

Analysis and Countermeasures on the International Competitiveness of Telecommunication Service Trade between China, Japan, and South Korea

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Abstract

Purpose – Based on the telecommunication service trade data of China, Japan, and South Korea from 2009 to 2019, this paper compares and analyzes the international competitiveness of the three countries' telecommunication service trade, and finds the existing problems in China through the comparison, so as to make reasonable planning and industrial development strategy, and find away to catch up.

Design/methodology – The comparative analysis method was used to compare and analyze the international competitiveness of telecommunication service trade among China, Japan, and South Korea from the three aspects of market share, trade surplus, and export proportion represented by MS, TC, G-L, RCA, and CA.

Findings – The international competitiveness of telecommunication service trade among China, Japan, and South Korea does not have competitive advantages. China is larger than Japan and South Korea, but only close to average globally, and its share of trade in telecommunications services is lower than Japan and South Korea's.

Originality/value – This paper tries to explore international competitiveness in the field of telecommunication service trade, and through the comparison of five indicators to find problems in China, so as to put forward countermeasures to improve the international competitiveness of China's telecommunication service trade, and lay a foundation for subsequent research on the source factors of international competitiveness.

Keywords: CA, Telecommunication services trade, G-L, MS, RCA, TC

JEL Classifications: F40, O14

1. Introduction

At present, the world has entered the era of the service economy. Promoting the sustained development of the service trade is an important driving force for high-quality development of national economies and the promotion of higher-level opening. With the process of global economic integration and the rapid development of emerging industries, the phenomenon of service outsourcing and commercial division of labor is becoming more and more clear. The scale of the global service trade is growing rapidly, and the role of the service trade is becoming more and more important. According to UNCTAD data, global trade in services contracted in 2020 due to COVID-19. Tourism was the worst affected, losing 63% in the year and hitting tourism-oriented economies hard. International transport sales, which include passenger and freight exports, fell 20%. However, new growth was achieved in knowledge-intensive services

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trade, financial, insurance, commercial, and intellectual property services grew by 6.5% in the Asian market, and exports of communications, computer, and information services grew by about 10% in all parts of the world except Africa, opening up new opportunities for development. As a typical representative of knowledge-intensive service trade, telecommunication service trade is different from other service trade in that it requires the fastest speed of technological innovation, the widest universality, and the strongest permeability. Further, it has large R&D investment, high technological content, and rapid upgrading, and the technological environment is complicated and highly uncertain. Continuous innovation in communication technology has been driving the rapid development of trade in other services. Therefore, telecommunication service is not only a tradable object but also the basis of other trade, and its importance is self-evident. The development of telecommunication service trade is the inevitable result of the process of economic globalization, and also directly drives the development of finance, tourism, transportation, and other fields.

In 2020, China, Japan, and South Korea ranked 3rd, 10th, and 23rd, respectively, in the total import and export trade of telecommunications, computer, and information services. In 2020, Japan's total trade in telecommunications, computer, and information services was \$30.56 billion and \$10.63 billion, respectively, up 10.4% and 13.7% from 2019, accounting for 8.9% and 5.6% of the country's total trade in services. China's trade in telecommunications, computer, and information services totaled \$92 billion, up 14.1% from 2019, while imports grew 22.7% and exports 9.8%, accounting for 13.9% of total imports and exports of services. It is the world's third largest importer and the third largest exporter of telecommunications, computer, and information services. In 2020, Japan and South Korea ranked fourth and fifth in terms of trade with China, accounting for 6.8% and 6.1% of China's total import and export volume, respectively. Japan's top three trading partners are China, the United States, and South Korea. The top three major trading partners of South Korea are China, the United States, and Japan. It can be seen that China, Japan, and South Korea play a pivotal role in Asia and are one of each other's most important trading partners, with close international trade and cooperation.

Japan and South Korea are China's main competitors in Asia, and globally, and they compete in many fields. In emerging industries, the competition is more intense. Countries are scrambling for favorable resources and positions to win favorable situations for themselves. The communication industry is an emerging industry and a leading and strategic industry in many countries. Although Japan and South Korea have different development paths in the communication industry, they basically represent a higher level today. A comparative analysis of the international competitiveness of China's telecommunication service trade with Japan and South Korea is helpful to clearly see the gap between China and developed countries, find problems so as to formulate reasonable planning and industrial development strategy, and find a way to catch up quickly.

