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Competitiveness and Trade Flows of Indonesian Processed Tuna in The International Market

Khoirul Ichsan[1*], Nia Rosiana[2], Rita Nurmalina[3]
[1]Magister Science of Agribusiness, Faculty of Economic and Management, IPB University, Bogor, West Java, Indonesia
[2,3]Departement of Agribusiness, Faculty of Economic and Management, IPB University, Bogor, West Java, Indonesia
*Correspondence Email: khoirulichsan98@gmail.com

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ABSTRACT

Indonesia is one of the biggest producers of tuna with 19.1% of the world's supply. However, despite steadily rising demand worldwide, its exports of processed tuna have decreased. This study examines the competitiveness of Indonesian processed tuna and the factors influencing its export performance across major destination markets during the period 2012–2023 by integrating the Revealed Comparative Advantage (RCA) index with an import demand model estimated using panel data regression under the Random Effect Model (REM). The results show that Indonesian processed tuna is highly competitive in many destination markets, with RCA values higher than 4 in nine out of ten nations. However, competitiveness Spain is still comparatively low because Spain serves as a processing and re-export hub. The empirical results show that while geographic distance and exchange rates have significant negative effects on Indonesia's processed tuna export volume, real GDP per capita in destination countries has a positive and statistically significant effect. Import tariffs and non-tariff measures like Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) measures have no statistically significant effects. To determine how to strengthen Indonesia's position in the global processed tuna trade, this study links destination-specific competitiveness with export performance and offers policy-relevant insights that highlight the significance of focusing on high-income consumption-oriented markets, improving logistics efficiency, and maintaining exchange rate competitiveness.

Keywords: *exchange rate, GDP per capita, import demand model, panel data, random effects model, revealed comparative advantage*

BACKGROUND

Tuna is a prominent fishery commodity among the most sought-after fish in the global market (FAO, 2018). According to data from the International Trade Centre (2024), there has been an observed increase in global demand for processed tuna, as evidenced by 0.56% annual increase in import volume (Figure 1). This persistent upward trend in consumption signifies a substantial opportunity to augment Indonesia's tuna exports (Arthatiani et al. 2020). Indonesia is the world's largest tuna producer, contributing 19.1% of global supply, and national tuna production has

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continued to increase, reaching 1.5 million tons in 2023 (KKP, 2024). Nevertheless, despite its strong production capacity, Indonesia's performance in processed tuna exports remains relatively limited. Based on International Trade Centre data, during the 2012–2023 period, Indonesia's average processed tuna exports amounted to approximately 75,268 tons, accounting for only 4.65% of total global exports. Moreover, from 2018 to 2023, the volume of Indonesia's processed tuna exports showed a clear downward trend, with an average annual decline of 2.27%, indicating a weakening competitiveness of Indonesian processed tuna in the global market (International Trade Centre, 2024).

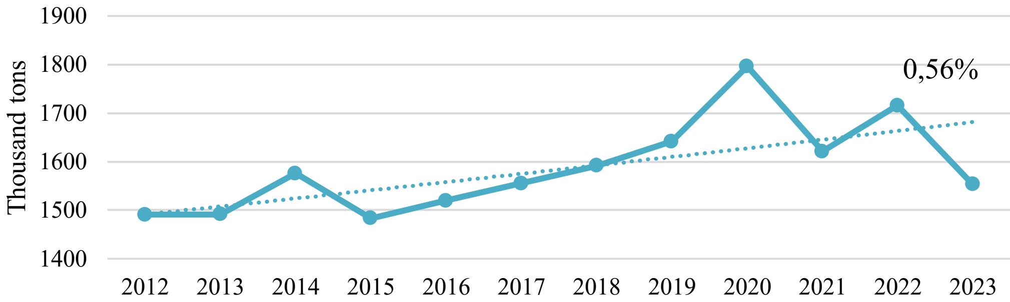

Figure 1. Global Import Volume of Processed Tuna (2012–2023)
Source: ITC Trade Map, 2024

The observed decline in the volume of Indonesian processed tuna exports may be attributed to concerns regarding product quality and safety, which have not yet met international standards. The substantial number of export rejections from destination countries exemplifies this phenomenon. Irawati et al. (2019) observed that tuna was the commodity with the highest number of rejections in the European Union between 2011 and 2017, with 27 cases, surpassing those of shrimp and crab. Rejections have also been documented in Japan and the United States (Arizona, 2018), including inadequate labelling, elevated histamine levels, substandard quality, and Salmonella and carbon monoxide (Resnia et al. 2015). These rejections indicate that Indonesian products do not comply with Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT) regulations. While these policies are intended to promote public health, they have the potential to act as non-tariff barriers, thereby restricting market access and impeding exports (Tristi et al. 2021).

Several studies have previously investigated the competitiveness of various Indonesian tuna products in international markets. Yusuf et al. (2018) reported that, during the period 2009–2015, Indonesian tuna showed a high level of competitiveness in both the Japanese and United States markets. This finding was subsequently corroborated by Hartanto et al. (2021), who determined that Indonesian tuna, skipjack, and yellowfin tuna possess a comparative advantage in the US market, exhibiting an average RCA value of 13.68 and an upward trend. According to Khaliqi et al. (2019), three of the six types of Indonesian tuna, as classified by HS codes, have been shown to possess a comparative advantage, particularly within the Japanese market. Conversely, Rahmansyah et al. (2021) demonstrated that Indonesia's processed tuna exports to the European Union exhibited robust competitiveness, with an average RCA value of 2.57 from 2003 to 2018. Furthermore, Nursya'ban et al. (2024) observed the competitive advantage of Indonesia's fresh yellowfin tuna (HS 030232) exports within the global market. However, Putri et al. (2018) observed that from 2012 to 2016, Indonesia's competitiveness remained inferior to that of Thailand and the Philippines.

