Empirical Analysis on the Impacts of Technical Barrier to Trade on Chinese Agro-products Export

ZHAO Qi[1,2]*

1. College of Management, Ocean University of China, Qingdao 266100, China; 2. School of Business Administration, Qingdao Hismile College, Qingdao 266100, China

Abstract In view of the impacts on Chinese agro-products export caused by various technical barriers to trade, the academic circles analyzed them from the costs and quantity of exported agro-products. On the basis of the status quo of Chinese agro-products, the gravity model is introduced to analyze the impacts on Chinese agro-product export caused by technical barriers to trade. The results show that as long as the quality of Chinese agro-products can achieve the standard set by developed countries, for one thing, the health of Chinese consumers can be ensured, for another thing, the export of Chinese agro-products will be more smooth, which can provide reference for our government to make decisions and solve trade dispute.
Key words Technical barrier to trade, Gravity model, Agro-products, Export, China

With the development of economic globalization and the trend of trade freedom, at the same tine of shaking off the traditional tariff and non-tariff barriers, technical barriers to trade have become an important management method for countries of the world to adjust the trade interest. Due to the differences of economic development and technological level, various standards and technical codes, which made great contribution to the progress of human society in the past, restrict the development of national trade nowadays. Some even are used by some countries as trade protectionism[1]. As one of the advantaged traditional export products, Chinese agro-products bore the brunt of technical barriers to trade. Many developed countries always using the pretexts of meeting the quality safety of agro-products; protecting human health and ecological environment to refuse Chinese agro-products, which has caused grave effects on Chinese agricultural economy and farmers' living[2]. Therefore, on the basis of expounding the effects on export costs and quantity of Chinese agro-products export, the gravity model is adopted to analyze the effects caused by technical barriers to trade to provide references for the government to make decisions and solve trade disputes.

1 The effects of technical barriers to trade on export costs and quantity of Chinese agro-products

In the first place, the effects of technical barriers to trade on export costs and quantity of Chinese agro-products can be explained from the perspective of economics. After the import country setting the technical barriers to trade, the export countries have to increase the relevant expenses before entering the market of import country. The expenses will inevitably lead to the raise of costs and reduce the price competitiveness of such products in the market of import country. It can be seen from Fig. 1 that AC represents the average unit cost of agro-products

of export country; supposing that the international market price of agro-products is P_0, before the import country adopting technical barriers to trade the output of enterprise export is Q_1. When the import country increases standard, the costs increased of export enterprises use $\triangle AC$ to express. And then, the position of average unit cost curve AC of agro-products in the export country moves upward to AC_1. Under the situation that the export yield is still Q_1, the prices of the agro-products in import country should be raised to P_1 to avoid loss. But the increase of price will deter the export. The enterprises can increase the yield through expanding scale, for example increasing the quantity of export products to Q_2 to reduce costs and get profits.
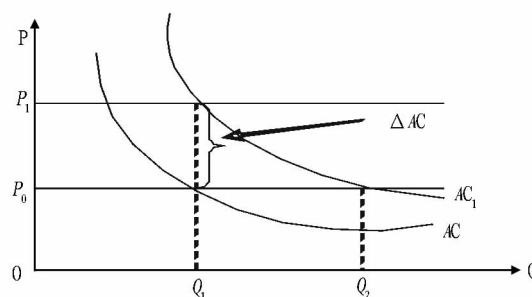

Fig. 1 The impact of technical trade barriers on export costs of agro-products

In Fig. 2, S refers to the supply cure of agro-product in export country to import country, and D refers to the demand curve of import country on agro-products. Supposing that before the implementation of technical barriers to trade, the export quantity of agro-products in the market of import country is equal to the import quantity of import country, the balance number is OQ and the balance price is OP. After the import country implanting technical barriers to trade, the agro-products of export country will be affected and the costs will be increased. Supposing that the elasticity of supply curve become smaller, and then the supply curve moves to S_1, equilibrium price move
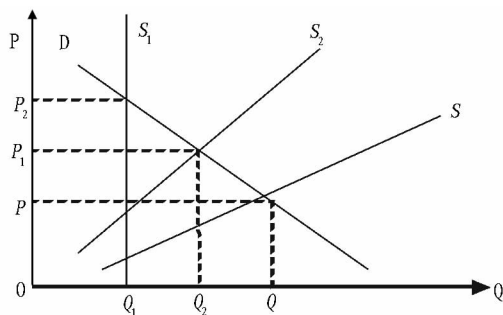
Fig. 2   The impact of technical trade barriers on export quantity of agro-products

upward to P_1, the quantity of export decrease to Q_1. If the agro-products of export country can not achieve the technical standard of import country in a short time period, the supply curve will move to S_2, the supply elasticity is extremely small and the equilibrium price will increase to, and the export volume will decrease to Q_2 [3]. Through the analysis above , it can be seen that technical barriers to trade directly restrict the import to a certain degree, which agrees with the direct restriction on export of TBT and different discrimination towards different imported products thought by scholars.

