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Can the Competitiveness of Indonesian Frozen Cephalopod Commodities in the Chinese Market Improve with Product Downstreaming?

Alwi Mulato[1, 3] , Metusalach[2*] , Mardiana E.Fachry[2], Nursinah Amir[2]

[1]Faculty of Marine Science and Fisheries, Hasanuddin University, Jl. Perintis Kemerdekaan KM. 10, Makassar City 90245, South Sulawesi, Indonesia. Telp./Fax. +62852-4023-7877.
[2]Faculty of Marine Science and Fisheries, Hasanuddin University, Jl. Perintis Kemerdekaan KM. 10, Makassar City 90245, South Sulawesi, Indonesia.
[3]Center for marine and fisheries Education, agency for marine and fisheries research and Human Resources Development, Ministry of Marine Affairs and fisheries, Jakarta, Indonesia

[*]**Corresponding Author: mminanga@hotmail.com**

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ABSTRACT

Frozen cephalopods are a key commodity in Indonesian fisheries and one of the largest market exports to China. The purpose of this study is to enhance the competitive advantage of Indonesia's frozen cephalopod products in the Chinese market. The methods used include the analysis of revealed comparative advantage (RCA), revealed symmetric comparative advantage (RSCA), comparative export performance (CEP), market share index (MSI), and product prices. Data were collected and processed from the Trade Map. The analysis results show that Indonesia has the highest RCA and CEP values for frozen cephalopods. However, India's frozen cephalopod MSI index is the highest due to a broader market share for Indian products. The price of Vietnamese frozen cephalopods is the highest, attributed to their better quality specifications. To improve competitiveness, efforts should focus on downstream products, optimizing the abundance of cephalopod resources, and implementing good manufacturing practices (GMP) and sanitation standard operating procedures (SSOP) at each stage, from capture to export. Additionally, strengthening the quality assurance system (HACCP) on refrigerated vessels and throughout the supply chain will help minimize product rejections. Enhancing the efficiency of fish distribution, logistics systems, and warehouse receipts is also crucial. Furthermore, increasing the government's role in controlling exchange rates, export taxes, and domestic cephalopod prices is recommended. This research provides the latest recommendations for Indonesia's policy framework to improve the competitiveness of its frozen cephalopod products in the Asian market.

INTRODUCTION

Competitiveness is the ability of a product to enter into a foreign market and the ability to survive and be in demand in that market. Competitiveness is influenced by comparative and competitive advantage. Comparative advantage is a natural advantage,

while competitive advantage is an advantage that is created or modified **(Amirnejad *et al.*, 2020; Nabin *et al.*, 2022)**.

Cephalopods are Indonesian fishery commodities that are a mainstay in fishery commodity export activities; these commodities rank third of all Indonesian fishery export products. On the export commodities in the global market, it is shown that the cuttlefish octopus squid trade reached US $ 10.75 billion; this has increased from 2020 by US $ 2.27 billion when the world economy began to rise after being hit by the global attack of the COVID-19 outbreak **(Jasper *et al.*, 2021; Pepita *et al.*, 2021)**. The world trade in cephalopod commodities is mostly aimed at China in the period of 2017 to 2022. China has increased by 20% for these commodities. Cephalopod commodities imported by China are 90% in the condition of frozen products and the rest in processed or preserved form as much as 7% and 3% in other forms **(Pudyastuti *et al.*, 2018; Joshua *et al.*, 2021; Mursit, 2022)**.

Indonesia's frozen cephalopod commodities mostly have a market destination, namely China; other Asian countries also carry out considerable export activities to China, Vietnam, India, Malaysia and Pakistan thus there is competition in these trade activities **(Pudyastuti *et al.*, 2018; Firzatullah, 2020; Wang *et al.*, 2022)**.

Table 1. Export amount of frozen cephalopod commodities to China market
(Thousand US$)

Country	2017	2018	2019	2020	2021	2022
World	530,497	564,332	923,518	699,135	1,011,418	944,577
Indonesia	132,261	227,849	234,065	201,928	265,565	309,762
Malaysia	2,412	19,388	47,306	45,921	49,896	69,863
India	1788	12,061	39,454	34,694	39,600	49,601
Pakistan	3,909	7,882	28,796	21,230	36,677	36,852
Vietnam	2183	4,442	7,610	8,404	3,706	11,629

(Trade Map, 2023)

Table (1) presents quantitative data on the value of cephalopod export commodities including squid, octopus and cuttlefish (in thousands of US dollars) from several countries, including Indonesia, to the Chinese market from 2017 to 2022.

In general, the value of frozen cephalopod exports to China shows an increasing trend from year to year, although there are slight fluctuations. This indicates an increase in demand for this fishery product in the Chinese market. Indonesia consistently dominated as the largest exporter of frozen cephalopods to China during the period. This shows Indonesia's great potential in meeting the Chinese market demand for these commodities. Other countries such as Malaysia, India, Pakistan and Vietnam also experienced growth in export value, although on a smaller scale than Indonesia. This

indicates that there is an increasingly fierce competition in the Chinese market **(Andres *et al.*, 2021; Kathuria, 2021; Vasilii *et al.*, 2021).**

Supporting factors for increased exports are China's rapid economic growth which has increased demand for various products, including seafood products such as frozen cephalopods. Changes in the consumption patterns of the Chinese people who are increasingly favoring seafood contribute to the increase in demand for frozen cephalopods. The quality of frozen cephalopod products produced by exporting countries, including Indonesia, that meet the Chinese market standards is also an important factor **(Ospina & Alvarez, 2022; Harrison *et al.*, 2023)**.

