# Analysis of Determinant Indonesian Tuna Fish Competitiveness in Japanese Market

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**Abstract:** *Japan is the main market of Indonesian tuna exports, either the world's largest tuna market, even so the competition level is high. This condition has made it as the main point for Indonesia to be able to compete it's tuna in the global market. The research used time series data of world's tuna's import and export in 1982-2012 from UN Comtrade and Indonesia Ministry of Maritime Affairs and Fisheries. Data were analyzed to measure market share (MS), Revealed Symmetric Comparative Advantage (RSCA), Trade Specialist Ratio (TSR), while the determinant (factors) of competitiveness employed simultaneous equations. The results showed that: (1) The average market share of Indonesian tuna in the Japanese market was 25.20%, (2) Indonesia tuna have a high competitiveness and it growth to maturity, (3) Quality and trust is a decisive determinant (factor) of Indonesian tuna competitiveness in the Japanese market.*

## 1. Introduction

Tuna is a top two commodity right after shrimp in Indonesia fishery exports, which has the highest export growth (9.87%) compared to other commodities (MMAF, 2011). The volume of export in 2011 reached 141 774 tonnes with a value of US$ 499 million,

it has increased 30.1% compared to 2010 and it states as the largest exporter of tuna fish in Southeast Asia (UN Comtrade, 2013). The largest share of Indonesian tuna export in 2010 were Japan (32.45%) and the US (16.34%). In the ASEAN region, Indonesia ranks second place as a producer of tuna af-

ter Thailand (FAO, 2010).

Indonesia dominates exporting fishery products in Asian countries (76.74%) with a value of about 52.99%, and 47.86% of the volume of exports to Asia was tuna which has been exported to Japan (MMAF, 2011). The number of countries that export tuna to Japan during the 1988-2012 period is 78 countries. After the enactment of the quality requirements of fish in the Japanese market in 2003, the number of exporters has decreased, but the number is still larger exporters (71.80%) compared to the previous period. The largest exporter to Japan during the last 5 years are Thailand, Indonesia, Australia, South Korea and the EU-27, with a market share between 43.95% - 57.75%.

Tuna has been exported either as fresh, frozen and preserved. The average growth in export and import of world's tuna in 1988-2012 is 16.65% and 12.01% while the growth of the exporters about 80.44%. Fresh and frozen tuna trade in the Japanese market is more competitive than the preserved tuna, with a CR4 (Concentration Ratio) value is between 55.06% - 67.16%, and 66.48% - 78.93%, while the CR4 value of the preserved tuna larger than 95.85% (Hidayati et al, 2014). Trading liberalization requires the improvement of the fish products quality and quantity to be able to compete in international markets. Fare barriers, environmental and food safety issues considered by the most of the importing countries to makes such an additional standard that different from other countries to ensure that the imports of fishery products which entering their country is standarized, such as Japan with The Safety Basic Law in 2003 (Nguyen and Wilson, 2009; Juarno, 2012). It shows the enhance-

ment of world's tuna trade competitiveness.

The competitiveness of a commodity in a country is reflected by the volume of production as well as the value and volume of exports of the commodity. The increase of tuna exports must be supported by the increase in quantity, quality, and plus value of the tuna, so it needs a concerted effort to make the tuna exports business can grow continually and have competitiveness to face the existing challenges (Purnomo and Suryawati, 2007). The changes in the global world order beside to provide opportunities but on the other hand also increasing its competition. The identification of comparative advantage patterns is the first step that needs to be continued by the analysis of the driving factors (Gonarsyah, 1990; Juarno, 2012; Cai and Leuang, 2006).

## 2. Method

This research used time series data of the world imported tunas and Indonesian tuna which has been exported to Japan and the world in 1988 - 2012, source from UN Comtrade and Indonesian Ministry of Maritime Affairs and Fisheries (MMAF) from various publications. The indicators which being used to analyze the competitiveness of Indonesian tuna in Japanese market are the Market Share (MS) analysis, Revealed Symmetric Comparative Advantage (RSCA) and Trade Specialist Ratio (TSR) (Ng, 2002; Anonymous, 2013). The formula is as follows:

$$MS_j = \frac{X_j}{M_j} x100\% \quad .................... (1)$$

($MS_j$ = market share of Indonesia in Japanese market, $X_j$ = export value of Indonesian tuna in Japanese market, $M_j$ = import value of Japanese market)

$$RSCAj = \frac{RCAj - 1}{RCAj + 1} \text{ , and}$$

$$RCAj = \frac{\dfrac{Xj}{Xw}}{\dfrac{Xwj}{Xww}} \quad .....(2)$$

which Xj = export value of Indonesia tunas to Japanese market, Xw = export value of Indonesia tuna to the world, Xwj = export value of the world tuna to Japanese market, Xww = export value of the world tuna, RCAj = Revealed Comparative Advantage of Indonesia in Japanese market..