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In addition to assessing competitiveness, several studies have examined the factors influencing Indonesian tuna exports. Rifaldi et al. (2020) discovered that export prices, exchange rates, and domestic production are the primary determinants of export volume. As posited by Ramli et al. (2020), the real GDP of the importing country, real GDP (i.e., Indonesia), real exchange rate, and RTA index have a significant positive effect on exports. Conversely, distance hurts exports. This assertion is further substantiated by Wiranthi et al. (2019), who demonstrated that the population of the importing country, production volume, and real exchange rate significantly influence canned tuna exports to the European Union. Tristi et al. (2021) also mention that GDP per capita, population, exchange rate, export prices, and SPS barriers positively impact exports, while economic distance, TBT, and tariffs negatively impact exports. In the policy context, Da Silva et al. (2023) demonstrate that tariffs, non-tariff barriers (SPS and TBT), and exchange rate fluctuations also affect competitiveness and export volume. Despite the growing global demand for processed tuna, Indonesia's export performance shows a contrasting trend. World imports of processed tuna continue to increase, yet Indonesia's processed tuna export volume has experienced a declining trend in recent years, accompanied by a relatively small share in global exports. Moreover, export performance and competitiveness are often analysed separately or treated as parallel outcomes, with limited integration of competitiveness indicators into export performance analysis across individual destination markets. This study addresses these gaps by analysing the competitiveness of Indonesian processed tuna in international markets while simultaneously examining the factors influencing its exports to major destination countries.

RESEARCH METHODS

The present study utilizes secondary data from 2012 to 2023, particularly on processed tuna classified under HS 160414. This commodity was selected because, according to data from the International Trade Centre (2024), the average export value of Indonesian processed tuna is higher than that of other tuna products, such as frozen tuna and fresh tuna.This commodity was analyzed using the RCA (Revealed Comparative Advantage) and the import demand theory estimated using panel data regression. The export destinations for processed tuna include several Asian countries, such as Saudi Arabia, Japan, Australia, Jordan, and Thailand; European countries, including Italy, Spain, and the United Kingdom; and countries in the Americas, namely the United States and Ecuador. These ten countries were selected because they represent the largest importers of processed tuna in the international market and, at the same time, are countries that import processed tuna from Indonesia. Indonesia's primary competitors in the processed tuna market are Thailand, Ecuador, Spain, and China, which were selected based on their status as the five largest exporters of processed tuna globally during the 2012–2023 period. The RCA analysis is calculated using export value and export volume data of Indonesian processed tuna, as well as corresponding import data from destination countries, sourced from the International Trade Centre (ITC) Trade Map database. The variables used in the import demand model, along with their definitions and data sources, are summarized in Table 1.

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Table 1. Data Sources

No.	Data Used	Source	Unit
1.	Export value and export volume	ITC Trade Map	USD and tons
2.	GDP per capita of Indonesia and destination countries	World Bank	USD
3.	Distance between the capital city of Indonesia and the capital city of destination countries	Freemaptools	Kilometres (km)
4.	Exchange rate (Local Currency Unit, LCU)	World Bank	IDR/LCU
5.	Import tariffs imposed by destination countries	ITC MacMap	Percent (%)
6.	Sanitary and Phytosanitary (SPS) measures applied by destination countries	ITC MacMap; UNCTAD, TRAINS	Count
7.	Technical Barriers to Trade (TBT) applied by destination countries	ITC MacMap; UNCTAD, TRAINS	Count

Comparative advantage is measured using the Revealed Comparative Advantage (RCA) index, which compares the share of a specific commodity’s exports in a country’s total exports to the share of that commodity in global exports (Balassa, 1965). This method was developed by Balassa (1965). An RCA value greater than 1 indicates a comparative advantage, whereas a value less than 1 suggests its absence. The RCA formula is presented as a modification of the equation written by Amanda & Rosiana (2023), with the following equation:

$$\mathrm{RCA}_{ij} = \frac{(Xij/\sum Xij)}{(Xwj/\sum Xwj)}$$

Information:
RCAij : Revealed comparative advantage of country i in processed tuna exports.
Xij : Export value of processed tuna from country i (USD).
Xwj : Total export value of processed tuna from all countries (USD).
∑Xij : Total export value of all commodities from country i (USD).
∑Xwj : Total export value of all commodities from all countries (USD).

