting for 77.72% from 2007 to 2022. The country's extensive sea area and rich marine resources make seafood exploitation and export a vital economic sector. According to the General Statistics Office, seafood consistently ranks among Vietnam's top 10 export categories, with tuna being the most commercially valuable product. Vietnam is among the world's top 10 seafood and canned tuna exporters. However, as a typical developing nation, its fisheries are characterized by small-scale operations, low efficiency, limited competitiveness, and outdated infrastructure (Nga & Xoan, 2024; Nguyen, 2018; Nguyen, 2022). The US and EU are currently the largest import markets for Vietnamese canned tuna. The EVFTA free trade agreement signed in August 2020 has reduced EU import tariffs, enhancing competitiveness and export opportunities. While improvements in seafood export quality have been made since 2015, strict tariff and non-tariff barriers in the US and EU remain significant challenges. Additionally, since receiving a yellow card warning for IUU fishing violations in 2017, Vietnam's seafood exports to the EU have faced reduced competitiveness, highlighting ongoing quality and sustainability standards issues.

This study integrates various tools to comprehensively evaluate export competitiveness, focusing on key determinants such as the availability of raw materials (tuna resources), trade policy, and the business environment. Based on the research findings, we will propose policy implications for enhancing competitiveness.

Keywords
Export competitiveness, Tuna, Vietnam, US and EU market.

Palabras clave
Competitividad de las exportaciones, atún, Vietnam, mercado de EE.UU. y UE.

Palavras-chave
Competitividade das exportações, atum, Vietname, mercado dos EUA e da UE.

JEL codes
D, F

2. Theory and Literature Review

Mercantile theory, while not explicitly discussing competitiveness, but it focuses on national wealth and success in international markets, emphasizing wealth accumulation and a nation's presence in global trade. This indicates that the origins of competitiveness theory stem from mercantile thought. The classical school of economics, particularly through the works of Smith and Ricardo, directly tackled export competitiveness with Smith's absolute advantage theory (Smith, 1776) and Ricardo's comparative advantage theory (Ricardo, 1817). These theories examine production factors and argue that an exporter's absolute or relative advantage is fundamental to international trade, implying the basis for an exporter's competitive edge despite not using the term "competitiveness."

The neoclassical school, represented by Ohlin and Heckscher, contributed to economic theory with the H–O (Heckscher-Ohlin) theory, which assesses international trade through comparative advantages based on labor and capital. While classical economics evaluates national competitiveness solely through internal production factors, it overlooks external conditions that can affect manufacturing, such as government policies (Ruzekova, 2020). Likewise, trade conditions between nations are vital for competitiveness (Irshad, Xin, & Arshad, 2018; Kuik et al., 2019). Modern economic theory broadens the understanding of competitiveness to include both internal and external production factors. Porter's diamond model exemplifies this perspective, identifying essential components shaping competitiveness—corporate strategy, structure, competition, production factors conditions, related and supporting industries, and demand conditions. Importantly, Porter highlights the government's role in developing and maintaining competitive advantages (Porter, 1990). Modern economics recognizes that rapid advancements in science and technology, with deeper global integration, allow for the easy imitation or replacement of production advantages. Consequently, trade mechanisms among partners have become crucial competitive tools, evident in tariff barriers (Kimsanova, 2022; Masood et al., 2023), non-tariff barriers (Katsikeas, 1996) and varying levels of trade freedom (Masood et al., 2023; Obeng et al., 2023). Furthermore, contemporary economic theory examines competitiveness more holistically. However, the best methods for measuring and analyzing competitiveness, whether from industry or national perspectives, remain debated, with no universally accepted definition for this complex term (Ruzekova, 2020). Cellini (2002) argues that the concept is inherently vague and hard to quantify, while Porter (1990) defines competitiveness primarily as the ability to capture market share. Expanding on this, Cellini (2002) notes that a country's competitiveness can be gauged by its ability to sell in foreign and domestic markets, particularly as costs and prices fluctuate. (Nevima, 2024) expands on this by defining competitiveness as a multi-layered concept assessed through various performance indicators, includes both single and multi-factor indices to quantify internal and external factors of production activities on export competitiveness. Among these, the Revealed Comparative Advantage (RCA) index, introduced by Balassa (1965) is commonly employed in studies of export competitiveness. Additionally, Porter highlights market share, export scale, and export growth rate as key indicators (Irshad, Xin, & Arshad, 2018; Lombardi et al., 2016). Other indicators have also emerged from different theoretical frameworks on competitiveness. For example, classical competition theory assesses competitiveness based on production costs (Fetscherin, 2012; Hooy, 2015), lower selling prices, higher product quality (Ricardo, 1817; Smith, 1776), or labor productivity advantages (Sunny, 2014). Neo-technology theory evaluates competitiveness based on the modernity of production technology (Caglayan, 2014; Chadha, 2009), while internalization theory suggests that achieving competitiveness involves creating a market structure that minimizes transaction costs (Jones, 2005; Whitelock, 2002). Building on these ideas, indices such as the Trade Specialization Ratio (TSR) (Al Mani, 2021; Paluš et al., 2015), and the National Specialization Index (MI) (Sujová et al., 2015) are single-factor measures that assess competitiveness. Heckscher-Ohlin's