$$TSR = \frac{(Xj - Mj)}{Xj + Mj)} \quad .................. (3)$$

which Xj = export value of Indonesia tunas to Japanese market, Mj = imported Indonesian tuna from Japanese market. The analysis of the determinant competitiveness factor carried out by simultaneous equations below:

*Fresh Tuna :*

$$Ln(QXTSIJ_t) = a_{10} + a_{11}ln(PXTSIJ_t)$$
$$+ a_{12}ln(PXTBIJ_t) + a_{13}ln(PXTOIJ_t)$$
$$+ a_{14}ln(ER_t) + a_{15}ln(QTSI_t) +$$
$$a_{16}ln(QXTSIJ_{(t-1)}) + a_{17}D\_law + \varepsilon_{1i} \ ... \ (4)$$
$$Ln(PXTSIJt) = b_{11} + b_{12}ln((PXTBIJ_t) +$$
$$b_{13}ln(PXTOIJ_t) + b_{14}ln(PXTSIJ_{(t-1)}) +$$
$$b_{15}ln(ER_t) + b_{16}ln(DMTSJ_t) + \mu_{1i} \ \ .....(5)$$

*Frozen Tuna :*

$$LnQXTBIJ_t = a_{20} + a_{21}ln(PXTSIJ_t) +$$
$$a_{22}ln(PXTBIJ_t) + a_{23}ln(PXTOIJ_t)$$
$$+ a_{24}ln(ER_t) + a_{25}ln(QTBI_t) +$$
$$a_{26}ln(QXTBIJ_{(t-1)}) + a_{27}D\_law + \varepsilon_{2i} \ .. \ .(6)$$
$$Ln(PXTBIJt) = b_{21} + b_{22}ln((PXTSIJ_t) +$$
$$b_{23}ln(PXTOIJ_t) + b_{24}ln(PXTBIJ_{(t-1)}) +$$
$$b_{25}ln(ER_t) + b_{26}ln(DMTBJ_t) + \mu_{2i} \ ..... \ (7)$$

*Preserved Tuna :*

$$Ln \ QXTOIJ_t = a_{30} + a_{31}ln(PXTSIJ_t) +$$
$$a_{32}ln(PXTBIJ_t) + a_{33}ln(PXTOIJ_t)$$
$$+ a_{34}ln(ER_t) + a_{35}ln(QTOI_t) +$$
$$a_{36}ln(QXTOIJ_{(t-1)}) + a_{37}D\_law + \varepsilon_{3i} \ .....(8)$$
$$Ln(PXTOIJt) = b_{31} + b_{32}ln((PXTSIJ_t) +$$
$$b_{33}ln(PXTBIJ_t) + b_{34}ln(PXTOIJ_{(t-1)}) +$$
$$b_{35}ln(ER_t) + b_{36}ln(DMTOJ_t) + \mu_{3i} \ .......(9)$$

where QXTIJ = total export of Indonesia tunas to Japanese market (kg); PXTIJ = Indonesian tuna export price's to Japan (US$); QTI = Indonesian tuna's productions (kg); DMTJ = changes in the amount of Japanese tuna import (kg) ; ER = exchange rate (Rp/Yen); t = time (years); D_law = dummy variable (<2003 = 1, ≥2003 = 0);  (S= fresh, B = Frozen, O = preserved); a,b= estimate parameter; ε , μ= error term.

Japan is the world's largest market for tuna, particularly in the form of fresh (fresh tuna). Imports of fresh tuna fish in Japan has increased along with the consumption of this commodity in Japan (Kusumastanto, 2008). Consumption of fish per capita per year in Japan is 110 kg (FAO, 2003). Based on the type of product, Indonesia is a major exporter of fresh tuna in Japanese market, with an average market share is 25.20% in 1989-2012 and in 2003-2012 the proportion of the average value of exports increased to 56.52% (Figure 2 ). In 2012, Indonesia is the largest supplier of Yellowfin type (28.85%) both in the form of fresh and frozen (UN Comtrade, 2013). Other types of fresh tuna exported to Japan is the largest Albacora tuna and blue-finned tuna (*Tuna Tunus*), whereas in frozen form is Cakalang (65.11%). Preserved tuna are the most traded of tuna product in the world. The volume of the trade in 2012

is approximately 63.60% of the total world tuna trade. Nevertheless, Japan's imports of preserved tuna is relatively small compared to fresh and frozen tuna. In 2012, imports of preserved tuna Japan only 6.61% of the total value of imports of tuna. Indonesian exports of preserved tuna to Japan in 2012 was 17.11% of the total exports of processed Indonesia Tuna or 5.99% of total world exports of tuna

