

The Structure and Competitiveness of China's Apple Exports

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Abstract: The paper investigates the structure of Chinese apple exports in the global market, using export concentration index. It also examines the competitiveness of Chinese apple exports among major apples exporters such as Chile, France, Italy, Poland and USA from 2000 to 2009. Some sophisticated and comprehensive measures of international competitiveness were used such as Relative Export Advantage Index (RXA), Relative Import Penetration Index (RMP) and Relative Trade Advantage Index (RTA). Results indicated that Russia is the main importer of Chinese apples and China has expanded into some Southeast Asian markets that traditionally consumed large quantities of high quality U.S. apples such as the Indonesian market. On the basis of relative trade advantage index, apple exports in China, France, Italy, Poland and USA experienced a marginal global competitive advantage, but in Chile it experienced a strong global competitive advantage in fresh apples exports from 2000 to 2009.

JEL Codes: F14, Q17, Q18

Key words: Apples • China • Competitiveness • Exports

INTRODUCTION

Apples are one of the most widely cultivated tree fruits and the third most internationally traded fruits behind bananas and grapes. Apples are commonly consumed not only because of their flavor taste but also because of the important nutrients contents, including high levels of antioxidants, vitamins and dietary fiber. Apple trees are deciduous and grow in temperate regions of the world. However, apples' popularity is global: they are consumed worldwide in greater quantities than any other temperate region tree fruit, such as peaches and pears [1].

Apples are produced commercially in 36 states throughout almost every region of the country. The Chinese apple industry increasingly dominated global production; the European Union (EU) and the United States were the world's second- and third-largest apple producers, respectively. Other large producers include Iran, Turkey, Russia, India and Chile.

Apple exports worldwide increased from 5.3 million mt in 2000 to 7.5 million mt in 2008. The four largest exporters (China, the EU, Chile and the United States) accounted for 65 percent of global trade in apples in 2008. The export growth experienced by these countries represented 100 percent of the growth in global exports of

apples between 2000 and 2008. There has, however, been some shift away from the large traditional markets of the United States and Europe to developing markets, such as Russia and Southeast Asia. The major global markets tend to have one or two dominant, often counter-seasonal, suppliers in addition to domestic production. For example, the U.S. market is supplied primarily by Chile, while China and Poland are the primary suppliers to the Russian market. The major global markets are also the world's largest apple producers.

In just two decades, China has made a remarkable leap from being a small fruit and vegetable apple producer to becoming the world's largest apple producer and exporter. In the early 1980s, China produced less than 5 million tones of apples per year [2]. China's share of world exports increased significantly by both volume from 5.6 to 15.5 percent and value from 4 to 11 percent between 2000 and 2008. Although China is the largest exporter by volume, apples exported from the United States, France and Italy receive prices almost twice high as Chinese apples. This price disparity exists for two reasons. First, the cost of production in China is significantly lower, despite the fact that yields are generally half those of U.S. orchards. Second, despite recent improvements, Chinese apples are of generally lower quality than those from Western Europe and the United States. These large price

disparities help to explain global trade flows as well as the specific markets in which exporters tend to sell their product.

The United States in recent years has been slowly losing market share to China. China is very proactive in opening additional markets and is trying to meet EU fruit standards by improving quality, food safety, apple variety and packaging. However, increased production costs are likely to limit China's export growth [3]. In 2008, China's global export market share was about 15.5 percent, while the United States had nearly 9.5 percent of the market.

This paper examined Chinese apple exports trends in the international market during the period 2000-2009. It identified the export concentration and major international markets for Chinese apple exports. In addition, it examined the competitiveness of Chinese apple exports.

Methodology and Source of Data: The paper devotes attention to the evaluation of Chinese apples export structure by estimating some economic indicators such as *Export Concentration Index* for calculating the geographical concentration of Chinese apple exports at the importing countries. The paper also devotes attention to the evaluation of competitiveness of apple exports in China and the competing countries from 2000 to 2009. For the evaluation of competitiveness of foreign trade, there were created many indicators on the basis of market or trade information. Some sophisticated and comprehensive measures of international competitiveness will be used such as *Relative Export Advantage Index (RXA)*, *Relative Import Penetration Index (RMP)* and *Relative Trade Advantage Index (RTA)*. In order to calculate the relevant indicators, we have used data on production, exports and imports for China and major exporters of apples in relation to total world trade for the period 2000-2009. Data sources included publications of the Food and Agriculture Organization (FAO), the National Bureau of Statistics of China [4] and the United Nations Commodity Trade Statistics Database.