theory, on the other hand, evaluates competitiveness through labor and capital intensity (Dhiman, 2019; Fetscherin, 2012). Beyond single-factor measures, multi-factor indexes offer broader evaluations of competitiveness. One notable example is the Constant Market Share (CMS) index, initially proposed by (Tyszynski, 1951), which posits that the export structure of a country's commodities impacts its global export performance, regardless of changes in other factors. Leamer later expanded this approach by analyzing how commodity composition and market effects influence export scale (Leamer, 1970). This multi-factor method has since been widely applied to measure export performance and competitiveness (Khaliqi et al., 2019; Suhana et al., 2016).

In examining the factors that determine competitiveness, the classical economic perspective asserts that absolute or relative advantages in production factors drive international trade. Building on this foundation, empirical studies have identified various exporter advantages, such as costs (Dhiman, 2017), prices (Ricardo, 1817a; Smith, 1776), production technology (Kumar, 1994; Parlakgul, 2018), labor productivity (Sunny, 2014), geographical distance (Irshad, Xin, & Arshad, 2018; Masood et al., 2023), and economic scale (Obeng et al., 2023) as essential factors in enhancing competitiveness. With the advancement of science and technology and the rapid pace of global economic integration, the dynamics of trade relationships between trading partners have increasingly become a critical determinant of export competitiveness. Empirical studies further highlight the role of trade barriers, including taxes (Kimsanova, 2022; Masood et al., 2023), non-tax barriers (Katsikeas, 1996), and trade freedom (Masood et al., 2023; F. Natale et al., 2015) as significant factors influencing competitiveness. Additionally, both macroeconomic and microeconomic policies play a substantial role.

Theoretical perspectives and numerous studies suggest that exchange rates are fundamental to determining competitiveness (Abafita, 2021; Obeng et al., 2023). However, the impact of exchange rates on competitiveness is not universally consistent; while some studies assert that only substantial changes in exchange rates affect export competitiveness, others find that exchange rates do not significantly influence exports (Assoua, 2022; Dhiman, 2019). Specific industry-focused studies also contribute to our understanding of competitiveness. For instance, research by (Hidayati et al., 2015) identifies intra-industry management policy as a key factor in determining Indonesia's tuna export competitiveness in the Japanese market. Furthermore, (Chen, 2022) shows that the application of environmental regulations has significantly boosted the profitability of export products, thereby enhancing the export competitiveness of Chinese companies. Research by (Hidayati et al., 2015) suggests that Indonesia's fisheries law impacts its competitiveness in exporting frozen and processed tuna to the Japanese market. Additionally, empirical studies indicate that beyond economic factors, a range of natural, political, social, cultural, and business environment conditions in both exporting and importing countries can influence export competitiveness. For instance, factors like natural resources (Allcott, 2014; Aragón, 2013), common borders (Irshad, Xin, Hui, et al., 2018; Tadesse & Abafita, 2021), common language (Irshad, Xin, & Arshad, 2018; Masood et al., 2023), and the level of corruption in either the exporting (Obeng et al., 2023) or importing country (Abidin et al., 2013; Obeng et al., 2023) have been shown to significantly affect export competitiveness.

Methodologically, export competitiveness studies often rely on secondary and cross-sectional data (Parlakgul, 2018; Paul, 2021; Rettab, 2009). To examine the determinants of export competitiveness, researchers employ various methods, including gravity models (Irshad, Xin, & Arshad, 2018; Kuik, 2019) and the GARCH model (Asteriou, 2016; Caglayan, 2014). Other commonly used approaches include factor analysis (Parlakgul, 2018), cointegration and causality techniques (Asteriou, 2016; Dhiman et al., 2020), as well as multiple and logistic regression analyses (Malik, 2016; Upadhyay, 2016). Despite this methodological diversity and the wide range of subjects addressed, most studies focus on analyzing

specific aspects of export competitiveness rather than providing a comprehensive review of both methods and determinants (Paul, 2021). As a result, the theory of export competitiveness and perspectives on the topic remain subjects of considerable debate (Ruzekova, 2020). Consequently, further research is needed to advance export competitiveness theory, broaden the scope of study subjects, and take a more holistic view of the factors that influence export competitiveness (Paul, 2021).

In this study, we also use the gravity model to determine export competitiveness. Proposed by Tinbergen (1962), this model examines how various factors influence trade flows between countries. Tinbergen suggested that trade is proportional to the countries' economic size (GNP or GDP) and inversely proportional to their geographical distance. This is represented by **equation (1)**, which can also be transformed into a linear form as **equation (2)**.

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

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

Where F_{AB} is the level of trade exchange from country A to country B, M_A, and M_B are the size of each country's economy, D_{AB} is the geographical distance between the two countries, G is a constant, ε is the residual in the model. Model (4) is a simple form to identify the factors affecting exports. Later studies have extended the model by incorporating additional factors, such as the model proposed by Anderson (2003), which adds trade barriers and dummy variables, to be considered the most popular and effective approach in many applications of gravity models. Up to now, this model has been widely utilized to identify factors influencing countries' exports (Kimsanova, 2022; Masood et al., 2023) and is also employed in numerous studies to determine export competitive.

