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Competitiveness of China's Agricultural Product Export to the United States of America

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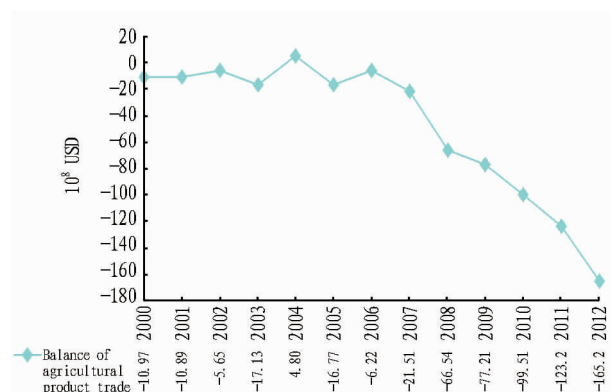
Abstract Taking major agricultural product importers at the American market as reference object and using market share and growth rate, this paper analyzed current situation of the competitiveness of China's agricultural product export to the United States of America. It used the Exports Similarity Index to evaluate the competitiveness of China's agricultural product export to USA and it analyzed the competitiveness of China's agricultural product export to USA by the shift share method. Research results indicate that China's agricultural products occupy small portion of American market and are faced with intense competition of many developing countries, especially the Thailand. However, China still has strong export competitiveness and ranks the second place only second to India. Finally, it came up with recommendations for raising the competitiveness of China's agricultural product export to USA and promoting China's agricultural product export to USA.

Key words Export competitiveness, Exports Similarity Index, Shift share analysis method

1 Introduction

Since China's accession to the WTO, Sino-US bilateral trade has been growing substantially, rising from 80.48 billion USD in 2001 to 484.7 billion USD in 2012 having annual growth rate up to 17.55%. At the same time, the favorable trade balance of China to USA also grows considerably, rising from 28.08 billion USD in 2001 to 218.9 billion USD in 2012, having annual growth rate up to 19.81%. However, Sino-US agricultural product trade volume is small. In 2012, the trade volume of agricultural product was 30.708 billion USD and accounted for a small portion of Sino-US trade. In 2001, the proportion was 4.35%. In 2004, it dropped to 2.44%. Later, it took on slow rising trend. In 2012, it reached 6.34%. It should be noted that except 2004, China's agricultural product trade with USA was always adverse trade balance and gradually deteriorated (as shown in Fig. 1). On the one hand, the development speed of Sino-US agricultural product trade lags behind other fields of industrial products, and agricultural product trade does not obtain its due position and the development potential is huge. On the other hand, Sino-US agricultural product trade is extremely unbalanced. As a large agricultural country, China must energetically develop agricultural product export to the USA. We believe that constantly raising the competitiveness of China's agricultural product export to the USA is the key to solve these problems.

By now, researches about competitiveness of agricultural product export have made outstanding achievements, such as Bowen and Pelzman (1984)^[1], Traill & da Silva (1996)^[2], Thorne (2005)^[3], Qu Xiaobo et al (2007)^[4], Maria Crescimanno, Antonino Galati (2012)^[5], etc. Nevertheless, most researches adopt



Data source: calculated according to UN Comtrade data (agricultural product trade consisted of chapter 01–24 data)

Fig. 1 Balance of Sino-US agricultural product trade in 2001–2012

World Market Share (WMS), Revealed Comparative Advantage Index (RCA), Trade Competitiveness Index (TC), and Grubel–Lloyd (G–L) index (*i. e.* Index of Intra–industry Trade). In this study, with reference of existing documents, we took major agricultural product importers at the American market as reference objects, studied the competitiveness of China's agricultural product export to the USA by the market share, growth rate, and the Exports Similarity Index, as well as the shift share method, to make clear competitiveness situation of China's agricultural products at American market, provide practical basis and decision making reference for Chinese government and agricultural product export enterprises, so as to further explore American market and promote China's agricultural product export to the USA.