Totally, the average growth of Indonesian tuna exports to Japan showed a positive growth rate, but with strict quality requirements, the average growth rate after 2003 is smaller than the previous period.

The trade balance of tuna on the Japanese market is still experiencing high surplus (95.66% of export value), except for frozen tuna in 2008, and with the highest average growth in the preserved tuna. The highest contribution of trade balance surplus is fresh tuna (58.94%) and frozen as the lowest (7.24%). In the Japanese market, Indonesia was second of preserved tuna exporter after Thailand with an average market share over the last ten years at 19.38%, but still higher than the world market share (4.27%).

Fishery products which are exported to Japan must complete the quality standards set by the Food Sanitation Law and strictly enforced since 2003. Surely, it effect on Indonesian exports of fishery products. It showed in the trend rate of growth in market share of tuna where it's total is decreased / negative (-0.2903). Based on the type of product, fresh tuna trend decreased to 13.30%, and frozen tuna at 3.25%, while the preserved tuna rose (4.77%).

**Figure 1**. Market share Indonesia Tuna in the Japanese market, 1988-2012
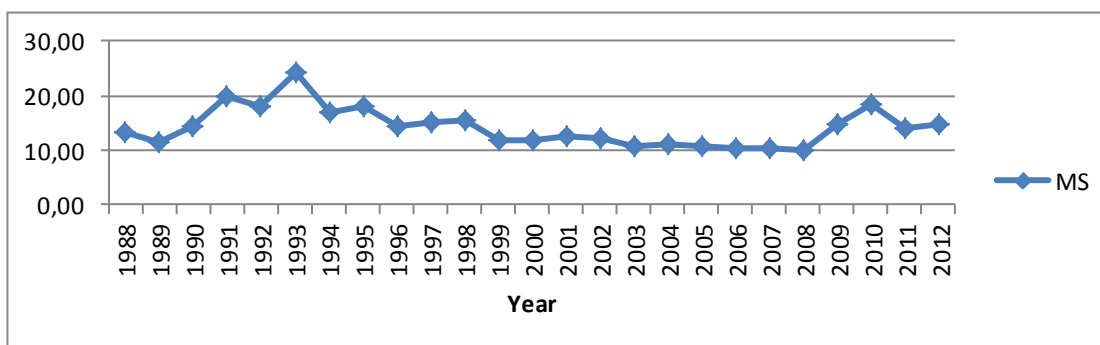


**Figure 2**. Market Share of Indonesian Fresh (TS), Frozen (TB), Preserved (TO) Tunas in Japanese market in 1989-2012
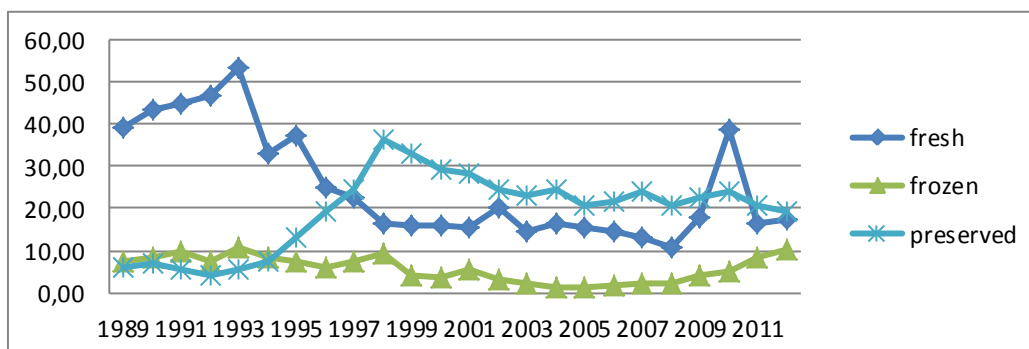
**Figure 3**. *RSCA* of Fresh Tuna, Frozen Tuna and Preserved Tuna of Indonesia
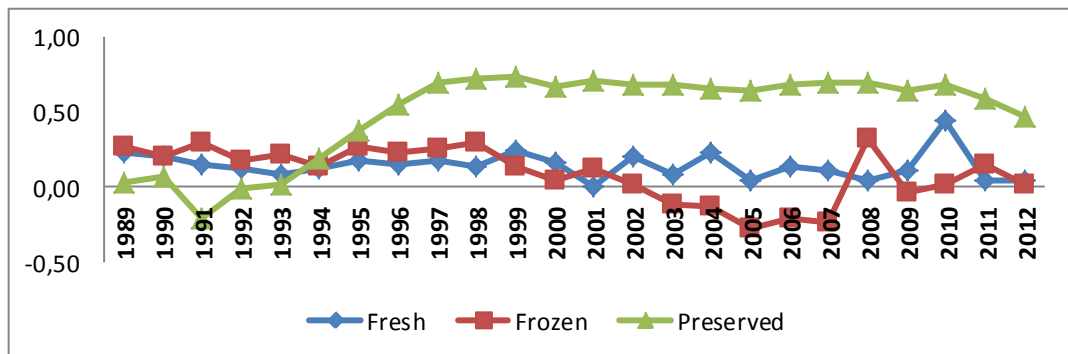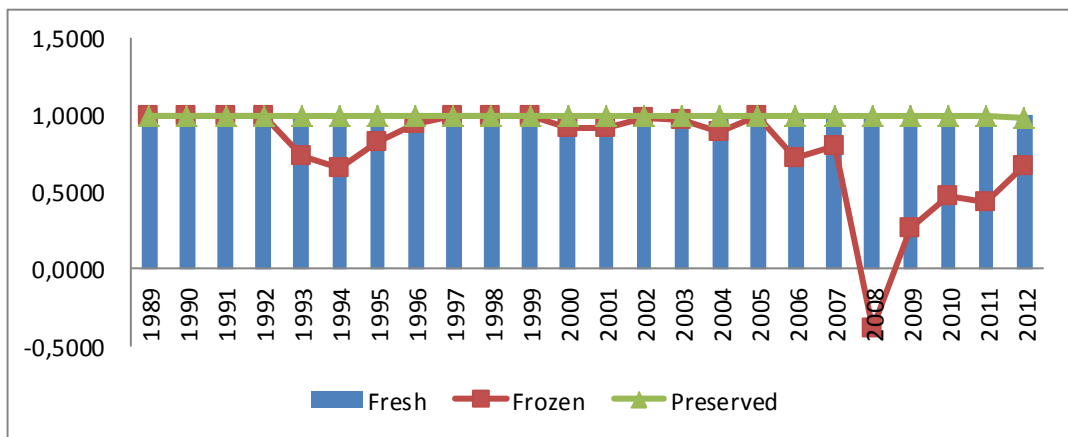in Japanese Maket in 1989-2012



**Figure 4.** The value of Trade Specialist Ratio (TSR) of Indonesia Tuna (fresh, frozen,
preserved) in Japanese Market, 1989-2012



