# An Empirical Study of Chinese Trade Patterns in the Aquatic Industry using the Annual Data of 1987-2019

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**Abstract**—The study analyzes the import trade patterns of aquatic products of China by using annual data from 1985 to 2019. The research employed the weighted indicators of $RM_{cj}$ to capture the revealed comparative advantage of the China's import in the aquatic product, and used the weighted indicators of $HX_{cj}$ and $HM_{cj}$ to gauge the China's export and the import policy intervention. The research shows that China has comparative advantage in the aquatic product import. However, the restriction of the China's import in aquatic products of 1987- 2018 has arisen, and began to boost the import in 2019. China has been protectionist in her trade in the products.

**Keywords-**China; trade pattern; aquatic products; protectionism

## 1 Introduction

This research aims to investigate the Chinese trade patterns and to explore the degrees of the export and import policy intervention in the aquatic products. The theme of the study is of important implications because of the following reasons:

Currently 35% of the global aquatic products will enter international trade, the global total trade volume of aquatic products (export dollars) is more than $ 150 billion. China has been one of the world's largest seafood exporters in the consecutive years since 2002.

From 2016 to 2019, China's aquatic product exports have basically remained stable. Despite the impact of some Sino-US economic and trade frictions, it is an objective fact that export growth is facing a bottleneck. However, with the high-speed development of China's economy and the further reform of supply relations, our country's imports of aquatic products have increased significantly in these years. During the same period, the imports of aquatic products of China increased by 99.5%, and the surplus decreased from US$11.36 billion to US$1.96 billion. Therefore, the fundamental reason for the growth of our country's total aquatic product trade in recent years is the substantial increase in its imports.

In the next years, China's aquatic product trade may achieve a flat or even a deficit in imports and exports. How much does the increase in import trade volume of aquatic products have to do with the reform of supply-side structural policies? This article draws some implicative conclusions and suggested the propositions on the Chinese future adjustments in the trade

ICEMME 2022, November 18-20, Nanjing, People's Republic of China

DOI 10.4108/eai.18-11-2022.2326921

policies in the industry by analyzing the Chinese trade patterns in the aquatic product from 1985 to 2019.

## 2 Methods and Material

### 2.1 Indicators of the Trade Patterns

- Symmetric revealed comparative advantage

The indicator of " revealed comparative advantage" was originated by Balassa (1965) [1]:

$$RCA_{ck}=(X_{ck}/X_{c})/(X_{wk}/X_{w}) \quad (1)$$

where $X$ means export, The export of $k$ products in country c is represented by $X_{ck}$, and the total export of $k$ products in the world is shown by $X_{wk}$. If $RCA_{ck}>1$, it suggests that country $c$ is able to professionally produce $k$ products more, and has a comparative advantage beyond average standard in the export trade of k products of the world.

The $RCA$ is restricted to the range from 0 to infinity. Dalum, Laursen and Villumsen (1998) performed a logarithmic transformation to solve the problem of uncertainty in the average value of the RCA index and asymmetry in the distribution [2]:

$$RX_{ck}=RSCA_{ck}=(RCA_{ck}-1)/(RCA_{ck}+1) \quad (2)$$

where the symbol of $RSCA_{ck}$ indicates the country $c$'s "symmetrical revealed comparative advantage" of exports of product $k$. The mean of $RSCA_{ck}$ is 0, and the range of it is [-1,1]. And if $RSCA_{ck}>0$, the $RSCA>1$, means that country $c$ has comparative advantage in exporting k products. Relatively if $RSCA_{ck}<0$, $RSCA<1$, then there is comparative disadvantage of export of country in the product $k$. $RSCA_{ck}=0$ shows that country $c$ has no comparative advantage in exporting $k$ products, and the export comparative advantage status is the same as that of many others.