The methodology employed in this study is based on import demand theory, which explains that the demand for imported goods is primarily determined by income levels and trade-related policy factors in the importing country (Goldstein & Khan, 1985). The selection of variables in this study draws upon previous empirical works by Ramli et al. (2020), Tristi et al. (2021) and Da Silva et al. (2023). The dependent variable is the export quantity of processed tuna, while the independent variables include the real GDP per capita of the importing country, the bilateral exchange rate, trade-related costs proxied by geographic distance, the import tariff imposed by the importing country on processed tuna, and dummy variables representing Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT) as non-tariff measures (NTMs), which are widely recognised as factors affecting import demand through price and compliance cost channels (Anderson & Van Wincoop, 2003; Kee et al., 2009). All continuous variables were transformed into their natural logarithmic forms to address potential heteroscedasticity and scale disparities among the variables. This transformation helps reduce the impact of significant numerical differences, converting, for example, a tenfold difference between two values into a more manageable twofold difference

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(Gujarati, 2011). This study applies panel data regression using cross-sectional observations across destination countries and time-series data. The study employs panel data regression using the Random Effect Model (REM) to estimate the import demand for Indonesian processed tuna across destination countries. The REM is chosen to accommodate unobserved cross-country heterogeneity while allowing for both cross-sectional and time-series variation under the assumption that individual effects are uncorrelated with the explanatory variables (Juanda, 2009). The REM is then used to estimate the import demand function for Indonesian processed tuna exports, specified as follows:

$$\text{Log } Xit = \beta 0 + \beta 1 \text{ Log } GDPPC_{jt} + \beta 2 \text{ Log } DIS_{ij} + \beta 3 \text{ Log } EXC_{ijt} + \beta 4 \, DSPS_{jt} + \beta 5 \, DTBT_{jt} + \beta 6 \, TIM_{jt} + \varepsilon_{ij}$$

Information:

β0	: Intercept term
βn	: Coefficients of the independent variables
Xit	: Export volume of Indonesia's processed tuna (in tons)
GDPPCjt	: Real GDP per capita of country j (in USD)
DISij	: Geographical distance between Indonesia and destination country j, measured as the distance between the capital city of Indonesia and the capital city of country j (kilometres)
EXCijt	: Real exchange rate between Indonesia and country j (Rupiah per local currency unit)
DSPSjt	: Dummy variable for Sanitary and Phytosanitary (SPS) measures, equal to 1 if destination country j applies SPS measures on processed tuna imports in year t, and 0 otherwise
DTBTjt	: Dummy variable for Technical Barriers to Trade (TBT), equal to 1 if destination country j applies TBT measures on processed tuna imports in year t, and 0 otherwise
TIMjt	: Import tariff rate on processed tuna imposed by destination country j (percent)
εij	: Error term

Based on international trade theories, this study formulates five hypotheses to examine the factors influencing Indonesia's processed tuna exports. First, the real GDP per capita of the importing country is expected to have a positive effect on export volume ($\beta 1 > 0$), as higher income levels increase purchasing power and stimulate demand for imported goods, including higher-quality processed fish products (Salvatore, 2013). Second, geographical distance between Indonesia and the importing country is hypothesized to have a negative effect on exports ($\beta 2 < 0$), since greater distance increases transportation and logistics costs, thereby reducing price competitiveness in destination markets (Salvatore, 2013). Third, the exchange rate is expected to be negatively correlated with export volume ($\beta_3 < 0$). A depreciation of the Indonesian rupiah against the partner country's currency reduces the foreign-currency price of Indonesian products, thereby improving price competitiveness and stimulating export demand (Mankiw, 2009). Fourth, non-tariff measures (NTMs), particularly Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT), are hypothesized to negatively affect exports ($\beta 4$ and $\beta 5 < 0$) because compliance with technical and health-related requirements raises production and certification costs and restricts market access (Appleton, 2003; Stone & Casalini, 2021). Fifth, import tariffs imposed by destination countries are expected to have

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an adverse effect on exports (β6 <0), as higher tariffs increase product prices in importing markets and reduce import demand (Salvatore, 2013).

RESULT AND DISCUSSION

Competitiveness of Indonesia's Processed Tuna in International Markets

The competitiveness analysis of processed tuna uses HS code 160414 and the Revealed Comparative Advantage (RCA) method to evaluate comparative advantage in global trade. The assessment covers five major processed tuna-exporting countries, including Indonesia, from 2012 to 2024. Exporting countries such as Ecuador, Thailand, Indonesia, and Spain exhibit substantial comparative advantages in processed tuna exports, with RCA values exceeding 4 (Table 2).

Table 2. RCA Values of Processed Tuna Exporters in International Markets

Year	Country				
	Indonesia	Thailand	Ecuador	Spain	China
2012	4,84	30,48	91,52	5,15	0,40
2013	4,99	28,18	100,66	4,42	0,46
2014	4,69	27,70	103,58	4,60	0,43
2015	5,46	25,96	107,20	4,50	0,41
2016	5,30	25,41	121,09	4,64	0,47
2017	5,30	21,69	137,91	4,68	0,46
2018	5,31	22,36	128,75	4,61	0,48
2019	6,10	22,10	118,79	4,27	0,50
2020	4,31	21,32	105,77	4,40	0,46
2021	3,49	20,67	126,57	4,72	0,61
2022	3,28	23,00	108,82	4,37	0,63
2023	3,61	20,62	106,50	5,22	0,68
Average	4,72	24,12	113,10	4,63	0,50