2   Empirical analysis on the influences of technical barriers to trade on export of Chinese agro-products

As for China, the target markets of agro-products are Japan, America, Korea, Germany, and Russia. But these countries have forceful polices for protecting their own agriculture and high demand on the quality of imported agro-products, so they are easy to restrict the import of agro-products. In order to test whether the TBT restricts import or stimulates the export of Chinese agro-products , we should combine the relevant data of the markets of target countries including Japan, America and Korean and introduce into the empirical analysis of gravity model of trade according to the specific situation of Chinese agro-products.

2.1   Data source and model establishment   The basic thought of trade gravity model originates from the " the law of gravity" in Physics. That is the gravity of two objects is in positive proportion to their weight and in negative proportion to their distance. Tinbergen and Poyhonen, first introduced the gravity model into trade to conduct the research on econometrics. Through empirical study, it can be founded that the volume of bilateral trade of two countries is in positive proportion to the total volume of economy of each of the two countries, and in negative proportion to the distance of the two countries. The general form of trade gravity model can be expressed as follows:

$$\ln(M_{ij}^k) = b_1 + b_2 \times \ln(GDP_i) + b_3 \times \ln(GDP_j) + \sum \beta_m \times \ln(Z_{ij}^m) + U_{ij}^k$$

In the equation, M_{ij}^k is the monetary value of k products or elements exported from i country to j country; GDP_i and GDP_j refers to the gross domestic product of i country and j country respectively, Z_{ij}^m is a series of variables that reflect the trade cost of visible bilateral trade barriers, including distance, language barriers, economic community or not and U is the random disturbance term [4].

2.1.1   Data source. The data come from the website of Ministry of Agriculture, UN Trade Statistics Database, *China Statistical Yearbook* 2004 – 2009, http://www. indo. com/distance/index. html and WTO/TBT Notification and Enquiry of China(Table 1 – 5).

Table 1   Chinese Agro-products Export Data during 2004 – 2009

×10^8 U. S. dollars

Year	Japan	USA	Korea	Germany	Russia
2004	74.00	24.00	21.30	6.80	6.00
2005	79.40	29.60	28.60	9.40	7.30
2006	82.38	38.48	29.03	11.14	8.91
2007	76.61	40.26	32.16	12.69	11.41
2008	71.20	51.34	31.74	16.45	14.44
2009	77.00	47.38	28.34	14.98	12.01

Note: Data source: website of Ministry of Agriculture.

Table 2   Per capita GDP of destination countries of Chinese Agro-products Export from 2004 to 2009   U. S. dollars

Year	Japan	USA	Korea	Germany	Russia
2004	36 158	38 793	15 242	33 323	4 113
2005	35 718	40 841	17 762	33 851	5 340
2006	34 229	42 907	19 926	35 346	6 942
2007	34 384	44 518	21 876	40 273	9 119
2008	38 578	45 230	19 296	44 363	11 858
2009	39 731	46 381	17 074	40 875	8 694

Note: Data source: UN Trade Statistics Database.

Table 3   Chinese GDP during 2004 – 2009   Yuan

Year	GDP	Year	GDP
2004	12 335	2007	19 524
2005	14 053	2008	22 698
2006	16 165	2009	23 535

Note: Data source: *China Statistical Yearbook* 2004 – 2009.

Table 4   Distance from China to the Capitals of Destination Counties   km

Country	Distance	Country	Distance
Japan	2 094.73	Germany	7 351.47
USA	11 147.05	Russia	5 785.72
Korea	954.11		

Note: Data source: http://www. indo. com/distance/index. html

Table 5   Total Amount of TBT and SPS Reports

Year	Japan	USA	Korea	Germany	Russia
2004	24	269	34	2	1
2005	23	237	25	1	2
2006	25	379	53	1	1
2007	24	371	53	3	1
2008	23	275	49	1	2
2009	18	118	33	1	1

Note: Data source: WTO/TBT Notification and Enquiry of China.

2.1.2   Model establishment. The specific form of trade gravity model is applied as follows:

$$\ln(M_{ij}^k) = b_1 + b_2 \ln(GDP_{ij}) + b_3 \ln(GDP_{jt}) + b_4 \ln DIS_{ij} + b_5 \ln T_{jt} + U_{ij}$$

In this model, M_{ij}^k refers to the export volume of China to each country in t time period; GDP_{it} refers to the GDP of each import country in t time period and GDP_{jt} means the local gross product of China in t time period; DIS_{ij} represents the distance of the major ports of each export country from China to these

countries；T_{jt} stands for the influencing factors of technical barriers to trade of each import countries in t time period；U_{ij} represents residual items.

