**Export Performance of Indonesian Processed Tuna Commodities in the Japanese Market**

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***Abstract***. *Tuna commodity is globally competitive, but its performance is still below its competitor country, namely Thailand and is starting to compete with other countries, namely the Philippines, Vietnam and China. This study aims to evaluate the competitiveness performance and analyze the demand for processed tuna commodities in the Japanese market. Export competitiveness analysis is processed using the Revealed Comparative Advantage (RCA) index and the Revealed Competitiveness Advantage (RC) index. The level of competition and export demand will be analyzed using the Almost Ideal Demand System (AIDS) model. The results showed that the export performance of Indonesian processed tuna commodities was comparatively and competitively competitive in the Japanese market. The demand for Indonesian processed tuna commodities in the Japanese market has fulfilled the demand theory. Indonesian processed tuna is a normal item for Japanese consumers. For Indonesia, processed tuna from competitor countries Thailand, the Philippines, Vietnam, and China are substitute goods. Thus, an increase in prices in these four countries will increase Indonesia's share.*

***Keywords****: Almost Ideal Demand System; Revealed Comparative Advantage; Revealed Competitive Advantage; Tuna Commodities.*

**INTRODUCTION**

The fisheries sector plays an important role in Indonesia's economic growth. The sector has contributed to Fisheries GDP by 2.58% in 2022 (MMAF 2023). Fisheries GDP theoretically consists of several components, namely domestic fisheries product consumption and non-domestic fisheries product consumption (exports). Research by KKP (2022b) shows that the export value of fishery products has a positive correlation with the value of fishery GDP at constant prices with a value of 85.93%. This shows that the main support of fisheries GDP is the export of fisheries products. One of Indonesia's capture fisheries export products is dominated by tuna commodities. This commodity plays an important role in fulfilling the consumption of tuna commodities in the world. The reason is because Indonesia produces the highest catch in the world. Indonesia's catch contributes 17% of the total global catch, followed by Vietnam at 8% and Ecuador at 5% (FAO 2022).

The tuna commodity has become the main commodity of national fisheries, not only because of its high production, but this commodity group is able to meet the needs of domestic and foreign consumption (export). Tuna exports have been carried out in fresh, frozen and processed forms. Tuna exports have experienced fluctuations and a sharp decline from 2013 to 2016, then began to increase until 2021 (Figure 1).

The value of tuna exports has continued to decline since 2013 until the lowest in 2016. This decline occurred due to a decrease in tuna production. The cause of the decline in production is the implementation of KP Regulation No. 56 of 2014, which is about a moratorium on fishing licenses in WPPNRI. In addition, there was a decrease in catch production caused by the adaptation of the use of several types of fishing gear (Dinas Kominfo Jawa Timur 2017). The increase in exports that began in 2016 occurred after President Joko Widodo implemented the Global Maritime Fulcrum (GMF) rules in full until now.

One of the main export markets for Indonesian tuna commodities is Japan. This is at least shown through the following reasons. First, Japan has become the main export destination for Indonesian tuna fisheries. Japan absorbed 16% of Indonesia's tuna exports in 2021 (UN Comtrade 2022). Second, Japan is one of the countries with the largest import needs for fishery products with the main products being tuna, shrimp, and salmon (Ministry of Trade 2021). Third, bilateral cooperation between Indonesia and Japan formed through the Indonesian-Japan Economic Partnership Agreement (IJEPA) has had an impact on trade growth for both countries. Fourth, high demand for high value species such as bluefin tuna, big eye tuna, yellowfin tuna, and demand for processed tuna.

**Figure 1**. Indonesia tuna export value in Japanese market 1989-2021 (Trade Map 2023)

Tuna exports are carried out in three forms, namely fresh, frozen, and processed. Exports of these commodities are mostly in processed products with harmonized system (HS) code 160414. This study will specifically analyze processed tuna commodities. Processed tuna is the most exported product. Indonesian processed tuna meets 21% of Japan's consumption in 2022 (Trade Map 2023). Indonesia's processed tuna exports are below competitor Thailand and above other countries, namely the Philippines, Vietnam, and China (Figure 2). Indonesia's processed tuna exports fluctuate, but tend to increase from 2001-2022. This fluctuation indicates competition with other countries. The largest producer of processed tuna exports is dominated by Thailand.