Export Concentration Index: It refers to the share of a specific commodity's exports of a specific country to total exports of this country to the whole world. Export concentration index is derived from the following equation [5].

$$H_j = \sqrt{[\sum(x_i / X_t)^2]}$$

Where x_i is country j 's exports of product i and X_t is country j 's total exports. The lower is this index; the less concentrated are a country's exports.

Relative Export Advantage Index (RXA): It expresses the ratio of a country's export share of a certain product in the world market to the same country's share in world export of all other commodities. The special feature of this measure is that the world 'total' is taken as the sum across all countries except the one studied. This avoids counting countries and commodities in both the numerator and the denominator. This aspect is especially relevant if a country is fairly important in trade on international markets and/or if the commodity considered is important in total trade. In these cases, double counting would lead to biased index values. As mentioned above, China is the highest apple producer in the world. Relative Export Advantage Index (RXA) can be expressed as follows [6].

$$RXA_{ij} = \left(X_{ij} / \sum_{l, l \neq j}^u X_{il} \right) / \left(\sum_{k, k \neq i} X_{kj} / \sum_{k, k \neq i \neq j}^u X_{kl} \right)$$

Where X refers to exports, subscripts i and k denote the product while j and l the countries. The numerator is equal to a country's exports of a specific product category relative to the exports of this product from all countries except the country in question. The denominator reveals the exports of all products, except the commodity in question, from the respective country as a percentage of all other countries' exports of all other products. The level of this indicator shows the degree of revealed export competitiveness. If $RXA_{ij} > 1$, the country has a comparative advantage in the evaluated product category, but if $RXA_{ij} < 1$, the country has a comparative disadvantage.

Relative Import Penetration Index (RMP): It is very similar to RXA . The differences are that it considers imports and that the interpretation is reversed from that of the RXA . The RMP index is defined as follows [7].

$$RMP_{ij} = \left(M_{ij} / \sum_{l, l \neq j} M_{il} \right) / \left(\sum_{k, k \neq i} M_{kj} / \sum_{k, k \neq i \neq j} X_{kl} \right)$$

Where M refers to imports, subscripts i and k denote the product while j and l the countries. The numerator is equal to a country's imports of a specific product category relative to the imports of this product from all countries except the country in question. The denominator reveals the imports of all products, except the commodity in question, to the respective country as a percentage of all other countries' imports of all other products. The level of this indicator shows the

degree of revealed import penetration. If $RMP_{ij} > 1$, the country has a comparative disadvantage in the product category, but if $RMP_{ij} < 1$, the country has a comparative advantage.

Relative Trade Advantage Index (RTA): The RTA index describes a country's share of the world market pertaining to one commodity relative to its share of all traded goods and it accounts for imports as well as exports. It is calculated as the difference between relative export advantage (RXA), which equates to the Balassa index and its counterpart, relative import advantage (RMA). It can be expressed as follows [8].

$$RTA_{ij} = RXA_{ij} - RMP_{ij}$$

The competitive advantage revealed by this indicator is implicitly weighted by the importance of the relative export and the relative import advantages. Hence, it is not dominated by extremely small export or import values of the commodity considered. A positive value indicates competitive advantage and a negative one a competitive disadvantage. If $RTA > 0$, export has a higher comparative advantage than import but, if $RTA < 0$, import has a higher comparative advantage than export.

While RXA and RMP indexes are exclusively calculated using either export or import values, the RTA considers both export and import activities. From the point of view of trade theory, this seems to be an advantage. Therefore, in considering both exports and imports, the RTA index is considered to be a more appropriate measure of competitiveness.

RESULTS AND DISCUSSION

The Relative Importance of Chinese Apple Exports:

Table 1 shows that the total value of Chinese exports raised to 1430.7 billion dollars in 2008, compared to 249.2 billion dollars in 2000. The value of Chinese agricultural exports reached 12.4 billion dollars in 2000 and rose to 33.3 billion dollars in 2008. Apple exports value ranged from a minimum of 96.56 million dollars in 2000, representing about 0.78% of China's total agricultural exports value to a maximum of 712.13 million dollars in 2009, representing about 2.16% of China's total agricultural exports value. The annual average of export value estimated to 343.28 million dollars, representing about 1.54% of Chinese total agricultural exports value and about 8.5% of the world apple export value during the period of study. The average amount of apple exports reached about 739.58 thousand tons, representing approximately 3.04% of the

Chinese total production. China's apple exports volume ranged from a minimum of 297.65 thousand tonnes in 2000 to a maximum of 1171.81 thousand tonnes in 2009. The annual average of export volume estimated to 739.58 thousand tonnes during the period of study.

