China and Singapore Trade Index Analysis and Innovation-Driven Management

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Abstract: In this paper, the trade of general and classified industries in China and Singapore is taken as the research object, and the trade closeness and trade potential of the two countries are analyzed through the index of trade association and index of revealed competition. The results show that China and Singapore have a high index of trade integration and close trade links. The indicative competition index shows that the product mix of the two countries is complementary. Therefore, in the two countries trade innovation, it is suggested that China should vigorously develop the real economy, pay attention to technological innovation, and strive to achieve system innovation.

1. Introduction

Chinese premier li keqiang and Singaporean prime minister lee hsien loong witnessed the signing of the protocol to upgrade the free trade agreement in Singapore on November 12, 2018. This is an important step to implement the proposal of the 19th national congress of the communist party of China (CPC) to promote the construction of free trade zones and build an open world economy. It is of great significance to further tap the potential of bilateral economic and trade cooperation between China and New Zealand and deepen economic and trade cooperation between China and asean countries.

This paper takes the overall and classified product trade of China and Singapore as the research object, analyzes the trade closeness and trade potential of the two countries by measuring the trade index, and proposes innovative management countermeasures for the trade development of the two countries based on the analysis results.

The data used in this chapter are from the world monetary fund (IMF) and the UN Comtrade database (UN Comtrade) to make the analysis results clearer and more accurate. Among them, the total value of trade between the two countries is derived from IMF, and the data of industry classification is derived from UN Comtrade SITC classification (international standard classification of trade). Under this classification method, trade commodities are divided into ten types, as shown in the following table (it should be noted that due to the incomplete data of some countries' industries, the data in this chapter are intercepted from 2000 to 2016):

Table 1 SITC classification

Code	category
SITC0	Food and main live food for eating
SITC1	Beverages and tobacco
SITC2	Non-edible materials other than fuel
SITC3	Fossil fuels, lubricants and related raw materials
SITC4	Animal and vegetable oils and waxes
SITC5	Chemical products
SITC6	Finished goods classified mainly by raw materials
SITC7	Machinery and transportation equipment
SITC8	Miscellaneous products
SITC9	Other goods not classified

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2. Trade Association Analysis

Trade mix refers to the ratio of a country's exports to a trading partner to its total exports and the ratio of that trading partner's total imports to the world's total imports. This index is used to measure the trade closeness of micro industries. When the index value is higher (> 1), the trade closeness between the two countries is stronger. The lower the value (< 1), the looser the trade relationship between the two countries.

Calculation formula:

$$TCD_{ab} = (X_{ab} / X_a) / (M_b / M_w) \quad (1)$$

$$TCD_{ab} = (X_{ab} / X_a) / (M_b / M_w) \quad (2)$$

In formula 1, TCD_{ab} is the combination degree of the total export trade of country b to country b, X_{ab} represents the export volume of country a to country b, X_a represents the total export volume of country a, M_b is the total import volume of country b, M_w is the total import volume of world commodities.

Thus, we can respectively list the trade combination formula of China and Singapore as exporters:

$$TCD_{cs} = (X_{cs} / X_c) / (M_s / M_w) \quad (3)$$

$$TCD_{sc} = (X_{sc} / X_s) / (M_c / M_w) \quad (4)$$

TCD_{cs} Is China's total export trade to Singapore, X_{cs} is China's export to Singapore, X_c is China's total export value, M_s is Singapore's total import value, M_w is the world's total import value. TCD_{sc} Is Singapore's total export value to China, X_{sc} is Singapore's total export value to China, X_s is Singapore's total export value to China, M_c is Singapore's total export value, is China's total import value.

According to the formula, the trade binding index of China and Singapore from 2000 to 2016 is calculated, as shown in table 2.