2 Research area and data source

2.1 Scope of agricultural products and definition of comparison objects In this study, we adopted the Harmonized Com-

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modity Description and Coding System (HS classification method). HS is the commodity classification catalogue widely used in

the world. Agricultural products refer to all agricultural products listed in chapter 01 – 24 in HS catalogue (Table 1).

Table 1 Agricultural and sideline products listed in HS coding system

Code	Agricultural and sideline products	Code	Agricultural and sideline products
HS01	Live animals	HS13	Lac; gums resins and other vegetable saps and extracts
HS02	Meat and edible meat offal	HS14	Vegetables plaiting materials, vegetable products
HS03	Fish and fish products	HS15	Animal, vegetables fats and oils, cleavage products, <i>etc</i>
HS04	Dairy products	HS16	Meat, fish and seafood food preparations
HS05	Products of animal origin	HS17	Sugars and sugar preparations
HS06	Live trees, plants, bulbs, roots, cut flowers, <i>etc</i>	HS18	Cocoa and cocoa preparations
HS07	Edible vegetables and certain roots and tubers	HS19	Cereal, flour, starch, milk preparations and products
HS08	Edible fruit, nuts peel of citrus, melons	HS20	Vegetable, fruit, nut etc food preparations
HS09	Coffee, tea, mate and spices	HS21	Miscellaneous edible preparations
HS10	Cereals	HS22	Beverages, spirits and vinegar
HS11	Milling products, malt, starches, inulin wheat gluten	HS23	Residues, wastes of food industry, animal fodder
HS12	Oil seed, oleagic fruits, grain, seed, fruit, <i>etc</i>	HS24	Tobacco and manufactured tobacco substitutes

Data source: Harmonized Commodity Description and Coding System

This study belongs to scope of international competitiveness researches, while the international competitiveness researches are inseparable from international comparison. We selected major importers at American agricultural product market to make comparative analysis. Agricultural product importers of the USA include Canada, the EU, Mexico, India, Brazil, Thailand, Australia, and Indonesia. Since there are many developing countries, we selected New Zealand but did not select Chile. In 2012, agricultural products of China and these 9 countries (regions) accounted for 70% of agricultural product import of the USA. Thus, the study on competitiveness of China's and these countries' agricultural product export to the USA can reflect the competitive structure and form of China's agricultural products at American market.

2.2 Study methods

2.2.1 The Exports Similarity Index. Since there is difference in structure of exported products of all countries, the comparison results of market share and growth rate can not fully reflect competition degree of countries. We used the Exports Similarity Index (ESI) to evaluate the competitiveness of China's agricultural products at American market. The calculation formula is as follows:

$$ESI = \left[\sum_i \left(\frac{X_{iw}^l}{X_{iw}^t}, \frac{X_{jw}^l}{X_{jw}^t} \right) \right] \times 100$$

where X_{iw}^l and X_{jw}^l are respectively export volume of the product l of the country i and j at the common export market w , and X_{iw}^t and X_{jw}^t are separately the total export volume of the country i and j at the export market w . The variation range of this index is 0 – 100. When $ESI = 0$, it indicates that the exported commodity structure of the country i and country j is totally different; when $ESI = 100$, it indicates that exported commodity structure of the country i and country j is completely the same. If the ESI is closer to 100, exported commodity structure of two countries will be more similar and trade competition in the world market or the third party market will be more intense.

2.2.2 Shift Share Analysis (SSA). The Shift Share Analysis method is a method for measuring export competitiveness (Herschede F, 1991^[6], Voon J P 1998/2003^[7-8], Wilson P, 2005^[9],

and Du Li *et al.* 2011^[10]). A shift – share analysis, used in regional science, political economy, and urban studies, determines what portions of regional economic growth or decline can be attributed to national, economic industry, and regional factors. The analysis helps identify industries where a regional economy has competitive advantages over the larger economy. A traditional shift – share analysis splits regional changes into just three components, but other models have evolved that expand the decomposition into additional components. In this study, we took description of Du Li *et al.* (2011) about Shift Share Analysis as reference. Namely, we took several countries to be compared with each other as the control group to study export situation of each country relative to the control group. A single country in the control group is called a competitor. Net Shift (NS) reflects the export competitiveness of a country. When $NS > 0$, the country has advantage in export competition; when $NS < 0$, the country stays in inferior position in export competition. Actual Change (AC) in export represents actual change in export volume. SE) refers to Share Effect. The calculation formula is as follows:

