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An empirical study on the factors affecting seafood trade under the background of RCEP

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Abstract
This paper uses panel data from 2013 to 2022 on China and five member countries of RCEP, the major trading partners, to construct a gravity model of trade. It analyzes the factors influencing China's seafood trade. Based on the empirical research results, this paper proposes strategies such as increasing technological input, deepening industrial structural reforms, and actively attracting foreign direct investment.

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1. Introduction

In recent years, with the rapid development of China's seafood trade, there has been increasing attention on the changes in the total volume of seafood trade, the competitive advantages in seafood trade, and the trade barriers related to seafood products. The Regional Comprehensive Economic Partnership (RCEP) came into effect in January 2022, covering ten ASEAN countries, China, Japan, South Korea, Australia, and New Zealand. The content of the RCEP agreement is relatively practical and substantial, providing many opportunities for the development of seafood trade.

Firstly, member countries will reduce tariffs on agricultural products imported from China, thereby enhancing the export competitiveness of Chinese seafood products. Secondly, RCEP will stimulate the potential for agricultural product trade and investment. Furthermore, RCEP will further integrate rules of origin, lower market access barriers for service trade, implement negative list management, and promote liberalization of industrial investment, among other policies, which will continue to bring more benefits to seafood export enterprises. Conducting relevant research on RCEP and considering it as an important opportunity in China's "dual circulation" strategy layout will help promote the high-quality development of China's seafood trade.

In terms of individual countries, among the top ten export markets for Chinese seafood, five are RCEP member countries, namely Japan, South Korea, Thailand, Malaysia, and the Philippines. This article will analyze the factors influencing seafood trade between China and these five countries.

2. Current Situation of China's Seafood Industry

According to the data from the 2022 National Fishery Economic Statistics Bulletin, the total production of aquatic products in China reached 68.65 million tons in 2022, with a year-on-year growth of 2.62%. Among them, the aquaculture production was 55.6546 million tons, an increase of 3.17% compared to the previous year, while the fishery catch production was 13.0045 million tons, showing a growth of 0.35% compared to the previous year. In 2022, China's marine seafood production was 34.59 million tons, a growth of 2.13% compared to the previous year, and freshwater seafood production was 34.06 million tons, showing a year-on-year growth of 3.13%, as shown in Figure 1.

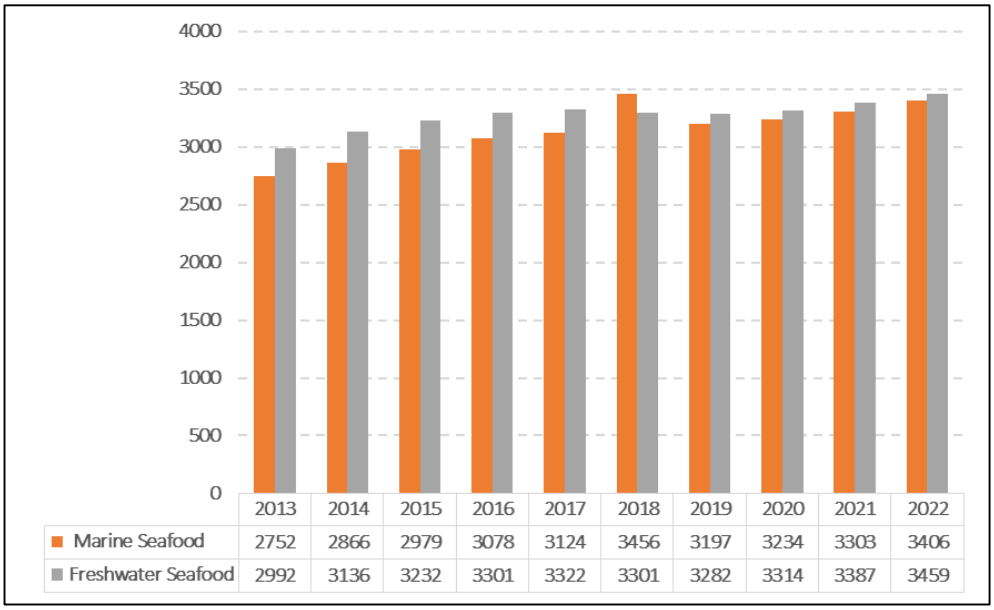

Fig 1: Production of Marine and Freshwater Seafood in China from 2013 to 2022 (Unit: 10,000 tons)

3. Gravity Model Specification

The gravity model is a cornerstone in current empirical research on international trade flows. This model suggests that bilateral trade flows are positively proportional to the economic size of the two countries involved and inversely proportional to the distance between their capitals. It can be expressed mathematically as $T_{ij} = A\frac{Y_i \times Y_j}{D_{ij}}$. In this equation, T represents trade, T_{ij} represents the exports or trade value from country i to country j, A is a constant, Y_i and Y_j represent the economic size of country i and j, typically measured by their respective GDPs. D represents distance, and D_{ij} represents the distance between country i and j. The variables i and j can represent any two countries.