The challenges faced include increasing competition in the Chinese market, which means that exporting countries must continually improve product quality and price competitiveness. Changes in regulations in China related to the import of fishery products could also impact export volumes. For Indonesia, the implication is the need to strengthen the fisheries sector, as the data table shows the significant potential of Indonesia's fisheries, particularly in cephalopod production. The government should provide greater support to enhance the productivity and quality of fishery products **(Madduppa *et al.*, 2021; Li *et al.*, 2022)**.

The problem formulation in this research is as follows:

- What specific factors cause fluctuations in export values in certain years?
- How do Indonesia's RCA, CEP, MSI and selling price of frozen cephalopods compare with other exporting countries?
- What is the downstream scheme of cephalopod products at each stage that will be exported to China?
- What policies can the Indonesian government take to increase exports of frozen cephalopods to China?

This study aimed to improve the competitiveness of Indonesian cephalopod commodities in the Chinese market by looking at the competitive position of frozen cephalopod commodities to evaluate the competitiveness of these commodities in the Chinese market. The results of this study will be able to contribute to the preparation of policy papers to improve the competitiveness of Indonesian frozen cephalopod commodities in evaluating policies due to increasingly competitive market pressures.

MATERIALS AND METHODS

1. Date and place

The research was conducted over five months, from March to July 2023. Data were collected from the Trade Map and several governmental agencies including the South Sulawesi Provincial Maritime and Fisheries Office, and the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia.

2. Sampling data and collection method

This research is sourced from Trade Map data, related agencies, and the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, in the form of export data on squid commodity sales to China from 2017 to 2022.

3. Data analysis method

3.1 Revealed comparative advantage (RCA) analysis

The RCA analysis method was introduced by **Balassa (1965)** that reveals a country's inclination to export goods that it excels in producing compared to others.
The formula equation of this method is:

$$\mathbf{RCAt} = \frac{\boldsymbol{Xa/Xb}}{\mathbf{Xc/Xd}}$$

Explanation:

RCAt = Export competitiveness index of frozen cephalopods (cuttlefish-octopus-squid) from country *i*.

Xa = Total export value of Frozen Cephalopod (Squid-Octopus-Cuttlefish) from country *i* to the destination country of China.

Xb = Total export value of Cephalopod (Squid-Octopus-Cuttlefish) from country *i* to the destination country of China.

Xc = Total global export value of Frozen Cephalopod (Squid-Octopus-Cuttlefish) to the destination country of China.

Xd = Total export value of Frozen Cephalopod (Squid-Octopus-Cuttlefish) from the world to the destination country China.

Based on this assessment, the understanding of the results of each criterion is as follows:

RCA > 1 means that the products of country *i* have a comparative advantage for export.

RCA < 1 means that the products of country *i* do not have a comparative advantage for export.

RCA = 1 means neutral

3.2 Revealed symmetric comparative advantage (RSCA) analysis

The RCA value will be adjusted using the RSCA formula to ensure stability, resulting in a scale ranging from (-1) to 1, thus minimizing fluctuations.

The formula equation of this method is:

$$\mathbf{RSCAt} = \frac{(\boldsymbol{RCA-1})}{(\boldsymbol{RCA+1})}$$

If the value of RSCA > 0, then the commodity originating from country *i* has a comparative advantage; if RSCA < 0, then the commodity from country *i* does not have a comparative advantage.

3.3 Comparative export performance (CEP) analysis

The purpose of CEP analysis is to assess a nation's specialization in particular exported goods. When a country's CEP value exceeds one, it indicates a relative export advantage for that country.

The formula equation of this method is:

CEP = [Xa / Xb] / [Wc / Wd]

Explanation:

Xa = Total exports of Frozen Cephalopod (Squid-Octopus-Cuttlefish) products from country *i.*

Xb = Total exports of Cephalopod (Squid-Octopus-Cuttlefish) products from country *i.*

Wc = Total global exports of Frozen Cephalopod (Squid-Octopus-Cuttlefish) products.

Wd = Total global exports of Cephalopod (Squid-Octopus-Cuttlefish) products.

The CEP value will indicate that when a country's CEP value surpasses one, it signifies a relative advantage in exporting that specific product **(Elkhider *et al.*, 2023)**.

3.4 Market share index (MSI) analysis

The MSI serves as a means to evaluate competitiveness characteristics among exporting countries.

The formula equation of this method is:

$$\mathbf{MSI} = \left\{\frac{Xib}{\mathbf{Miw}}\right\}$$

Explanation :

MSIt = Export competitiveness index of Frozen Cephalopod (Squid-Octopus-Cuttlefish) from country *i.*

Xib = Export value of country *i* for Frozen Cephalopod (Squid-Octopus-Cuttlefish) products.

Miw = Total import value of Frozen Cephalopod (Squid-Octopus-Cuttlefish) products in country *i.*

The MSI represents the proportionate share of imports from different countries within particular commodity sectors, measured on a scale from 0 to 100. When a country lacks exports in a specific commodity, its MSI value is 0, but it rises to 100 if the country is the sole exporter of that commodity **(Muhammad *et al.*, 2020)**.

3.5 Analysis of product prices per unit

The analysis of product price per unit is intended to establish the initial currency value of an exported commodity until it reaches the consumer or market destination country.

The formula equation of this method is:

$$\mathbf{HPUi} = \left\{\frac{Nvi}{\mathbf{Nki}}\right\}$$

Explanation:

HPUi = Unit price index of frozen cephalopod (Squid-Octopus-Cuttlefish) products from country *i*.

Nvi = Total export value of country *i* for frozen cephalopod (Squid-Octopus-Cuttlefish) products in currency units ($).