Source: ITC Trade Map (Processed), 2024

Four countries exhibit strong competitiveness in processed tuna exports, with RCA values exceeding 4, namely Ecuador, Thailand, Indonesia, and Spain, while China does not display a comparative advantage as its RCA value remains below 1 (Table 2). Ecuador records the highest average RCA value at 113.1, reflecting an exceptional degree of export specialization rather than export volume alone. This extreme RCA is primarily driven by the disproportionately large share of processed tuna in Ecuador's total exports, which accounts for approximately 4.3%, far exceeding the global average share of 0.038%. Under the Balassa index framework, such export concentration inflates RCA values when a commodity dominates a country's export structure, even if its global market share remains moderate. Ecuador's RCA value grew by an average of 1.95% each year, which matched the annual export growth of 4.87%. The highest value was recorded in 2017, with an RCA of 137.91 and a 42.3% increase in exports compared to the previous year (Figure 2). However, Ecuador's market share is still lower than Thailand's, at 13.70% compared to 30.3%. Trade data

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further support this specialization pattern. According to the World Integrated Trade Solution (WITS), in 2023 Thailand and Ecuador were the world's leading exporters of prepared or preserved tuna, with export values of USD 2,087.35 million and USD 1,188.73 million, respectively. Their exports were primarily destined for major markets in the United States, the European Union, and Asia, underscoring their strong integration into global value chains and sustained demand in high-income markets. Despite Thailand's larger export value and volume, Ecuador's RCA remains substantially higher due to its more concentrated export structure and heavier reliance on processed tuna as a core export commodity.

Although Thailand is the world's largest exporter of processed tuna, accounting for 30.32% of the global market share, it ranks second in competitiveness based on an average RCA value of 24.12, behind Ecuador. The share of Thailand's processed tuna exports in its total national exports reaches 0.93%, higher than that of Indonesia, Spain, and China, and significantly above the global average of 0.038%. However, Thailand recorded the most significant decline in RCA among the major exporting countries, with a drop of 3.28% (Figure 2), in line with an average export contraction of 1.63% over the 2012–2023. A significant decline occurred in 2013–2015, 2019, 2021, and 2023, primarily attributed to the European Union's yellow card sanctions in response to illegal, unreported, and unregulated (IUU) fishing practices and labour rights violations in the fisheries sector (Thammachote & Trochim, 2023). As a result, Thailand's tuna exports to the EU plummeted by 40% in 2014 and continued to decline until 2020. The sanctions were finally lifted in 2023, following comprehensive reforms in fisheries governance through amendments to the Royal Ordinance on Fisheries B.E. 2558, which emphasized stricter IUU fishing control and marine resource conservation (Thammachote & Trochim, 2023).

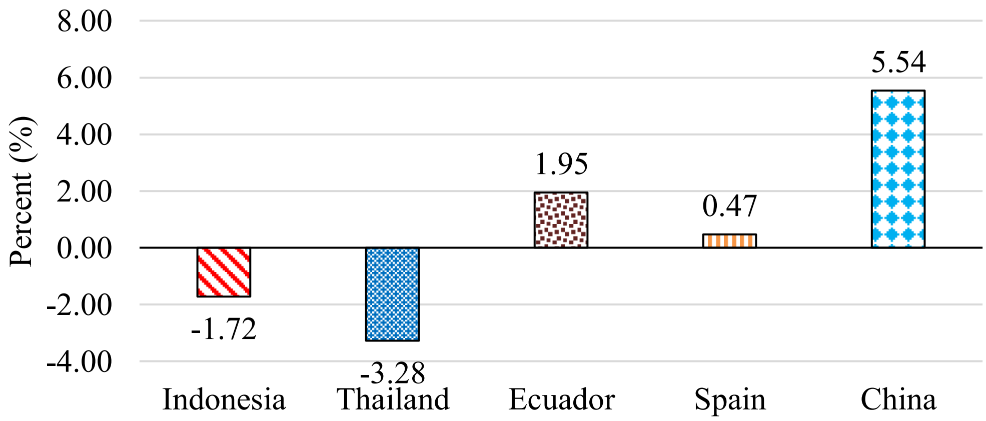

Figure 2. Average RCA Growth of Processed Tuna in the Top 5 Exporting Countries
Source: ITC Trade Map (Processed), 2024

Indonesia also competes strongly in processed tuna exports, with an average RCA value of 4.72. Its market share is 4.58%, below the top four exporting countries. However, Indonesia's RCA value declined by an average of 1.72% (Figure 2), in line with export contractions observed in 2014, 2015, 2016, 2020, and 2021, with the most significant decline occurring in 2012 at 18.68%. This trend is consistent with the findings of Putri et al. (2018), who noted that implementing IUU fishing policies by Minister of Marine Affairs and Fisheries Susi Pudjiastuti contributed to the suppression

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of export performance. During the enforcement of this policy, Indonesia's processed tuna exports fell from USD 351.5 million in 2012 to USD 278.9 million in 2016.

Spain maintains strong competitiveness in processed tuna exports, with an average RCA value of 4.63 (Table 2) and a market share of 8.03%. Although not the highest, Spain demonstrates consistent export performance, with an average annual growth rate of 3.69% and an RCA increase of 0.47% (Figure 2). The highest RCA value was recorded in 2023, reaching 5.22, alongside a remarkable annual export growth of 22.18%. According to StatLedger (2023), this growth was driven by rising demand from European markets, particularly Germany, France, and Italy. As the region's leading exporter of canned tuna, Spain also imports raw frozen tuna—primarily from Ecuador, the Philippines, and Indonesia—to support its domestic processing industry.

