Tuna industries competitiveness in international market. Case of Indonesia

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Abstract. Tuna fish is one of exporting national fishery commodities in the international market. This study aimed at analyzing the dynamics of competitiveness of national tuna fish commodities in the international market during the period of 1998-2014. The analytical method used in this research was Constant Market Share (CMS). The result of the analysis shows that the competitiveness dynamics of fresh tuna commodity was more resulted from the factor of tuna fish exporting growth effect. The increase of export in the market of tuna fish has resulted in increasing the export of Indonesian tuna commodities. The competitiveness dynamics of the canning and frozen tuna were resulted from the factor of competitiveness effect. The most competitive tuna in Indonesia was airtight canning skipjack (*Katsuwonus pelamis*).
Key words: Tuna fish, competitiveness, international trade, target market, constant market share.

Introduction. It is a big business to trade marine fisheries products though such products tend to decrease globally (Taylor et al 2007). According to a report published by Food and Agricultural Organization (FAO 2001), almost 40 % of world fisheries product was traded globally. This amount of trading is much higher than such other main food products as wheat flour (20 %) and rice (5 %). As a result, the international fisheries trading can be said as the most prospective commodity to commercialize. Besides, this reflects that the fisheries product is the most favorite commodity in the world. It is because of the protein contained in such product as well as the reasonable price to pay.

Fish and tuna fisheries products are the main Indonesian marine commodities to trade. The industry of tuna fishery has significantly contributed to both Indonesian and world fisheries (Sunoko & Huang 2014). This kind of industry has begun since the early cooperation with some stakeholders from Japan, Taiwan, and Korea in 1962 for the longline tuna vessels and for purse seine tuna vessels in 1974 (Sunoko & Huang 2014).

Since the last 17 years, the international market of Indonesian tuna fish has tended to increase. It is reported that the total amount of tuna exported reached US$21,133,530 in 1998 and increased sharply in 2014 to US$522,184,403, or about 142.73 % (UN-Comtrade 2016).

From the contribution of each commodity point of view, the airtight container skipjack (*Katsuwonus pelamis*) (HS 160414) contributed the highest commodity each year. This high contribution was in line with the high yield of skipjack (*K. pelamis*) harvest of all tuna production nationally (UN-Comtrade 2016). In 2014, the total contribution of the skipjack tuna production nationwide was 64.07 % (FAO 2016).

It is predicted that the contribution of Indonesian tuna export would be even greater if the government and law enforcement officials forcefully punished the illegal trading activities in tuna fish commodity. In 2011, there were about 20-35 % of tuna illegally exported from Indonesia to the USA. In other words, there were approximately 3,889 tons - 6,805 tons of tuna illegally exported without being reported (Pramod et al 2014).

Based on the situation above, it is clear that tuna fish is a commodity where the government and key players need to put more attention on it pertaining with maintaining and increasing its contribution toward the national economy, including improving the social welfare. The increased performance of trade of tuna fish and fishery products could be promoted by various factors, including competitiveness, world growth factors, and the composition and distribution of the commodity in the world market. Therefore, this study is very significant as an input for the future business development strategy of Indonesian tuna fisheries.

This paper was to analyze the competitiveness dynamics of tuna fish and fisheries products in both national and international markets as well as the factors influencing the dynamics.

Definitions of Tuna Fish and Tuna Fishery Products. This research focused on the commodity of tuna and tuna fishery products according to the *Harmonized System* (HS) code 1996. According to HS 1996, there were two parts of tuna and tuna fishery products: tuna fish (HS 03) and processed tuna (HS 16). In the group of HS 03, there are two classifications, i.e. fresh tuna (HS 0302) and frozen tuna fish (HS 0303).

The products of fresh fish (HS 0302) consist of albacore tuna (*Thunnus alalunga*) (HS 030231), yellow fin tuna (*Thunnus albacares*) (HS 030232), skipjack tuna (*K. pelamis*) (HS 030233), and other tuna, including big eye tuna (*Thunnus obesus*) (HS 030239). Meanwhile, the frozen product of tuna (HS 0303) consists of albacore tuna (*T. alalunga*) (HS 030331), yellow fin tuna (*T. albacares*) (HS 030322), skipjack tuna (*K. pelamis*) (HS 030333), and other tuna, including big eye tuna (*T. obesus*) (HS 0303339). The processed tuna fish (HS 16) consists of a classification of processed product, i.e. processed or preserved product (HS 16049). It only consists of skipjack tuna (*K. pelamis*) packaged in airtight container (HS 160414).