Nki = Total export value of country *i* for frozen cephalopod (Squid-Octopus-Cuttlefish) products in quantity (kg)

The unit price of the commodity represents the quantity value in kilograms, with the currency unit of dollars serving as a benchmark for the commodity's export price.

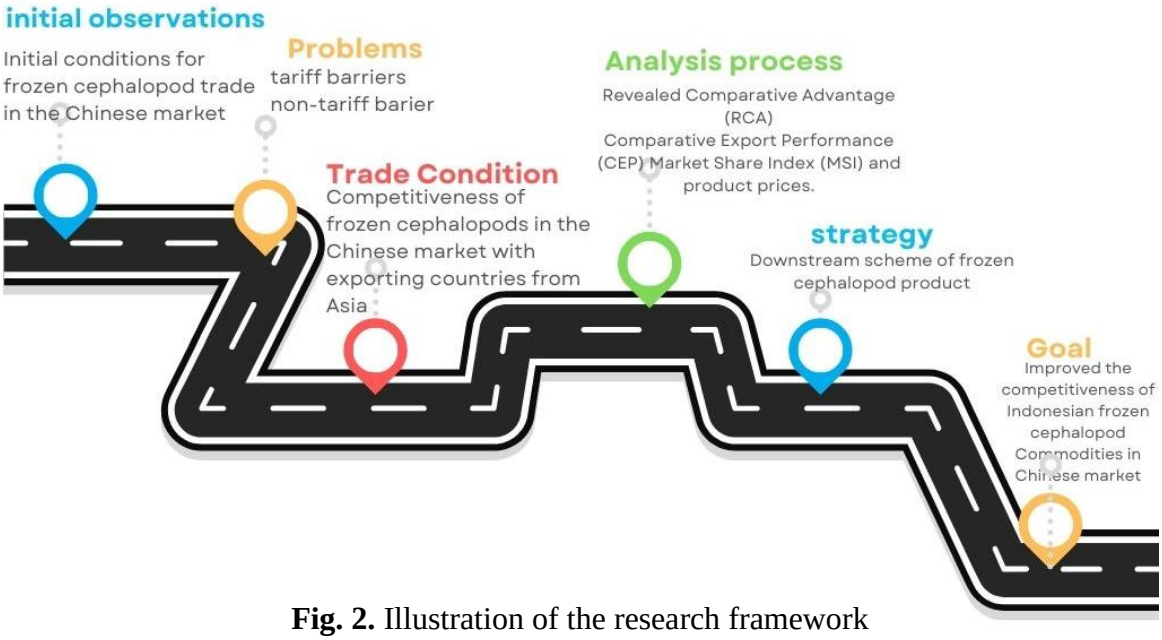

Fig. 2. Illustration of the research framework

RESULTS

1. RCA analysis

The results of the revealed comparative advantage (RCA) calculation for frozen cephalopod commodities to China provide insights into the comparison of market shares for similar commodities marketed to China. The analyzed results (Table 2) depict the movement of RCA values for frozen cephalopod commodities destined for the same market over a six-year period from 2017 to 2022. The analysis applied HS codes 030743 and 030752, representing frozen cephalopods exported to China. Sales of frozen cephalopods began in 2017, as this was the year when export data with the HS code was effectively reported to the World Trade Organization. In the RCA data, Indonesian frozen cephalopod commodities exhibit a higher comparative advantage value compared to competing countries such as Malaysia, India, Pakistan, and Vietnam.

Table 2. RCA value of frozen cephalopods commodities in the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	1.19	1.22	1.13	1.12	1.12	1.11
Malaysia	1.14	1.22	1.13	1.11	1.11	1.10
India	1.19	1.22	1.13	1.12	1.12	1.11
Pakistan	1.16	1.22	1.13	1.12	1.10	1.10
Vietnam	0.86	1.18	0.90	0.28	0.11	0.17

From data in Table (2), it can be seen that Indonesia's frozen cephalopod commodities in the Chinese market from 2017 to 2022 experienced intense competition with similar products from competing countries, namely Malaysia, India, and Pakistan. In terms of RCA value, Indonesia has comparable competitiveness with Malaysia, India, and Pakistan. The greater the RCA value, the greater the market share and the competitiveness of the frozen cephalopod commodity. Frozen cephalopod commodities from Vietnam have low competitiveness because they have an RCA value of less than one. The RCA value of frozen cephalopods from the five countries above is not directly proportional to the value of the selling price per unit of the commodity, and thus researchers conducted a more detailed RCA analysis based on the type of commodity. The results obtained from the analysis are based on the HS code.030752 (frozen octopus) and HS Code. 030743 (frozen cuttlefish) presented in Table (3).

Table 3. RCA value of frozen octopus commodities destined for the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	0.36	0.68	0.66	0.80	0.98	0.64
Malaysia	0	1.13	1.49	1.15	1.81	0.43
India	13.00	6.26	2.85	2.61	5.71	6.47
Pakistan	9.96	15.88	6.35	5.19	7.51	5.18
Viet Nam	10.23	10.59	6.92	0.85	1.22	1.51

The RCA analysis of frozen octopus commodities destined for China yields different results compared to the RCA value of frozen cephalopods, indicating a specialization in the types of products exported to China. Table (3) shows that the RCA analysis for frozen octopus reveals that Pakistan has the highest RCA value, followed by four other countries, with Indonesia having a value below one. This indicates that Indonesia does not have a comparative advantage in the competitiveness of frozen octopus commodities.

This also suggests that Indonesia’s export volume of frozen octopus is relatively small compared to the total global export of cephalopods to China, resulting in lower competitiveness for frozen octopus commodities. Frozen octopus exports from India, Vietnam, and Pakistan show high RCA values, making them more competitive compared to other countries, despite a decrease in 2019 and 2020.