Balassa (1965) and Dalum, Laursen and Villumsen (1998) only conducted research on export trade, while this research also focuses on imports, so the following measurement for the comparative advantage in the import is needed [3]:

$$RCAM_{ck}=(X_{ck}/X_{c})/(X_{wk}/X_{w}) \quad (3)$$

In the above formula, $M$ stands for imports, $c$ stands for country, and $k$ and $w$ stand for product $k$ and the world, respectively. Therefore, the "symmetrical dominant comparative advantage" of product k can be described as:

$$RM_{ck}=RSCAM_{ck}=-(RCAM_{ck}-1)/(RCAM_{ck}+1) \quad (4)$$

$RM_{ck}$ (or $RSCAM_{ck}$) stands for the comparative revealed advantage shows in the import's product $k$ by country $c$.

The function of the minus sign on the right side of equation (4) is to enable $RM_{ck}$ and $RX_{ck}$ to express the same meaning at the same time. According to the theory of comparative advantage, under the same other conditions, the more imports of country $c$ and $k$ products, the smaller the comparative advantage.

- Net export ratio

In this research took the indicator of net export ratio (NX)

$$NX_{ck}=(X_{ck}-M_{ck})/\ (X_{ck}-M_{ck}) \tag{5}$$

as a benchmark. *NX* can reflect the net export capacity of country *c*. Therefore, in the trade of country *c*, the import and export under the relative position of product *k* is reflected by the net export ratio *(NX)*. On the other hand, the range of *NX* is [-1,1], which is the same as *RSCA*. And its mean value is also 0. In the trade of product *k*, when country *c* is in a surplus position, $NX_{ck}>0$; it can be known that in the trade of product *k*, when country *c* is in a deficit state, $NX_{ck}<0$. So $RCA_{ck}$ and $NX_{ck}$ can be analyzed at the same time, for the range and average value of $NX_{ck}$ and $RSCA_{ck}$ are the same.

- Trade pattern deviation index.

According to the factor endowment theory, each country should focus on professionally producing products with comparative advantages and exporting such products [4]. In Ricardo's theory of free trade, a country should export more products with strong comparative advantages. In equilibrium, $NX_{ck}$, $RX_{ck}$ and $RM_{ck}$ should be strictly consistent, or

$$NX_{ck}= RX_{ck}= RM_{ck} \tag{6}$$

The difference between $NX_{ck}$ and $RX_{ck}$ is:

$$hm_{ck}= NX_{ck}- RM_{ck} \tag{7}$$

$$hx_{ck}= NX_{ck}- RX_{ck} \tag{8}$$

In import and export trade, this difference between $NX_{ck}$ and $RSCA_{ck}$ is the "trade divergence index" or "policy intervention index" of country *c* on product *k*. The "policy intervention index" indicates: when country *c* has a certain comparative advantage in the export and import of product *k*, whether the actual situation of the comparative advantage is consistent with its net export capacity. When $hm_{ck}=hx_{ck}=0$, the trade mode is balanced in this period. If $hm_{ck}>0$, it means that the proportion of net exports of *k* products is greater than the symmetrical comparative advantage, and country *c* adopts import restriction intervention policies for *k* products. If $h_{ck}<0$, it means that the import capacity of *k* products of this country is greater than the comparative advantage. Then country *c* adopts a policy to promote imports [5].

- The weighting average index of intervening policy.

The trade policy index for the entire category of intervention should be obtained by the weighted average of *n* types of Chinese aquatic products and their processed products collected [6]:

$$HM_{cj} = \sum_{k=1}^{n} (\omega_1 \cdot hm_{ck}) \tag{9}$$

$HM_{cj}$ is the import intervening policy index for category j, then the weight

$$\omega_1=(X_{ck} + M_{ck})/\ (X_c + M_c) \tag{10}$$

is the specific gravity of the product k in the trade of importing and exporting aquatic products of China. The *NX* part inevitably involves both the import value and the export value in the calculation process of the *h* and *H* indicators.

In the same way, the NX index of the j product can be weighted by formula (9). For example, weighting the indicator of symmetric and revealed comparative advantage of imports, its weight is the percentage of the product in the total import value of the product category

$$HX_{cj} = \sum_{k=1}^{n} (\omega_2 \cdot hx_{ck}) \tag{11}$$

$$\omega_2 = M_{ck} / \sum_{i=1}^{n} M_{ck} \tag{12}$$

for only trade in import is involved in this study [7].