Table 2 Trade index of China and Singapore

Year	TCD_{cs}	TCD_{sc}
2000	1.15	1.17
2001	1.22	1.17
2002	1.24	1.25
2003	1.17	1.21
2004	1.18	1.32
2005	1.19	1.41
2006	1.24	1.53
2007	1.32	1.44
2008	1.16	1.34
2009	1.29	1.24
2010	1.02	1.15
2011	0.94	1.11
2012	0.97	1.11
2013	1.05	1.15
2014	1.08	1.22
2015	1.32	1.39
2016	1.26	1.28

Looking at the table, china-singapore trade is highly correlated, with the overall index between 0.94 and 1.39. In the ten years from 2004 to 2013, when China was an exporter, it reached the highest level in 2007 and 2015 and reached the lowest level in 2011. When Singapore was an exporter, it was highest in 2006 and lowest in 2011 and 2012. The two countries share the same index range and trend. This shows that China and Singapore have maintained a high level of trade and export volume, improved openness to the outside world and close trade links.

3. Indicative Competition Index Analysis

Indicative competition index is an index obtained on the basis of subtracting the import comparative advantage of the export comparative advantage of the industry, industry or certain product, aiming to measure the comprehensive competitive advantage of the industry, industry or product. The calculation formula is:

$$CA_a^i = RCA_a^i - (M_a^i / M_a)/(M_w^i / M_w) \quad (5)$$

$$RCA_a^i = (X_a^i / X_a)/(X_w^i / X_w) \quad (6)$$

Where, RCA_a^i is the realistic comparative advantage of country a in industry I. According to the formula, the CA index formulas of China and Singapore are listed as follows:

Table 3 meanings of indicators

CA_c^i =China index of indicative competition	CA_s^i =Singapore index of competition
X_c^i =China exports category I products	X_s^i =Category I exports from Singapore
X_c =Total export of sitc 9 products in China	X_s =Total export of sitc 9 products in Singapore
M_c^i =The amount of class I products imported from China	M_s^i =The amount of class I products imported from Singapore
M_w =Total import of sitc 9 products in China	M_s =Total import of sitc 9 products in Singapore
X_w^i =World export of category I products	
X_w = Total exports of sitc of nine categories in world	
M_w^i =World imports of category I products	
M_w =Total imports of sitc of nine categories in world	

According to the formula calculation, the indicative competition index of nine categories of commodities between China and Singapore from 2000 to 2016 is obtained.

It can be seen from the below table that the index range of competition of various commodities in China is slightly different. SITC0, SITC6, SITC7 and SITC8 are positive, among which the eighth category of miscellaneous manufactured goods has the most obvious competitive advantage. From the perspective of development trend, the competitive advantages of food and main edible live animals, beverage tobacco and non-edible raw materials gradually decrease.

Table 4 Indicators of competitive advantage of various commodities in China from 2000 to 2016 (%)

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2000	0.19	0.05	-0.89	-0.27	-0.56	-0.43	-0.11	-0.15	0.89	-0.07
2001	0.19	0.06	-1.09	-0.21	-0.43	-0.43	-0.11	-0.20	0.90	-0.07
2002	0.22	0.08	-1.09	-0.25	-0.80	-0.48	-0.09	-0.23	0.99	-0.07
2003	0.24	0.06	-1.44	-0.31	-1.16	-0.51	-0.12	-0.25	0.99	-0.03
2004	0.16	0.07	-1.87	-0.42	-1.36	-0.57	0.05	-0.20	0.97	-0.04
2005	0.20	0.03	-2.11	-0.42	-1.02	-0.55	0.17	-0.10	1.12	-0.04
2006	0.22	-0.01	-2.13	-0.52	-1.04	-0.52	0.36	-0.07	1.23	-0.01
2007	0.23	-0.03	-2.51	-0.56	-1.57	-0.49	0.43	0.04	1.30	-0.02
2008	0.18	-0.08	-2.96	-0.64	-1.50	-0.40	0.55	0.15	1.34	-0.07
2009	0.18	-0.08	-3.63	-0.76	-1.47	-0.54	0.27	0.11	1.38	-0.06
2010	0.15	-0.10	-3.80	-0.90	-1.41	-0.58	0.39	0.12	1.44	-0.50
2011	0.13	-0.17	-3.98	-0.98	-1.30	-0.55	0.51	0.13	1.54	-1.33
2012	0.06	-0.22	-4.05	-1.08	-1.54	-0.56	0.61	0.20	1.73	-1.78
2013	0.01	-0.22	-4.30	-1.11	-1.35	-0.57	0.69	0.20	1.83	-2.78
2014	-0.02	-0.26	-4.14	-1.19	-1.19	-0.52	0.72	0.21	1.93	-2.33
2015	-0.08	-0.31	-4.17	-1.24	-1.20	-0.48	1.09	0.32	2.13	-0.28
2016	-0.03	-0.31	-4.11	-1.24	-1.04	-0.46	0.94	0.24	1.82	-0.32