Unlike other major exporting countries, China is not competitive in processed tuna exports, with an average RCA value of only 0.50 (Table 2). This low level of competitiveness is attributed to the small share of processed tuna exports in China's total exports, which stands at just 0.019%, below the global average of 0.038%. This indicates a lack of comparative advantage, as processed tuna plays a minimal role compared to China's leading export commodities such as electronics, machinery, and textiles. Nevertheless, China's RCA has grown at an average, a relatively% (Figure 2), and its global market share for processed tuna has reached 6.76%, a relatively large proportion for a product with a low contribution to national exports. This phenomenon can be explained by the immense scale of China's total exports, valued at approximately USD 2.6 trillion. As a result, although the country's average annual export value for processed tuna is only USD 509 million, China remains a significant player in the global market due to its strong trade capacity and logistics infrastructure.

Overall, the RCA results reveal clear heterogeneity in the sources and patterns of competitiveness among major processed tuna exporters. Ecuador's exceptionally high RCA reflects extreme export specialization, driven by the dominant role of processed tuna in its national export basket rather than sheer export volume. Thailand, by contrast, combines large-scale export capacity and the highest global market share with a declining RCA trend, highlighting the vulnerability of competitiveness to regulatory and sustainability-related trade barriers. Indonesia occupies an intermediate position, exhibiting a stable comparative advantage with an average RCA above 4, yet facing declining trends linked to domestic policy interventions and supply-side constraints that have limited export growth. Spain demonstrates a structurally different competitiveness pattern, characterized by moderate RCA values supported by consistent export growth, strong downstream processing capacity, and integration within European value chains through imports of raw tuna. China represents a contrasting case, where a low RCA coexists with a relatively sizable global market share, reflecting the dilution effect of a highly diversified export structure rather than weak participation in processed tuna trade.

Competitiveness of Indonesia's Processed Tuna in Destination Markets

Indonesian processed tuna products exhibit strong competitiveness in international markets, particularly in the country's top ten export destinations. This is evidenced by the RCA values, which reflect a product's comparative advantage in export markets. As shown in Table 3, nine of the ten destination countries display RCA values for Indonesia exceeding 4, indicating high market competitiveness. However, one exception is Spain, where Indonesia's RCA value falls below the

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threshold of 2. This suggests that, while Indonesia maintains market access to Spain, its processed tuna products are relatively less competitive.

Table 3. RCA Values of Indonesian Processed Tuna in Destination Countries

Year	Destination Countries									
	KSA	JPN	USA	THA	ITA	AUS	ENG	GER	JOR	ESP
2012	25,81	4,83	6,26	8,60	0,59	1,87	21,30	22,35	25,49	4,14
2013	42,75	4,02	5,06	11,11	4,65	3,60	24,96	27,12	30,16	0,55
2014	36,63	5,29	5,46	5,32	6,38	3,96	25,69	20,87	13,68	1,61
2015	37,25	5,33	6,83	4,89	10,31	6,68	18,88	6,74	10,07	1,83
2016	36,51	5,33	7,22	6,02	9,61	5,29	17,49	1,70	14,04	2,41
2017	36,78	6,42	7,21	9,55	12,82	8,68	16,21	1,98	20,09	4,97
2018	30,82	6,15	6,10	15,66	15,29	7,28	21,89	1,22	26,04	1,95
2019	27,64	8,82	7,95	12,84	17,21	11,22	15,83	0,46	49,22	2,50
2020	28,27	6,89	6,00	10,68	4,30	12,05	9,71	0,80	30,79	0,40
2021	28,87	5,38	5,20	10,42	0,31	13,65	12,34	1,69	14,07	0,19
2022	47,26	4,76	4,22	9,19	0,30	10,21	14,60	0,17	8,46	0,17
2023	54,05	4,61	4,15	9,91	0,37	12,47	10,06	2,71	10,39	0,07
AVG	36,05	5,65	5,97	9,52	6,85	8,08	17,41	7,32	21,04	1,73

Notes :

KSA :	Saudi Arabia	ITA :	Italy	JOR :	Jordan
JPN :	Japan	AUS :	Australia	ESP :	Spain
USA :	United States	ENG :	United Kingdom	AVG :	Average
THA :	Thailand	GER :	Germany		

Source: ITC Trade Map (Processed), 2024

Indonesia competes strongly in processed tuna exports to several countries, including Saudi Arabia, Jordan, and the United Kingdom. The high average RCA values reflect Indonesia's comparative advantage in these markets. Saudi Arabia is the primary destination for Indonesia’s processed tuna exports, with the highest average RCA value of 36.05, indicating a strong competitive position. This finding is consistent with Fadhila (2019), who also reported a strong competitiveness of Indonesian processed tuna in the Saudi market, with an average RCA of 18.92. Although the RCA values remain high, the trend in Saudi Arabia has shown fluctuations, with a general upward trajectory of 9.79%. This increase aligns with Indonesia's export growth to Saudi Arabia, which rose by 7.73%. In 2023, the RCA value peaked at 54.05, and Indonesia captured 53% of the processed tuna market share in Saudi Arabia that year (Figure 3).

