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The Influence of Japan's Green Trade Barrier on Fujian's Aquatic Products Export

-Based on the Empirical Analysis of the Positive List System

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***Abstract*—Fujian Province, as a major province of aquatic products production and export, occupies an important position in aquatic products export trade in China. However, since 2002, it has continuously encountered obstacles from the green trade barrier in various countries so that serious losses have been caused in the export trade of aquatic products, among which, Japan, as a major importer of aquatic products in Fujian province, has particularly set omnifarious obstacles for the reason of green environmental protection. After analyzing the status quo of aquatic products in Fujian Province, the thesis empirically analyzes the influence effect and degree of the green trade barrier measures implemented by Japan on aquatic products in Fujian Province with the econometric model, and proposes suggestions for the analysis results.**

Keywords—Green trade barrier; Aquatic products export; Positive list system; Influence

I. INTRODUCTION

China has a long history of aquaculture and the output of aquatic products in China has always ranked the first in the world by virtue of abundant marine resources and inland resources. With the transformation of the institutional system and the degree of opening deepening after the reform and open up, the aquatic industry in China has ushered in another spring one by one. However, as the largest export market for aquatic products in Fujian Province, Japan has begun to adopt various green trade barrier measures in order to safeguard its own interests in the face of the continuous increase export quantity of aquatic products in recent years, with a view to reducing the aquatic products export to Japan from Fujian Province and maintaining the interests of its aquatic products industry in Japan. As an economically strong province on the southeastern coast of China, the maritime advantage in Fujian is very prominent and it is an important trading port for the export of aquatic products. The series of green trade barriers set by Japan have had a particularly serious influence on Fujian Province. The green trade barriers are characterized by cumbersome inspection and quarantine measures and strict pesticide residue limit standards, which seriously hinder the export of aquatic products from Fujian Province. However, the green trade barrier is not originally formulated to create barriers for export trade of other countries, and however, with the increasing expansion of new trade protectionism, it has become a means of trade protection and has hindered the development of global economic integration. Therefore, it is of practical significance to study the influence of the green trade barriers set by Japan on the export trade of aquatic products in Fujian.

II. STATUS QUO ANALYSIS OF THE INFLUENCE OF THE GREEN TRADE BARRIERS ON FUJIAN'S AQUATIC PRODUCTS EXPORT

A. Export Status Quo

It is well known that Fujian Province is a traditional fishery province with a sea area of 136,000 square kilometers and an available cultivation area of 1,500 square kilometers in the shallow beach. There are many species of neritic organisms more than 3,000 species, and the number of shellfish, algae, fish, and shrimp rank among the best in China. The operational fishery covers an area of 125,000 square kilometers and there are five major fisheries in the shallow beaches in the east of Fujian, middle of Fujian, outside of Fujian and Taiwan. It has the natural advantages of developing seawater and freshwater aquaculture, developing marine industries and developing ports. Fujian Province also has strong economic strength and economic basis to export. According to the statistics in the past three years, it shows that the GDP of Fujian Province in 2013 reached 2.186849 trillion Yuan, ranking 11th in China, and it also reached 2.405576 trillion Yuan in 2014, with an increase of 9.9% over the previous year. In 2015, The GDP of Fujian Province reached 2.597982 trillion yuan, and the per capita GDP of the province reached 68,260.17 Yuan, which was higher than the national average. It shows that it has a unique advantage to develop the fishery industry.

According to the statistics released by Fujian Provincial Bureau of Statistics in Figure 1, it shows that the total export volume of aquatic products in Fujian Province has been steadily increasing since 2008. The total export volume was increased to USD 5.4482 billion in 2015 from only USD 1.01912 billion in 2007, showing that it had an optimistic growth trend. Especially in the two years from 2010 to 2011, the increase was very obvious. Compared with 2009 and 2010, the year-on-year growth of aquatic products export volume was 74.39% and 51.38% respectively in 2010 and 2011, both of which exceeded 50% of the annual growth rate. Among

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them, more than 70% of the world eel consumption market was Fujian's leading product- broiled eel, which was of a very significant export advantage because of its strong international market competitiveness and high added value, etc.