Methodology. Types and Source of Data. The data used in this study was secondary data pertaining with the trade of this commodity during the period of 1998-2014. The data was taken from www.comtrade.un.org, downloaded on June 2016.

Measurement of Competitiveness Dynamics: Constant Market Share Analysis (CMSA). Constant Market Share Analysis (CMSA) or constant market share model is an analysis of competitiveness used to measure the dynamics of competitiveness level or comparative degree of an industry or country (Tambunan & Tulus 2000). The usage of this approach was based on the theoretical foundation on the growth rate of export of a certain country that can be lower, equal, or higher than the average exporting growth throughout the world (standard growth). Negative deviation between the export growth of a certain country and the standard growth is resulted from three aspects, i.e. (Tambunan & Tulus 2000):
(1) The growth of demand get slower, for instance due to the less interest on a certain product;
(2) The problems of distribution faced the exporting countries. The growth of import in the major market has been slower due to the slower economic growth in the importing countries, for example. Therefore, the dominating exporting products of a certain country are the products with high demand in the world market where the exporting may decrease due to the slow growth of economy.
(3) The competitiveness in price or quality

The basic assumption from the constant market share model is that the market share of a certain country in the world market tend to be stagnant all the time. According to Leamer & Stern (1970), the exporting demand in a certain country was from two competing supplying countries can be represented with the relation:

$$\frac{q_1}{q_2} = f\left(\frac{p_1}{p_2}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

where q_1 and p_1 are the number and the price of a certain commodity from supplier i. The correlation is well known as a basic form of substitution elasticity.

By multiplying (p_1/p_2) to get the equation:
$$p_1q_1/p_2q_2 = p_1/p_2 * f(p_1/p_2) \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (2)$$
The market share of Country 1 can be written by the following equation:

$$\frac{p_1q_1}{p_1q_1 + p_2q_2} = \left[1 + \frac{p_2q_2}{p_1q_1}\right]^{-1} \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3)$$

$$= g\left(\frac{p_1}{p_2}\right) \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (4)$$

The equation (4) indicates that the market share of a country tends to be constant except the price (p_1/p_2) changes. Based on the theoretical point of view above, the dynamics of competitiveness of a certain product can be caused by 4 effects: i.e. (1) growth effect, (2) the effect of exporting commodity composition, (3) world market distribution effect, and (4) competitiveness effect.

The commodity effect shows how many different exports resulted from the rapid growth in importing aspects for a certain commodity compared with other commodities. The positive score resulted suggests that the export of a certain commodity of the country increases due to the increasing demand of the commodity (Aswicahyono & Pangestu 2000).

The effect of distribution shows how many difference found in export resulted from the demand factor of the target country. A positive score of the effect suggests that the growth of export of a certain country is resulted from the right market selection. In contrast, a negative score indicates that the country's exports are destined for countries that request does not grow as fast as the growth of the world (Aswicahyono & Pangestu 2000).

Meanwhile, the effect of competitiveness is the difference between the actual growth of country j for product i exported to country k and the total growth rate of importing product k. The exporting country j for a certain commodity has a rapid growth in competitiveness in country k of all sources. If exports by country j of product i to country k is growing faster than other countries' exports to certain countries, the market share j in the country k increases. It means that a certain commodity of country j has higher competitiveness (Aswicahyono & Pangestu 2000).

Based on the explanation above, according to the CMS analysis, the growth rate of exporting Indonesian tuna fish compared with the standard growth (average) can be explained in three factors: composition of exporting commodity, distribution of world market, and competitiveness.

