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**Impact of Trade blocs on Agricultural Trade and Policy Implications
for China: Gravity Model Study**

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1. Introduction

During the last 10 years, regionalism has re-emerged as a major issue in the policy agenda. According to WTO statistics, there are 380 regional trade arrangements reported to GATT/WTO, in which 250 trade blocs have been taken into practice. As an important complementary type of global multilateral free trade economy system, regional economic cooperation organizations have been an essential part of the process of globalization for every country.

China have been increasing active attitudes toward regional economic integration since 1999. China took part in and signed Asia Money Exchange Treaty and put forward the ideas to establish China-ASEAN FTA. China and ASEAN signed “Framework Agreement on comprehensive economic cooperation between China and ASEAN” in Nov. 2002. In the framework of China-ASEAN FTA, the early harvest plan had been put into practice and taken the lead in opening agricultural and primary material import market. Though China is in the primary stage to implement FTA strategy, Chinese government has drawn specified FTA strategy and target. In the Report to the Seventeenth National Congress of the Communist Party of China on Oct. 15, 2007, China said that she will implement a strategy of free trade areas and expand bilateral and multilateral trade and economic cooperation. What’s the trade blocs effect on the agricultural trade flow and how do Chinese government to choose cooperation partner are the urgent questions we need to study and answer at this time.

The objective of this paper is to evaluate the determinants of bilateral agricultural trade flows among 49 countries, and particularly to measure the effects of preferential agreements between several economic blocs and areas: European Union (EU), North-American Free Trade Area (NAFTA), Association of Southeast Asian Nation (ASEAN), and South American Common Market (MERCOSUR) on agricultural trade flows. The period under study is from 2001-2006.

2. Gravity Model

Traditional international trade theories focused on analysis the foundation of international trade, trade pattern and welfare effects. It ignored, however, determinant factors of trade flow in the real world. The gravity model is an effective tool to explain bilateral trade flow.

Tinbergen (1962) and Pöyhönen (1963) were the first authors to apply the gravity equation to analyze international trade flows. According to this model, exports from country *i* to country *j* are explained by their economic sizes (GDP or GNP), their populations, direct geographical distances, and a set of dummies incorporating some type of institutional characteristics common to specific flows. Linnemann (1966) included population as an additional measure of country size. The choice of the particular explanatory characteristics varies highly. Mostly, the gross national product per capital and geographical distance are used (Bergstrand, 1985). Other variables that are commonly used in a GM are dummy variables to control for cultural similarity among trade partners, such as language or historical relationships such as colonialism.

Theoretical support for research in this field was originally very weak, but since the second half of the 1970s several theoretical developments have appeared in support of the gravity model. Anderson (1979) made the first formal attempt to derive the gravity equation from a model that assumed product differentiation. Bergstrand (1985, 1989) also explored the theoretical determination of bilateral trade in a series of papers, in which gravity equations were associated with simple monopolistic competition models. Helpman (1987) used a differentiated product framework with increasing returns to scale to justify the gravity model. Deardorff (1995) has proven that the gravity equation characterizes many models and can be justified from standard trade theories. Finally, Anderson and Wincoop (2001) derived an operational gravity model based on the manipulation of the CES expenditure system that can be easily estimated and helps to solve the so-called border puzzle. The differences in these theories help to explain the various specifications and some diversity in the results of the empirical applications.

(1) Simplified gravity model

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \alpha_3 \ln POP_i + \alpha_4 \ln POP_j + \alpha_5 \ln D_{ij} + \varepsilon_{ij}$$

(2) Augmented gravity model

$$\begin{aligned} \ln T_{ij} = & \alpha_0 + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \alpha_3 \ln POP_i + \alpha_4 \ln POP_j \\ & + \alpha_5 \ln D_{ij} + \alpha_6 \ln ABS_{ij} + \alpha_7 Border_{ij} + \sum \alpha_m PTA_{ij}^m + \varepsilon_{ij} \end{aligned}$$

where \ln denotes natural logarithms, T_{ij} denotes the trade value between country i to j , GDP_i and POP_i are income and population of country i , GDP_j and POP_j are income and population of country j , $Border_{ij}$ is a dummy that takes a value of 1 when countries share the same border and zero otherwise, D_{ij} is the distance between the two countries. ABS_{ij} is the income difference between trade partners. PTA_{ij} is a bundle of trade blocs, such as *MERCOSUR* is a dummy that takes a value of 1 when both countries belong to Mercosur, *NAFTA* takes a value of 1 when countries are members of the North American Free Trade Area, and *EU* takes a value of 1 when countries are members of the European Union. *APEC* takes a value of 1 when countries are members of the Asia-Pacific Economic Cooperation. *ASEAN* takes a value of 1 when countries are members of the Association of Southeast Asia Nations.