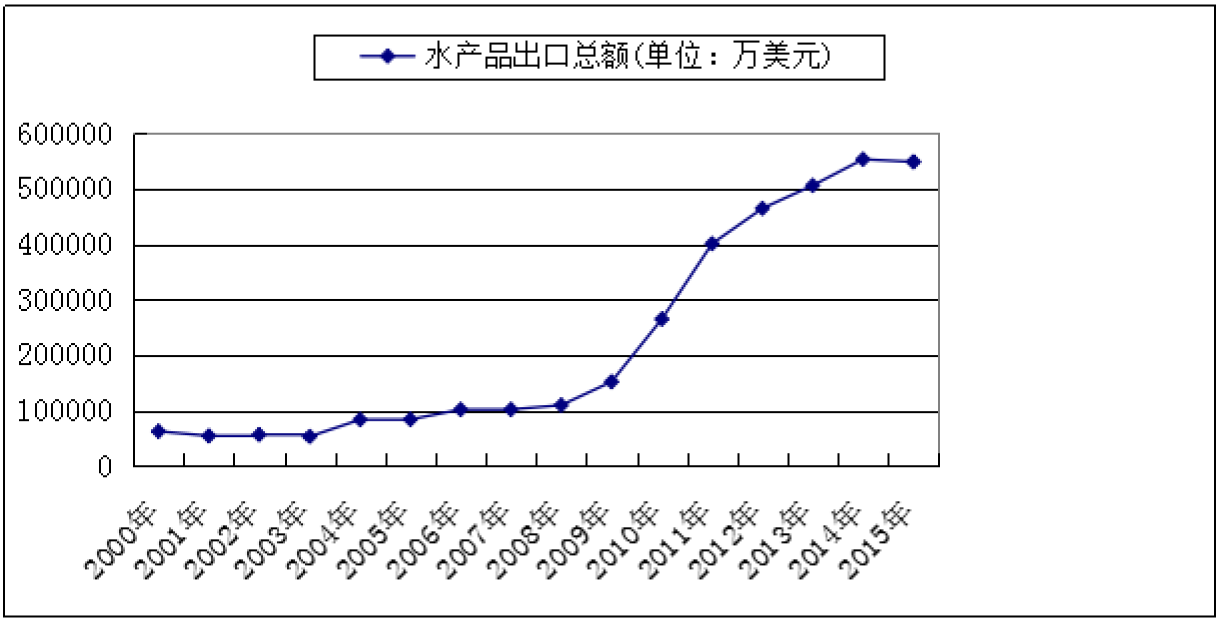

Fig. 1. Total export volume of Fujian's aquatic products

[a] Data source: Fujian Statistical Yearbook

B. Export Repeated Suffer from Green Trade Barrier Set by Japen

Fujian, which is the first coastal province for opening up, has good foreign trade conditions and relatively high foreign-oriented economy level. Therefore, China is plagued firstly by the challenges of green trade barriers after accession to the World Trade Organization, which has been evidenced by the factual data. As a major province of aquatic products export trade, Fujian Province has frequently encountered incidents such as the rejection and detainment of goods by importing countries, the termination of trade contracts, and the suspension of trade partnerships in export trade. Although the export of Fujian's aquatic products has enjoyed a good growth trend over the past decade, it still faces very severe challenges. Since 2002, foreign countries have greatly improved the safety, health and quality standard requirements of aquatic products, and currently, the requirements of the importing countries and regions on the safety and sanitation and quality of the aquatic products should generally include on the control of microbiological harmful germs, the monitoring of shellfish toxins and the monitoring of chemical substances etc. rather than just meeting the requirements of freshness and no pathogenic bacteria in the past.

Table 1 lists a series of trade measures implemented by Japan during the period from 1996 to 2013, the aquatic products from China were strictly inspected, which greatly restricted the export of China's aquatic products and posed a more detrimental influence on Fujian's aquatic products export to Japan. Japan has mainly set stricter inspection standards and constantly modifying its relevant laws and regulations to set green trade barriers with a view to restrict the import of aquatic products from other countries. Among them, the most prominently influencing trade measures were the positive list system implemented by Japan in 2006 and the rigorous inspection implemented in 2013, which caused a significant decrease in the export volume of Fujian's aquatic products in the following years.