The mathematical equation pertaining with it can be expressed below (Leamer & Stern 1970):

(a)   Standard growth
$$r = \frac{V_t - V_{t-1}}{V_{t-1}} \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

Where:

r : standard growth of all exporting commodities and targetted countries

V_t : the world export year t

V_{t-1} : the world export year t-1

(b)   Composition of commodity
$$\frac{\sum_i (r_i - r) V_{i(t-1)}}{V_{t-1}} \quad\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (2)$$

Where :

$V_{i(t-1)}$: commodity export product i in the year of t-1

V_{t-1} : total export in t-1

r_i : standard growth for commodity i

(c)   Distribution of world market

$$\frac{\Sigma_i \Sigma_j (r_{ij} - r_i)\, v_{ij(t-1)}}{V_{t-1}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (3)$$

where:

$V_{ij(t-1)}$: exporting commodity i to country j in t-1

r_{ij} : standard growth of commodity i to country j

(d) Competitiveness

$$\frac{\Sigma_i \Sigma_j (v_{ijt} - v_{ij(t-1)}) - r_{ij} v_{ij(t-1)}}{V_{t-1}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (4)$$

Referring to the effects above, the growth of export of a certain country (or the deviation toward the standard growth) is:

$$\frac{V_t - V_{t-1}}{V_{t-1}} = r + (2) + (3) + (4) \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (5)$$

Result and Discussion. Growth of Tuna Fish Production in Indonesia. During the period of 1998-2014, the average production of tuna fish in Indonesia was 482,957.47 per year. The total production of tuna fish in 1998 was 420,497 tons and sharply increased into 653.404 tons in 2014. The contribution of the production of tuna in Indonesia reached 10.79 % in 1998 and increased into 12.60 % in 2014. The total production of tuna in the world was 3.898.220 tons and in 2014 was 5.186.287 tons.

Based on the types of commodity, it can be seen that during the period of 1998-2014, tuna fish production was dominated by skipjack tuna (*K. pelamis*) and yellow fin tuna (*T. albacares*). Meanwhile, the production of big eye tuna (*T. obesus*), albacore tuna (*T. alalunga*) and southern bluefin tuna (*Thunnus maccoyii*) had relative low contribution. The contribution of skipjack tuna (*K. pelamis*) in 1998 toward the total production was 55.01 %, and increased into 64.07 in 2014. The total production of skipjack tuna (*K. pelamis*) in 1998 was 231,324 tons and in 2014 was 418,644 tons. In addition, during the period 1998-2014, total production of tuna (*K. pelamis*) in Indonesia has contributed an average of about 12.20% of the world production of tuna (*K. pelamis*).

Meanwhile, the production of yellow fin tuna (*T. albacares*) in 1998 was 139,405 tons or about 33.15 % of the total national production of tuna. In 2014, the production of this tuna increased, i.e. 172,953 tons or about 26.47 % of the total production. The contribution of yellow fin tuna (*T. albacares*) toward the total production of the world during the period was 9.96 % per year.

Market Share Analysis of Tuna and Tuna Fisheries Product. The increase of each commodity of tuna fish has positively contributed toward both national and international market of tuna commodities. The high production of skipjack tuna (*K. pelamis*) and yellow fin tuna (*T. albacares*) positively contributed toward the market share of the commodities, either for national and international markets, particularly for frozen and packaged products. Meanwhile, the fresh product sold during the period tended to decrease.