The extended gravity model expands the scope and explanatory power of the gravity model by including additional explanatory variables such as FTAs (Free Trade Agreements) and population size. This improves the accuracy of model estimation. Considering the characteristics of the seafood industry, it is best to use China's seafood production to better reflect the fishery effect of China as an exporter of seafood. The modified gravity model is represented by equation (1):

$$LnM_{ijt} = \beta_0 + \beta_1 LnGDP_{jt} + \beta_2 LnX_i + \beta_3 LnP_{jt} + \beta_4 LnD_{ij} + \beta_5 BOR_{ij} + \beta_6 FTA_{ij} + \mu_{jt} \quad (1)$$

In this equation, the country i represents China, the country j represents the selected five RCEP member countries that import seafood from China, t represents time, Ln denotes the natural logarithm, and the specific meanings and theoretical explanations of each variable can be found in Table 1.

4. Sample Selection and Data Sources

Following the principles of representativeness and importance in sample selection, this study focuses on six countries: Japan, South Korea, Thailand, Malaysia, the Philippines, and China. These countries are selected from the top ten seafood export markets in China within the period of 2013 to 2022, and they are also members of the Regional Comprehensive Economic Partnership (RCEP). These six countries will be the subjects of empirical analysis. The data sources are listed in Table 1.

Table 1: Specific Meanings, Theoretical Explanations, and Data Sources of Variables

Variables	Specific Meanings	Theoretical Explanations	Data Sources
M_{ij}	China's seafood export trade value to RCEP member countries	Dependent Variable	UN Comtrade database
X_i	China's seafood production	Reflects the potential export value of China's seafood products.	China Fishery Statistical Yearbook
GDP_{it}	Per capita Gross Domestic Product (GDP) of China	The larger the total GDP, the higher the potential export value of China.	World Bank database
GDP_{jt}	Per capita Gross Domestic Product (GDP) of RCEP member countries	The larger the total GDP, the higher the potential import demand of RCEP member countries.	World Bank database
P_{it}	Population size of China	Reflects the market size and demand within China's domestic market.	World Bank database
P_{jt}	Population size of RCEP member countries	Reflects the market size and demand of the importing country.	World Bank database
D_{ij}	Geographical distance between the capitals of the two countries	The farther the distance, the higher the trade costs and the lower the trade volume.	CEPII database
BOR_{ij}	Dummy variable indicating whether the country shares a common border with China (1 for yes, 0 for no)	When two countries share a common border, trade costs will decrease.	CEPII database

FTA_{ij}	Dummy variable indicating whether the country has signed a free trade agreement (FTA) with China (1 for yes, 0 for no)	When two countries sign an FTA, it indicates favorable trade conditions for both parties.	WTO database
μ_{jt}	Random error term	Represents unobserved factors that were not observed or measured.	–

5. Empirical Research Results

This study uses panel data from 2013 to 2022 for China and the main seafood trading countries in the Regional Comprehensive Economic Partnership (RCEP). Mixed effects models, fixed effects models, and random effects models are established, and a Hausman test is conducted. The results are shown in Table 2.

Table 2: Regression Results of Mixed Effects, Fixed Effects, and Random Effects Models

Independent Variable	Mixed Effects	Fixed Effects	Random Effects
$LnGDP_{jt}$	3.143*** (0.469)	2.487*** (0.884)	3.143*** (0.418)
LnX_i	3.406** (1.599)	0.708 (1.835)	3.406** (1.617)
LnP_{jt}	3.233*** (0.670)	10.326** (2.750)	3.233*** (0.572)
LnD_{ij}	3.133*** (0.525)	–	3.133*** (0.462)
BOR_{ij}	–	–	–
FTA_{ij}	4.393*** (1.110)	–	4.393*** (0.961)
Constant	-123.8*** (23.741)	-195.911*** (40.245)	-123.8*** (18.242)
R-squared	0.87888	0.6032	0.8788
F-test	F(5,44)=63.82	F(3,42)=21.28	–
Prob>F、Prob>chi2	0.000	0.000	0.000
Hausman Test	–	Prob>chi2=0.0540	

Note: *** represents significance at the 1% level, ** represents significance at the 5% level, and * represents significance at the 10% level. Prob>F is used to indicate significance in the mixed effects and fixed effects models, while Prob>chi2 is used to indicate significance in the random effects model.