TABLE I. CONTENTS OF GREEN TRADE BARRIERS SET BY JAPAN AND RELATED INCIDENTS

Year	Contents	Incidents
1996	The *Food Sanitation Law* was revised in 1995 and implemented in 1996.	In 1998, China's eels were rejected by Japanese importers for the "Oxalic acid" incident.
2000	Japan revised the *Food Sanitation Law* and authorized it to the Ministry of Health, Labour and Welfare, and when it deems it necessary, it can exercise measures to prohibit the entry of similar foods from the exporting country.	In 2002, China's frozen braised eel and live eel encountered 11 antibiotic residues testing in Japan, including chloramphenicol.
2001	In the *No. 15 Bulletin for Aquatic Medicines*, only 4 types of fish vaccines can be used.	In April, the live eels encountered more than 48h drug residues testing at airport and the scope of inspections were expanded continuously hereafter.
2002	The *Food Sanitation Law* was revised again, stipulating the prohibition of the circulation of imported agricultural products containing unset standards for drug residues.	
2003	The No. 17 Bulletin for the *Guidelines for the Use of Fish Medicines* was issued, in which the number of indications for the origin of the imported fishes was increased from 6 to 9.	In 2003, Japan unilaterally announced the implementation of an enrofloxacin residue command inspection on processed Chinese eel products. The minimum detection limit was 0.05 mg/kg, which seriously affected the export of China's aquatic products to Japan, making the China's eel products almost at a state of poor sales at that time.
2005	A Scheme for the *Positive List System of Residual Pesticide Chemicals in Food Products* was established.	
2006	The *Positive List System* began to be implemented and the strict standards were implemented on most agricultural products, including aquatic products.	The *Positive List System* in 2006 and the provisions in 2007 such as prohibiting the detection of "enrofloxacin", making China's eel industry at a state of crisis once again.
2007	Japan announced the relevant provisions of the *Detailed Rules for the Imported Food Surveillance and Inspection Program*.	
2013	The Ministry of Health, Labour and Welfare of Japan issued 0515 No. 5 Bulletin. The Bulletin announced by Japan states that it had detected excessive levels of trifluralin residues in China's eel recently and it ordered to implement the command inspections on the eels and processed products (only for simple processing) imported from China.	From 2013 to 2015, the export volume of Fujian's aquatic products to Japan was significantly deceased.

Since 1996, the green trade barriers set by Japan have become wider and wider, and the degree of strict inspection has become higher and higher so that the trade frictions between China and Japan have become increasingly frequent, which is also an important reason for the decrease in the export volume of China's aquatic products.

III. EMPIRICAL ANALYSIS

A. *The Construction of the Model and the Description of the Data*

a) The Construction of the Model

In physics, the explanation on the "gravitation law" is the origin of the gravity model in Newton's "universal gravitation" law, and the "gravitation law" means the gravitational force between two objects is directly proportional to their respective masses and inversely proportional to the distance between them. For gravitational model, as the law of universal gravitation described in physics, the gravitational force between two objects is directly proportional to their respective masses and inversely proportional to the square of the distance between them. Tinbergen (1962) and Poyhone (1963) firstly used the gravitational models when studying international trade volumes. In their research, they found that the trade volume of the two countries is directly proportional to their respective scale economies (GDP) and inversely proportional to the distance between them. Compared with other trade theories, the trade gravitational model quantifying the trade of two countries or regions has creating a space for the study on the international trade. The general form of the gravitational model can be expressed as:

$$\ln M_{ij}^k = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \sum \gamma_m \ln Z_{ij}^m + U_{ij}^k \quad (1)$$

In formula (1), M_{ij}^k is the type k of commodities or the magnitude of value of elements exported from country i to country j and GDP_i and GDP_j represents the scale economy (GDP) of the country i and country j respectively, Z_{ij}^m (m=1, 2, 3,…..) represents a series of variables that reflect the cost of trade, including distance, cultural difference, regional economic organization, language barrier, etc., and U_{ij}^{k} are random disturbing terms.

The text will make some modifications to the gravitational model based on what has been studied. The geographic distance from Fujian Province to Japan is a constant and it has no influence on the regression model. Therefore, the variable should be removed. An extended gravitational model equation can be obtained after the basic international trade gravitation model is modified and a new explanatory variable is introduced:

$$\ln Y = \alpha + \beta_1 \ln GDP + \beta_2 \ln Q + \beta_3 \ln P + \beta_4 D_1 + \beta_5 D_2 + \varepsilon \quad (2)$$

In formula (2), α is the intercept term, β_1、β_2、β_3、β_4 and $\beta_5$are parameters for the various variables, ε is the random error term; Y is the trade volume of aquatic products exported from Fujian to Japan as an interpreted variable; GDP is the GDP of Japan; Q is the output of Fujian's aquatic products; P is the unit price of Fujian's aquatic products exported to Japan; $D1$、$D2$ is a dummy variable.