Based on the Figure 1, it can be seen that the market shares of tuna of Indonesia in the international market were (1) 48.42 % of packaged skipjack tuna (*K. pelamis*) (HS 160414); (2) 15.53 % of frozen skipjack tuna (*K. pelamis*) (HS 030343); (3) 13.64 % of fresh other tuna (HS 0302393); (4) 10.17 % of fresh yellow fin tuna (*T. albacares*) (HS 030232); (5) 6.16 % of frozen other tuna (HS 030349); (6) 3.80 % of frozen yellow fin tuna (*T. albacares*) (HS 030342); (7) 1.48 % of fresh skipjack tuna (*K. pelamis*) (HS 030233); (8) 0.72 % of frozen albacore (*T. alalunga*) (HS 030341); and 0.09 % of fresh albacore (*T. alalunga*) (HS 030231).
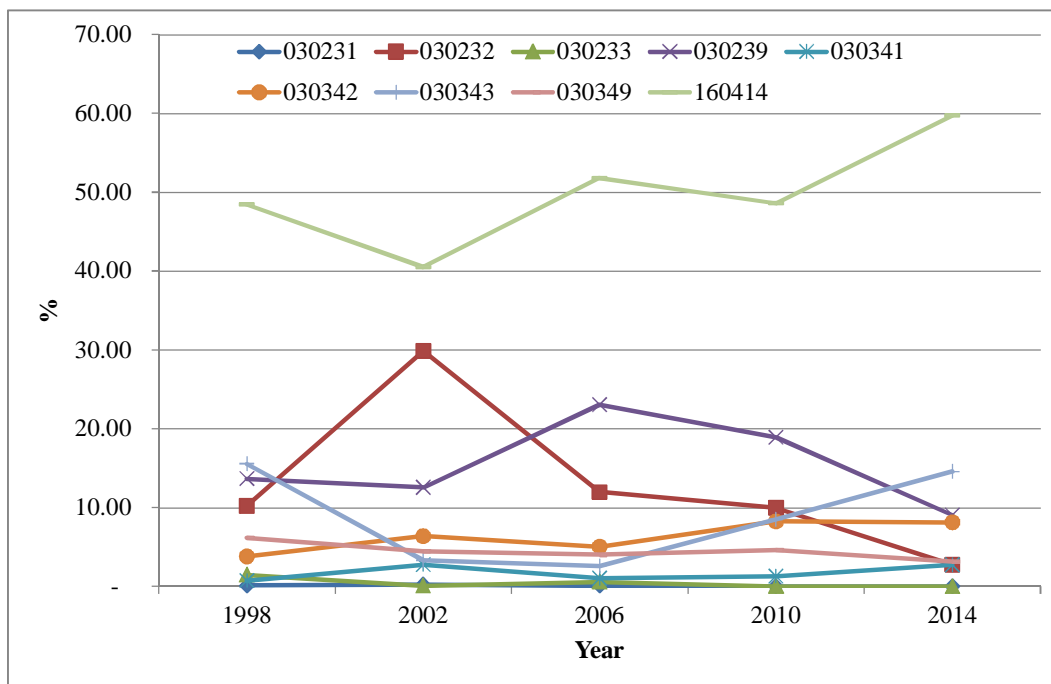
Figure 1. Market shares of tuna and tuna fish product of Indonesia in 1998-2014.

Meanwhile, the market share of tuna fish of Indonesia were: (1) 59.72 % of packaged skipjack tuna (*K. pelamis*) (HS 160414); (2) 14.57 % of frozen skipjack tuna (*K. pelamis*) (HS 030343); (3) 9.02 % of fresh other tuna (HS 030239); (4) 2.73 % of fresh yellow fin tuna (*T. albacares*) (HS 030232); (5) 3.13 % of frozen other tuna (HS 030342); (6) 8.12 % of frozen yellow fin tuna (*T. albacares*) (HS 030342); (7) 0.01 % of fresh skipjack tuna (*K. pelamis*) (HS 030233); and (8) 2.72 % of fresh albacore (*T. alalunga*) (HS 030341). It is noted that there is no trading for fresh albacore (*T. alalunga*) in 2014.