Based on the current situation of the manufacturing industry and trade relations with partner countries, the factors determining the competitiveness of Vietnam's canned tuna exports in the US and EU markets are proposed as follows:

Firstly, production resources are crucial for determining export competitiveness (Paul, 2021). Vietnam benefits from a substantial domestic supply of tuna for processing and export, bolstering its market position. Thus, we propose the following research hypothesis:

H1: Annual domestic tuna output (Q_{vt}) positively impacts Vietnam's competitiveness in exporting canned tuna.

Second, product quality is crucial for export competitiveness. Although the quality of canned tuna from Vietnam is not highly appreciated (Nga & Xoan, 2024; Nguyen, 2018), it has improved significantly due to recent fisheries reforms (Nga, 2024; Xoan, 2024). As consumer income rises, so does the demand for higher-quality products (Mankiw, 2007). This study will explore the relationship between the importing country's income (real GDP per capita: GDP_{jt}) and the purchasing power of Vietnamese canned tuna (tuna export turnover: EX_{vt}) to assess quality competitiveness. So the second research hypothesis is as follows:

H2: Product quality is a factor that positively affects export competitiveness.

Third, price is still a crucial competitive tool. Low prices have recently given Vietnam a significant advantage in seafood exports, including canned tuna (Xoan, 2023; Nguyen, 2018). Additionally, Vietnam's exported seafood quality has markedly improved in recent years, leading to higher export prices. Thus, this study investigates the relationship between Vietnam's relative export price compared to its competitors and the export scale of canned tuna to evaluate competitiveness in terms of price and quality. The third research hypothesis is as follows:

H3: The export price compared to its competitors (P_{jvt}) negatively impacts Vietnam's canned tuna export competitiveness.

As global economic integration deepens, market barriers have become crucial competitive tools (Bernard, 2007; Katsikeas, 1996; Paul, 2021). From 2007 to 2022, the average import tax on canned tuna from Vietnam was over 10% per year in the US and about 20% in the EU. Starting in 2020, the EU began reducing taxes for Vietnam under the EVFTA agreement, following an 8-year roadmap. Additionally, since 2017, the EC's yellow card warning for IUU fishing violations has harmed Vietnam's exports. This warning has tarnished Vietnam's reputation in the EU market and led to 100% pre-inspection of exports, increasing storage time and costs, thus reducing competitiveness. Therefore, we propose the following research hypotheses:

H4: Import tax rate (T_{jvt}) negatively impacts export competitiveness.

H5: EC's yellow card (C_{jvt}) negatively impacts export competitiveness.

Fifth, industry management policy significantly impacts export competitiveness (Chen, 2022; Costantini, 2012; Hidayati et al., 2015). Since 2017, the Government has introduced an updated Fisheries Law, marking a pivotal change in the industry. This includes regulations on co-management, a national fisheries database, fishing quota allocation, and inspections of fishing vessels, particularly addressing IUU fishing issues after the EC's "yellow card" warning to Vietnam. Additional provisions ensure responsible management of fishing ports and establish clear guidelines for confirming the origin of seafood products. The revised law also emphasizes compliance with international standards for export products to boost competitiveness. Hence, the following research hypothesis is proposed:

H6: Significant changes in the fisheries law (LAW_{vt}) positively influence Vietnam's canned tuna export competitiveness.

Seventh, Vietnam's deep integration into the global economy has significantly spurred economic growth (Su, 2019). From 2007 to 2022, global political and economic fluctuations, including epidemics and conflicts, caused notable volatility in world oil prices. According to the Ministry of Industry and Trade of Vietnam, world oil prices influence approximately 65% of this country's oil prices. In addition, rising oil prices contributed to inflation in the US and EU, particularly in 2021 and 2022, which impacted consumer choices. This study thus explores the effects of inflation and trade openness on the competitiveness of Vietnam's canned tuna exports. Therefore, the following research hypotheses are proposed as follows:

H7: Inflation in importing and exporting countries (INF_{vjt}) negatively affects Vietnam's canned tuna export competitiveness.

H8: Trade openness (TF_{vt}) positively influences Vietnam's canned tuna export competitiveness.

Geographical distance poses an export barrier by increasing costs, and limiting export competitiveness (Tinbergen, 1962). Therefore, we propose the ninth following research hypothesis:

H9: Geographical distance (D_{vj}) negatively affects Vietnam's canned tuna export competitiveness.