Among the indicators selected in this text, the green trade barriers are dummy variables. With the Positive List System began to be implemented by Japan in 2006 and the Bulletin issued by the Ministry of Health and Welfare of Japan in 2013 as a mark, the text sets Japan's green trade barriers as two dummy variables, i.e. D1 and D2 with 2006 and 2013 as the boundaries respectively. The value of D1 is 0 between 1998 and 2005, but 1 between 2006 and 2015; the value of D2 is 0 between 1998 and 2012, but 1 between 2013 and 2015. Among them, the value 0 indicates that no green trade barrier has been set and the value 1 indicates that Japan has taken certain measures and set the related green trade barriers.

b) Data Description

In the text, the time series data are constituted by the export trade volume of aquatic products from Fujian Province to Japan, the gross domestic product (GDP) of Japan, the aquatic product output of Fujian Province and the unit price of aquatic products exported to Japan from 1998 to 2015, and Eviews software is used to perform the relevant multiple linear regression analysis.

The trade volume of aquatic products exported from Fujian to Japan that the data is from the Trade Database of United Nations Statistics Division; Japan's GDP is from the United Nations Database; the output of Fujian Province's aquatic product is from Fujian Statistical Yearbook; the unit price of aquatic products exported from Fujian to Japan is calculated based on the relevant data.

B. Measurement and Inspection Model

In the text, the Granger causality test is used to determine the causal relationship between two variables and determine whether a change in one variable will result in a change in another variable. However, the data required for Granger causality test must be stable, therefore, the data need to be tested by unit root test and co-integration test. Granger causality test can only be carried out after passing through both tests.

a) Unit Root Test

TABLE II. UNIT ROOT TEST RESULTS

Variable	ADF value	1% critical value	5% critical value	10% critical value	Result
	-3.358087	-4.728363	-3.759743	-3.324976	Stable
	-1.141387	-4.616209	-3.710482	-3.297799	Unstable
	-2.668050	-4.616209	-3.710482	-3.297799	Unstable
	-3.927083	-4.667883	-3.733200	-3.310349	Stable
	-2.140608	-4.886426	-3.828975	-3.362984	Unstable
	-2.969279	-4.667883	-3.733200	-3.310349	Unstable
	-3.528537	-4.667883	-3.733200	-3.310349	Stable
	-4.182357	-4.728363	-3.759743	3.324976	Stable
	-6.473457	-4.725363	-3.759743	-3.324976	Stable
	-5.984981	-4.728363	-3.759743	-3.324976	Stable
	-7.317773	-4.728363	-3.759743	-3.324976	Stable
	-3.813052	-4.886426	-3.828975	-3.362984	Stable

From the test results in Table 2, it can be seen that the variables have passed the significance level test of 10% and 5% respectively, but the ADF values of the variables are higher than the test critical values at each level, which may led to the failure of the test. After the first-order differential is carried out on all the variables, there are still variables that cannot pass the test, but after the second-order difference is carried out on all the variables a, the ADF values of each variable will pass the test at a 5% significance level, indicating the selected variables are in the second-order unit root series.

b) Co-integration Test

The co-integration test is used to determine whether there is a long-term equilibrium relationship between and,,,. First, according to the Engle-Granger Method, the least-squares regression should be carried out on the several variables, the obtained equation will be as follows: where e is the residual term, and after the unit root test on the residual sequence, the test structure will be shown in the following table.

TABLE III. RESULTS OF UNIT ROOT TEST IN THE RESIDUAL SEQUENCE

Variable	ADF value	1% critical value	5% critical value	10% critical value	Result
e	-6.055771	-5.295384	-4.008157	-3.460791	Stable

From the test results in Table 3, it can be seen that the residual sequence e has passed the unit root test at a 1% level of significance, it can be concluded that there is a co-integration relationship between and, therefore, the Granger causality test can be carried out on each variable.

c) Granger Causality Test

TABLE IV. GRANGER CAUSALITY TEST RESULTS

Dummy assumption	Observed value	Lag order	F test value	Probability
Not for the Granger cause	17	1	9.46460	0.0082
Not for the Granger cause	17	1	0.20039	0.6613
Not for the Granger cause	17	1	0.05251	0.8221
Not for the Granger cause	17	1	1.72112	0.2107
Not for the Granger cause	17	1	5.34524	0.0365
Not for the Granger cause	17	1	0.15676	0.6981

From the results in Table 4, it can be concluded that the reason for influence the change in the export trade volume of aquatic products from Fujian Province to Japan is the output of aquatic products in Fujian Province and the gross domestic product of Japan, because both of them have passed the significant level test of 5%. However, the unit export price of Fujian’s aquatic products has no significant influence on the export trade volume of Fujian’s aquatic products. The possible reason is that the average price of Fujian’s aquatic products is roughly the same as the price of aquatic products in the past years, and the influence on the export trade volume is not significant.

C. Regression Analysis

After the variables that have no significant influence on the regression results are removed and the regression is carried out on the constructed model with the remaining variables, the results can be shown below.