The same phenomenon was also for tuna fish trading in the world. Based on Figure 2, it can be seen that during the period of 1998-2014, the market share of tuna and tuna fish production sharply decreased while for two groups of frozen tuna tended to be stabile. Meanwhile, the packaged tuna fish increased significantly.
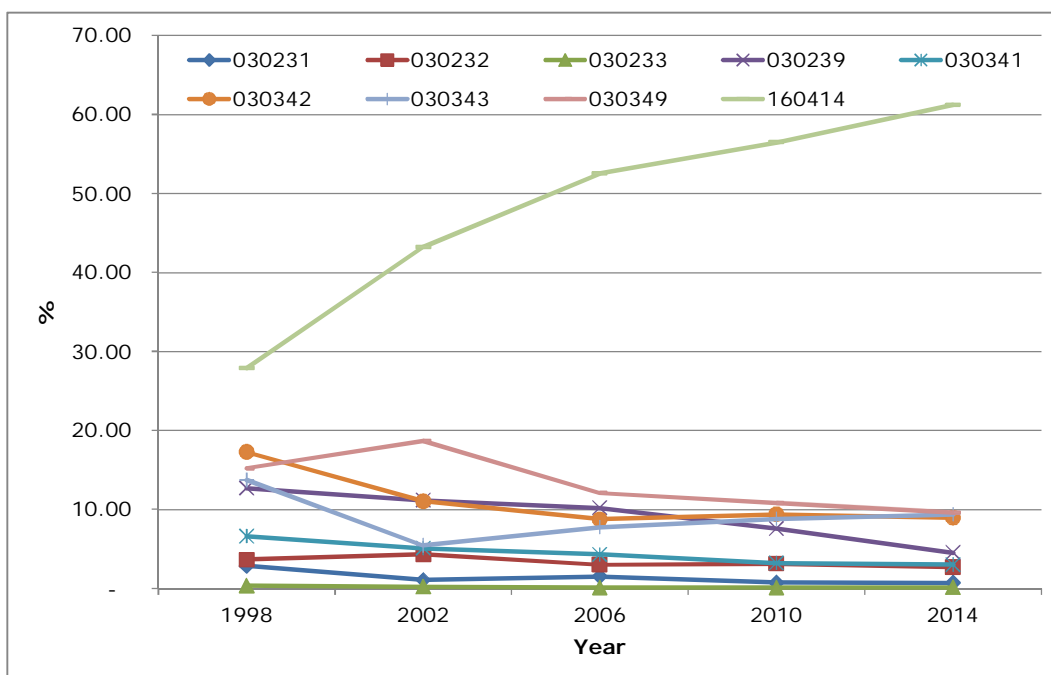

Figure 2. Market share of tuna and tuna fish production during the period of 1998-2014.

Constant Market Share Analysis (CMS). The analysis of CMS was to determine if the market share of commodity of tuna and tuna fish production in Indonesia which tended to increase was highly competitive; also important to know whether it was based on the competitiveness due to the increase on demand. This is important to determine because of it foundation on demand where the demand decreased the export of this commodity tended to decrease, too.

This CMS analysis on tuna commodities were classified into three groups: fresh tuna commodity, frozen tuna commodity, and canning tuna commodity. Besides, this was also to strengthen the result of analysis. The period analysis was divided into four periods: 1998-2002, 2002-2006, 2006-2010, and 2010-2014. The shorter period analyzed, the more accurate the result of the CMS analysis (Aswicahyono & Pangestu 2000).

Based on Figure 3, it is suggested that the fresh tuna commodity was influenced by the demand in almost all periods. This is seen from the positive growth effect though the score was too low. This suggests that the increase of economic growth in the exporting target countries has promoted the increase of fresh tuna commodity demand from Indonesia. However, fresh other tuna (HS 030239 and fresh yellow fin tuna (*T. albacares*) (HS 030232) were found to be high in some periods. The high value commodities competitiveness other fresh or chilled tuna (fresh) (HS 030 239) is driven by the types of tuna southern bluefin tuna (*T. maccoyii*) which is owned by Indonesia. Besides, the Indonesian export of fresh tuna was distributed to the slow growth countries. Tuna export commodities are distributed to the market / state of relatively rapid growth found only on commodities skipjack (*K. pelamis*) fresh. As for other commodities tend to be distributed on the market / country imports grew relatively slowly.