Among the five countries exporting frozen octopus to China, Indonesia's frozen octopus commodity has an RCA value below one, meaning it lacks comparative competitiveness. This is due to the smaller export volume of Indonesian frozen octopus compared to Indonesia's own frozen cephalopod exports, as well as the global export volume of cephalopods and frozen octopus entering China.

The competitiveness of frozen cuttlefish commodities, as shown in Table (4), was analyzed based on the RCA values from five exporting countries. The RCA values for these countries were as follows:

Table 4. RCA value of frozen squid cephalopod commodities to the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	1.23	1.26	1.16	1.14	1.12	1.13
Malaysia	1.20	1.22	1.10	1.11	1.09	1.14
India	0.52	0.87	1.01	1.04	1.00	0.79
Pakistan	0.66	0.21	0.75	0.89	0.94	0.86
Viet Nam	0.33	0.54	0.47	0.25	0.08	0.09

Data presented in Table (4) show that Indonesia has the highest RCA value for frozen squid exports, followed by Malaysia, India, and Pakistan, with Vietnam having the lowest RCA value. Indonesia and Malaysia have RCA values greater than one, indicating a comparative advantage and making them competitive in the frozen squid market. India had an RCA value below one in 2017 and 2018, but it significantly rose above one in 2019, 2020, and 2021, indicating a strong competitive advantage, although it decreased again in 2022. Both Pakistan and Vietnam have RCA values for frozen squid that remain below one, meaning they do not have a competitive advantage in these commodities.

2. RSCA analysis

The data obtained pertain to the five exporting nations sharing a common market objective concerning frozen cephalopod commodities, frozen guitar commodities, and frozen cuttlefish commodities are as follows.

Table 5. RSCA value of frozen cephalopod commodities (SGC) destined for the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	0.085	0.098	0.061	0.056	0.055	0.050
Malaysia	0.064	0.098	0.061	0.053	0.053	0.050
India	-0.074	0.084	-0.051	-0.566	-0.798	-0.710
Pakistan	0.074	0.098	0.060	0.055	0.049	0.047
Viet Nam	0.085	0.098	0.062	0.057	0.055	0.050

Table 6. RSCA value of frozen octopus commodities destined for the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	-0.471	-0.193	-0.201	-0.113	-0.012	-0.220
Malaysia	-1	0.059	0.195	0.071	0.288	-0.397
India	0.822	0.827	0.747	-0.078	0.100	0.203
Pakistan	0.817	0.882	0.728	0.677	0.765	0.677
Viet Nam	0.857	0.725	0.480	0.446	0.702	0.732

Table 7. RSCA value of frozen squid cuttlefish commodities destined for the Chinese market

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	0.104	0.113	0.076	0.064	0.056	0.062
Malaysia	0.091	0.101	0.050	0.052	0.045	0.067
India	-0.502	-0.300	-0.361	-0.606	-0.844	-0.834
Pakistan	-0.204	-0.648	-0.142	-0.056	-0.029	-0.076
Viet Nam	-0.319	-0.068	0.004	0.019	0.001	-0.118

The RSCA analysis offers an intricate portrayal of the benefits of these commodities in facilitating export operations to the Chinese market through more symmetrical values on a scale from -1 to 1. When the RSCA value surpasses 0, the commodity holds a comparative advantage; conversely, if the RSCA value is at or below 0, the export commodity lacks a comparative advantage. Examination of the RSCA analysis reveals that the competitive value competition for frozen cephalopods, frozen octopus, and frozen cuttlefish aligns with the RCA value, with the sole distinction being the quantitative RSCA value's range from 1 to -1. A country's RSCA value of -1 signifies infeasibility or unreported export data for one of the commodity sales.

3. CEP analysis

CEP analysis was used to illustrate a country's export specialization in a specific commodity on the global market. The outcomes of the CEP analysis reveal a focus on leading export commodities among the five exporting nations targeted at China. These commodities are categorized into three groups for analysis: frozen cephalopods, frozen octopus, and frozen cuttlefish. This categorization allows for a specific examination of the particularly specialized export commodities from each country.

Table 8. Frozen cephalopod CEP values

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	1.295	1.409	1.424	1.382	1.380	1.360
Malaysia	0.836	0.979	1.082	1.090	1.127	1.152
India	0.859	1.334	1.355	1.361	1.377	1.365
Pakistan	0.000	1.346	0.460	1.350	1.170	1.136
Vietnam	0.000	0.980	1.030	0.946	0.964	0.931

The results of the CEP analysis for frozen cephalopod commodities show that Indonesia ranks first, followed by Malaysia, India, Pakistan, and Vietnam. The table indicates that Indonesia has a stronger relative advantage in the export performance of frozen cephalopods compared to the other four competing countries. The higher CEP value for Indonesia also suggests that its frozen cephalopod commodities have a higher total sales value.

From the data depicted in Table (8), it is evident that Vietnam's CEP value for frozen cephalopods from 2017 to 2022 did not show feasible specialization, although in 2019, Vietnam's CEP increased to 1.03, entering the feasible category. Indonesia's CEP value for frozen cephalopods has remained stable above 1, though it has fluctuated with a decline from 2020 to 2022.

Regarding frozen octopus, the CEP analysis shows that Indonesia had the highest value and was categorized as having a feasible specialization for world exports from 2017 to 2019. However, in the subsequent years, its CEP value declined due to new export restrictions and the global impact of the COVID-19 pandemic. Malaysia followed a similar trend, with an increase in 2019; however, a decline was detected in the following years, making it no longer feasible for export specialization.