Thus, the research model of factors determining the competitiveness of Vietnam's canned tuna exports in the US and EU markets is built as in **equation (3)**.

$$LnEX_{vjt} = \beta_0 + \beta_1 INF_{vjt} + \beta_2 T_{jvt} + \beta_3 TF_{vt} + \beta_4 lnQ_{vt} + \beta_5 P_{jvt} + \beta_6 LnGDP_{jt} + \beta_7 lnD_{vj} + \beta_8 C_{jvt} + \beta_9 LAW_{vt} + \varepsilon \quad (3)$$

Where β_0 represents the intercept coefficient, ε is the error term, ln is the natural logarithm, and β_1 through β_9 are regression coefficients. EX_{vjt} is Vietnam's export turnover of canned tuna in market j in year t.

3. Methodology and Data

3.1. Methodology

3.1.1. Assessment of Competitiveness

This study assesses Vietnam's canned tuna export competitiveness using three indicators.

First, the market share index (MS) provides a clear picture of the export scale and the exporter's position in the market. Among the various criteria for evaluating export competitiveness, the ability to export, as reflected through market size, is considered one of the most significant factors (Voinescu, 2015). As Porter (1990) argues, competition fundamentally revolves around gaining market share, making the ability to capture and sustain market share a key measure of competitiveness.

The market share index is calculated as follows:

$$MS = \frac{X_{ij}}{X_{wi}} 100\% \quad (4)$$

Where: X_{ij} is the export value of product i of country j; X_{iw} is the global export value of product i.

Second, the revealed comparative advantage (RCA) index illustrates a country's specialization in particular goods (Paul, 2021) by measuring the concentration of a manufacturing industry relative to others within the economy. According to Balassa (1965), the RCA index is calculated as follows:

$$RCA = \frac{\frac{X_{ij}}{X_j}}{\frac{X_{wi}}{X_w}} \quad (5)$$

Where: X_{ij} is the export value of commodity i of nation j;

X_j is the export value of all commodities of nation j;
X_{wi} is the global export value of commodity i;
X_w is the global export value of all commodities

Third, the constant market share index (CMS), a multi-factor index proposed by (Tyszynski, 1951) evaluates how a country's export structure for specific goods affects its global export performance, even when other factors change. (Leamer, 1970) further developed this approach by analyzing the impacts of commodity composition and market dynamics on changes in export scale. We adopt this index to determine the fluctuations in the scale of Vietnam's tuna exports to the US and EU markets during the research period, paying particular attention to the impact of competitive effects on changes in competitiveness.

In this study, the CMS index is calculated as follows:

$$\Delta q = \sum_{i=1}^{n} r\, q_i^0 + \left(\sum_{i=1}^{n} (r_i q_0^i - r q_i^0) \right) + \left(\sum_{i=1}^{n} \sum_{j=1}^{m} r_{ij} q_{ij}^0 - \sum_{i=1}^{n} r_i q_i^0 \right) + \left(\sum_{i=1}^{n} (q_i^1 - q_i^0) \right) - \sum_{i=1}^{n} \sum_{j=1}^{m} r_{ij} q_{ij}^0) \quad (6)$$

Where:

$\Delta \mathbf{q}$: The change in the country's export value between two periods.

r: The percentage change in total exports of the world for all commodities from the beginning to the end.

$\mathbf{r_i}$: The percentage change in total world exports for commodity i from the first period to the last period.

$\mathbf{r_{ij}}$: The percentage change in total world exports of commodity i to market j.

$\mathbf{q_i^0}$: Total export volume of the country for commodity i in the first period.

$\mathbf{q_{ij}^0}$: The country's total export volume of commodity i to market j in the first period

World Trade Effect: $\sum_{i=1}^{n} r\, q_i^0$ This component measures the growth in a country's exports assuming the country's exports grow at the same rate as the world average. If there is any growth or decline in a country's exports, a portion of it can be attributed to the general growth or decline in global exports.

Commodity Composition Effect: $\left(\sum_{i=1}^{n} (r_i q_0^i - r q_i^0) \right)$ This component evaluates the concentration of a

country's exports in high-demand goods. A positive value signifies that the country's exports are focused on products with a demand growth rate exceeding the global average (r).

Market Distribution Effect: $\left(\sum_{i=1}^{n}\sum_{j=1}^{m} r_{ij}q_{ij}^{0} - \sum_{i=1}^{n} r_i q_i^0\right)$ This component analyzes a country's export distribution across different import markets, evaluating whether these markets experience demand growth higher or lower than the global rate for a specific product. A positive value signifies that the exporter targets markets with above-average import growth, enhancing export performance.

Competitive Effect: $\left(\sum_{i=1}^{n}(q_i^1 - q_i^0)\right) - \sum_{i=1}^{n}\sum_{j=1}^{m} r_{ij}q_{ij}^{0})$ This component indicates the country's export competitiveness. A positive value means the country outperforms the global average in exports, showcasing higher competitiveness, while a negative value signifies lower competitiveness relative to other exporters.

3.1.2. Identifying factors that determine competitiveness

The research model of the factors determining export competitiveness in this study is built as in **equation (3)**. The model's research variables are detailed in **Table 1**.