Chinese Apple Production and Exports Compared to Major Apple Exporters: Chile, France, Italy, Poland and USA are considered major apple exporters in the world. France, Italy and Poland have their existence as members of the European Union customs exemptions, protection and the quota shares of open and high prices. These advantages not enjoyed by the Chinese apple exports and also the same reasons as for Chile which is a strong proponent of pressing ahead on negotiations for a free trade area of the Americas (FTAA).

Table 2 reflects the situation of apple's production and exports in China and the rival exporting countries. The table indicates that China is the leading player with a rate 38.8% share in the average global apple production by volume; a head of other apple exporters such as Chile (2%), France (3.5%), Italy (3.5%), Poland (3.5%) and U.S.A (6.9%). Chile has the largest exporting proportion of its production amounted to 49.5% with a higher price than the Chinese apple price, with an average export price 627.54 dollars per tones. It followed by France, Italy, Poland, U.S.A and China where the export ratio to production was 32.92%, 31.01%, 17.30%, 16% and 3.04%, respectively. Although China is the largest producer of apples in the world, it is exporting only 3.04% of its production with an export price averaged at 464.13 dollars per tones during 2000-2009. China, the largest global exporter, accounted for 11.3% of average global exports volume of apples, it followed by France (10.9%), USA (10.6%), Italy (10.3%), Chile (9.5%) and Poland (5.8%), respectively.

Export Structure: The structure of Chinese apple exports is summarized by calculating export concentration index, reported in Table 3. The export concentration index measures the total concentration of export structure from global export pattern. It is shown from Table 3 that Russia is the main importer of Chinese apples where it imported about 139.6 million tonnes with 56.71 billion dollars which accounted for 18.87% of the average quantity of the Chinese apple exports during the period (2000-2009). The export concentration coefficient in Russian market is estimated at 16.99% and the quantity of apple imports ranges between 61.27 thousand tonnes as a minimum and about 236.37 thousand tonne as a maximum. It's followed by Vietnam, Indonesia, Philippines,

Table 1: The relative importance of Chinese apple exports: 2000-2009

Year	World apple exports (million dollar)	Total China's export (million dollar)	China's Agricultural Exports		Chin's Apple Exports		
			Value (million dollar)	Share in total exports (%)	Quantity (thousand tonnes)	Value (million dollar)	Share in agricultural exports (%)
2000	2282.76	249200	12400	4.98	297.65	96.56	0.78
2001	2422.30	266100	12890	4.84	303.56	100.67	0.78
2002	2882.75	325600	14720	4.52	438.74	149.43	1.02
2003	3422.57	438200	17650	4.03	609.05	209.77	1.19
2004	3820.73	593300	19010	3.20	774.13	274.41	1.44
2005	3883.19	762000	22750	2.99	824.05	306.31	1.35
2006	4367.87	968900	26100	2.69	804.23	372.56	1.43
2007	5584.59	1217800	31050	2.55	1019.23	512.60	1.65
2008	6339.99	1430700	33340	2.33	1153.32	698.34	2.09
2009	5386.05	1201600	32940	2.74	1171.81	712.13	2.16
Average	4039.28	745340	22285	3.49	739.58	343.28	1.39

Source: collected and calculated from the data of National Bureau of Statistics of China

Table 2: The relative importance of apples trade in China and the rival countries, 2000-2009

Average	World	China	Chile	France	Italy	Poland	USA
Production (thousand tonnes)	62816.12	24350.06	1252.00	2178.29	2175.80	2187.81	4348.26
Export Amount (thousand tonnes)	6550.00	739.64	619.55	717.20	674.80	378.51	695.83
Ratio of exports to production	10.43	3.04 %	49.48 %	32.92 %	31.01 %	17.30 %	16.00 %
Export Value (million dollars)	4039.28	343.29	388.79	577.62	507.84	115.14	515.04
Export Price (U.S. \$/tonnes)	616.68	464.13	627.54	805.39	752.58	304.20	740.18