India and Pakistan, on the other hand, have not yet reached feasible specialization in frozen octopus exports. Although Pakistan had a relatively high CEP value of 4.31 in early 2018, it did not maintain this advantage. In contrast, Vietnam's frozen octopus exports have shown consistent growth, with a feasible specialization for global exports from 2018 to 2022. This reflects the increasing market share and global demand for frozen octopus from Vietnam.

Table 9. CEP value of frozen octopus

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	1.396	1.515	1.434	0.954	0.905	0.899
Malaysia	0.499	0.717	1.008	0.800	0.487	0.525
India	0.225	0.457	0.453	0.472	0.450	0.553
Pakistan	0.000	4.311	0.152	0.986	0.540	0.776
Vietnam	0.000	2.375	3.260	2.792	2.266	2.078

The results of the CEP analysis for the frozen cuttlefish commodities show that India has the highest CEP value, above one, indicating that it has a specialization for global exports. Indonesia's frozen cuttlefish commodities have a CEP value similar to that of India, also categorizing them as feasible for global export specialization. Additionally, Indonesia's frozen cephalopod exports are primarily dominated by the frozen cuttlefish, in contrast to frozen octopus commodities.

Table 10. CEP value frozen the squid cuttlefish

Country/Year	2017	2018	2019	2020	2021	2022
Indonesia	1.268	1.374	1.421	1.489	1.551	1.519
Malaysia	0.925	1.065	1.099	1.163	1.358	1.367
India	1.027	1.621	1.569	1.585	1.712	1.644
Pakistan	0.000	0.376	0.533	1.441	1.397	1.260
Vietnam	0.000	0.524	0.501	0.482	0.493	0.537

From the results of the analysis, it can be seen that the CEP of cuttlefish from Malaysia has the feasibility of specialization for exports globally. This is indicated by the magnitude of the CEP value, which is more than 1 (one) from year to year starting from 2017 to 2022, while the CEP value of frozen cuttlefish commodities from Pakistan and Vietnam still does not have specialization for exports globally because it is below 1 (one).

In the frozen cephalopod commodity market segment, it can be seen that Vietnam is superior in the specialization of frozen octopus commodities but weak in the specialization of the frozen cuttlefish commodities. This value is the opposite of Indonesia which has a lower CEP specialization value of frozen octopus commodities compared to the frozen cuttlefish commodities for export globally. This CEP value will provide an overview of broader market segmentation and the ability to develop market reach, so that it does not depend globally on one market area **(Babool, 2007; Silvia, 2021)**.

4. Market share index (MSI) analysis

The MSI analysis aims to assess the competitive position of Indonesian frozen cephalopod commodities in the global market. This approach evaluates the competitiveness of export commodities by comparing them with those of rival countries. MSI represents the relative share of imports from different countries and their competitors within specific commodity sectors, with values ranging from 0 to 100. This metric helps clarify the characteristics of frozen cephalopod commodities exported by major suppliers to China, a key market for Indonesia's frozen cephalopod exports.

The MSI value is influenced by the import volumes from the target market, particularly China, for Indonesian cephalopod exports. A higher MSI value indicates stronger market dominance in a given export commodity. As shown in Table (11), Indonesia's MSI value for frozen cephalopod commodities is lower than India's, reflecting India's superior export specifications and broader market reach in this sector. However, Indonesia's MSI value is higher than that of its other competitors—Vietnam, Pakistan, and Malaysia—all of which have MSI values lower than Indonesia's for frozen cephalopods.

Table 11. MSI frozen cephalopods in dollars ($)

Country/Year	2017	2018	2019	2020	2021	2022
India	0.792	1.224	0.700	0.719	0.650	0.859
Indonesia	0.592	0.942	0.581	0.706	0.589	0.747
Vietnam	0	0.781	0.430	0.525	0.400	0.519
Pakistan	0	0.008	0.001	0.066	0.094	0.076
Malaysia	0.090	0.104	0.085	0.109	0.095	0.129

In Table (11), it can be seen that the movement of the MSI value of frozen cephalopod commodities from the five exporting countries of frozen cephalopod commodities in 2017 experienced a fairly high surge, but in the following year, it experienced a simultaneous decline in 2019.

The analysis of frozen octopus commodities shows that the highest MSI value in 2017 and tends to be stable. This value indicates that Indonesian frozen octopus commodities have good product specifications for global export expansion. Frozen octopus commodities from Vietnam at the beginning of 2017 tended to be low but experienced a very sharp increase from 2018 to 2022. This shows that the MSI of frozen octopus commodities from Vietnam has the potential for good market expansion specifications compared to frozen octopus commodities from Indonesia. Frozen octopus commodities from other competitor countries such as India, Pakistan, and Malaysia are still below the MSI value of Indonesian frozen octopus.

Table 12. MSI frozen octopus in dollars ($)

Country/Year	2017	2018	2019	2020	2021	2022
India	0.811	1.612	0.667	0.967	2.338	1.594
Indonesia	2.491	3.894	1.667	1.890	4.254	2.260
Vietnam	0.000	7.281	3.876	6.008	10.367	5.312
Pakistan	0.000	0.104	0.001	0.186	0.478	0.238
Malaysia	0.210	0.294	0.225	0.311	0.451	0.270

In Table (12), the MSI value of Indonesian frozen octopus commodities shows an increase from 2017 to 2018; while in 2019, it decreased simultaneously from the five countries, and then in 2022 it decreased again. The MSI value of frozen octopus commodities from Vietnam experienced a sharp increase because the number of exports of these commodities increased greatly from the previous year, and this allowed Vietnam to expand its market share to various states and to have far more market alternatives compared to Indonesia.