The fluctuating export trade value of processed tuna commodities (Figure 2) in Indonesia and other competing countries shows competition in the Japanese market. This suggests that research on the competitiveness of processed tuna commodities can be important information in marketing these commodities in the Japanese market. Therefore, this study aims to evaluate the competitiveness performance of processed tuna exports and investigate the demand for Braid to capture emerging opportunities for the development of Indonesian processed tuna exports.

**METHODS**

The data used in this study are secondary data. The tuna commodities analyzed are processed tuna with HS code 160414. The data used are export data of tuna commodities in 5 major exporting countries of Japan, namely Thailand, Indonesia, the Philippines, Vietnam, and China for the last 22 years (2001-2022). This data was obtained from the Trade Map agency.

The analysis method used in this research is quantitative. The quantitative method is used to analyze export competitiveness. Export competitiveness analysis is processed using the Revealed Comparative Advantage (RCA) index and the Revealed Competitive Advantage index. The level of competition and export demand will be analyzed using the Almost Ideal Demand System (AIDS) model. This data processing uses Microsoft Excel and STATA.

**Comparative and Competitiveness Analysis**

Competitiveness analysis will be conducted using the RCA and RC indices. The Revealed Comparative Advantage (RCA) index was first used by Bela Balassa in 1965, where Balassa tried to separate the demarcation boundaries between countries based on revealed comparative advantage in certain sectors and countries that do not have it. A country has a comparative advantage if the RCA value > 1, and vice versa if 0 < RCA < 1, then the country has a comparative disadvantage of its products in the world market. This approach is formulated in the following mathematical model.

$$RCA= \frac{X\_{ad}/X\_{a}}{X\_{wd}/X\_{w}}$$

Description:

Xad = Total exports of Indonesian tuna

 commodity groups to the

 Japanese market

Xa = Total exports of Indonesia to the

 Japanese market

Xwd = Total world exports of tuna

 commodities to Japan

Xw = Total world exports to the

 Japanese market

The Revealed Comparative Advantage (RCA) index has a drawback, which is that it contains asymmetric values. The asymmetry in the RCA index is that if a country has a comparative advantage, it will be valued between 1 and infinity and if the country does not have a comparative advantage, it will be valued between 0 and 1. This causes the need for additional other methods that are symmetrical so that it can be known exactly whether a country has a competitive advantage or not.

The Revealed Competitive Advantage (RC) index is one of the alternative indices used because it is symmetric and this index has been used to measure competitiveness in agricultural products under the RCA model. This index is also known as the Vollrath index. The Vollrath index states that RCA can be estimated under international competitiveness in four principle areas, namely Relative Trade Advantage (RTA), Revealed Competitiveness Index (RC), Relative Export Advantage (RXA), and Relative Import Advantage (RMA). Positive values on RXA, RTA, and RC indicate a country has a competitive advantage and vice versa. The Vollrath Index can be expressed as follows.

$$RMA=\left(\frac{M\_{ad}}{M\_{na}}\right)/\left(\frac{M\_{dr}}{M\_{nr}}\right) $$

$$RXA=\left(\frac{X\_{ad}}{X\_{na}}\right)/\left(\frac{X\_{dr}}{X\_{nr}}\right)$$

$$RTA = RXA – RMA$$

$$RC=Ln\left(RXA\right)-Ln\left(RMA\right)$$

Description:

Mad = Total imports of Indonesia's tuna

 commodity group

Mna = Total imports of Indonesia other

 than TUNA commodity groups

Mdr = Total imports of tuna commodities

 from all countries, except Indonesia

Mnr = Total imports of all commodities,

 except tuna commodities from all

 countries, except Indonesia.

Xad = Indonesia's total exports of tuna commodity groups

Xna = Total exports of Indonesia other

 than tuna commodity groups

Xdr = Total exports of tuna commodities

 from all countries, except

 Indonesia

Xnr = Total exports of all commodities,

 except tuna commodities from all

 countries, except Indonesia.