2. Theoretical Basis and Advance Research

2.1. Theoretical Basis

Under the conditions of economic globalization and fierce competition in the international market, every country tries to improve its international competitive strength, expand its share in the international market, improve its national welfare by developing industries with

competitive advantages, and cultivate products with core competitiveness. Industry competitiveness is competition in the same industry in the international market. Traditional trade theory offers an explanation, and stressed that factor endowment and the resulting cost advantages, namely the traditional international trade theory to explain the source of industry international competitiveness. It mainly includes the theory of absolute advantage, law of comparative advantage, and factor endowment theory.

2.1.1. Classical International Trade Theory

Adam Smith, a British classical economist in the 18th century, emphasized the role of specialization, capital accumulation, and foreign trade in promoting economic growth and development in his book "A Study on the Nature and Causes of National Wealth". In terms of international trade, Smith advocated free trade and put forward the theory of absolute advantage. Smith(1972) thought the professional division of labor, the increase of population and capital determine the growth of national wealth. All countries should make full use of their respective advantageous natural endowment or acquired conditions, and the international division of labor has absolute advantage production on the basis of the domestic products to foreign trade.

Based on Smith's liberal economic theory, Ricardo (2021) believed that there are two ways to increase national wealth. One is to maintain productive labor with more input, which can increase the quantity and value of products. The other is to increase labor productivity without increasing any labor quantity. Ricardo proposed the theory of comparative advantage trade and advocated the implementation of free trade. He believed that countries should produce and export products with a comparative advantage, and import products with a comparative disadvantage. The international division of labor and foreign trade brought by comparative advantage are important factors to promote economic growth.

2.1.2. Neoclassical International Trade Theory

Heckscher and Ohlin (1991) further developed the theory of international trade after Ricardo, whose basic idea of factor endowment theory is that the abundance of factors of production determines the relative price of goods and the pattern of trade. Ohlin assumes that countries have similar demand conditions and the same production efficiency of factors of production, and the difference in commodity prices determines the trade pattern. The differences in commodity prices are due to different factors of production in different countries, and different commodities need different proportions of production factors. When each country exports goods that make intensive use of its own abundant and cheap factors of production, and imports goods that make intensive use of its scarce and expensive factors of production, the trading nation gains comparative advantage(Ohlin,2001).

2.1.3. The Definition of International Competitiveness

In the 1980s, especially since the 1990s, the phase of globalization began and many developed and developing countries faced unprecedented international competition patterns. Under this background, analysis and research on international competitiveness began to take the lead in developed countries. In the following 30 years, the definition and evaluation of industrial competitiveness by governments and relevant scholars became a research hotspot, and numerous outstanding theories and viewpoints emerged.

In 1989, WEF and IMD jointly carried out research, and the two institutions jointly interpreted international competitiveness as analyzing the facts and policies of countries or regions to create and maintain an environment for enterprises to create more value and enhance the ability of people to benefit society (IMD, 1995/2003). In 1996, WEF started independent research due to differences with IMD. The difference lies in that WEF regards productivity as national (regional) competitiveness, and believes that people's well-being and national prosperity are brought by the improvement of productivity. Competitiveness assessment information comes from all aspects that determine the level of productivity including factors of production, policies, and institutions. International competitiveness is a collection of factors, policies, and systems that determine the productivity level of a country, and then the national economic prosperity and well-being (WEF, 2006). IMD states that productivity is one performance of competitiveness, and the country as the main competitiveness expression is a kind of comprehensive ability. Therefore, the evaluation information of competitiveness level should be all information about the current situation of society, economy, science, and technology and system of the evaluated economy.

Due to the huge differences in property rights systems, operation mechanisms, management philosophy, enterprise culture, development level, and other aspects of enterprises in various countries (regions), there are different explanations on the source of competitiveness in different countries (regions), which can be roughly summarized as the following three viewpoints.

- ① Nordic viewpoints. In this view, the quality of labor force, economic socialization, product and service quality, and high efficiency are the main factors that constitute competitiveness, and human development must be given importance to improve competitiveness.
- ② Commonwealth view. According to this view, adaptable labor force, free socialization, perfect financial facilities, innovative entrepreneurs, and abundant natural resources are the main factors that constitute competitiveness.
- ③ Asian perspective. This view attaches importance to the role of the government and holds that the effective industrial and financial policies of the government are important factors to improve international competitiveness (Zhang Wen-Bing, 2006).