In Table (13), the MSI value of the Indian country ranks the highest and is followed by the MSI value of the Indonesian commodity. Commodities from India have superior specifications and higher market expansion compared to commodities from

Indonesia. This is because India has a higher number of commodity exports, and most of them are aimed at the Chinese market. The MSI value of the frozen cuttlefish commodities from Vietnam, Pakistan, and Malaysia get a lower position than from Indonesia and India and do not have export specifications, so the market segment is still relatively low.

Table 13. The frozen squid cuttlefish MSI in dollars ($)

Country/Year	2017	2018	2019	2020	2021	2022
India	0.791	1.197	0.702	0.705	0.608	0.815
Indonesia	0.484	0.740	0.502	0.641	0.498	0.657
Vietnam	0	0.336	0.181	0.225	0.154	0.236
Pakistan	0	0.002	0.001	0.059	0.084	0.067
Malaysia	0.083	0.091	0.075	0.098	0.086	0.121

From Table (13), it can be observed that the MSI value of frozen cuttlefish commodities from exporting countries with the destination of China has increased quite dramatically in 2018; then in 2019 to 2022, it tends to decrease and slightly increase until 2022. This is possible due to changes in export arrangements to China due to the covid-19 outbreak. The condition of the global outbreak caused changes in the issuance of a new approval number in export activities to China. Commodities from Pakistan and Malaysia are very low in 2017 to 2022, since both countries are new competitor countries that do not yet have special specifications for the frozen cuttlefish commodities globally.

The MSI value reflects the market share index of a commodity in global trade, with comparison values based on global data. The frozen cuttlefish commodities with high MSI values are likely to dominate the global market. This value provides an overview of the market segment coverage of a country's commodity in the global market, which helps create a more competitive alternative. An increase in demand in the destination market is possible due to factors such as price competition, quality assurance systems, and product excellence. Therefore, it is important to focus on downstream processes before export activities to enhance the selling value of the commodity **(Bown, 1983; Dinh *et al.*, 2022; Nguyen *et al.*, 2022)**.

5. Product price per unit analysis

Price competition plays a significant role in determining the volume of export commodities. When assessing the cost of goods sold, a country considers all costs affecting the production process or ensuring quality services that align with the commodity's cost. Table (14) presents the data analysis of frozen cephalopod product sales destined for China, indicating fluctuations in the value of frozen cephalopod commodities from Indonesia. However, by 2022, these values stabilized and were superior to those of competing countries. Notably, Indonesia's frozen cephalopod commodities may surpass the global cephalopod price. Vietnam emerges as Indonesia's strongest competitor, commanding the highest selling price for these commodities,

particularly in 2017 and 2018, when Vietnamese commodity prices reached $4,800 US dollars per ton. This price represents the peak in commodity export activities of frozen cephalopods destined for China. The price value corresponds to the quality value of the goods offered. A higher unit price signifies a higher level of quality benefit, whether in terms of product quality, sensory appeal, or utility value.

Table 14. Product price value per unit of frozen cephalopods US dollars/tons

Country/Year	2017	2018	2019	2020	2021	2022
World	3,535	3,034	2,740	2,449	2,181	2,854
Indonesia	2,300	2,487	2,626	2,434	2,455	3,037
Vietnam	4,442	4,827	2,502	2,775	3,968	2,157
India	2,824	2,485	1,776	1,637	1,764	2,501
Malaysia	1,521	2,041	2,375	1,951	2,106	2,786
Pakistan	2,620	3,095	2,049	1,982	1,994	2,591

Changes in the per-unit selling price of frozen cephalopod commodities over the years can be seen in Table below. The highest selling value consistently comes from Vietnam, which dominates the market despite a decrease in price from 2018 to 2019. Overall, Vietnam's price remains above the global average. Indonesian frozen cephalopod commodities have shown a gradual increase in value from 2017 to 2020, with a further rise in 2022, slightly surpassing the global price for frozen cephalopods.

The per-unit selling value of frozen cephalopod commodities above represents an aggregate of all frozen commodities. The following analysis will break down these values by commodity type, specifically frozen octopus and the frozen cuttlefish, both of which significantly impact the total sales value of frozen cephalopods.

The detailed analysis, as shown in Table (15), reveals that the per-unit selling price of frozen octopus from Vietnam reached its highest value in 2021, at $5,451. This value is higher than the world price, which at that time was $2,092 per ton, reflecting Vietnam's market dominance with a premium price. Meanwhile, the price of Indonesian frozen octopus commodities remains below the world price and significantly lower than Vietnam’s.

For frozen octopus, Vietnam is Indonesia's strongest competitor. Other countries also have prices above Indonesia's, though some have seen declines. Overall, Indonesia’s frozen octopus commodities occupy the lowest price position in the market.

Table 15. Product price value per unit of frozen octopus in US dollars/tons

Country/Year	2017	2018	2019	2020	2021	2022
World	5,100	3,451	3,043	2,514	2,092	2,756
Indonesia	2,036	2,185	2,379	2,014	2,016	2,560
Vietnam	5,451	5,447	3,100	3,843	5,657	2,391
India	3,784	3,451	1,933	1,631	1,540	2,524
Malaysia		1,646	2,418	1,628	1,849	2,726
Pakistan	3,752	4,881	2,273	2,083	1,874	2,624

Table (15) shows the price trends for frozen octopus commodities from 2017 to 2022. It is clear that the price of frozen octopus from Indonesia consistently remains near the bottom and shows little variation from year to year. In contrast, Vietnam dominates the market, maintaining a strong competitive position throughout the period. While Vietnam's prices remain relatively high, by the end of 2022, they are nearing the global price for frozen octopus.