Source: FAO and United Nations Commodity Trade Statistics Database

Table 3: Chinese fresh apple exports, 2000-2009

Partner	Exports Quantity (Tonnes)			Export Concentration	Export Price (\$/tonnes)
	Minimum	Maximum	Average		
Russia	61271	236370	139592.40	16.99	406.28
Vietnam	8540	162848	79401.78	9.66	310.25
Indonesia	27818	113759	77122.11	9.39	580.13
Philippines	27207	81353	64707.78	7.87	515.92
Thailand	14429	99701	57104.44	6.95	574.60
Malaysia	32391	49607	42918.44	5.22	519.80
Bangladesh	2614	92469	29189.11	3.55	482.60
Hong Kong	17644	31621	25682.67	3.13	253.55
Singapore	19235	28386	25102.22	3.05	611.85
Emirates	1468	41766	18737.11	2.28	661.35
Saudi Arabia	1582	42574	18388.22	2.24	657.48
Others	-	-	161691.40	29.67	-
Total	-	-	739637.70	100.00	464.13

Source: collected and calculated from the United Nations Commodity Trade Statistics Database

Thailand and Malaysia markets with an average quantity estimated by 79.40, 77.12, 64.71, 57.10 and 42.92 thousand tonnes, respectively at the same period. The geographical export concentration estimated at 9.66%, 9.39%, 7.87%, 6.95% and 5.22%, respectively for these countries. While China's largest growth market was Russia during this period, it also expanded into many Southeast Asian markets that have traditionally consumed large quantities of U.S. apples such as markets of Indonesia and Philippines.

The different markets in Table 3 acquire about 70% of the average quantity of Chinese apple exports during the period (2001-2009). United Arab Emirates market has the highest price where it is reached US\$ 661.35 per tonnes during the period of study.

Competitiveness of Chinese Apples and Major Apples Exporters: The major apple exporters in the world are earlier shown China, Chile, France, Italy, Poland and USA. Table 4 depicts competitiveness indicators of China and

the major apple exporters in international market. It describes the trends and status in the competitiveness of apples from 2000 to 2009. According to the *RXA* index, China and the other competing countries (Chile, France, Italy, Poland and USA) reached a high comparative advantage in apple exports during the period 2000-2009. The *RMP* index shows a comparative advantage to China and the competing countries during the period of study, where this index reached values less than 1. On the basis of the more complex index *RTA*, the apple exports in China and the competing exporter countries were done with a higher comparative advantage than the import of this commodity during the period of study (2000-2009). It is clear that *RTA* index values for China and the major apple exporters indicated in Table 4 are mostly positive, with values less than 5, except Chile with values very high greater than 20. This indicates that apple's industry in China, France, Italy, Poland and USA experienced a marginal global competitive advantage. On the other hand, Chile experienced a strong global competitive advantage in fresh apples exports from 2000 to 2009. This is because of this country's success in high-value agricultural exports that was based on world market demand and because of series of reforms which moved apple's industry in Chile away from the initial import substitution industrialization model. Chile has achieved its competitiveness by focusing on comparative advantage combined with foreign investment or partnerships, subsidies, tax exemptions, duty drawback schemes, publicly provided market research and public initiatives fostering scientific expertise.

SUMMARY AND CONCLUSION

The competitive performance of the Chinese apple exports was calculated using trade data from National Bureau of Statistics of China (different issues), FAO [9] and United Nations Statistics Division [10].

The relative importance of Chinese apple exports has been analyzed during the period 2000-2009. Results have indicated that the annual average of export volume estimated to 739.58 thousand tones and the annual average of export value estimated to 343.28 million dollars, representing about 1.54% of Chinese total agricultural exports value and about 8.5% of the world apples export value. The relative importance of Chinese apple exports ranges from a minimum of 0.78% in 2000 to a maximum of 2.16% in 2009 from the total value of china's agricultural exports.

By comparing china with the rival countries, the study reveals that China is the leading player with a rate 38.8% share in the average global apple production by volume. Although China is the leading player in global apples production, it is exporting only 3.04% of its production compared to other countries such as Chile (49.5%), France (33%), Italy (31%), Poland (17%) and USA (16%). China, the largest global exporter, accounted for 11.3% of average global exports volume of apples, it followed by France (10.9%), USA (10.6%), Italy (10.3%), Chile (9.5%) and Poland (5.8%), respectively.