The Score of Constant Market Share (CMS) : (A) Albacore (*Thunnus alalunga*), Fresh; (B) Tuna Sirip Kuning (*Thunnus albacares*), *Fresh*; (C) Cakalang (*Euthynnus* (*Katsuwonus*) *pelamis*), Fresh; (D) Others Tuna, Fresh
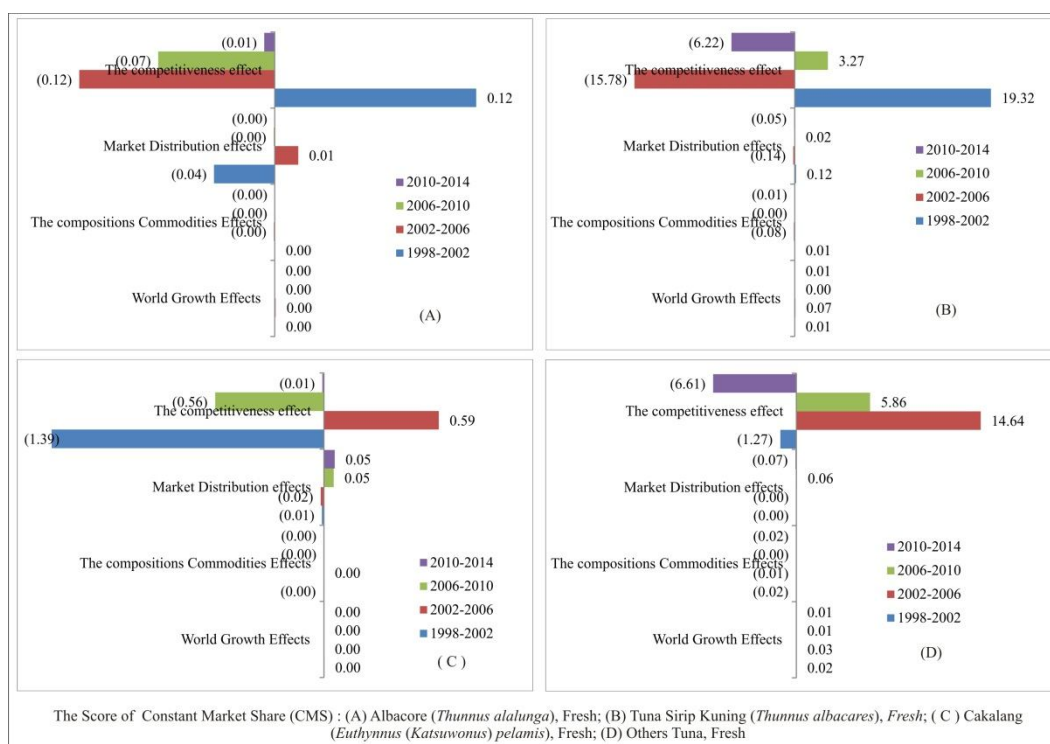
Figure 3. The scores of Constant Market Share (CMS) for fresh tuna.

Figure 4 shows that the trade of frozen tuna and tuna fish product commodity was influenced by competitiveness score though the value was still small. This is a starting point to increase the performance of exporting tuna and tuna fish commodities in Indonesia. The higher score of competitiveness effect means the more demanded commodity in the international market. This can be resulted from the competitive price and/or the quality of the commodity. Based on this situation, the main actors of tuna fish

business need to encourage to increase their product. Moreover, Indonesia is the most productive country for tuna fish (Galland et al 2016).
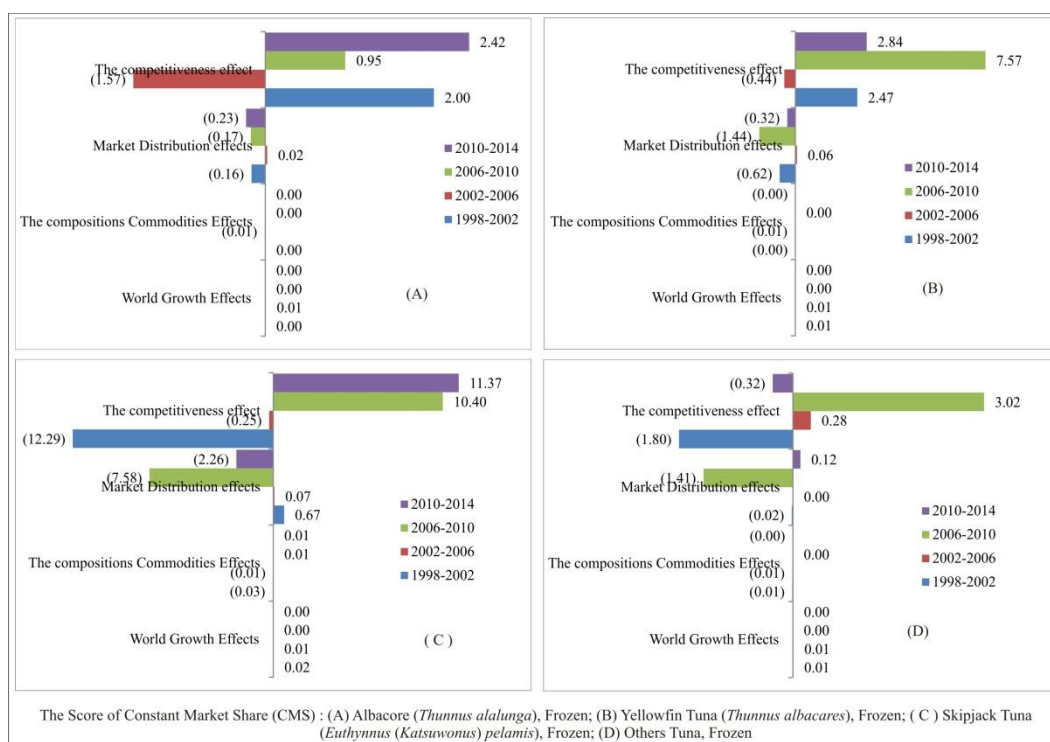