$$NS = AC - SE \quad (1)$$

$$AC = X_{li}^t - X_{li}^0 \quad (2)$$

$$SE = X_i^0 P_{lr}^0 G_{lr} \quad (3)$$

X_{li}^0 and X_{li}^t are export volume of the product l of country i at the early period and period t ; X_i^0 is the total export volume of the country i at the early period; P_{lr}^0 refers to the export volume of product l in the control group to total export volume at the early period; G_{lr} is the growth rate of export of product l in the control group at $[0, t]$ period.

The Net Shift is result of 3 effects: Industry Structure Effect (ISE), Competitive Effect (CE) and Interactive Effect (IE). The calculation formula is as follows:

$$NS = ISE + CE + IE \quad (4)$$

$$ISE = X_i^0 (P_{li}^0 - P_{lr}^0) G_{lr} \quad (5)$$

$$CE = X_i^0 P_{lr}^0 (G_{li} - G_{lr}) \quad (6)$$

$$IE = X_i^0 (P_{li}^0 - P_{lr}^0) (G_{li} - G_{lr}) \quad (7)$$

where P_{lr}^0 refers to the export volume of product l in the control

group to total export volume at the early period; P_{li}^0 refers to the export volume of product l of the country i to total export volume at the early period; G_{li} is the growth rate of export of product l of the country i at $[0, t]$ period.

2.3 Data source Following data in this study were selected from UN Commodity Trade Statistics Database (UN Comtrade) using HS1996 commodity classification method. The selected data are mainly China's and major competitors' agricultural product export to the USA. We used the data to make comparison and analysis of competitiveness of China's agricultural product export to the American market.

3 Calculation results and analyses

3.1 Comparative analysis of competitiveness of China's agricultural product export to the USA From Table 2 and Table 3, it is known that:

(i) The market share of China's agricultural products at the American market remains in the fourth or fifth position. In 2012, market share of China's agricultural products at the American mar-

ket was 5.57%, greatly lower than Canada (18.65%), the EU (13.53%) and Mexico (12.74%), but higher than Brazil (3.66%), Thailand (2.88%), Australia (1.86%), Indonesia (1.70%) and New Zealand (1.58%), similar to India (5.76%).

(ii) The market share of China's agricultural products at the American market keeps steady rising. In 2001, the market share of China's agricultural products at the American market was 2.19%. In 2012, it rose to 5.57% (except 2004 and 2010). The market share of Canada, the EU, and Australia takes on declining trend, while that of New Zealand, Mexico, India, Indonesia, Thailand, and Brazil has fluctuation. It should be noted that the market share of India takes on declining trend in 2001–2010, but it rapidly rose in 2011 and 2012.

(iii) As for the growth rate, except India, China has the highest growth rate, followed by Brazil and Indonesia. From comparison, we can know that rapid growth countries are mainly developing countries, indicating that competitors of China at the American market are mainly developing countries.

Table 1 Market share (%) of China's and major competitors' agricultural products at the American market in 2001–2012