In the test, the P-value of the F-test is 0.0000, rejecting the null hypothesis. This indicates that the fixed effects model is superior to the random effects model, as fixed individual effects are better than non-fixed effects. The Hausman test results in a P-value of 0.0540, failing to reject the null hypothesis. Therefore, the random effects model is preferred over the fixed effects model. Overall, it is more reasonable to choose the random effects model for regression in this study.

The empirical results in Table 2 indicate that the coefficient of $LnGDP_{jt}$ is 3.143, significant at the 5% level. This suggests a significant positive correlation between the per capita GDP of Japan, South Korea, Thailand, Malaysia, the Philippines, and their intra-industry trade in seafood products. The better the overall economic development of RCEP member countries, the higher the seafood consumption awareness and level of consumption. By improving their economic development, China and RCEP importing countries can effectively promote China's export trade in seafood products to these countries.

The coefficient of LnX_i is 3.406, significant at the 5% level. This indicates that for every 1% increase in China's seafood production, there will be a corresponding 3.406% increase in its seafood export trade with RCEP member countries. This shows a positive and significant effect, meaning that as China's seafood production increases, its trade in seafood products with RCEP member countries becomes more frequent and the trade volume increases.

The coefficient of LnP_{jt} is 3.233, significant at the 5% level. This suggests that the population of the importing countries also has a positive impact on China's intra-industry trade in seafood products. The larger the population of the importing countries, the larger the labor force available for seafood trade, leading to an expansion of the market size and further development of the seafood industry.

The coefficient of LnD_{ij} is 3.133, significant at the 5% level. This indicates that as the capital distance between two countries increases, China exports more seafood products to RCEP member countries. This differs from the expected sign before setting up the gravity model for trade. The positive coefficient can be attributed to the fact that as the capital distance between two countries increases, there is lower overlap in the types of seafood products in their respective waters. To increase the diversity of seafood products, trade between the countries becomes more frequent.

The coefficient of FTA_{ij} is 4.393, significant at the 5% level. This suggests that signing a free trade agreement benefits trade between China and RCEP member countries, promoting economic integration, eliminating trade barriers, and providing a more liberal economic and trade space for mutual benefit.

The variable BOR_{ij}, representing the presence of a common border, did not pass the significance test. This is because the selected five countries do not share a common border with China, and the values are all 0.

6. Recommendations

Firstly, China has abundant marine fishery resources, but the value-added of seafood products is low. Over-reliance on primary seafood products can lead to overfishing and harm the ecological balance of marine ecosystems. China should increase investment in technology, optimize seafood quality, enhance the market competitiveness and value-added of Chinese seafood products. Developing the tertiary industry of seafood products and exploring the value of seafood products from the perspectives of tourism and services are also important. While increasing the export of high-quality seafood products, attention should be given to the sustainable use of resources and avoiding overfishing.

Secondly, China should continuously deepen industrial restructuring, transform production methods, reduce the

production and fishing costs of seafood products, improve the trade structure of Chinese seafood products, enhance the technological level of Chinese seafood products, establish an export warning mechanism, and strengthen the ability of Chinese enterprises to respond to trade frictions and trade barriers. Support should also be provided for technological research on seafood products. Implementing comprehensive supervision and management throughout the production and sales process, building brand effects, adopting multi-channel marketing, and expanding market share in RCEP countries, especially in countries and regions with rapidly growing demand, are crucial.

Thirdly, to enhance the international competitiveness of seafood products, it is necessary to ensure the safe and high-quality transportation and sales of seafood products throughout the entire process. China should actively promote foreign direct investment and implement the "going global" policy. By engaging in cross-border operations and actively participating in various forms of international direct investment, Chinese seafood exporters can establish wholly-owned or joint venture production plants overseas and set up research institutes abroad to fully leverage domestic technical talents and align with international standards.

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