3. Data

We selected 24 developing countries or regions (including China), 21 developed countries and 4 transitional countries as sample.

21 developed countries are: the United States, Japan, Britain, Germany, France, Italy, Canada, Switzerland, Belgium, the Netherlands, Finland, Norway, Denmark, Sweden, Greece, Portugal, Spain, Austria, Australia, New Zealand, Ireland ; 24 developing countries or regions are include: South Korea, Singapore, Malaysia,

Indonesia, Thailand, India, Vietnam, Mexico, the Philippines, Brazil, Algeria, Egypt, Turkey, Argentina, Colombia, Chile, China, Hong Kong, China, Iran, Morocco, Saudi Arabia, Ukraine, United Arab Emirates and South Africa. In addition, the sample also includes 4 transitional economies: Russia, Hungary, Poland, the Czech Republic.

We choose these countries as samples is concerned about the following considerations. Firstly, the 49 sample countries or regions reached 89.99 percent share of the world trade in agricultural products (from 2003 to 2005 average data); Secondly, the selected samples of 49 countries or regions are China's major trade partners within the top 50; finally, the volume of agricultural products trade flow between China and other sample countries accounted for 91.86% of the total trade volume in 2006, So it is favorable for China's agricultural export potential estimates to select those 49 countries as sample.

In this paper, we use WTO agricultural statistics. WTO trade in agricultural products mainly include classification of Section 0, Section 1, Section 2 (not include the Division of 27 and 28) and Section 4 in accordance with the SITC (Standard International Trade Classification). Specifically, It concludes food (food and live animals; beverages and tobacco; animal and vegetable oils; oil and wax; fuel oil and fruit) and raw materials (leather; skins; rubber; timber; pulp and waste paper; fibers and their waste products; move Plant raw materials, etc.).

Bilateral trade flows data comes from United Nations Commodity Trade Statistics Database COMTRADE. the GDP and population data comes from world bank development indicators database; Distance Data comes from the "distance calculator" in the website of www.indo.com; In addition, it is possible that bilateral trade takes up 0 value, in view of the condition that 0 value can not take Logarithm, we substitute 0.025 for 0 (Kalbasi, 2001).

4. Results and discuss

The regression results of the equation 1 (table 1) show that: The basic variables in the simple form of gravity model are all pass through significant test. This shows that the gravity model can be used to explain the agricultural trade flows between countries. Equation 2 includes all the considered variables, GDP of the two trade partners, population POP, distance between two trade partners D_{ij} , as well as dummy variables, such as whether two trade partners share common borders *Border*, belongs to same preferential trade arrangement *EU*, *APEC* and *ASEAN* or not. all of those variables pass the significance test. But the variable ABS_{ij} , which measures economic development difference between two trade partners, and the dummy variable *NAFTA*, whether the countries are both members of NAFTA, don't pass the test of significance.

The paper uses "backward method" to screen the explanatory variables whose regression coefficient significant unequal to zero. The results are showed as equation 3. The result shows that GDP, POP_j, geographical distance (D_{ij}) of the trade partners, the dummy variables of the preferential trade arrangement EU, APEC and ASEAN,

Border_{ij} are all passed by test at 1% significance level. And the variables of POP_i and ABS_{ij} are also passed by test at 10% significance level. F value and fit degree R² of the equation are satisfactory. After comprehensive comparison, the paper will use the parameters of equation 4 to test the trade potential of Chinese agriculture products.

Table 1: factors which determine agricultural trade flows:
Regression result of gravity model

T_{ij}	equation 1	equation 2	equation 3
$LnGDP_i$	0.88*** (26.88)	0.83*** (25.68)	0.83*** (25.71)
$LnGDP_j$	0.61*** (22.44)	0.60*** (22.76)	0.60*** (22.85)
$LnPOP_i$	-0.05* (-1.81)	-0.04* (-1.64)	-0.04* (-1.65)
$LnPOP_j$	0.12*** (4.53)	0.08*** (2.91)	0.08*** (2.91)
LnD_{ij}	-0.67*** (-20.40)	-0.38*** (-9.26)	-0.38*** (-9.28)
$LnABS_{ij}$		-0.04 (-1.60)	-0.04 (-1.60)
EU		1.00*** (8.65)	1.00*** (8.65)
$APEC$		1.17*** (12.09)	1.17*** (12.25)
$ASEAN$		1.38*** (5.00)	1.38*** (4.99)
$NAFTA$		0.21 (0.36)	
$MERCOSUR$		1.66* (1.69)	1.65* (1.68)
$Border_{ij}$		1.09*** (6.84)	1.10*** (6.95)
$_cons$	4.21*** (7.63)	2.85*** (4.66)	2.84*** (4.65)
$Adj R^2$	0.48	0.55	0.55
F	432.28	237.18	258.83

Note: *means the significant level is 10%, **means the significant level is 5%, ***means the significant level is 1%. Numerical value in brackets means the value of T test for independent variable.