**Demand Analysis**

The AIDS model was introduced by Dealton and Muelbauer in 1980, and has subsequently grown in use in agricultural economics to analyze import and export demand (Alston et al. 1990). The two main assumptions made when applying AIDS to import or export demand analysis are product aggregation across import/export sources or precluding separability between goods. The implication of product aggregation is that prices aggregated across import sources change together by the same proportion (Yang and Koo 1994). This model is a simultaneous equation processed using Seemingly Unrelated Regression (SUR). The dependent variable in this model is share, while the independent variables are price and revenue. The equation in this model is as follows.

$$w\_{i}=α\_{i}+\sum\_{j=1}^{n}γ\_{ij}lnP\_{j}+β\_{i}ln\frac{x}{p^{\*}}$$

The following is a mathematical model of the market share of skipjack tuna for Indonesia and other competing countries in the international market.

$$w\_{t}=α\_{1}+γ\_{11}lnP\_{t}+γ\_{12}lnP\_{i}+γ\_{13}lnP\_{f}+γ\_{14}lnP\_{v}+γ\_{15}lnP\_{c}+γ\_{16}lnP\_{r}+β\_{1}ln\frac{x}{p^{\*}}$$

$$w\_{i}=α\_{2}+γ\_{21}lnP\_{t}+γ\_{22}lnP\_{i}+γ\_{23}lnP\_{f}+γ\_{24}lnP\_{v}+γ\_{25}lnP\_{c}+γ\_{26}lnP\_{r}+β\_{2}ln\frac{x}{p^{\*}}$$

$$w\_{f}=α\_{3}+γ\_{31}lnP\_{t}+γ\_{32}lnP\_{i}+γ\_{33}lnP\_{f}+γ\_{34}lnP\_{v}+γ\_{35}lnP\_{c}+γ\_{36}lnP\_{r}+β\_{3}ln\frac{x}{p^{\*}}$$

$$w\_{v}=α\_{4}+γ\_{41}lnP\_{t}+γ\_{42}lnP\_{i}+γ\_{43}lnP\_{f}+γ\_{44}lnP\_{v}+γ\_{45}lnP\_{c}+γ\_{46}lnP\_{r}+β\_{4}ln\frac{x}{p^{\*}}$$

$$w\_{c}=α\_{5}+γ\_{51}lnP\_{t}+γ\_{52}lnP\_{i}+γ\_{53}lnP\_{f}+γ\_{54}lnP\_{v}+γ\_{55}lnP\_{c}+γ\_{56}lnP\_{r}+β\_{5}ln\frac{x}{p^{\*}}$$

Description:

α, γ, β, θ, λ, σ = Regression parameters

wi = Share of Indonesian tuna imports

 in the Japanese market

wt = Share of Thai tuna imports in the

 Japanese market

wf = Share of Philippine tuna imports

 in the Japanese market

wc = Share of Chinese tuna imports in

 the Japanese market

wv = Share of Vietnamese tuna imports

 on the Japanese market

pi = Export price of Indonesian tuna

 on the Japanese market (US$/ton)

pt = Export price of Thai tuna on the

 Japanese market (US$/ton)

pf = Philippine tuna export price on the

 Japanese market (US$/ton)

pc = Export price of Chinese tuna on

 the Japanese market (US$/ton)

pv = Export price of Vietnamese tuna

 on the Japanese market (US$/ton)

x = Total import value of the United

 States (tons)

p\* = Stone's geometric price index

This model is formed with several assumptions, which are as follows.

1. Adding up:

$$\sum\_{i=1}^{n}α\_{i}=1, \sum\_{i=1}^{n}γ\_{ij}=0, \sum\_{i=1}^{n}β\_{i}=0$$

1. Homogeneity:

$$\sum\_{i=1}^{n}γ\_{ij}=0$$

1. Symmetry:

$$γ\_{ij}=γ\_{ji}$$

The restrictions on this model can be seen in Table 1. After that, elasticity calculations were carried out consisting of uncompensated (own price), compensated (cross price), and expenditure (expenditure). The formula used is as follows.