Table 1 - Explanation of variables

Variable	*Explain*	*Author suggested*	*Expected sign*
EX_{vjt}	Vietnam's tuna export turnover to the country j in the year t (thousands of dollars)		
INF_{vjt}	The inflation rate of Vietnam is multiplied by the inflation rate of the importing country.	Rahman et al., 2019	-
Tj_{vt}	Tuna import tax rate for Vietnam in the year t (%)	Anderson, 2003, Kimsanova, 2022, Masood, 2023	+
TF_{vt}	The level of trade freedom of Vietnam in year t	Masood et al., 2023; Natale, 2015	+
Q_{vt}	The volume of tuna caught in Vietnam in the year t	Allcott, 2014; Aragón, 2013; Nga & Xoan, 2024	+
P_{jvt}	Vietnam's relative export prices compared to its competitors in the year t	Porter (1985, 1990)	+
GDP_{jt}	GDP per capita of the importer in the year t (dollar/ people)	Abidin et al., 2013; Hassan Khayat, 2019	-
D_{vj}	Distance from Viet Nam to importer (km)	Tinbergen, 1962	-
C_{jvt}	Dummy variable, if Vietnam gets a yellow card warning, the value will be 1, and the rest will be 0	Author's suggestion	+
LAW_{vt}	The Dummy variable is 1 from 2019 - 2022 and 0 from 2007 - 2018.	Hidayati et al., 2015	+/-

Source: Suggested and collected by the author

Previous studies indicate that OLS regression, random effects models (REM), and fixed effects models (FEM) are appropriate for estimating the impact of independent variables on dependent variables in panel data regression, even with small samples (Cevik, 2022; Hassan Khayat, 2019; Taylor, 1980). This study will select the most suitable model among OLS, FEM, and REM to estimate the regression results.

3.2. Data and Source of Data

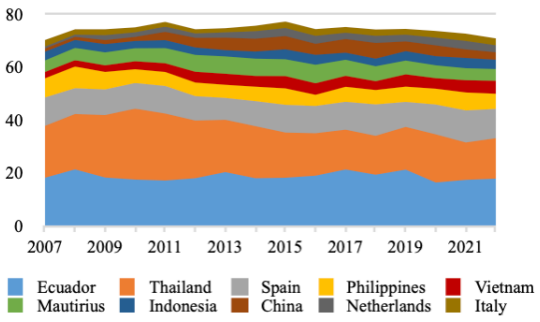
This study analysis of factors affecting Vietnam's tuna export competitiveness is based on balanced panel data comprising 192 observations from 12 of Vietnam's regular tuna importers, including the US and 11 EU countries, from 2007 to 2022. Data on export turnover, import tax rates, and export volumes were collected from the ITC, while inflation rates and GDP per capita were collected from the World Bank. Geographical distances and Vietnam's trade freedom index were collected from Thomson Reuters, and tuna exploitation volume data came from the Vietnam Fisheries Institute. The variable C_{jvt} (EC yellow card) was set to 1 from 2017 to 2022, indicating the European Commission's warning to Vietnam, and 0 for previous years. LAW_{vt} (fisheries law) was assigned a value of 1 from 2019 to 2022, marking the implementation of the new fisheries law, and 0 for earlier years.

4. Research Results and Discussion

4.1. Assess Export Competitiveness

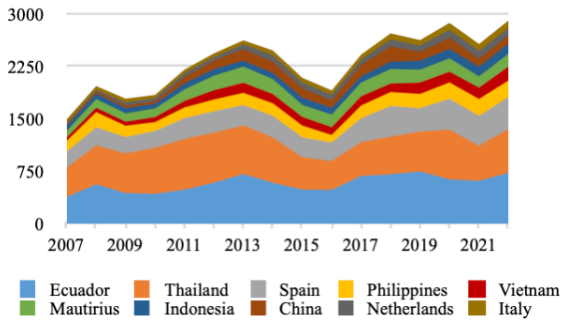
From 2007 to 2022, Vietnam improved its ranking in tuna exports to the US and EU from 8th to 5th place. Its market share grew from 2.416% to 4.899%, while the total export value surged from $51.4 million to $200.9 million. These gains reflect Vietnam's enhanced competitiveness in canned tuna, attributed to significant fisheries reforms. However, its market share still so small compare to the leading exporters like Ecuador, Thailand, and Spain, and the country's export value and market presence in canned tuna have faced instability in recent years. Thailand boasts a well-developed tuna processing industry, supported by government policies and low labor costs. Ecuador excels in production capacity with a large commercial tuna fishing fleet and competitive pricing. Since 2016, Ecuadorian tuna has benefited from a tax exemption in the EU due to a Free Trade Agreement. Spain also has a significant domestic tuna supply and a strong fishing fleet, with its tuna recognized for quality and enjoying a 0% preferential tariff in the EU for intra-bloc exports. In contrast, Vietnam's exported tuna faces high import taxes in the US and EU markets.

Figure 1 - Market share (%)



Source: Author's calculations based on ITC data

Figure 2 - Value of export (1000 $)



Source: ITC

Table 2 shows that from 2007 to 2022, Vietnam had a significant comparative advantage over the global average (Hinloopen, 2001). However, this advantage has gradually declined due to increased competition from major exporters and persistent domestic tuna fishing industry challenges. Overfishing has notably reduced fish productivity and restricted the growth of exports.