2.2 Relevant Research on Trade in Telecommunication Services

As a new service trade, telecommunication service trade relies on the update and iteration of digital technology, and has achieved fast development. Wang Xiao-Hong and Fei Jiao-Yan (2020) believed that China's ICT service trade was characterized by fast growth and optimized export structure, and the competitiveness of information and communication enterprises was greatly enhanced. Liu Zhong-Yin (2017) pointed out that China's export of telecommunication service trade has increased significantly, but its international competitiveness and opening level need to be improved. Jin Hong-Bin (2018) stressed the importance of seizing the opportunities brought by the Belt and Road Initiative to improve the development level of China's telecommunication service trade. BRICS is an important object of study. Du Zhen-Hua (2012), with BRICS countries as the research object, analysis showed competition in the field of telecommunication service trade of BRICS countries, but with communications services representative of an emerging service that contain huge development potential, through complementary cooperation can on the scale, speed, and quality to narrow the gap with developed countries. Biryukova and Matiukhina (2019) studied the information technology services of BRICS countries and found that although the export

of information and communication technology services of BRICS countries increased, their competitiveness level declined. It was also pointed out that investment and improvement of the terms of trade in ICT services can greatly promote the growth of BRICS ICT services exports. Zhou Bi-Xuan and Qu Wen-Jing(2018) pointed out that the new pattern of vertical and vertical integration development of global telecommunication services is taking shape, and China should seize the major opportunity of the Belt and Road Initiative, establish a globally-oriented strategy, and promote China's telecommunication service trade export. Luo Wen-Qi(2016) emphasized that the structure of China's telecommunication service trade is constantly optimized, but the monopoly of the telecommunication service industry and imperfect laws and regulations also restrict the development of telecommunication service trade. Zhang Jun and Yu Miao(2015) found a long-term stable relationship between the openness of China's telecommunication services and its international competitiveness by constructing the openness index of telecommunication services. Appropriately enhancing the openness level is conducive to improving the international competitiveness of China's telecommunication service trade.

3. Current Development Status of China-Japan-South Korea Telecommunication Service Trade

3.1. Development Status of China's Telecommunication Service Trade

In the past decade, China's telecommunication services have developed rapidly and presented an overall upward trend, from 24.078 billion US dollars in 2009 to 41.792 billion US dollars in 2019, with an average annual growth rate of 6.32%. Except for 2009 and 2017, the telecommunication service trade maintained a surplus in all other years, and the trade balance continued to rise. However, China's total trade in telecommunication services accounts for 0.56% of the total trade in services, indicating that China's telecommunication services are not fully developed. The share of communications service exports in global communications service exports rose from 1.37 percent in 2009 to 2.71 percent in 2019. During the same period, the proportion of telecommunication service imports in world telecommunication service imports fluctuated, dropping to 1.23% in 2014, and then slowly rising.

3.2. Development Status of Japan's Telecommunication Service Trade

From 2009 to 2019, the export volume of Japan's telecommunication service trade fluctuated around \$1 billion, but the total volume of telecommunication service trade showed an overall growth trend with an average annual growth rate of 5.25%. In 2014, there was a significant increase, up \$1.2 billion from the previous year. Japan's telecommunication service trade structure is unbalanced, the import amount is obviously higher than the export amount, and the deficit continues to increase. It had a trade surplus until 2017, but fell in 2018, causing a trade deficit again.

3.3. Development Status of South Korea's Telecommunication Service Trade

Over the past decade, South Korea's communications services have experienced slow growth, with imports and exports fluctuating at \$1.3 billion, and negative growth from 2015

to 2017. From 2009 to 2019, South Korea's total exports and imports of telecommunications services grew at an annual rate of minus 0.58 percent. The import and export structure of South Korea's telecommunication service trade is also unbalanced, with the import volume significantly higher than the export volume, and the country has been in a deficit.