1. Uncompensated elasticity

$$e\_{ij}=-δ\_{ij}+\frac{\hat{γ}\_{ij}}{\overbar{w}\_{i}}-\hat{β}\_{i}\frac{\overbar{w}\_{j}}{\overbar{w}\_{i}}$$

1. Compansated elasticity

$$e\_{ij}^{\*}=-δ\_{ij}+\frac{\hat{γ}\_{ij}}{\overbar{w}\_{i}}+\overbar{w}\_{j}$$

1. Expenditure elasticity

$$η\_{i}=1+\frac{\hat{β}\_{ij}}{\overbar{w}\_{i}}$$

**Table 1**. The restrictions on various version of the processed tuna product AIDS Model

|  |  |  |
| --- | --- | --- |
| Adding up | Homogeneity | Symmetry |
| $$α\_{1}+α\_{2}+α\_{3}+α\_{4}+α\_{5}=1$$$$β\_{1}+β\_{2}+β\_{3}+β\_{4}+β\_{5}=0$$$$γ\_{11}+γ\_{21}+γ\_{31}+γ\_{41}+γ\_{51}=0$$$$γ\_{12}+γ\_{22}+γ\_{32}+γ\_{42}+γ\_{52}=0$$$$γ\_{13}+γ\_{23}+γ\_{33}+γ\_{43}+γ\_{53}=0$$$$γ\_{14}+γ\_{24}+γ\_{34}+γ\_{44}+γ\_{54}=0$$$$γ\_{15}+γ\_{25}+γ\_{35}+γ\_{45}+γ\_{55}=0$$ | $$γ\_{11}+γ\_{12}+γ\_{13}+γ\_{14}+γ\_{15}=0$$$$γ\_{21}+γ\_{22}+γ\_{23}+γ\_{24}+γ\_{25}=0$$$$γ\_{31}+γ\_{32}+γ\_{33}+γ\_{34}+γ\_{35}=0$$$$γ\_{41}+γ\_{42}+γ\_{43}+γ\_{44}+γ\_{45}=0$$$$γ\_{51}+γ\_{52}+γ\_{53}+γ\_{54}+γ\_{55}=0$$ | $$γ\_{12}=γ\_{21}$$$$γ\_{13}=γ\_{31}$$$$γ\_{14}=γ\_{41}$$$$γ\_{15}=γ\_{51}$$$$γ\_{23}=γ\_{32}$$$$γ\_{24}=γ\_{42}$$$$γ\_{25}=γ\_{52}$$$$γ\_{34}=γ\_{43}$$$$γ\_{35}=γ\_{53}$$$$γ\_{34}=γ\_{43}$$$$γ\_{45}=γ\_{54}$$ |

**RESULTS AND DISCUSSION**

**Comparative Advantage Analysis**

The export performance of Indonesia's processed tuna commodities is measured through comparative and competitive advantage indices. The comparative advantage index uses the Revealed Comparative Advantage (RCA) method. This index is useful to analyze Indonesia's competitive position compared to other exporting countries (Thailand, Philippines, China, and Vietnam). The RCA values of Indonesia and other exporting countries can be seen in Figure 2.

The RCA value of processed tuna exporting countries can be seen in Figure 2. The RCA value of Indonesia's processed tuna commodities is more than 1 every year. This shows that Indonesia has comparative advantage performance for processed commodities. Indonesia's processed tuna RCA value is in the range of 5.2943 - 8.4917. Indonesia's RCA value is below Thailand and the Philippines, but above China and Vietnam. The RCA value of processed tuna in Thailand is in the range of 15.1679 - 22.7333 and in the Philippines in the range of 3.3198 - 16.4570. Thailand's position is the highest among other exporting countries. This is because Thailand's total exports of processed tuna commodities are the highest among other exporting countries. Thailand's processed tuna exports have met 92% of global consumption needs. Hamilton et al. (2011) stated that the raw material factor is a factor that affects the export performance of canned tuna processing. Indonesia obtains tuna raw materials from domestic catches, but Indonesian tuna is not well managed so that the quality of Indonesian tuna is low (Apridar 2014). Meanwhile, Thai processed tuna obtains raw materials from cheap tuna raw materials from the Pacific and Indian Oceans, and then exports the final product in the form of processed tuna.