Table 5 indicators of competitive advantage of various commodities in Singapore from 2000 to 2016 (%)

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2000	-0.22	-0.21	-0.02	-0.59	-0.09	0.08	-0.31	-0.10	-0.19	0.54
2001	-0.24	-0.19	0.03	-0.54	-0.06	0.18	-0.29	-0.08	-0.08	0.59
2002	-0.22	-0.09	0.02	-0.57	-0.10	0.25	-0.26	-0.06	-0.04	0.53
2003	-0.18	-0.20	-0.01	-0.39	-0.07	0.40	-0.19	0.00	-0.04	-0.17
2004	-0.20	-0.14	0.01	-0.36	-0.10	0.51	-0.21	0.00	-0.04	0.45
2005	-0.16	-0.18	0.00	-0.34	-0.09	0.44	-0.23	0.00	-0.12	-2.00
2006	-0.15	-0.15	0.00	-0.37	-0.10	0.47	-0.26	-0.09	-0.12	1.52
2007	-0.17	-0.12	0.00	-0.42	-0.16	0.50	-0.22	-0.02	-0.11	0.78
2008	-0.16	-0.16	-0.01	-0.60	-0.15	0.36	-0.28	-0.06	-0.10	0.98
2009	-0.17	-0.12	-0.12	-0.64	-0.13	0.43	-0.30	-0.01	-0.09	0.68
2010	-0.22	-0.10	-0.02	-0.72	-0.21	0.44	-0.23	0.08	-0.06	0.89
2011	-0.19	-0.14	-0.03	-0.81	-0.44	0.52	-0.28	0.07	-0.09	1.81
2012	-0.20	-0.13	-0.06	-0.86	-0.57	0.58	-0.28	0.02	-0.09	1.71
2013	-0.19	-0.22	-0.04	-0.93	-0.39	0.49	-0.24	0.05	-0.07	1.76
2014	-0.17	-0.15	-0.02	-0.95	-0.44	0.54	-0.27	0.06	-0.01	1.73
2015	-0.19	0.09	0.00	-0.76	-0.48	0.55	-0.27	0.10	-0.07	1.16
2016	-0.16	0.01	0.03	-0.61	-0.48	0.52	-0.25	0.06	-0.07	0.49

It can be seen from the above table that the indicative competition index of various commodities in Singapore is mostly negative. The competition index of chemicals, machinery and transportation equipment and other unclassified commodities was positive, among which chemicals were the most advantageous.

By comparing the competitive advantage indexes of the two countries, we can see that China has obvious advantages over Singapore in labor-intensive industries such as food, finished products distributed by raw materials, and miscellaneous finished products, while Singapore has obvious advantages in capital-technology-intensive industries such as chemicals, machinery and transportation equipment. Therefore, the industrial structure of the two countries can complement each other and benefit from each other.

4. Summary

Through the index analysis, the following innovative measures can be proposed for China to deepen the development of trade with Singapore: first, to vigorously develop the real economy. As the world's largest "world factory", China's strong manufacturing base can support the development of different industries. The real economy and virtual economy should be combined. Through international trade and regional trade with Singapore, the virtual economy can effectively serve the real economy.

Second, we need to focus on technological innovation. China's economic development should realize the transformation from a manufacturing power to a manufacturing power and even an innovation power, learn advanced national technologies, strive to develop technology-intensive industries, promote innovation through trade, and realize the two-wheel drive of trade and innovation.

Finally, to realize system innovation, China should make full use of the Singapore Chinese more and closer trade relations and trade complementary advantages, grasp the opportunities brought about by the "area" strategy, strengthen the political and cultural contact between the two countries, to strengthen people's friendly exchanges, enhance mutual understanding and traditional friendship, so as to promote the development of trade between the two countries. Close trade relations will also promote friendly exchanges and form a healthy long-term development of bilateral relations.

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