Country	Canada	EU	Mexico	India	China	Brazil	Thailand	Australia	Indonesia	New Zealand
2001	23.1	17.2	11.7	1.49	2.19	1.93	3.55	2.96	1.22	1.72
2002	22.65	18.63	11.17	1.66	2.77	2.22	3.08	3.04	1.29	1.87
2003	21.5	20.4	12.5	1.52	3.32	2.61	3.26	3.14	1.18	1.9
2004	20.7	19.8	12.6	1.47	3.27	2.71	2.97	3.24	1.42	2.14
2005	19.96	18.59	12.63	1.46	3.65	2.63	2.99	3	1.55	2.06
2006	19.36	18.77	13.12	1.28	4.38	3.66	3.27	2.6	1.54	1.79
2007	19.83	18.34	12.44	1.19	4.74	3.23	3.06	2.61	2.02	1.65
2008	21.09	16.38	12.12	1.28	5.02	3.45	3.2	2.18	2.01	1.62
2009	19.26	15.71	13.52	1.19	5.1	2.81	3.57	2.24	1.87	1.59
2010	19.14	15.48	13.62	1.47	5.6	2.93	3.67	1.95	1.76	1.54
2011	18.66	13.81	13.91	2.89	5.51	3.72	3.44	1.79	1.72	1.52
2012	18.65	13.53	12.74	5.67	5.57	3.66	2.88	1.86	1.7	1.58

Data source: calculated and arranged on the basis of chapter 01–24 in UN Comtrade.

Table 3 Growth rate (%) of agricultural product export of China and major competitors in the USA in 2002–2012

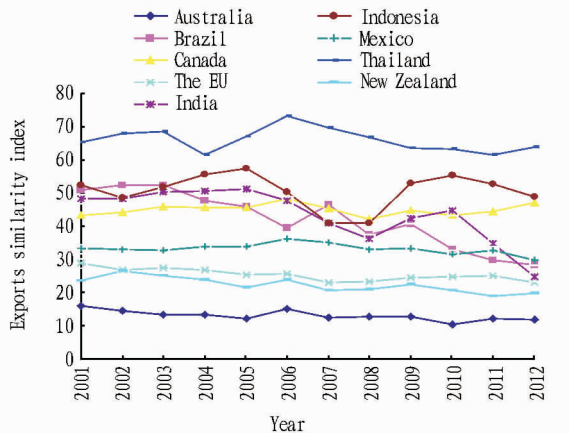
Country	Canada	EU	Mexico	India	China	Brazil	Thailand	Australia	Indonesia	New Zealand
2002	3.77	14.9	1.28	17.7	34.1	21.7	−8.1	8.75	11.6	15.3
2003	0.84	16.44	18.68	−2.7	27.54	25.36	12.72	9.98	−2.78	7.94
2004	9.52	10.3	15.2	9.96	12	17.9	3.43	17	37.1	28.2
2005	5.25	2.54	9.03	8.32	21.7	6.06	9.95	1.18	19.1	4.82
2006	8.34	12.77	16.05	−1.55	33.79	55.11	22.23	−3.11	11.23	−2.7
2007	10.75	5.67	2.51	0.6	17.09	−4.59	1.28	8.3	41.48	−0.68
2008	15.58	−2.97	5.89	16.86	15.03	15.99	13.34	−9.27	8.07	7.03
2009	−17	−12.8	1.4	−15.6	−7.55	−25.9	1.46	−6.36	−15.2	−11
2010	10.82	9.86	12.35	36.98	22.42	16.17	14.68	−3.17	5	7.98
2011	14.91	5.18	20.33	132.36	15.98	49.66	10.56	8.37	15.1	16.26
2012	5.68	3.6	−3.08	107.6	6.86	4.2	−11.7	10.08	4.33	10.1
Average	6.22	5.95	9.06	28.22	18.1	16.52	6.36	3.79	12.27	7.57

Data source: calculated and arranged on the basis of chapter 01–24 in UN Comtrade.

3.2 Comparative analysis of competition degree of China's agricultural product export to the USA Using the above Exports Similarity Index calculation formula, we calculated ESI of China and competitors and plotted the Fig. 2 according to calculation results.

From Fig. 2, we can know that:

(i) The Exports Similarity Index of China and major competitors to the USA is relatively high. From the average value of ESI in 2001–2012, the highest Exports Similarity Index is Thailand (65.94), Indonesia (50.61), India (43.27) and Brazil (42.01).