Figure 2 shows that the RCA value of the Philippines is greater than that of Indonesia since 2005 until now. This shows that there has been a shift in Japan's market share, so that Indonesia's market share of processed tuna is getting smaller. The Business Intelligence Analysis Report (MoT 2021) states that Indonesia needs to be very aware of the Philippines' processed tuna export performance due to this decline in market share.

**Competitiveness Advantage Analysis**

Competitive advantage is measured using the Vollrath index method. This index has been used to measure competitiveness in agricultural products under the RCA model. This index has been known as the Vollrath Index in four principle areas, namely Relative Trade Advantage (RTA), Revealed Export Advantage (RXA), Revealed Import Advantage (RMA), and Revealed Competitive Advantage (RC). The value of the Vollrath Index Revealed Competitive Advantage (RC) of Indonesia in 2001-2022 can be seen in Table 2.

Indonesian tuna commodities have a comparative advantage shown in the previous section with the RCA value. The RCA value has shortcomings because it ignores the impact of economic policies, such as trade structures distorted by trade restrictions. This is shown by the RCA value that only shows the value of exports, without analyzing the value of imports. Therefore, Indonesia's RCA value, which has a comparative advantage, must be deepened with a competitive advantage seen from the export and import values. The Revealed Trade Advantage (RTA) value is a value that shows the difference between the value of exports (Revealed Export Advantage (RXA)) and imports (Revealed Import Advantage (RMA)) of a country. The RTA value provides a comprehensive calculation of comparative advantage by combining exports and imports from trade relations between countries (Jambor and Abu 2016). Indonesia has a positive RTA value every year. This is in line with the value of RXA. A positive RTA indicates that the value of exports (RXA) is greater than imports (RMA). Indonesia's RTA value is in the range of 3.4964 - 10.8215.

**Figure 2**. RCA value of processed tuna exporting countries in the Japanese market from 2001-

 2022

The lowest value of RTA was in 2012-2013. This is because Indonesia imported a lot of processed tuna from Japan.

Competitive advantage is obtained through the natural logarithm (Ln) of RXA and RMA values. The difference between the natural logarithms of the two results in the value of competitive advantage (Revealed Competitiveness (RC)). Indonesia's competitive advantage has a positive value every year in the range of 0.7304 - 7.2009. The lowest RC value was in 2012-2013. This is in line with the RTA value. Indonesia's low RTA and RC values in 2012-2013 were due to Indonesia importing processed tuna from Japan, which lowered the RTA and RC values (Trade Map 2023).

**Demand Analysis of Indonesia Processed tuna**

The Almost Ideal Demand System (AIDS) model in this study is a demand system that can analyze competition between the main exporting countries of processed tuna commodities in the Japanese market, namely Thailand, Indonesia, the Philippines, Vietnam and China. The discussion in this section is the analysis of competition analysis among major exporting countries of processed tuna in the Japanese market (Table 3) and elasticity for each exporting country consisting of own price elasticity (uncompensated), cross price (compensated), and expenditure (Table 3).

Table 3 shows the estimation results of the AIDS model of processed tuna commodities in the Japanese market. The coefficient of determination in the AIDS model of Thailand, Indonesia, the Philippines, Vietnam, and China was 14.66%, 33.99%, 58.29%, 31.56%, and 16.61%, respectively. These results indicate that the share of processed tuna exports in the Japanese market from each country is as large as the coefficient of determination. Independent variables including the price of processed tuna from each country are jointly able to explain the export share of processed tuna from Thailand, Indonesia, Philippines, China, and Vietnam as indicated by the p-value of each country of 0.000 significant at the 1% level. The independent variables of frozen tuna prices that are not significant at the 10% real level are Thailand's price in the Thailand and Philippines equation, Indonesia's price in the Indonesia equation, and the Philippines' price in the Philippines equation.