## 2.1 Competitiveness of Indonesia Tuna in Japanese Market

RCA value starts from zero to infinity. A product is declared to have competitiveness if the value of its RCA > 1 (strong competitiveness), and not competitive if RCA <1 (competitiveness being if $0.5 \leq$ RCA <1, and weak if $0 \leq$ RCA <0.5) (Darwanto, 2010). Realizing the limitations of the RCA developed Revealed Symmetric Comparative Advantage (RSCA) that limit the values between -1 to 1. Based on the criteria of RSCA value, then a product can be called competitive if the value is RSCA> 0, and not competitive advantage if the RSCA <0 (Anonymous, 2013).

Japan dominates the world tuna consumption as well as one of the world's tuna market (Kusumastanto, 2008). Indonesian tuna export's growth has showed a positive trend. Based on TSR analysis, the total Indonesian Tuna in 1989-2012 has strong competitiveness as indicated by the value of the TSR> 1, and at this stage of maturity growth, while based on the type of product (indicated by the value of RSCA and TSR), the fresh and preserved Indonesia Tuna in 1989-2012 have a strong competitiveness and the degree of specialization to grow and to mature. Since 1995 the level of competitiveness of preserved tuna is higher than the fresh tuna. Both products have a fairly established TSR value. Frozen tuna still have the competitiveness but fluctuated. In 2005, it's began decreasing and on 2008 the TSR value is negative, but starting from 2009-2012 the

competitiveness has increased and grow toward maturity (Figure 3 and Figure 4). According Kusumastanto (2008), the decreasing is partly due to the export prohibition on bluefin tuna and the volume limitation. This limitation happened because Indonesia has not joined the Commission For The Conservation Of Southern Bluefin Tuna yet and also because of the refutation of Indonesian tuna (from West Sumatra) in the Japanese market. Value of imports for fresh and preserved tuna is relatively small compared to the value of frozen tuna's imports.