The Score of Constant Market Share (CMS) : (A) Albacore (*Thunnus alalunga*), Frozen; (B) Yellowfin Tuna (*Thunnus albacares*), Frozen; (C) Skipjack Tuna (*Euthynnus* (*Katsuwonus*) *pelamis*), Frozen; (D) Others Tuna, Frozen

Figure 4. The scores of Constant Market Share (CMS) for frozen tuna.

It is similar with the canning tuna commodity (HS 160414) where the trading performance was more resulted from the competitiveness. Based on Figure 5, it can be seen that the score of competitiveness effect of canning tuna commodity (HS 160414) has higher score compared with the frozen tuna. Besides, the commodity tended to significantly increase during the last periods. It means that the canning tuna commodity (HS 160414) was a major tuna commodity for Indonesia. Moreover, the availability of skipjack tuna (*K. pelamis*) as its raw material for the canning tuna commodity tends to increase.
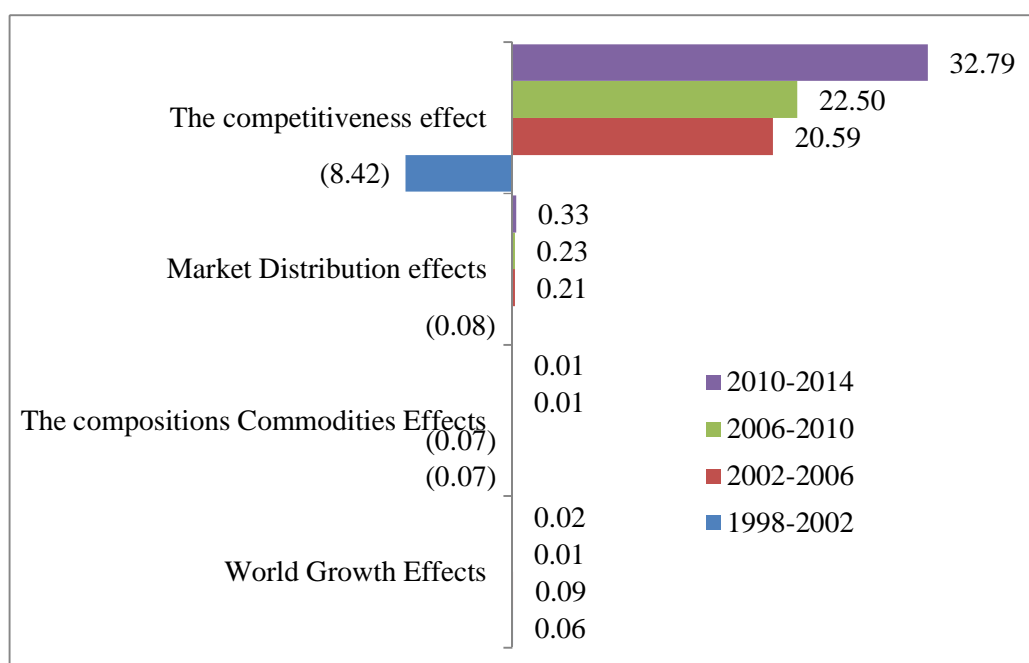

Figure 5. Scores of Constant Market Share (CMS) for canning tuna commodity.