**Table 2**. Competitive analysis of Indonesian processed tuna in the Japanese market from

 2001-2022.

|  |  |  |  |
| --- | --- | --- | --- |
| Year | RTA | RXA | RC |
| 2001 | 10.4547 | 10.5943 | 4.3291 |
| 2002 | 7.4479 | 7.4901 | 5.1814 |
| 2003 | 7.5395 | 7.5571 | 6.0669 |
| 2004 | 8.6656 | 8.6788 | 6.4891 |
| 2005 | 7.0423 | 7.0707 | 5.5152 |
| 2006 | 6.7621 | 6.8024 | 5.1288 |
| 2007 | 7.4293 | 7.4587 | 5.5401 |
| 2008 | 7.0165 | 7.0657 | 4.9668 |
| 2009 | 8.5961 | 8.6025 | 7.2009 |
| 2010 | 8.0846 | 8.1373 | 5.0384 |
| 2011 | 7.5901 | 7.6346 | 5.1430 |
| 2012 | 4.6775 | 7.7936 | 0.9167 |
| 2013 | 3.4964 | 6.7456 | 0.7304 |
| 2014 | 7.5177 | 7.5989 | 4.5381 |
| 2015 | 7.4271 | 7.4426 | 6.1709 |
| 2016 | 7.4219 | 7.4333 | 6.4794 |
| 2017 | 9.0549 | 9.7039 | 2.7048 |
| 2018 | 8.0499 | 8.5525 | 2.8342 |
| 2019 | 10.8215 | 10.8416 | 6.2894 |
| 2020 | 10.1458 | 10.1725 | 5.9395 |
| 2021 | 7.0335 | 7.0396 | 7.0364 |
| 2022 | 6.8652 | 6.8765 | 6.4057 |

Table 3 shows the AIDS model equations of the five exporting countries, namely Thailand, Indonesia, Philippines, China, and Vietnam. The average export share of processed tuna in the Japanese market is highest in Thailand (56.79%), followed by Indonesia (21.99%), Philippines (14.09%), Vietnam (3.12%), and China (1.45%). The Indonesian AIDS model shows that a 1% increase in the price of Indonesian processed tuna will increase the import share of Indonesian processed tuna in the Japanese market by 0.1311%, decrease the import share of Thai processed tuna by 0.0907%, Philippines by 0.0206%, China by 0.0005%, and Vietnam by 0.0034%. The Thailand AIDS model shows that a 1% increase in the import price of processed tuna from Thailand will increase the import share of processed tuna from Thailand by 0.2143%, decrease the share of processed tuna from Indonesia by 0.0907%, Philippines by 0.1742%, China by 0.0007%, and increase the import share of processed tuna from Vietnam by 0.0015%. The Philippines AIDS model shows that a 1% increase in the price of processed tuna from the Philippines will increase the share of processed tuna from the Philippines by 0.2211%, decrease the share of processed tuna from Thailand by 0.1742% and Indonesia by 0.0206%, and increase the share of processed tuna from China by 0.0004% and Vietnam by 0.0006%. The China AIDS model shows that a 1% increase in the price of processed tuna from China will increase the share of processed tuna from China by 0.0007%, decrease the share of processed tuna from Thailand by 0.0007% and Indonesia by 0.0005%, and increase the share of processed tuna from the Philippines by 0.0004% and Vietnam by 0.0003%. The Vietnam AIDS model shows that a 1% increase in the price of processed tuna from Vietnam will increase the share of processed tuna from Vietnam by 0.0012%, decrease the share of processed tuna from Indonesia by 0.0034%, and increase the share of processed tuna from Thailand by 0.0015%, the Philippines by 0.0006% and China by 0.0002%.