Table 1. Comparison of Trade Scale in Telecommunication Services

Unit: \$100 million

Year	<u>Import and Export</u>			<u>Export</u>			<u>Import</u>			<u>Balance</u>		
	China	Japan	Korea	China	Japan	Korea	China	Japan	Korea	China	Japan	Korea
2009	24.08	17.92	14.44	11.98	6.68	5.55	12.10	11.24	8.89	-0.11	-4.56	-3.34
2010	23.57	17.60	14.92	12.20	7.35	6.00	11.37	10.25	8.92	0.83	-2.90	-2.92
2011	29.17	17.33	15.06	17.26	7.60	5.81	11.91	9.73	9.26	5.36	-2.13	-3.45
2012	34.41	21.52	15.54	17.93	9.68	6.00	16.47	11.84	9.54	1.46	-2.16	-3.54
2013	33.01	22.74	16.96	16.72	9.16	6.47	16.29	13.57	10.49	0.43	-4.41	-4.02
2014	23.04	34.65	13.44	12.94	13.84	5.54	10.10	20.82	7.89	2.84	-6.98	-2.35
2015	27.10	26.99	13.78	16.54	10.01	6.57	10.55	16.98	7.21	5.99	-6.97	-0.65
2016	28.84	32.23	13.26	17.02	12.75	6.05	11.82	19.48	7.21	5.20	-6.73	-1.16
2017	35.84	38.18	12.42	17.81	19.50	5.22	18.02	18.68	7.20	-0.21	0.82	-1.98
2018	36.75	30.85	14.30	20.98	12.61	6.31	15.77	18.24	7.99	5.21	-5.63	-1.67
2019	41.79	28.40	13.70	23.97	14.30	5.17	17.82	14.10	8.53	6.16	0.19	-3.35

Data source: UNCTAD

3.4. Comparison of Service Trade between China, Japan, and South Korea

As can be seen from Table 1, China's trade in telecommunication services is the largest among China, Japan, and South Korea. It has developed rapidly in the past decade, and its total trade reached 4.179 billion US dollars in 2019, widening the gap with Japan and South Korea. The annual growth rate was 6.32 percent, outpacing Japan's 5.25 percent and South Korea's -0.58 percent. In contrast, South Korea's total trade in communications services has grown slowly, staying at around \$1.3 billion for nearly a decade, and even recording negative growth some years. South Korea's total trade in telecommunications services has been lowest among the three, with exports of less than \$700 million. In addition, China is the only country to maintain a trade surplus in communications services. With the rapid growth of the overall scale of trade in services, the balance of trade in telecommunication services is increasing, with 600 million dollars in 2019. Both Japan and South Korea are deficit countries in the telecommunication service trade. Japan's service trade deficit fluctuates between \$400 million, indicating that its service trade import and export growth rate is relatively stable. By contrast, South Korea's total trade in services is small, but its deficit is smaller than Japan's. This shows that South Korea's import and export of service trade is relatively balanced. In terms of the internal structure of trade in services, the total volume of telecommunication services among China, Japan, and South Korea accounts for only 0.56%, 0.76%, and 0.71% of the total volume of trade in services. Therefore, considering the basic situation of total import and export of telecommunication services of the three countries and the proportion of telecommunication service trade in the internal structure of service trade, the development of telecommunication service trade of the three countries is not sufficient.

4. Analysis of the International Competitiveness of China-Japan-South Korea Telecommunication Service Trade

4.1. International Competitiveness Index System

The analysis index of international competitiveness is mainly reflected in three aspects. First, the index of export market share reflects the market share. Second, the TC index and G-L index reflect net export (trade surplus). Third, the RCA index and CA index reflect the proportion of exports (Zheng Ji-Chang and ZhouLei, 2005).

4.1.1. Share of Export Market

In terms of market share, there is export market share MS index, which is the proportion of a country's total exports in the world's total exports, indicating the proportion of the country's exports in the world market, and reflecting the overall competitiveness or changes in the competitive position of a country's exports (Tian Yuan and Fu Yi-Zhong, 2013). An increase in the proportion indicates that exports are becoming more competitive.

$$MS_{ij} = X_{ij} / X_{wj} \quad (1)$$

Where MS_{ij} represents the market share index of national products, X_{ij} represents the total export volume of product j in country i ; X_{wj} stands for the total amount of world exports of product j . The higher the MS_{ij} value is, the stronger the international competitiveness of the industry in which the product is located; otherwise, it is weaker.

The international competitiveness of an industry will ultimately be reflected in the market share of its products in the international market. In free and sound market conditions, national markets are open to all countries, as are international markets. The international market share of a product reflects the international competitiveness of the industry in which the product is located.

4.1.2. TC Index

The TC index, which represents the proportion of a country's import and export trade balance in total import and export, is also known as trade specialization coefficient, trade competitiveness index, comparative advantage index, or net export ratio. It is a powerful tool for analyzing the international competitiveness of industry structure, and can reflect the comparative advantage of the calculated object in general (Pei Chang-Hong, Wang Dong and Tang Jing, 2011). The TC index can be used to analyze the international competitiveness of the service trade as a whole.

$$TC = (X_{ij} - M_{ij}) / (X_{ij} + M_{ij}) \quad (2)$$

Where X_{ij} is the export volume of product j in country i ; M_{ij} is the import amount of product j in country i .