Figure 6 shows that Indonesia is the biggest supplier for skipjack tuna (*K. pelamis*) in the world. In 2014, Indonesia produced 418,633 tons or 12.21 % of the total production of skipjack (*K. pelamis*) in the world (3,058,608 tons). Such an amount of tuna would be able to fulfill then need of raw material for the national processing tuna industries. This is for increasing the competitiveness of canning tuna in the international market.
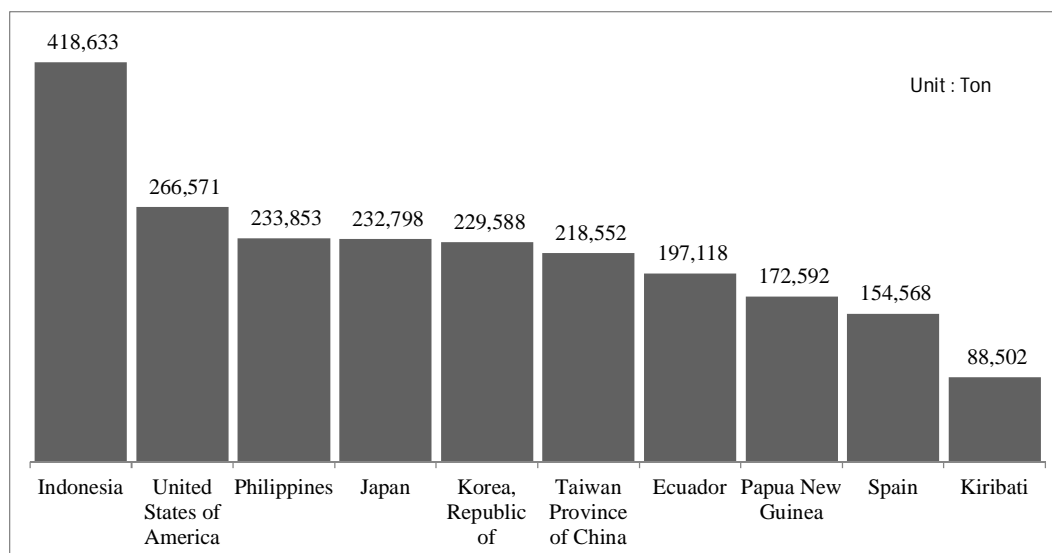

Figure 6. Top 10 countries producing skipjack in 2014.

The high or low competitiveness of such a product depends on the price of tuna commodity. The price of tuna depends on the species, quality indicators, handling method and market condition (Huang & Leung 2011). The success of tuna fishing is highly influenced by the skill of understanding the tuna behaviors, water temperature, salinity, sea current, and mating time, other than the vessel used to catch (Kusumastanto & Tridoyo 2008). On the other side, the problems faced in handling tuna fish were classified into two aspects: the process of catching and the handling process on the vessel. This was due to the lack of sanitation and hygienic standard of the vessel, especially artisanal fishery vessel (Sunoko & Huang 2014).

As a matter of fact, the high competitiveness of Indonesian tuna commodity trading in the international markets should be felt by all players in the major tuna fishery. Food and Agriculture Organization (FAO 2015) mandates that each country should ensure the implementation of effective fisheries management system to prevent overexploitation driven by market demand which will result in threatening the sustainability of fishery resources, food security and nutrition. The fisheries management system should cover responsible post-harvest practices, policies and actions that enable benefiting export earnings for small-scale fishermen in all stages of the value chain.

Conclusion. Based on the result of discussion above, there are some points to conclude: (1) The competitiveness dynamics of fresh tuna commodity was more resulted from the effect of exporting growth for tuna. The increase of exporting growth for tuna in the world market has resulted in the increase export of Indonesian tuna commodity; (2) The competitiveness dynamics of frozen and canning tuna commodities were more resulted from the competitiveness effect; and (3) Indonesia has a strong competitiveness in intight canning skipjack (*K. pelamis*) commodity.

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