From the regression result of equation 3 we can see that trade blocs, such as EU, APEC and ASEAN all have promotion effect to trade flow of agricultural products. Agricultural products of Countries with preferential trade arrangement are 2.72 ($EXP(1.00) = 2.72$), 3.22 ($EXP(1.17) = 3.22$) and 3.94 ($EXP(1.38) = 3.97$) times

more than that of Countries without such kind of preferential trade arrangement. It fully tells us that trade blocs play the key role in promoting agricultural products trade. Besides, the influence of trade partners' income gap ABS_{ij} to agricultural products with inverse relationship is not significant.

5. Policy Implications for China

Table 2 summarizes Chinese latest circumstances of participating in the preferential trade arrangement. China signed "Goods Trade Agreement" with ASEAN in Nov,2007 and implemented the overall tax-reduction program in July 20th, 2005. The "Bangkok Agreement" concluded by developing countries has finished the third round of negotiations of expanding the scope of trade concessions and the margin of preference. Every country will reduce tariffs of more than 4000 items of products. China-Pakistan Early Harvest Program, which is an important part of the FTA, covers zero-tariff products and preferential tariff products of the two sides and will be carried out in Jan, 2006.

The China-Chile Process of Tariff Concession on tariffs will fully start in the second half of 2006. According to the arrangement; Chinese mainland will implement zero-tariff to 1087 kinds of products originated in Hong Kong while almost all products originated in Macao and liberalize 19 fields of service trade to Hong Kong and Macao. Except the already implemented agreements, China's negotiation with New Zealand, Australia, Gulf Cooperation Council and Southern African Customs Union on establishing FTAs is under way, and also the FTAs with India, Iceland, Japan and South Korea are in the feasibility study stage.

Table 2: The latest progress of Chinese participating FTAs (up to March 2006)

Stages of FTAs	free trade agreement	Latest progress
Have signed /implemented FTAs	Chinese Mainland and Hong Kong CEPA	Jan, 2004 and Feb, 2005 CEPA and complementary implemented.
	Chinese Mainland and Macao CEPA	Jan, 2004 and Feb, 2005, CEPA and complementary implemented.
	Bangkok Agreement	1 st July,2006, more than 4000 kinds of goods will implement tariff concession
	China - Pakistan Early Harvest Agreement	Assigned in Apr, implemented in 1 st Jan,2006
	China - ASEAN FTA (trade in goods)	assigned "goods trade agreement" in Nov.2004, and implemented at 20 th June,2005
	China – Chile FTA	Assigned FTA in Nov.2005, second half of 2006 will implement tariff concession in goods trade
FTAs in negotiation	China - New Zealand FTA	Nov.2004 started negotiation up to now has finished 6 rounds of negotiation
	China – Australia FTA	May.2005 started negotiation, up to now has

	China—GCC FTA	finished 4 rounds of negotiation Apr.2005 started negotiation, up to now has finished 3 rounds of negotiation
	China—SACU FTA	Apr.2005 started negotiation
FTAs in feasibility study	China – India FTA	United feasibility study
	China – Iceland FTA	United feasibility study
	China, Japan, South Korea FTA	feasibility study
	China – India FTA	feasibility study

Note: CEPA GCC, SACU each was Closer Economic Partnership Arrangement, the Gulf Cooperation Council and the Southern African Customs Union.

Source: Economy Report: China, Workshop on Identifying and Addressing Possible Impacts of FTAs Development on APEC Developing Member Economies, China MOFCOM, June 2005. And some are arranged by data from department of commerce. <http://www.mofcom.gov.cn>

From the empirical analysis, China takes active attitude towards the regional integration is reasonable in order to promote international agricultural trade. Although the classic trade theory tell us that the greater difference between two trade partners the more trade creation when each of them participate in the same trade blocs, our empirical results didn't support this rules from the international agricultural trade perspective. So, China can choose wider types of countries as our cooperate partner, need not narrow down to seek for special type separately, such as Japan and ASEAN.

6. Conclusion

For above analysis, we can get following conclusion:

1. Preferential trade arrangement has positive effect on international agricultural trade. The agricultural trade flow between EU, APEC and ASEAN are 2.72, 3.22 and 3.94 times separately than other countries.
2. China should take actively action and attitude towards regional economic cooperation. On the base of the former Preferential trade arrangement, such as APEC, China need to promote established FTA. Furthermore, seeking for regional integration with other countries had influential meaning.
3. The income difference has insignificant negative effect on agricultural trade. So, it need not to select partner similar economic with China level when China seek for regional cooperation partner from promoting agricultural trade perspective.

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