Vietnam should decrease resource exploitation to address these challenges, though this might diminish its long-term comparative advantage. The main competitors such as Mauritius, Ecuador, Thailand, the Philippines, Indonesia, and Spain have notable comparative advantages. Mauritius and Ecuador boast significant and growing strengths, bolstered by ample tuna resources. Mauritius benefits from US tariff exemptions under the African Growth and Opportunity Act (AGOA), while Ecuador enjoys preferential treatment in the EU through sustainable development agreements. Conversely, Thailand, the Philippines, and Indonesia face declining export growth due to overfished tuna stocks, tariff disadvantages in US and EU markets, and heightened competition. Meanwhile, countries like the Netherlands, Italy, and Portugal maintain low comparative advantages as tuna is not their main export.

Table 2 - The RCA index of the 10 biggest exporters

Year	*Netherlands*	*Italy*	*Spain*	*Vietnam*	*Indonesia*	*Thailand*	*Mauritius*	*Ecuador*	*Philippines*	*Portugal*
2007	0.233	1.065	8.623	11.438	11.149	48.814	682.687	93.362	16.922	1.272
2008	0.342	0.954	8.378	9.984	8.908	56.661	531.634	88.846	36.563	1.282
2009	0.906	1.165	6.743	9.684	11.659	57.800	729.053	59.677	31.849	1.597
2010	0.672	0.989	7.327	11.402	8.941	67.171	662.375	62.349	31.485	1.273
2011	0.601	0.889	10.551	10.862	10.224	59.296	659.795	63.421	36.970	1.603
2012	0.627	0.856	8.363	10.979	9.135	55.005	665.908	74.656	41.565	1.650
2013	0.667	0.823	5.964	9.407	8.622	49.160	597.794	99.822	60.931	1.593
2014	0.903	0.964	6.771	7.634	8.336	42.056	549.630	95.302	34.042	2.337
2015	1.058	1.077	6.871	6.550	8.702	33.331	553.721	126.225	28.159	1.675
2016	1.367	1.040	6.712	5.717	7.868	31.700	587.301	163.526	18.075	2.026
2017	1.361	0.920	6.953	5.510	10.062	30.710	564.411	198.869	26.056	2.702
2018	1.259	0.943	7.544	4.227	9.131	30.824	625.054	183.812	27.329	2.651

2019	1.084	0.939	6.063	4.623	10.851	30.532	550.772	197.597	27.484	2.274
2020	1.352	1.063	5.825	4.302	5.646	32.466	623.484	169.975	29.967	2.405
2021	1.421	1.187	6.141	4.368	3.936	23.803	841.216	203.071	35.633	2.901
2022	1.168	1.137	5.896	2.740	3.121	25.870	894.391	174.667	30.498	3.318

Source: Author's research results

CMS analysis shows that the world trade effect significantly influenced Vietnam's tuna exports to the US and EU, resulting in a remarkable 658.83% increase in export value from 2015 to 2022 compared to 2007-2014. This indicates that Vietnam's tuna exports during this period followed the general growth trend of global trade. Additionally, the commodity composition effect contributed to a 108.90% increase, while the competition effect accounted for a 95.08% rise in exports. These findings indicate that Vietnam has prioritized exporting tuna products with higher growth rates than other global products, demonstrating positive trends for its tuna exports during the research period. From 2015 to 2022, Vietnam significantly reformed its fisheries sector compared to 2007-2014, notably with Decree 67/2014/ND-CP, which established policies prioritizing financial support for fishermen to enhance their boats and productivity. The country also introduced a tuna value chain policy for exploitation, processing, and export, yielding positive results. Since 2014, collaboration with Japan on post-harvest preservation technology has further modernized Vietnam's fisheries and increased tuna export competitiveness. However, market distribution issues have negatively affected tuna exports (**Table 3**). To improve competitiveness, Vietnam could diversify its market structure and target higher-demand markets such as France, Romania, Portugal, and Slovakia. While Thailand is a leading tuna exporter to the US and EU, its market share has consistently declined from 2007 to 2022. The decline in Thailand's tuna industry is attributed to fierce competition from Ecuador, Spain, and the Netherlands, along with high import taxes and diminishing domestic fish stocks. CMS analysis reveals a significant drop in Thailand's competitiveness in canned tuna exports, a trend also seen in Mauritius (**Table 3**). While Vietnam's tuna export competitiveness has improved more rapidly than that of Thailand, Mauritius, the Philippines, Spain, Indonesia, and Italy, its competitiveness in exporting canned tuna is far behind that of the market's leading exporters.