**Table 3**. AIDS model estimation results

|  |  |
| --- | --- |
| Variable | Equation |
| Thailand | Indonesia | Philipines | China | Vietnam |
| w | 56,79%\*\*\* | 21,99%\*\*\* | 14,09%\*\*\* | 1,45%\*\*\* | 3,12%\*\*\* |
| Price of Thailand | 0,2143\*\*\* | -0,0907\*\*\* | -0,1742\*\*\* | -0,0007\*\*\* | 0,0015\*\*\* |
| Price of Indonesia | -0,0907\*\*\* | 0,1311\*\*\* | -0,0206\*\*\* | -0,0005\*\*\* | -0,0034\*\*\* |
| Price of Philipines | -0,1742\*\*\* | -0,0206\*\*\* | 0,2211\*\*\* | 0,0004\*\*\* | 0,0006\*\*\* |
| Price of China | -0,0007\*\*\* | -0,0005\*\*\* | 0,0004\*\*\* | 0,0007\*\*\* | 0,0002\*\*\* |
| Price of Vietnam | 0,0015\*\*\* | -0,0034\*\*\* | 0,0006\*\*\* | 0,0003\*\*\* | 0,0012\*\*\* |
| Price of *rest of world* | 0,0498\*\*\* | -0,0158\*\*\* | -0,0273\*\*\* | -0,0001\*\*\* | -0,0001\*\*\* |
| x | -0,0428\*\*\* | -0,0355\*\*\* | 0,0658\*\*\* | 0,0035\*\*\* | 0,0253\*\*\* |
| R2 | 0,1466\*\*\* | 0,3399\*\*\* | 0,5829\*\*\* | 0,3156\*\*\* | 0,1661\*\*\* |
| Chi-square | 83,240\*\*\* | 134,87\*\*\* | 377,87\*\*\* | 124,71\*\*\* | 57,48\*\*\* |
| p-value | 0,0000\*\*\* | 0,0000\*\*\* | 0,0000\*\*\* | 0,0000\*\*\* | 0,0000\*\*\* |

Description: \*\*\* Significant at level 1%, \*\* Significant at level 5%, \* Significant at level 10%

Table 4 shows the estimated export elasticity of processed tuna commodities in the five exporting countries. Elasticities indicate the position and level of competition between processed tuna exporting countries in the Japanese market. The own price elasticity (uncompensated) in all exporting countries is negative, except for the Philippines which is positive. The negative price elasticity values are -0.6655 (Thailand), -0.4395 (Indonesia), -0.9497 (China), and -0.9360 (Vietnam). This negative value is in accordance with demand theory, where the relationship between demand and price is negative (Lipsey *et al.* 1995). Demand for processed tuna from Indonesia is elastic, i.e. if there is a 1% increase in the price of processed tuna, it will result in a 0.4395% decrease in demand for processed tuna originating from Indonesia.

The expenditure elasticities of the exporting countries are positive (Table 4). This indicates that the processed tuna commodities of the five countries are normal onions. Indonesia has an expenditure elasticity value of 0.8385, which means that if there is an increase in import expenditure of processed tuna from the Japanese market by 1%, the import expenditure will increase the demand for processed tuna exports from Indonesia by 0.8385%. This is in line with the research of Hsu *et al.* (2023) which states that the expenditure elasticity for Japanese fishery commodities in Japan is greater than 1 or close to 1. This value indicates that Japanese consumers have a relatively high dependence on fishery imports. This elasticity value also shows that the expenditure elasticity is inelastic because the value is less than 1, which means that Indonesian processed tuna is not sensitive to changes in total expenditure.

The cross-price elasticity (compensated) shows the level of export competition between processed tuna commodities of Indonesia, Thailand, Philippines, China, and Vietnam in the Japanese market. The cross-price elasticity of Indonesia against processed tuna of Thailand, Philippines, China, and Vietnam are 0.1555; 0.0472; 0.0122; and 0.0155 (Table 4). This value indicates that for Indonesia, processed tuna of Thailand, Philippines, China, and Vietnam is a substitute commodity. This value indicates that if there is an increase in the price of processed tuna of Thailand, Philippines, China, and Vietnam, it will increase the share of processed tuna of Indonesia by 0.1555%; 0.0472%; 0.0122%; and 0.0155%. Thailand's cross-elasticity value indicates that for Thailand, processed tuna from the Philippines is a complementary commodity and processed tuna from Indonesia, China, and Vietnam is a substitute commodity. The cross-elasticity value for the Philippines indicates that for the Philippines, processed tuna from Thailand is a complementary commodity and processed tuna from Indonesia, China, and Vietnam is a substitute commodity. The cross-elasticity value for China indicates that for China, processed tuna from Thailand, Indonesia, Philippines, and Vietnam are substitute commodities. The cross-elasticity value for Vietnam indicates that for Vietnam, processed tuna from Thailand, Indonesia, Philippines, and China are substitute commodities.