Indonesian processed tuna also exhibits strong competitiveness in the Jordanian and UK markets. In Jordan, an average RCA value of 21.04 indicates a solid comparative advantage, consistent with Fadhila (2019), who reported an even higher average RCA of 35.5. The competitiveness trend in Jordan shows an upward trajectory, with RCA growing by 2.69% annually, which is in line with increasing demand, reflected in a 16% annual rise in processed tuna imports from Indonesia (Figure 3). Indonesia's RCA in Jordan peaked at 49.2 in 2019, when export value reached USD 108 million. In contrast, while Indonesia also holds a strong position in the UK market with an average RCA of 17.41, the trend has declined, with RCA falling by 3.46% annually and imports dropping by 5.03% per year (Figure 3). This decline is associated with the UK’s increasingly

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strict requirements for sustainability standards, traceability, certification, inspections, and eco-friendly branding (KKP, 2024).

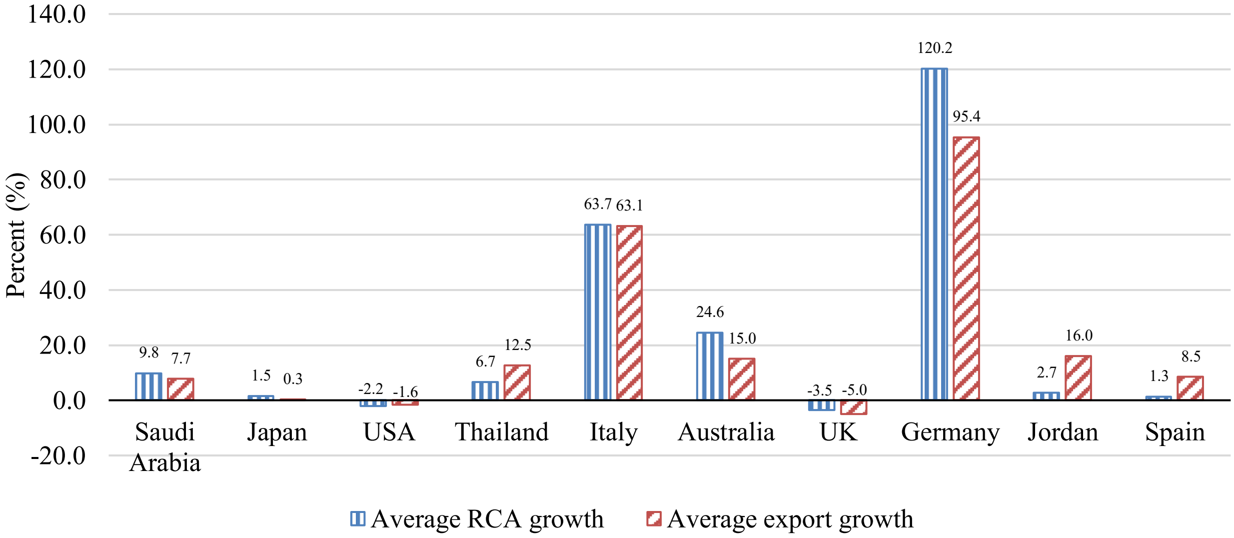

Figure 3. Average Export Growth and RCA Growth of Indonesia's Processed Tuna in Destination Countries
Source: ITC Trade Map (Processed), 2024

Beyond Jordan and the United Kingdom, Indonesia's processed tuna also demonstrates competitiveness in the Australian and Japanese markets, which present differing trends and characteristics yet remain promising for Indonesian exports. The average RCA value of 8.08 in Australia reflects a strong comparative advantage. The competitiveness trend in this market has shown notable improvement, with RCA growing by 0.25% annually, supported by a significant increase in Australia's imports of Indonesian processed tuna, which rose by 14.95% per year (Figure 3). Indonesia's competitiveness in this market peaked in 2021, when the RCA reached 13.65 and export value totalled USD 34 million. Meanwhile, an average RCA value of 5.65 in Japan also indicates strong competitiveness. This aligns with findings by Hana (2023), who reported an RCA of 6.22 for Indonesian processed tuna in the Japanese market. Although the competitiveness trend in Japan is improving, the growth is relatively modest, with RCA increasing by only 0.02% per year, mirroring the slow pace of import growth from Indonesia, which stood at just 0.28% annually.

Thailand serves as a strategic trading partner for Indonesia in processed tuna exports. With a market share of 24.93%, Indonesia is one of the primary suppliers to Thailand's fisheries industry. An average RCA value of 9.52 indicates that Indonesia is competitive in this commodity trade. Thailand's demand for Indonesian processed tuna has grown at an average rate of 12.54% per year (Figure 3), reflecting steady and consistent demand. However, the high import volume from Indonesia does not necessarily correspond to Thailand's domestic consumption. As a central hub for fish processing and distribution in Southeast Asia, Thailand actively engages in re-export activities, importing raw or semi-processed materials from other countries for further processing and re-exporting to global markets. Indonesia supplies semi-processed tuna products under HS codes 16041490, 16041491, and 16041499, which are then further processed and packaged into finished goods, such as canned tuna,

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classified under HS codes 16041411 and 16041419. This indicates that Thailand's high demand for Indonesian processed tuna is closely linked to its processing industry's need to support export activities, positioning Thailand as a global market leader in processed tuna trade, particularly in canned products.