Table 3 - Results of CMS decomposition of the change in export value and market share of canned tuna

Exporter	*Change in exports ($1000)*	*Change in market share (%)*	*World Trade Effect*		*Commodity Composition Effect*		*Market Distribution Effect*		*Competitiveness Effect*	
			Value	*%*	*Value*	*%*	*Value*	*%*	*Value*	*%*
Vietnam	734506	0.26	4839160	658.83	799851	108.90	-5602841	-762.80	698336	95.08
Ecuador	3246173	0.47	19463134	599.57	3217006	99.10	-22529511	-694.03	3095543	95.36
Thailand	48187	-5.71	66408545	137814.23	10976479	22778.92	-77134075	-160072.38	-202762	-420.78
Spain	770388	1.46	15325075	1989.27	2533038	328.80	-17749722	-2304.00	661998	85.93
Philippines	120616	-0.06	8976183	7441.95	1483648	1230.06	-10398906	-8621.50	59691	49.49
Netherlands	1462810	1.09	3047577	208.34	503725	34.44	-3524854	-240.96	1436362	98.19
Mauritius	-158839	0.32	8310127	-5231.79	-1373557	-864.75	-9620157	6056.55	-222366	-139.99
Italy	582248	0.81	4274989	734.22	706601	121.36	-4946708	-849.59	547366	94.01
Portugal	365250	0.67	1469088	402.21	242821	66.48	-1703227	-466.32	356568	97.62
Indonesia	659818	0.47	7932005	1202.15	1311059	198.70	-9209302	-1395.73	626057	94.88

Source: Author's research results

4.2. Competitiveness Factors Via the Gravity Model

Descriptive statistics reveal considerable variability in the data for this analysis. Key factors include the inflation rate product (INF_{vjt}) of exporting and importing countries, which fluctuates significantly. Export values of Vietnamese tuna ($LnEX_{vt}$) also show notable variability, while other variables demonstrate more stable trends (**Table 4**).

Table 4 - Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev	Min	Max
$LnEX_{vt}$	192	3.3285	.7230	1.5315	5.1901
TF_{vt}	192	74.25	7.8985	56	83
INF_{vjt}	192	17.6144	23.2115	-2.3882	88.7425
P_{jvt}	192	.7907	.1587	.3815	1.2927
LnQ_{vt}	192	4.8754	.1566	4.6197	5.0902
LnD_{vj}	192	3.9671	.0620	3.8818	4.1356
T_{jvt}	192	.1945	.0290	.0988	.2058
C_{jvt}	192	.3750	.4854	0	1
$LnGDP_{pjt}$	192	4.5510	.3792	4.0232	5.6742
LAW_{vt}	192	.25	.4341	0	1

Source: Statistical results from Stata

Next, we conduct tests to select the most suitable model and assess the extent to which it meets the hypotheses. If errors are detected, we identify methods to address them.

The Hausman test and Breusch-Pagan Lagrangian multiplier test suggest that the random effects model (REM) is preferable to the ordinary least squares (OLS) and fixed effects model (FEM). Thus, REM is selected for estimating the regression results. The Ramsay test confirms that significant variables are not omitted, while the Pesaran test shows no cross-dependence among the model's objects. However, the Wooldridge test points to autocorrelation among the independent variables, and the Breusch-Pagan test reveals heteroskedasticity in the model (**Table 5**). These issues breach linear regression assumptions and may skew estimation outcomes. To rectify these violations, we employ the feasible generalized least squares (FGLS) method, which can mitigate potential regression errors (Wooldridge, 2002, 2010). The FGLS results are displayed in **Table 6**.

Table 5 - Descriptive statistics of variables

Tests	Result	Conclusion
Hausman	Prob = 0.6350	REM estimation is better than FEM.
BP	Prob = 0.0000	REM estimation is more optimal than OLS.
Pesaran	Prob = 0.4798	There is no cross-dependency between objects in the model.
Ramsey RESET	Prob = 0.0578	The model does not omit important variables
Wooldridge	Prob = 0.0049	There is autocorrelation in the model.
BP	Prob = 0.0000	There is a phenomenon of variable error variance

Source: Model testing results

Table 6 - Descriptive statistics of variables

Variable	Coef.	Std. Err	z	P>|z|
TF_{vt}	2.5230***	.7400	3.41	0.001
INF_{vjt}	.0015***	.0006	2.64	0.008
P_{jvt}	.8880**	.3862	2.30	0.021
LnQ_{vt}	.7333**	.3300	2.22	0.026
LnD_{vj}	4.9414***	.9909	4.99	0.000
T_{jvt}	-5.6915***	1.8998	-3.00	0.003
C_{jvt}	-.1168**	.0512	-2.28	0.022
$LnGDP_{pjt}$	-.3290*	.1802	-1.83	0.068
LAW_{vt}	.0671	.0713	0.94	0.347
_cons	-22.6691***	2.8672	-7.91	0.000

Note: t statistics in parentheses; *p < 0.1; **p < 0.05; ***p < 0.01
Source: Authors' research results

The gravity model results in **Table 6** reveal key factors influencing Vietnam's canned tuna export competitiveness and their impacts. Key findings include:

Firstly, trade freedom is a crucial determinant of tuna exports, significantly affecting them at the 1% level. Specifically, a 1% increase in trade freedom results in a 2.5230% increase in tuna exports.

Secondly, currency devaluation in both exporting and importing countries significantly affects the competitiveness of exported goods. Although this variable is statistically significant at the 1% level, its impact on exports is relatively modest. This is consistent with previous studies indicating that currency devaluation in either country influences trade (Irshad, Xin & Arshad, 2018; Obeng et al., 2023).