2.2 Evaluation and analysis on regression results The model adopts EVIEWS5. 1 econometric software. The regression results can be seen on Table 6. From the regression results, it can be seen that the symbols used to explain variables are equal to expectation symbols, and all of them have achieved the significant level. F in the equation is 18. 4, which has passed the F test. After adjusting, R^2 is 0. 75, which indicates that the model has relatively good fitness. The regression results are analyzed as follows：

Firstly, the evaluation coefficient of average per capita GDP_{it} of import country is 0. 455 195, and it is in accordance with the expected symbol. The coefficient passed the statistical test at the 1% significant level, which indicates that for each additional increase of 1% of per capita GDP of import country, the aggregate value of export of Chinese agro-products will increase by 0. 45%.

Secondly, the evaluation coefficient of Chinese per capita gross domestic products GDP_{jt} is 0. 572 991, which is in accordance with the expected symbols. The coefficient passed the statistical test at the 10% of significance level. It implies that each additional 1% increase of Chinese per capita domestic products, the aggregate export value of agro-products will increase by 0. 57%.

Thirdly, the evaluation coefficient of distance variable DIS_{ij} is −0. 337 951, and is in accordance with the expected symbols. The coefficient passed the statistical test at the 1% of significance level. It indicates that each additional increase of 1% of the distance from import country, the aggregate output value of Chinese agro-products will reduce 33%. Fourthly, the evaluation coefficient of the reported number of technical trade barriers of each import country T_{jt} is 0. 184 977. It indicates that the technical barriers to trade have played a promoting role in the export of Chinese agro-products. But the significance of the influences is obviously lower that the traditional effects in the trade gravity model, that are the GDP and distance of the two parties of trade.

Table 6 Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	−4. 669 687	3. 423 635	−1. 363 956	0. 184 7
LOG(GDPIT)	0. 455 195	0. 142 218	3. 200 693	0. 003 7
LOG(GDPJT)	0. 572 991	0. 345 374	1. 659 043	0. 109 6
LOG(DIS)	−0. 337 951	0. 094 450	−3. 578 090	0. 001 5
LOG(T)	0. 184 977	0. 046 211	4. 002 881	0. 000 5

3 Conclusions

According to the regression results of gravity model and the export status of Chinese agro-products, the following conclusions can be drawn. The target of stipulating technical barriers to trade is to protect the health of consumers. Although some developed countries are excessively stricted on the mandatory standard and have the suspicion of trade protectionism, they have effectively protected the heath and safety of domestic consumers and the welfare of consumers in developed countries is improved. As long as the quality of Chinese agro-products can achieve the technical standard of developed countries, then not only the health of consumers can be guaranteed, but also the export of Chinese agro-products can be smoothened. From this perspective, it is proved that the technical barriers to trade have corrected the market failure caused by production, selling and consuming products to a certain degree.

References

[1] LIU X. Empirical analysis and countermeasure research on impacts of technical barriers to trade on China's agriculture export[D]. Shenyang：Shenyang University of Technology, 2007. (in Chinese).
[2] WANG HB, LI CP. Empirical analysis on the effects of technical barriers on China's agricultural exports[J]. Fujian Tribune：The Humanities & Social Sciences Monthly, 2008(9)：23 − 25. (in Chinese).
[3] XU HQ. Research on green trade barriers of China's agricultural products exports[M]. Beijing：China Economic Publishing House, 2009：16 −31. (in Chinese).
[4] LIU HC. Study on the influence and countermeasures of fruits export in China responding to sanitary and phytosanitary (SPS) measures [D]. Wuhan：Huazhong Agricultural University, 2009. (in Chinese).

3 Conclusions and suggestions

The consumption levels of rural residents in China have upgraded gradually in a general view. There is basic satisfaction with material life. With the increment in incomes of rural residents, chasing on entertainment consumption is increasing. Therefore, the potential consumption ability of farmers should be not neglected. The government is suggested to provide free skills training course for farers to promote the employment and increase the incomes；the New-Type Countryside Medical Insurance Systems should be further perfected, increasing the proportion of insuring areas and compensation；the sane Old-age Insurance Systems or rural residents should be established to clear their worries；policies of Chinese Government's Consumer Electronics Subsidy Program should be further perfected, increasing the quantities of types and modes to enlarge the selection possibilities and simplifying the program procedures, realizing one-stop shopping services.

References

[1] KOU MT, LI LT. Distribution of expenditure of rural consumers and analysis of consumption level in China[J]. Rural Economy, 2008(5)：74 −78. (in Chinese).
[2] National Bureau of Statistics of China. China statistical yearbook-2010 [M]. Beijing：China Statistics Press, 2010. (in Chinese).
[3] ZHANG LJ, REN YH. Experiments for multivariate statistical analysis [M]. Beijing：China Statistics Press, 2009. (in Chinese).
[4] YU XL, REN XS. Multivariate statistical analysis[M]. Beijing：China Statistics Press, 2007. (in Chinese).
[5] LIU M, WANG GR. Propensity analysis on consumption expenditure of rural residents in Hebei Province, China[J]. Journal of Anhui Agricultural Sciences, 2010, 38(3)：1478 −1481. (in Chinese).