The data show that the price of the Indonesian frozen cuttlefish commodities is consistently above the global average. The highest selling price occurred in 2022, at $3,514 per ton, while the lowest price was in 2017, at $2,564 per ton, still above the global price for cuttlefish that year. Vietnam’s frozen cuttlefish had a relatively high price in 2017 and 2018, but it experienced a sharp decline in 2019, falling below the global average for the frozen cuttlefish.

Frozen cuttlefish from Malaysia also exhibited strong competitiveness, with its highest price of $3,042 per ton in 2017, well above the global price and the price of Indonesian frozen cuttlefish.

Table 16. Product price value per unit of squid cuttlefish in US dollars/tons

Country/Year	2017	2018	2019	2020	2021	2022
World	1,970	2,617	2,437	2,384	2,270	2,952
Indonesia	2,564	2,789	2,872	2,853	2,894	3,514
Vietnam	3,433	4,207	1,903	1,706	2,279	1,922
India	1,863	1,519	1,618	1,643	1,987	2,478
Malaysia	3,042	2,435	2,332	2,274	2,362	2,845
Pakistan	1,487	1,309	1,824	1,881	2,113	2,557

The per-unit price of frozen cuttlefish commodities from Indonesia consistently remains above the global commodity price, highlighting the strength and market potential of this product, especially in comparison to competing countries. Overall, frozen cephalopod commodities can achieve higher prices if there is an increase in the benefits and financial returns from these products. Several factors influence the price

competitiveness of an exporting country, including domestic commodity prices, export taxes, currency exchange rates, and the GDP of the exporting country **(Fuja *et al.*, 2022)**.

DISCUSSION

The competitiveness of a country's export commodity can be measured using the RCA value parameter on the export commodity, the RCA value will affect the amount of demand in the sale of a country's export commodities to the target market destination **(Oktavilia *et al.*, 2019)**. The RCA value of frozen cephalopod commodities from Indonesia with the market destination of China occupies the top position, but this position is not directly proportional to the number of exports from other competitor countries such as India, Malaysia, and Pakistan where the number of Indonesian cephalopods export sales is much more than its competitor countries but the selling value is still relatively low.

A high RCA value means that Indonesia's frozen cephalopod commodities have a significant comparative advantage in producing and exporting frozen cephalopods to China. This is influenced by several factors, namely better product quality, more competitive prices, easier market access, Chinese consumer preferences for Indonesian products, and availability of abundant natural resources **(Sulistiyawati *et al.*, 2020; Fachrur *et al.*, 2023)**.

A high RCA indicates that Indonesia has a comparative advantage compared to other countries and other products produced by those countries. Although Indonesia's export volume is larger, the value of Indonesia's frozen cephalopod commodities is still in the low category. This could be due to competing countries having other advantages in this product specification. The market structure of frozen cephalopods in China may also have different segmentation. Non-economic factors such as diplomatic relations, trade agreements, and political preferences will also affect trade patterns. Indonesia should have a more effective marketing strategy for its frozen cephalopod products in the Chinese market, to capture a larger market share **(Vina-Cervantes *et al.*, 2018; Pawlak & Smutka, 2022)**.

Utilization of comparative advantage in frozen cephalopod commodities Indonesia needs to continue to develop and maintain its comparative advantage in frozen cephalopod production. This can be done by improving the quality of products to be exported by providing quality assurance systems such as certification supporting these products, production efficiency to reduce product selling prices and product innovation to obtain added value **(Nasikh *et al.*, 2021)**.

Market alternatives must be carried out even though the frozen cephalopod market in China has potential, but Indonesia needs to expand its export market segments to other countries to reduce the risk of dependence on one market. Increasing added value can be achieved through downstream efforts, such as further processing frozen cephalopod commodities into a wider range of processed products **(Handoyo *et al*., 2023)**.

Strengthening partnerships by cooperating with fisheries industry players, local governments, and research institutions needs to be strengthened to improve the competitiveness of Indonesia's frozen cephalopod products. Monitoring and evaluation are carried out by the government and industry players periodically monitoring the development of the frozen cephalopod market, both domestically and in foreign markets, and evaluating the policies and strategies that have been implemented **(Zhao & Yuan 2021; Saptana *et al*., 2022)**.

The RCA value for Vietnam fluctuates and remains at the lowest position. When it comes to the number of export commodities, Indonesia leads with the highest number of frozen cephalopod exports, far surpassing its competitors. However, this dominance highlights that Indonesian exports are still largely focused on frozen cephalopod commodities, which do not meet market demand for quality. Additionally, there is limited product diversification, which impacts the unit selling price of Indonesian frozen cephalopods and, consequently, their overall competitiveness. To enhance competitiveness and the selling value of these commodities, Indonesia must prioritize downstream processing before export, which could improve their market position **(Fauzan *et al.*, 2019; Kasmiaty *et al.*, 2022)**.

Frozen cephalopod commodities include frozen octopus (HS code 030752) and the frozen cuttlefish (HS code 030743). Analysis reveals that Indonesia ranks the lowest in the RCA value for frozen octopus compared to its competitors. However, in the RCA analysis for the frozen cuttlefish, Indonesia occupies the top position. When examining export sales to China, Indonesia dominates in frozen cephalopod exports, with frozen cuttlefish making up the largest portion of these exports. This dominance has a positive impact on the competitiveness of the Indonesian frozen cuttlefish in the Chinese market. In contrast, frozen octopus exports from Indonesia are smaller in volume and less competitive compared to the frozen cuttlefish **(Zhao & Yuan, 2021; Trade Map, 2023)**.