Thirdly, Vietnam's relative export prices compared to competitors significantly impact tuna exports, with a strong correlation at the 5% significance level. The rising export prices of Vietnam's tuna since 2014 reflect improved product quality, allowing for higher prices while sustaining rapid growth in exports to the US and EU markets.

Fourthly, the high annual volume of domestically harvested tuna is crucial for export success. This result supports previous research claims that resource abundance is a key driver of economic growth and aligns with the Heckscher–Ohlin theory that suggests countries should export goods that utilize their abundant resources.

Fifthly, geographical distance, typically associated with import costs, yields unexpected results in the regression analysis; it demonstrates a positive relationship instead of the expected negative one. This implies that factors like product-market compatibility and market incentives may have a greater impact on competitiveness than geographical distance. Thus, choosing the right markets for export is crucial for enhancing competitiveness.

Table 6 also identifies factors that hinder Vietnam's tuna exports.

Firstly, import tariffs are the primary barrier to competitiveness, as a 1% increase in tariffs can lead to a 5.69% decrease in exports. From 2007 to 2022, Vietnam's average import tax rate for canned tuna was over 10% in the US and more than 20% in the EU. However, agreements such as the EVFTA are expected to boost Vietnam's competitiveness in the EU market in the coming years.

Secondly, the yellow card warning issued by the European Commission in 2017 for IUU fishing has severely impacted the competitiveness of Vietnam's tuna exports. Research indicates that the yellow card has significantly hindered these exports.

Thirdly, an increase in the importing country's income negatively affects Vietnam's tuna exports, suggesting that Vietnamese tuna is viewed as lower quality compared to alternatives. As incomes rise, consumers tend to prefer higher-quality products, aligning with previous studies that raised quality concerns about Vietnam's tuna (Nguyen, 2018; Nguyen, 2023).

Finally, the 2019 fisheries law has positively influenced Vietnam's tuna exports, and its implementation is expected to enhance the competitiveness of the country's seafood products over time.

5. Conclusion, Policy Implications, and Future Research

5.1. Conclusion

Vietnam ranks as the 5th largest exporter of canned tuna to the US and EU markets, with an increasing export market share and improving competitiveness, indicating significant potential for its tuna exports. However, the exploitation of fisheries remains outdated, presenting significant challenges. This study evaluates export competitiveness through various methods, offering insights into the factors affecting Vietnam's canned tuna exports. By applying the gravity model, we analyze the impact of each factor on export advantage, providing valuable evidence for policy planning to enhance competitiveness. A key finding highlights the detrimental effect of the European Commission's yellow card for IUU fishing violations on Vietnam's export competitiveness. Conversely, changes in fisheries law have had positive but unclear effects on tuna export competitiveness. The relationship between Vietnam's relative tuna export price compared to competitors and turnover shows a decline in price competitiveness but improved product quality. However, the inverse correlation between the income levels of importing countries and their purchasing power for Vietnamese tuna highlights ongoing quality concerns. Despite these challenges, market share (MS) and constant market share (CMS) analyses indicate that Vietnam's tuna export competitiveness in the US and EU markets is improving, with potential for further growth in the coming years.

5.2. Policy recommendations to improve export competitiveness

The research findings suggest the following policy recommendations to promote sustainable export growth and strengthen Vietnam's long-term competitiveness in the global tuna market:

Firstly, promote sustainable management of fisheries: Sustainable fishing practices must be enforced to protect domestic tuna resources, a key determinant of competitiveness. The government should strictly regulate fishing activities by controlling the number of vessels, catch output, and permissible fishing seasons. Addressing IUU violations is essential for removing the EC yellow card in the short term and transitioning toward responsible and sustainable fishing practices in the long term. This approach will enhance Vietnam's reputation and increase the global competitiveness of tuna products.

Secondly, enhancing the quality of exported tuna is essential, as the negative correlation between the income levels of importing countries and Vietnam's tuna export turnover highlights quality issues. Efforts should prioritize modernizing onboard preservation techniques, minimizing long-term storage, and optimizing post-catch processing. Service fleets must be established to swiftly transport catches to shore, ensuring quality and compliance with international standards. Additionally, investment in modern infrastructure is necessary to support fisheries development.

Thirdly, diversifying export markets is also crucial. Investments in market research and trade promotion should target underutilized markets like the Czech Republic, Bulgaria, Hungary, Portugal, and Slovakia. Addressing non-tariff barriers and utilizing tariff incentives from agreements such as the EVFTA will be vital for expanding market access and boosting export volumes.

Fourthly, to enhance cost efficiency, the tuna processing industry should adopt an integrated production model that reduces intermediate steps, facilitating quick transportation of raw materials to processing facilities. Diversifying product offerings to include non-tuna seafood and general food products will optimize factory capacity, stabilize employment, and improve economic efficiency.

Fifthly, tighter control of inflation and lending interest is necessary to stabilize production costs and boost export competitiveness.

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