### 2.2 Data curation

We employed the 1976-2019 three-digit annual trade data of the "International Trade Standard Classification (SITC)" provided by the UN Comtrade database [8]. China was taken as the reporting country and defined four codes including “fish, fresh, chilled or frozen” (code 034), “fish, dried, salted or in brine; smoked fish” (code 035), “crustaceans and molluscs, fresh, chilled, frozen, salted, etc” (code 036), “fish, crustaceans and molluscs, prepared or preserved, nes” (code 037). The total world imports of aquatic products are gained by adding up all countries in Comtrade database.

## 3 Results and Discussion

### 3.1 Changes in aquatic products trade indicators

Figure 1 portrayed the weighted average indicators of $RM_{cj}$, $NX_{cj}$, and $HM_{cj}$ for the China’s seafood import during the period of 1985-2019.

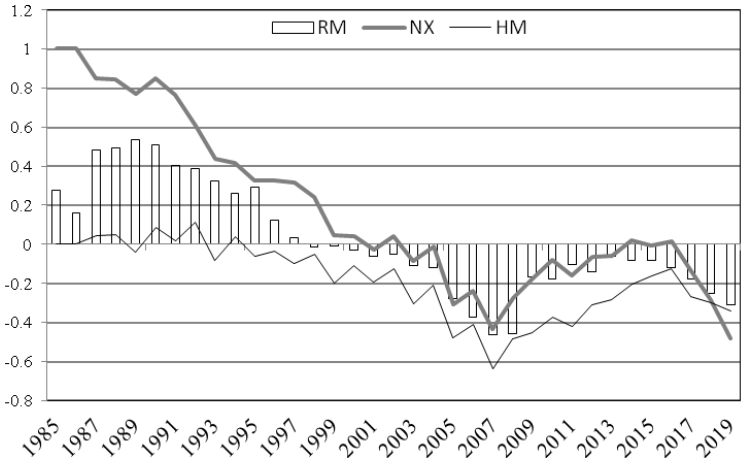


**Figure 1** The China’s trade patterns in the aquatic products (1987-2019)

The indicator of $RM_{cj}$ changed from positive to negative at the beginning of 2019, indicating that China's seafood were in comparative advantage before 2019 and in comparative disadvantage after 2019.

The indicator of $NX_{cj}$ has been positive but it been declining in recent years. This shows that China's aquatic products trade surplus is declining, and this is consistent with the results that may be caused by changes in the policy intervention index $H_{cj}$.

The weighted indicator of $HM_{cj}$ has been positive and turned negative in 2019, showing that China has adopted the import restricting policies in the aquatic products until 2019.

The import promotion trade policy in 2019 has resulted in an increase in China's seafood imports. It shows that China's domestic market for aquatic products has great potential, which to a certain extent can explain the correctness and necessity of China's emphasis on the domestic market.

### 3.2 Descriptive statistics for the Chinese import patterns in the aquatic products

Table 1. reports the descriptive statistics of the Chinese import patterns in the aquatic products during 1985-2019.

Table 1 Descriptive Statistics of the Chinese Indicators of RMcj, NXcj and HMcj

| N=35 | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|
| $RM_{cj}$ | -0.463 | 0.533 | 0.018 | 0.281 |
| $NX_{cj}$ | -0.482 | 1.000 | 0.174 | 0.428 |
| $HM_{cj}$ | -0.638 | 0.109 | -0.018 | 0.189 |

The indicator of the revealed symmetric comparative advantage for the Chinese import in the aquatic products ($RM_{cj}$) recorded its maximum (0.533) in the year of 1989 and the minimum occurred in the year of 2007, with a roughly declining trend. The mean value of $RM_{cj}$ is 0.018 during the sample period.

The indicator of net export ratio for the Chinese trade in the category of aquatic products ($NX_{cj}$) hit its peak in 1985 and had exhibited a downward trend before the year of 2007 with a phase low point of -0.436. $NX_{cj}$ had returned to 0.022 in 2014, and the recorded minimum was -0.482 in the year of 2019. The mean value is 0.174 for the period of 1985-2019.