Comparative export performance (CEP) analysis evaluates the export specialization of a country. Indonesia’s frozen cephalopod commodities occupy the top position, indicating that they are specialized for global export. This specialization enhances the potential for entering new market segments. Expanding market reach is essential to reduce dependence on a single market and explore alternative opportunities. Indonesia’s frozen octopus exports rank second in CEP value but have been categorized as not feasible for global specialization from 2020 to 2022. This decline is linked to reduced global demand due to quality issues, such as high salt content, poor texture, inadequate sensory appeal, and ongoing problems with chemical and microbiological contamination **(Fauzan *et al*., 2019; Mardiansyah *et al.*, 2021; Kasmiaty *et al.*, 2022)**. In contrast, Indonesia’s frozen cuttlefish has a superior CEP value, ranking second after India, signaling strong global competitiveness. India’s higher ranking is due to its larger volume of squid exports and its ability to diversify the product before export **(Ancy *et al.*, 2016; Das *et al.*, 2016; Sunee, 2018)**.

The Market Share Index (MSI) measures the competitiveness of export commodities among competing countries. Indonesia's frozen cephalopod commodities rank second after India in the MSI, indicating that while Indonesia's cephalopods have some market presence in China, they still lag behind India. To strengthen its position, Indonesia must expand its market reach and improve the quality of its frozen cephalopod commodities, particularly in terms of appearance and reducing chemical and microbiological hazards. For frozen octopus, Indonesia's quality still lags behind Vietnam's, whose superior product specifications have helped boost global demand **(Asche *et al.*, 2015; Nicholas, 2015)**.

For frozen cuttlefish, Indonesia ranks second in MSI, after India. This suggests that India has a larger share of the global demand for frozen cuttlefish, partly due to the fact that Indonesia exports a portion of its frozen cuttlefish to India for further processing, after which it is re-exported to China. This downstream role plays a crucial part in increasing the selling value of the commodity and enhancing the domestic economic benefits for Indonesia **(Swaminathan *et al.*, 2017; Andres Ospina *et al.*, 2022)**.

The per-unit price of Indonesian frozen cephalopod commodities has generally been lower than that of Vietnam, from 2017 to 2021. However, by 2022, the price of Indonesian frozen cephalopods surpassed both the Vietnamese price and the global price, reflecting improvements in product quality. The selling price of Indonesian frozen octopus, however, remained at the bottom from 2017 to 2022, alongside Malaysia. This decline can be attributed to the misalignment of product specifications with market demands. To address this, Indonesia needs to focus on utilizing its abundant natural resources and on improving human resource quality throughout the supply chain, from capture to export, while also enhancing downstream processes **(Zhao *et al.*, 2020; Salampessy *et al.*, 2022)**.

Regarding frozen squid, Indonesia's price competitiveness has improved significantly. In 2017 and 2018, Indonesia's prices were lower than those of Vietnam and Malaysia, but by 2019, Indonesia's frozen squid commanded the highest prices among its competitors, surpassing the world average. Indonesia's frozen cephalopod exports to China are dominated by the frozen cuttlefish, while frozen octopus exports remain limited. This is due to the smaller volume of frozen octopus exports, limited diversification of preparations, and ongoing issues with non-tariff barriers, such as quality concerns and contamination risks, including microplastics and mercury. These factors significantly affect export performance and commodity pricing **(Asche *et al.*, 2015; Fauzan *et al.*, 2019; Mardiansyah *et al.*, 2021)**.

CONCLUSION

Frozen cephalopods are Indonesia's largest export commodity to the Chinese market, with several competitor countries such as Vietnam, India, Malaysia, and

Pakistan. To assess Indonesia's competitive position in the frozen cephalopod market, key indicators such as RCA, CEP, MSI, and the price per unit are analyzed.

Indonesia's frozen cephalopod commodities show a relatively strong position in terms of RCA, but when considering total export volumes, there is little difference between Indonesia's exports and those from India, Malaysia, and Pakistan. In contrast, Vietnam, while ranking lower in RCA, dominates the market in terms of commodity price value due to higher product specifications.

In the CEP (Comparative Export Performance) analysis, Indonesia's commodities hold the top position, ahead of India, indicating that frozen cephalopods from Indonesia have a competitive advantage for global exports and significant potential for market expansion.

However, the MSI (Market Share Index) of Indonesia's frozen cephalopod commodities is still below that of India. This is due to Indonesia’s current focus on the Chinese market, without much diversification into other global markets. Expanding beyond China could increase Indonesia’s overall market share.

The price per unit (kg) of Indonesia's frozen cephalopod commodities is still lower than that of competitor countries, particularly Vietnam. The higher prices of Vietnamese products can be attributed to better specifications, which meet export market requirements more effectively. This gives Vietnam a significant competitive edge, despite their lower export volume compared to Indonesia.

To enhance the competitiveness of Indonesia's frozen cephalopod commodities, several measures should be taken:

1. Maximizing Resource Utilization: Indonesia should fully leverage its abundant natural resources while ensuring their sustainability.
2. Human Resource Development: Improving human resources at every stage—from capture to export—through expert training and knowledge transfer is essential. This would add value through the development of downstream products.
3. Quality Assurance System: Strengthening the quality assurance system at all stages of the supply chain, from capture to the final consumer, is crucial to minimize product rejection and meet market demands.
4. Government Support: The government should play a pivotal role in policy areas such as controlling exchange rates, managing export taxes, and stabilizing commodity prices domestically to ensure a competitive edge in the global market.

These steps, along with continued product diversification and improvement in quality, will strengthen Indonesia’s position in the global frozen cephalopod market.

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