Data source: UN Comtrade

Fig. 2 The Exports Similarity Index of China and major competitors to the USA in 2001–2012

Table 4 Analysis results of agricultural product shift share of China and major competitors in 2001–2012 (unit: 10⁸ USD)

Index	China	India	Brazil	Mexico	Indonesia	Thailand	New Zealand	Australia	EU	Canada
NS	42.85	53.09	21.81	11.74	5.9	-9.11	-2.7	-14.49	-49.03	-60.72
ISE	2.74	0	3.94	-3.7	0.46	-2.37	-6.36	-8.11	15.87	-20.47
CE	41.59	31.25	592	68.94	49.74	17.93	-0.11	-9.06	-45.42	-65.36
IE	-1.48	21.84	-574	-53.5	-44.29	-24.67	3.76	2.69	-19.48	25.11

Data source: UN Comtrade

Table 5 Analysis results of shift share of China's various agricultural products in 2001–2012 (unit: 10⁸ USD)

Index	1	2	3	4	5	6	7	8	9	10	11	12	
NS	0.04	-0.45	12.53	-0.36	1.19	0.15	3.02	0.49	0.56	-0.58	0	1.45	
ISE	-0.1	-0.46	1.29	-0.1	0.96	0	-0.35	-0.41	0.12	-0.56	-0.21	0.28	
CE	3.84	0.79	4.58	-0.4	0.02	0.76	4.91	1.91	0.39	-0.48	1.44	0.66	
IE	-3.7	-0.78	6.67	0.13	0.22	-0.62	-1.54	-1.02	0.05	0.47	-1.24	0.51	
Index	13	14	15	16	17	18	19	20	21	22	23	24	Total
NS	-0.15	0.06	0.16	8.98	0.78	-0.57	0.19	11.15	1.45	-2.51	5.47	-0.19	42.85
ISE	3.23	0.02	-0.52	2.12	-0.22	-0.33	-0.55	1.47	-0.15	-2.55	-0.27	0.03	2.74
CE	-1.2	0.01	3.5	1.74	1.62	-0.64	1.78	4.11	2.07	0.52	9.84	-0.17	41.59
IE	-2.18	0.03	-2.82	5.12	-0.61	0.4	-1.03	5.56	-0.47	-0.48	-4.09	-0.05	-1.48

Data source: UN Comtrade

From Table 4 and Table 5, we can know that:

(i) From total NS of agricultural products, the overall export competitiveness of developing countries is higher than developed countries. In the developing countries, except Thailand having negative NS, all other countries have positive NS, indicating that these countries are competitive in their agricultural products exported to the USA. China ranks the second place following India, showing that China has high competitiveness in agricultural products exported to the USA. Developing countries have negative NS, reflecting they are inferior in exporting agricultural products to the USA.

(ii) From specific product types, chapters (01), (03), (05), (06), (07), (08), (09), (12), (14), (15), (16), (17), (19), (20), (21), and (23) of China's agricultural products have positive NS, indicating these products are competitive at American market, especially chapters (03), (20), (16) and (23). Chapters (22), (10), (18) and (02) products are

This means that China has similar exported product structure and intense competition with these countries (regions).

(ii) The similarity is low between China and developed countries in products exported to the USA. Canada is the developed country with the highest export similarity with China. In 2001–2012, the average ESI of Canada and China was 44.91, while the average ESI between China and the EU, Australia, and New Zealand was 25.31, 12.95, and 22.26 respectively.

(iii) Except the Exports Similarity Index of China and India gradually declining, the ESI of China and other countries has no significant decline. This reflects that there will be no great change in the competition trend of China with these countries at the agricultural product import market of the USA.

3.3 Comparison and analysis of competitiveness of China's agricultural product export to the USA Through calculation by the above stated Shift Share method, we obtained following results:

not competitive.

(iii) As Net Shift effect, China's industrial structure effect and competition effect are positive, but the interaction effect is negative. In the control group, China's industrial structure effect ranks the third place, only second to the EU and Brazil, indicating that China has industrial structure advantage in exporting agricultural products to the USA. The export competitiveness of China's agricultural products is benefited from faster development of China's agricultural product export than major competitors. Specific to product types, China's export structure advantages mainly come from chapters (13), (16), (20) and (03) products.