**Table 4**. Elasticity estimation

|  |  |
| --- | --- |
| Elasticities | Countries |
| Thailand | Indonesia | Philipines | China | Vietnam |
| Uncompensated |
|  Price of Thailand | -0,6655\*\*\* | -0,5042\*\*\* | -0,9707\*\*\* | 0,0880\*\*\* | 0,5100\*\*\* |
|  Price of Indonesia | -0.1763\*\*\* | -0,4395\*\*\* | -0,0435\*\*\* | 0,0178\*\*\* | 0,0680\*\*\* |
|  Price of Philipines | -0,3173\*\*\* | -0,1165\*\*\* | 0,6353\*\*\* | 0,0600\*\*\* | 0,1329\*\*\* |
|  Price of China | -0,0023\*\*\* | -0,0047\*\*\* | 0,0095\*\*\* | -0,9497\*\*\* | 0,0200\*\*\* |
|  Price of Vietnam | 0,0003\*\*\* | -0,0207\*\*\* | 0,0186\*\*\* | 0,0252\*\*\* | -0,9360\*\*\* |
|  Price of Rest of world | 0,0857\*\*\* | -0,0758\*\*\* | -0,1820\*\*\* | -0,0007\*\*\* | 0,0172\*\*\* |
| Compensated |
|  Price of Thailand | -0,0547\*\*\* | 0,1555\*\*\* | -0,6681\*\*\* | 0,5193\*\*\* | 0,6167\*\*\* |
|  Price of Indonesia | 0,0602\*\*\* | -0,1840\*\*\* | 0,0736\*\*\* | 0,1848\*\*\* | 0,1093\*\*\* |
|  Price of Philipines | -0,1658\*\*\* | 0,0472\*\*\* | 0,7104\*\*\* | 0,1669\*\*\* | 0,1593\*\*\* |
|  Price of China | 0,0133\*\*\* | 0,0122\*\*\* | 0,0173\*\*\* | -0,9385\*\*\* | 0,0228\*\*\* |
|  Price of Vietnam | 0,0339\*\*\* | 0,0155\*\*\* | 0,0353\*\*\* | 0,0488\*\*\* | -0,9301\*\*\* |
|  Price of Rest of world | 0,1130\*\*\* | -0,0464\*\*\* | -0,1685\*\*\* | 0,0185\*\*\* | 0,0219\*\*\* |
| Expenditure | 0,9246\*\*\* | 0,8385\*\*\* | 1,4673\*\*\* | 1,2408\*\*\* | 1,8122\*\*\* |

Description: \*\*\*Significant at level 1%, \*\* Significant at level 5%, \* Significant at level 10%

**CONCLUSSION**

Indonesia's export performance of processed tuna commodities is comparatively and competitively competitive in the Japanese market. Indonesia is able to compete with other exporting countries to fulfill its export capacity. Competition with other exporting countries is strongly influenced by the price of each exporting country. A 1% increase in the price of Indonesian processed tuna will increase the import share in the Japanese market by 0.1131% and reduce the import share of processed tuna from competing countries, namely Thailand (0.0907%), the Philippines (0.0206%), China (0.0005%), and Vietnam (0.0034%).

The demand for Indonesian processed tuna commodities in the Japanese market has fulfilled the theory of demand. Indonesian processed tuna is a normal good for Japanese consumers. For Indonesia, processed tuna from competitor countries Thailand, Philippines, Vietnam, and China are substitute goods. Thus, an increase in prices in these four countries will increase Indonesia's share.

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