The average RCA value of 5.97 for Indonesian processed tuna in the United States market indicates the product's strong competitiveness in this destination. This finding is consistent with the results of Hartanto et al. (2021) who reported that Indonesian tuna products possess a significant comparative advantage in the US market, with an average RCA of 13.68 during the 2000–2019 period, as well as with Hana (2023), who found an RCA value of 6.84. Nevertheless, the long-term trend suggests a gradual decline in competitiveness, as reflected by a negative average annual RCA growth of –0.02% and a decrease in exports of –1.61% per year (Figure 3). This decline is linked to reduced canned tuna consumption in the United States, driven by heightened price sensitivity and growing concerns about health and environmental issues, such as mercury content and resource sustainability. As a result, US canned tuna imports dropped by more than 23% in the first half of 2015 compared to the same period the previous year (FAO, 2018). These dynamics underscore the need for Indonesia to strengthen its sustainable competitiveness to maintain and improve its position in the US market.

Italy and Germany are among the primary export destinations for Indonesian processed tuna within the European Union, with average RCA values of 6.85 in the Italian market and 7.32 in the German market. Figure 3 reflects Indonesia's strong competitiveness in both markets. This is consistent with findings by Hana (2023), who reported that Indonesian processed tuna maintains a high competitiveness level in Italy and Germany. Export performance to Italy has shown a consistent upward trend, with an average annual growth rate of 63.11% between 2012 and 2023 (Figure 3). Similarly, the German market presents strong potential, with an impressive average annual export growth rate of 95.37%. These results align with Rahmansyah et al. (2021), who observed a continuous increase in the competitiveness of Indonesian processed tuna exports to the European Union from 2011 to 2016. This growth has been driven by the expansion of Indonesia's domestic tuna processing industry and rising export prices of tuna products in the European market, which have contributed directly to the increasing value and competitiveness of Indonesian exports.

In contrast to Saudi Arabia and Jordan, which record the highest average RCA values of 36.05 and 21.04, respectively, Indonesia’s competitiveness in the Spanish market is relatively weak, with an average RCA of only 1.73 over the 2012–2023 period. While an RCA above one still indicates a comparative advantage, Indonesia’s position in Spain is substantially less favorable than in consumption-oriented markets. This difference reflects Spain’s role as a processing and re-export hub, where imported tuna is primarily used as an intermediate input and re-exported as finished products to other EU countries. Consequently, Indonesia’s exports to Spain capture limited value added, resulting in lower RCA values compared to those observed in final-demand markets such as Saudi Arabia and Jordan. Most of the tuna imported into Spain—particularly in frozen or loin form from non-EU countries—is processed domestically into canned tuna and pouch-packaged products, which are then re-exported to international markets. The primary export destinations for Spanish processed tuna are EU member states, with Italy, France, and Portugal as the largest markets. Approximately 88% of Spain's canned tuna exports are shipped to EU countries, especially Italy and

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France. At the same time, the remainder is distributed to other markets such as the United States, the United Kingdom, and Morocco (European Market Observatory for Fisheries and Aquaculture Products, 2017).

Overall, Indonesia’s processed tuna competitiveness varies substantially across destination markets, reflecting differences in market structure and value-chain positioning. Very high RCA values in Saudi Arabia, Jordan, and the United Kingdom indicate strong specialization in consumption-oriented markets with direct import demand. Moderate RCA values in Japan, Australia, the United States, Italy, and Germany reflect competitiveness based on market size and stable demand rather than dominance. In contrast, low RCA values in Spain highlight Indonesia’s limited competitiveness in processing and re-export hubs, where exports are primarily positioned as intermediate inputs rather than final products. These results indicate that Indonesia’s comparative advantage in processed tuna is strongest in final-demand markets and weaker in re-export-oriented processing centers.

Trade Flows of Indonesian Processed Tuna in International Markets

The model's goodness-of-fit test results indicate that the probability value for the F-statistic is 0.003, as shown in Table 4. This value is significantly lower than the 5% significance threshold, confirming the model is statistically valid. In other words, the overall regression is meaningful, and at least one of the independent variables included in the model has a statistically significant influence on the dependent variable. Furthermore, the coefficient of determination (R^2) for processed tuna is calculated at 0.252, which implies that approximately 25.2% of the variation in the dependent variable can be explained by the independent variables in the model.

Table 4. Results of Processed Tuna Trade Flows

Variable	Coef.	Prob.
GDP per Capita of Destination (GDPPCjt)	1.695***	0.001
Distance from Indonesia to Destination (DISij)	-0.610***	0.004
Exchange Rate (EXCijt)	-0.319*	0.055
Dummy Sanitary and Phytosanitary (DSPSjt)	-0.020	0.843
Dummy Technical Barriers to Trade (DTBTjt)	-0.091	0.398
Import Tariff (TIMjt)	-0.435	0.542
R-squared		0.252
Prob F-statistic		0.003

Note:
*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level
Source: Processed Data, 2024

Real GDP per Capita of the Destination Country

Gross Domestic Product (GDP) per capita reflects a country’s level of economic development and consumer purchasing power (Mankiw, 2009). From a trade perspective, higher GDP per capita in importing countries is expected to increase demand for higher-value and quality-differentiated

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products, including processed fishery products. The estimation results confirm this theoretical expectation, showing that the real GDP per capita of destination countries has a positive and statistically significant effect on Indonesia's processed tuna exports at the 1% significance level.