## 2.2 Determinant (factor) of competitiveness of tuna

The analysis result (Table 1) on the dependent variable of the exports amount and

**Table 1**. Estimated Determinants results of Indonesian Fresh, Frozen and Preserved tuna Competitiveness in Japanese Market

| Variable | | The estimated Parameters | | |
|---|---|---|---|---|
| Endogen | Eksogen | Fresh tunas | Frozen tunas | Preserved Tunas |
| Total export | Intercept | 14,9746 | 3,5619 | -37,4086* |
| of tuna | Indonesia fresh tuna export price to Japan | 1,5537* | 0,4568* | 1,3477* |
| (fresh/ | Indonesia frozen tuna export price to Japan | -0,4360 | 0,0280 | -1,7337 |
| | Indonesia preserved tuna export price to | | | |
| Frozen/ | Japan | -0,1971 | 0,6272** | 1,8588 |
| preserved) | Exchange rate | 0,5550 | -0,6418* | 0,1794 |
| | Indonesia fresh tuna production | -0,4097 | | |
| | Indonesia frozen tuna production | | 0,6635* | |
| | Indonesia preserved tuna production | | | 2,4685* |
| | Total export of fresh tuna lag time | 0,3156* | | |
| | Total export of frozen tuna lag time | | 0,0752 | |
| | Total export of preserved tuna lag time | | | 0,3104* |
| | Dummy variable | 0,4592 | 0,7054* | 2,1540* |
| | | $F_{count} = 35,81$ | $F_{count} = 12,26$ | $F_{count} = 90,61$ |
| | | $R^2 = 91,60\%$ | $R^2 = 78,87\%$ | $R^2 = 98,65\%$ |
| The export | Intercept | -0,8429 | -0,3951 | -1,1124* |
| price of | Indonesia fresh tuna export price to Japan | | 0,0655 | 0,0516 |
| Tuna | Indonesia frozen tuna export price to Japan | 0,0245 | | 0,0803 |
| | Indonesia preserved tuna export price to | | | |
| (fresh/ | Japan | 0,2524 | 0,2698 | |
| | Indonesia fresh tuna export price to Japan lag | | | |
| Frozen/ | time | 0,5277* | | |
| | Indonesia frozen tuna export price to Japan | | | |
| Preserved) | lag time | | 0,4848* | |
| | Indonesia preserved tuna export price to | | | |
| | Japan lag time | | | 0,5348* |
| | Exchange rate | 0,0678 | -0,0911 | 0,1714* |
| | Changes in the amount of Japanese fresh tuna | | | |
| | import | 0,0676 | | |
| | Changes in the amount of Japanese frozen | | | |
| | tuna import | | 0,0292 | |
| | Changes in the amount of Japanese | | | |
| | preserved tuna import | | | 0,0606* |
| | | $F_{count} = 15,23$ | $F_{count} = 3,02$ | $F_{count} = 56,51$ |
| | | $R^2 = 75,29\%$ | $R^2 = 37,65\%$ | $R^2 = 91,87\%$ |

* : significant at the 0,05 level; ** : significant at the 0,1 level

**Table 2**. Elasticity Analysis (Short and Long-Term) Competitiveness Determinants of Indonesian Tuna in Japanese Market