As for export structure, the concentration index revealed that Russia is the main importer of Chinese apples, where it imported about 139.6 million tonnes with 56.71 billion dollars which accounted for 18.87% of the average quantity of the Chinese apple exports during the period (2000-2009). The export concentration coefficient in Russian market is estimated at 16.99%, it followed by Vietnam (9.66%), Indonesia (9.39%), Philippines (7.87%) and Thailand (6.95%). While China's largest growth market was Russia during this period, it also expanded into many Southeast Asian markets that have traditionally consumed large quantities of U.S. apples such as markets of Indonesia and Philippines. United Arab Emirates market had the highest price where it is reached to US\$ 661.35 per tonnes during the period of study.

Concerning the competitiveness of Chinese apples in the global market, competitiveness indicators were used such as the relative export advantage index (*RXA*), the relative import penetration index (*RMP*) and the relative trade advantage index (*RTA*). According to the *RXA* index, China and the other competing countries (Chile, France, Italy, Poland and USA) reached a high comparative advantage in apple exports during the period 2000-2009. The *RMP* index showed a comparative advantage to China and the competing countries during the period of study, where this index reached values less than 1. On the basis of the more complex index *RTA*, values for China and the major apple exporters indicated in Table 4 are mostly positive, with values less than 5, except Chile with values very high greater than 20 because of this country's success in high-value agricultural exports that was based on world market demand. This indicates that apple's industry in China, France, Italy, Poland and USA experienced a marginal global competitive advantage, but in Chile it experienced a strong global competitive advantage in fresh apples exports from 2000 to 2009.

Table 4: Competitiveness indicators of major apple exporters

Country	Indicator	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
China	<i>RXA</i>	1.13	1.00	1.08	1.11	1.18	1.16	1.15	1.14	1.38	1.57
	<i>RMP</i>	0.15	0.18	0.17	0.13	0.13	0.11	0.09	0.09	0.10	0.13
	<i>RTA</i>	0.98	0.81	0.90	0.98	1.06	1.06	1.06	1.05	1.28	1.44
Chile	<i>RXA</i>	30.51	35.71	32.79	36.02	33.00	23.90	23.08	23.06	28.99	23.65
	<i>RMP</i>	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	<i>RTA</i>	30.50	35.71	32.79	36.02	33.00	23.90	23.08	23.04	28.99	23.64
France	<i>RXA</i>	4.95	4.79	4.93	4.53	3.85	3.56	3.78	3.63	3.76	3.48
	<i>RMP</i>	0.45	0.56	0.65	0.58	1.00	0.82	0.66	0.70	0.60	0.59
	<i>RTA</i>	4.51	4.24	4.28	3.95	2.85	2.74	3.12	2.93	3.16	2.88
Italy	<i>RXA</i>	3.17	2.97	3.72	3.97	3.30	3.97	4.28	4.33	4.41	4.31
	<i>RMP</i>	0.26	0.29	0.37	0.35	0.53	0.31	0.21	0.19	0.26	0.18
	<i>RTA</i>	2.92	2.69	3.36	3.63	2.77	3.66	4.07	4.14	4.15	4.13
Poland	<i>RXA</i>	2.94	1.95	2.79	2.85	3.70	3.61	3.07	3.18	2.86	4.68
	<i>RMP</i>	0.44	0.54	0.15	0.20	0.16	0.22	0.31	0.89	0.47	0.22
	<i>RTA</i>	2.51	1.41	2.64	2.65	3.54	3.38	2.76	2.30	2.39	4.46
USA	<i>RXA</i>	1.67	1.71	1.40	1.23	1.24	1.69	1.70	1.57	1.64	1.93
	<i>RMP</i>	0.27	0.27	0.26	0.30	0.37	0.20	0.24	0.27	0.21	0.26
	<i>RTA</i>	1.40	1.44	1.15	0.93	0.87	1.49	1.46	1.30	1.43	1.67

Source: Own calculations based on data from FAOSTAT and United Nations Commodity Trade Statistics Database (different issues)

It is clear that China's apple exports are facing several challenges. Therefore, there is a need for competitive strategies to be adopted by all the participants in order to improve the competitiveness of the Chinese apple exports. The government, therefore, has to play a crucial role in ensuring that the structural policies are conducive for the apple exports to maintain its competitive performance. There must be an organized specific policy to apply on the apple exports, since it is significantly important for its economic value. Production towards export must be directed according to demand of current or target markets. China must do marketing researches for importing countries and for the markets of Africa to be able to properly direct their exportation. Export supports must be arranged according to the needs of exporters. These supports must be subject to export with high quality. When these progressions are considered together with suitable conditions for exportation, China is thought to be able to increase its power in the new markets, by benefiting its potential which has not been used at all yet.

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