The Chinese import policy intervention ($HM_{cj}$) had its maximum (0.109) in the year of 1992 and the minimum (-0.638) in 2008, with the mean value of -0.018 during sample period. The indicator of $HM_{cj}$ was -0.034 in 2019.

### 3.3 One sample t-tests of Chinese import patterns in the aquatic products

Table 2 provides the one sample t-test results for $NX_{cj}$, $RM_{cj}$ and $HM_{cj}$ for the China's aquatic product imports. The test value is set to be 0 so as to inspect whether the mean values are significantly statistically not similar to zero.

Table 2 One-sample t-test results for the Chinese Indicators of RMcj, NXcj and HMcj

| Test value=0 | T-stat | Degree of freedom | Sig. (2-tailed) | Mean difference |
|---|---|---|---|---|
| $RM_{cj}$ | 0.374 | 34 | 0.711 | 0.018 |
| $NX_{cj}$ | 2.402 | 34 | 0.022 | 0.174 |
| $HM_{cj}$ | -5.765 | 34 | 0.000 | -0.184 |

We found that:

- The mean value of $RM_{cj}$ is 0.018 for the sample period of 1985-2019, suggesting that China has comparative advantage in aquatic product import. The mean difference, however, is insignificant (p=0.711).
- Chinese aquatic products have a trade surplus, making mean indicator of $NX_{cj}$ to be 0.174 and statistically significant (p=0.022).
- The indicator of $HM_{cj}$ is -0.184, showing that the Chinese net export ratio ($NX_{cj}$) has been larger than its import comparative advantage ($RM_{cj}$) guarantees. This fact implies that China has been significantly promoting its import, instead of restricting, in the aquatic products during the sample period.

## 4 Conclusions

This paper analyzes the symmetrical revealed comparative advantage and policy Intervening policy of aquatic product trade of China. It

We concluded that:

The revealed symmetric comparative advantage for the China's import in aquatic products ($RM_{cj}$) turned negative in the year of 1998, implying that the Chinese comparative advantage that revealed in the import in the product has undergone structural changes. The trade surplus or the indicator of net export ratio ($NX_{cj}$) has turned from positive to negative.

One of the most interesting results is that China has adopted import promoting policies ($HM_{cj}$ mean= -0.184) during the sample period. This fact seems to be out of ordinary as compared with the previous studies which focused on the Chinese export patterns [9-15].

The three indicators have followed similar time paths and there may be interactive nexus among $RM_{cj}$, $NX_{cj}$ and $HM_{cj}$. It may be inaccurate to judge whether the import restriction policy intervention can effectively affect the comparative advantage that revealed in the import of the Chinese aquatic products only by the mere observation and assumption [16-18]. The actual causal relationship among the indicator of the trade patterns. The export promotion policy intervention, which is also another form of protectionism [19-21], may also need to be taken into consideration to obtain the conclusions that are closer to the true interactive relationship among the Chinese trade patterns in the Chinese trade in the aquatic products.

The measuring of the degree of the import policy intervention shed a new light on the learning of a country's trade patterns in the certain product or an industry. Further time series analysis or panel data analysis, however, may be necessary to explore the causality and explain why China had promoted the import of the aquatic products since the end of the 1990s. What is more, the

trade patterns and the causal causality may be much different for the different county and for the different individual industry. It will be inappropriate and even be very dangerous to obtain the trade patterns in the other products or industries by only deducing for that of the Chinese aquatic products.

**Acknowledgements.** This work was financially supported by National Social Science Fund (22BJL031), Jilin Provincial Social Science Fund (2020J58), the 2023 Professional Degree Graduate Education and Teaching Reform Project of in Jilin Province Department of Education "Methodologies in International Commerce" and the College Poverty Stricken Students Supporting Programme funded by Jilin Provincial Ecological Industry Company Limited.

This work was financially supported by Jilin Provincial Social Science Fund (2020J58) and Changchun Social Science Fund (CSK2020ZYJ-001).

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