| Variable | Elasticity | | | | | |
|---|---|---|---|---|---|---|
| | Short run | | | Long run | | |
| | Fresh | Frozen | Preserved | Fresh | Frozen | Preserved |
| Export Volume : | | | | | | |
| Indonesia fresh tuna export price to Japan | 0,1284 | 0,0356 | 0,1284 | 0,1876 | 0,0385 | 0,1861 |
| Indonesia frozen tuna export price to Japan | -0,0049 | 0,0003 | -0,0255 | -0,0072 | 0,0003 | -0,0327 |
| Indonesia preserved tuna export price to Japan | -0,0113 | 0,0339 | 0,123 | -0,0165 | 0,0367 | 0,1784 |
| Indonesia frozen tuna productions | | 0,7436 | | | 0,8041 | |
| Total Indonesian processed tuna exports to Japan by different time | | | 3,1101 | | | 4,5098 |
| Export price : | | | | | | |
| Indonesia fresh tuna export price to Japan | | 0,4795 | 0,0743 | | 0,9308 | 0,597 |
| Indonesia frozen tuna export price to Japan | 0,0033 | | 0,0158 | 0,0071 | | 0,0339 |
| Indonesia preserved tuna export price to Japan | 0,1754 | 1,3733 | | 0,3713 | 2,6655 | |
| Changes of Total Japanese imports of fresh tuna | 0,7976 | | | 1,6888 | | |
| Changes of Total Japanese imports of frozen tuna | | 2,8091 | | | 5,4523 | |
| Changes of Total Japanese imports of preserved tuna | | | 1,0011 | | | 2,1521 |

Source : Secondary Data, Processed, 2013

export prices of tuna (fresh, frozen, and preserved) from Indonesia to Japan bring $F_{count}$ results greater than $F_{table}$ (sig 0.00), means that independent variable jointly give significant effect to the dependent variable. $R^2$ high value indicates that analysis export amount can be explained by exogenous variable in the model.

Fresh tuna export price effect on fresh tuna, frozen, and preserved export from Indonesia to Japan, however, affects both short and long term that are less responsive (Table 1 and Table 2). Meanwhile, export prices on the current year is determined by the price of the previous year.

This indicates that Indonesia is only as a market follower in the fresh tuna trading, so that exporters need to monitor the export prices developments. Japan is the dominant market to influence the world prices, especially the price of fresh and frozen tuna (Yu-

diarosa, 2009; WPI, 2010; Kusumastanto, 2008). The political importance of food production and the iconic status of fish cuisine make the sector particularly susceptible to economic nationalism (Barclay & Sun Hui (2005).

Japan is one of the country that consumes most fish mainly in fresh form. Quality is a major consideration in the purchase, even when the market is decreasing (Kagawa & Bailay, 2003; Batt & Marooka, 2003; Juarno, 2012). However, the quality is not observed directly in the trade data (Faruq, 2006; Juarno, 2012; Simangungsong, 2008). Dummy application of the requirements of product quality, that is positive, indicates that Indonesia has been able to meet the desired standards of consumers where exporters often check directly in order to maintain the quality of the product remain guaranteed until the destination. This indicates that the

management in the production of the need for continuous improvement, given that the market competition is more competitive (Hidayati *et al.,* 2015).

Production of preserved and frozen tuna positively influence toward Indonesian tuna exports to Japan, but the production of preserved tuna is more responsive than frozen tuna. Besides, an increase of Japanese preserved tuna's import gave a better price appreciation shown by the increase in export prices of preserved tuna. Thus, Indonesia should further improve the quality of products in preserved form. According Kuldilok *et al*. (2013), Smaller processing and fishing companies should merge to increase profit margins and market share. Tuna management and conservation could be used to support the sustainability of the industry. Indonesia as an exporter of preserved tuna in second position after Thailand in the Japanese market, but the market share is still relatively small, 2009-2012 is about 21,60%). Structuring of the management, infrastructure and institutions need to be increased from upstream to downstream, so that Indonesia can compete in the trade of preserved tuna.

## 3. Conclusion

It can be concluded that Indonesia is a major exporter of fresh tuna to the Japanese market with an average market share of 25.20%, Indonesian tuna both in total and by type of product is highly competitive with RCA> 1 (RSCA> 0) and TSR> 0, Indonesian tuna products in the Japanese market is in the growth to maturity, the export price of fresh tuna from Indonesia to Japan affect the export volumes of Indonesia fresh

tuna, frozen, and preserved to Japan, the determinant of competitiveness of Indonesia for fresh tuna in the Japanese market is the export price of fresh tuna, and for frozen tuna is export price of fresh and preserved tuna, the rupiah against the yen, production of frozen tuna and the enforcement of the requirements of quality standards of products, while preserved tuna was affected by the export price of fresh tuna, preserved tuna production, the amount of exports of fresh tuna in previous year and the enforcement of product quality standards requirements; the changes of imported Japanese tuna amount responsively influence to the price of Indonesian tuna which was exported to Japan; total exports of preserved tuna in previous year responsive responsively affect the volume of exports for Indonesian preserved tuna to Japan; the investigation of the market, the management of the production and maintaining quality and also trust is a key element in the increased export of tuna to Japan.

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