The estimated coefficient of 1.695 indicates that a 1% increase in the destination country's real GDP per capita leads to an approximately 1.695% increase in Indonesia's processed tuna export volume, ceteris paribus. This elasticity greater than one suggests that processed tuna exports are highly responsive to income growth in importing countries. From a trade strategy perspective, this finding implies that Indonesia's processed tuna exports are best positioned in high-income and rapidly growing markets, such as the United States, Germany, Italy, and Australia, where rising purchasing power supports sustained demand for processed and value-added seafood products. Consequently, exporters should prioritize market penetration and product differentiation in high-income economies, supported by quality upgrading, branding, and compliance with market standards. These results are consistent with international trade theory (Salvatore, 2013) and corroborated by previous empirical studies by by Tristi et al. (2021), Dou et al. (2015), Mashari et al. (2019), Khaliqi et al. (2019) which found that higher GDP per capita in importing countries tends to increase volumes.

Distance from Indonesia to Destination Country

The distance between Indonesia and destination countries is found to have a negative impact on processed tuna trade. Geographical distance is measured as the distance between the capital city of Indonesia and the capital city of the destination country and serves as a proxy for transportation and logistics costs, which tend to increase as export destinations become more distant (Salvatore, 2013). Consequently, exports to geographically distant markets are more likely to face higher trade costs and logistical constraints compared to exports to closer destinations.

The estimation results indicate that distance has a negative and statistically significant effect on Indonesia's processed tuna exports at the 1% significance level. The estimated coefficient of –0.610 implies that a 1% increase in distance reduces the volume of processed tuna exports by approximately 0.610%, ceteris paribus. From a trade strategy perspective, this finding suggests that Indonesia's processed tuna exports are more competitive in geographically closer markets such as Thailand, Japan, and Australia, where lower transportation costs enhance price competitiveness. In contrast, exports to more distant markets, including the United States, Germany, Italy, Spain, the United Kingdom, Saudi Arabia, and Jordan, face higher logistics costs, requiring exporters to emphasize efficiency, scale, and product differentiation to remain competitive. These results are consistent with previous studies by Natale et al. (2015) and Ramli et al. (2020), which highlight the role of distance-related trade costs in shaping fishery export performance.

Exchange Rate

The estimation results indicate that the exchange rate of the Indonesian rupiah against the currencies of destination countries has a significant effect on processed tuna exports. The estimated coefficient of the exchange rate variable is –0.319, implying that a 1% depreciation of the rupiah increases Indonesia's processed tuna export volume by approximately 0.319%, ceteris paribus. This result supports the hypothesis that currency depreciation enhances export competitiveness by lowering the foreign-currency price of Indonesian products in international markets. As explained by

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Mankiw (2009), a depreciation of the real exchange rate makes domestic goods relatively cheaper than foreign goods, thereby stimulating exports and improving net exports. This mechanism explains the positive response of processed tuna exports to rupiah depreciation observed in this study.

From a trade policy perspective, this finding highlights the importance of exchange rate stability and competitiveness for Indonesia's processed tuna exports. While sustained depreciation may improve export performance in the short run, excessive volatility can increase uncertainty and production costs for exporters. Therefore, policymakers should aim to maintain a competitive yet stable exchange rate environment through prudent macroeconomic management. In addition, export-support policies such as hedging facilities, export financing schemes, and incentives for value-added processing can help mitigate exchange rate risks and enable exporters to better capitalize on favorable exchange rate movements. Statistically, the exchange rate coefficient is significant at the 10% level (p-value = 0.055), indicating that exchange rate dynamics are a relevant factor shaping Indonesia's processed tuna export performance. This result is consistent with previous studies by Wiranthi et al. (2019) and Kusuma & Firdaus (2015), which also find that exchange rate depreciation positively affects the competitiveness of Indonesia's fishery exports.

CONCLUSION AND SUGGESTION

Indonesian processed tuna demonstrates strong competitiveness in most destination markets, particularly Saudi Arabia, Japan, the United States, Thailand, Italy, Australia, the United Kingdom, Germany, and Jordan, while competitiveness in Spain remains relatively weak due to its role as a processing and re-export hub. The empirical results show that real GDP per capita in destination countries significantly and positively affects Indonesia's processed tuna exports, highlighting the importance of demand growth and purchasing power. In contrast, exchange rate movements and geographical distance exert significant negative effects, reflecting the roles of price competitiveness and transportation costs, while non-tariff measures (SPS and TBT) and import tariffs do not exhibit statistically significant impacts during the study period. From a policy perspective, these findings imply that export strategies should prioritize high-income and consumption-oriented markets. The Ministry of Trade and related export promotion agencies should strengthen trade diplomacy, market intelligence, and product branding in markets such as the United States, Japan, and selected Middle Eastern and European countries. Macroeconomic stability and exchange rate risk management, led by Bank Indonesia and fiscal authorities, remain essential to support exporters' price competitiveness. At the same time, the significant effect of distance underscores the need for logistics cost reduction through improved port efficiency, cold-chain infrastructure, and shipping connectivity, which should be coordinated by the Ministry of Transportation in collaboration with the Ministry of Marine Affairs and Fisheries. Overall, Indonesia's processed tuna competitiveness is shaped more by demand conditions, competitiveness, and logistics efficiency than by formal trade barriers, suggesting that an integrated strategy linking trade policy, logistics development, and sustainable fisheries governance is crucial for enhancing Indonesia's long-term position in global processed tuna markets.

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