(iv) From the competition effect, Brazilian agricultural products have competition advantage of 59.002 billion USD, which is difficult to match for China and other competitions. China ranks the fourth place. Although it is positive (41.59) and has competition advantage, the advantage is not significant. China's competition advantages mainly come from chapters (23), (07), (03)

and (20) products.

(v) As for interaction effect of exported product structure and growth rate of export, China's interaction effect is negative, but the overall value is small, reflecting that China fails to fully use benign interaction between structural advantages and competition advantages. Chapters (03), (16) and (20) products have higher positive value, indicating excellent interaction effect and thus it is required to keep the situation. Chapters (23), (01), (15) and (13) products have higher negative value, so China should make further specialization in production of higher competitive products, such as chapter (23), (15) and (01) products. Alternately, in existing structural advantage, China should further cultivate competitive products, for example, chapter (13) products, or reduce production of uncompetitive products, such as chapter (4), (10) and (18) products.

4 Conclusions and recommendations

4.1 Conclusions (i) Since China's accession to the WTO, the growth of China's agricultural products exporting to the USA is rapid and the market share keeps rising. China is also expanding the export of agricultural products to the USA, but the overall export volume is still small, only 5% of the American market, far behind Canada, the EU and Mexico.

(ii) China has similar with developing countries in exporting agricultural product to the USA. Therefore, at the American agricultural product market, China has intense competition with developing countries, such as Thailand, Indonesia, India, and Brazil.

(iii) China has overall competitiveness in exporting agricultural products to the USA. In the ten importers of the USA, China ranks the second place following India. Specifically, China has significant competition advantage in chapters (03), (20), (16) and (23) products. But the competition is inferior in chapters (22), (10), (18) and (02) products.

(iv) China has structural advantage and competition advantage in export of agricultural products to the USA, but the interaction effect is negative. The structural advantages mainly come from chapters (13), (16), (20) and (03) products, while the competition advantages mainly come from chapters (23), (07), (03) and (20) products. The interaction positive effect mainly comes from chapters (03), (16), and (20) products, while the interaction negative effect mainly comes from chapters (23), (01), (15) and (13) products.

4.2 Recommendations (i) China should strengthen the support for export trade of agricultural products, to promote development of agricultural products exporting to the USA. Agriculture is the industry with the weakest self-support. Developing countries (such as India and Thailand) and developed countries (the USA and France) provide great support for production and export of agricultural products. Therefore, China should formulate new agricultural support policies within the framework of WTO rules, to support and develop export trade of agricultural products, raise international competitiveness of agricultural product export, so as to

boost export trade of China's agricultural products to the USA.

(ii) It is recommended to implement differentiated agricultural product strategy and launch "dislocated competition". China has similar with developing countries in exporting agricultural product to the USA. Therefore, at the American agricultural product market, China has intense competition with developing countries, such as Thailand, India, and Indonesia. Therefore, to avoid defeat of both parties, China should implement differentiated agricultural product strategy and launch "dislocated competition".

(iii) China should optimize the structure of agricultural products exporting to the USA and speed up export of advantageous agricultural products to the USA. It is recommended to optimize the structure of agricultural products exporting to the USA with the aid of advantages of diversity of China's agricultural products and low labor cost. China has competition advantage in aquatic products, vegetable, fruit, and nuts. Therefore, China should accelerate export growth of these agricultural products, to promote transformation of overall growth of agricultural products to competitive products.

(iv) China should fully grasp demands of American agricultural product market and cultivate competitiveness of major agricultural products. Through fully knowing demands of American agricultural product market, it is feasible to work out agricultural product development and marketing plan, to promote development of agricultural products exporting to the USA. For example, green and organic agricultural products are being favored by American consumers, China can support and encourage production of green and organic agricultural products and cultivate competitive advantage of green and organic agricultural products.

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