TABLE V. REGRESSION ANALYSIS RESULTS

Independent variable	Regression parameter	Standard deviation	t- Statistical value	Significance level
C	-30.68820	7.329151	-4.187143	0.0011
	3.239741	0.729218	4.442760	0.0007
	0.491974	1.051093	-0.468059	0.0447
D1	-0.035126	0.161121	0.218009	0.0830
D2	-0.891001	0.272681	3.267551	0.0061
Goodness of fit	0.853259	F- statistical value		18.89780
Corrected	0.808107	F-statistical value’s significance level		0.000025

From the regression analysis results in the above table, on one hand, it can be concluded that the significance levels of,… D2, and D1 have passed the significance test of 1% and 10% respectively; and the corrected goodness of fit is 0.81, and the fit effect is good; F-statistic value is 18.90, F-statistic value’s significance level is 0.000, indicating that the model has passed the test and there is a significant dominant relationship, on the other hand, each parameter of the regression equation has passed the corresponding test, well indicating that each independent variable has a strong ability to interpret the dependent variable.

D. Regression Conclusion

The following conclusions can be drawn from the above regression model:

First, the increase in the output of aquatic products in Fujian Province will help the export of Fujian’s aquatic products to Japan. The regression parameter in the regression result is 3.24, which indicates that for every 1% increase in the output of aquatic products in Fujian Province, the export volume of Fujian Province’s aquatic products to Japan will be increased by 3.24%.

Second, Japan’s GDP boosts the export of Fujian’s aquatic products to Japan. The regression parameter is 0.49, which indicates that for each 1% increase in Japan’s gross domestic product (GDP), the export value of Fujian Province’s aquatic products will be increased by 0.41%.

Third, the green trade barriers set by Japan in the area of aquatic products hinder the export of Fujian Province's aquatic products. The regression parameters of D1 and D2 obtained by regression are -0.03 and -0.89, both of which are negative, indicating that the higher the standard of Japan's green trade barriers is, the more severe the hindering effect will be.

Fourth, Japan has strengthened its green trade barriers in aquatic products. The D2 obtained by regression is more significant than D1, indicating that Fujian Province has adapted to the barriers set by Japan in the years after 2006. In this case, Japan has set stricter inspection orders, making a sharp drop in Fujian's aquatic products exports after 2013.

IV. COUNTERMEASURES AND SUGGESTIONS

Based on the above empirical analysis conclusions, the following suggestions are proposed:

First, importance should be attached to the quality of aquatic products and the output of aquatic products in Fujian should be increased under the premise of ensuring high quality. While improving the output, attention should also be paid to the construction of aquatic products enterprises, the improvement of the technological level, and the enhancement of the core competitiveness of products. The core competitiveness of products plays a crucial role in the export of products, which is related to whether the product can be sold and profitable in foreign markets and whether it can be demanded for a long time. One of the reasons why the aquatic products exported from Fujian Province are favored by foreign friends is that the price is relatively low, however, once the safety and quality problems are found in the aquatic products, such competitiveness will no longer be existed and the products will be rejected by all countries, it can be seen that the core competitiveness is very important. Therefore, the provincial government should pay attention to the construction of aquatic products enterprises and the technology investment, research and development should be strengthened, in order to improve the technical level, improve the core competitiveness of aquatic products in Fujian Province and achieve the goal of having a seat in the international community.

Second, constantly pay attention to the domestic economic growth in Japan so as to adjust the output of aquatic products in Fujian Province. When Japan's economic growth is at a relatively high level, the consumption power of Japanese will also be increased and they will be able to consume imported food so as to promote the export trade value of Fujian's aquatic products; when Japan's economic growth is declined, we must adjust the output so as to avoid the slow sales of Fujian's aquatic products due to the decline in the consumption power of Japanese.

Third, the information collection department for green trade barriers which have been encountered or may be encountered in the export of aquatic products and an early warning mechanism for green trade barriers should be established. China's aquatic products are frequently subject to obstruction from the green trade barriers by various countries, one of the important reasons is that most enterprises in China do not have enough information on a series of dynamic information on foreign trade barriers implemented in foreign countries, and there is no relevant information collection mechanism which has been established and no specialized personnel who can collect and update foreign green trade barrier information in a timely manner. Therefore, we can learn from the practice of foreign countries, set up a specialized organization to collect and study the situations of China's aquatic products that may encounter green trade barriers in major exporting countries, propose corresponding countermeasures for different situations, then form an early warning mechanism and provide timely and full information consultation for export enterprises and foreign trade departments so as to achieve the purpose of promoting export trade enterprises to organize production according to reasonable standards.

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