The value range of TC index is (-1,1). When the value is close to 0, it indicates that the comparative advantage is close to the average level. When the value is greater than 0, it indicates that the comparative advantage is large, and the closer the value is to 1, the stronger the competitiveness is. If $TC = -1$, it means that the country (or region) imports commodity j , but does not export it. If $TC = 1$, it means that the country (or region) only exports commodity j without importing it.

4.1.3. G-L Index

With the development of the world economy and the adjustment of world industrial structure, industrialization is increasingly popularized and deepened in developing countries. Intra-industry division of labor and intra-industry trade are increasingly replacing inter-industry division of labor and inter-industry trade. Trade between industries or products is actually the result of economic division of labor. The finer the division of labor, the more professional and competitive the industry. Therefore, the intra-industry trade index can also measure the competitiveness of a country's industries. In addition, according to the statistics of different countries and industries, the higher the degree of industrialization and the more developed the economy, the proportion of intra-industry trade is generally larger. The less developed the economy, the smaller the proportion of intra-industry trade. The G-L index is the most effective way to measure intra-industry trade so far, and was developed by Grubel Herbert G. and Lloyd P. J. (1975) as a statistical index designed to measure the share of intra-industry trade in various types of trade (MengXiang-Juan, 2009).

$$G - L = 1 - |X_i - M_i| / (X_i + M_i) \quad (3)$$

G-L represents the intra-industry trade index of a country's industry, X_i is the export value of the industry, and M_i is the import value of the industry.

The value range of the G-L index is (0,1). The larger the value, the more developed intra-industry trade is. When the index is 1, it indicates that the export volume and import volume of a certain commodity are the same, which is complete intra-industry trade. When the index is 0, it indicates that the commodities of a certain industry are not exported, but all imported. The closer the G-L index is to 1, the higher the degree of intra-industry trade is. On the contrary, the closer it is to 0, the lower the degree of intra-industry trade is.

4.1.4. RCA Index

The RCA index is an indicative comparative advantage index, which reflects the comparative advantage of a country (region) in a certain industry trade. It is expressed by the ratio of the share of the industry in the country's exports and the share of the industry in the world's total trade (Guo Xin-Ru, Gu Jiang, and Zhu Wen-Jing, 2010), excluding the influence of the fluctuation of the national total and the fluctuation of the world total, which can better reflect the comparative advantage of the export of a certain industry in a country compared with the average export level of the world.

$$RCA = (X_{ij} / Y_i) / (X_{wj} / Y_w) \quad (4)$$

Where X_{ij} represents the export volume of product j of country i ; Y_i represents all product exports of country i , including commodity exports and service trade exports; X_{wj} represents the world export volume of product j ; and Y_w stands for world product exports. In the telecommunication service trade, X_{ij} is the export value of telecommunication service trade of country i . X_{wj} is the export volume of world telecommunication service trade, and the meanings of other symbols remain unchanged.

It is generally believed that an RCA index greater than 2.5 indicates that the country has strong international competitiveness in the service trade. RCA between 1.25 and 2.5 indicates that the country has strong international competitiveness in the service trade. If it is between

1.25 and 0.8, it is considered that the country's service trade has moderate international competitiveness. If less than 0.8, it indicates that the international competitiveness of the country's service trade is relatively weak (Wu Wen-Juan, 2011).

4.1.5. CA Index

The CA index is the index of explicit competitive comparative advantage. An industry may have both exports and imports, but the index only considers the relative proportion of exports of an industry or product, ignoring the impact of imports of that industry or product (Kang Wen-Cheng, 2014). When there is inter-industry trade between countries or import and export trade within industries, such a comparative advantage without considering the import situation may lead to an incorrect conclusion.

In order to eliminate the influence of imports, Vollrath designed an index of revealed competitive advantage in 1988.

$$CA = RCA - (M_{ij}/M_i)/(M_{wj}/M_w) \quad (5)$$

M_{ij} represents the import of product j of country i , M_i represents the total imports of country i in a certain period, M_{wj} represents the imports of product j in the world market during the same period, and M_w represents the total imports of the world market during the same period. The formula above subtracts the comparative advantage of imports from the comparative advantage of exports to obtain the real competitive advantage of domestic products or industries.

If the CA index of a country is greater than 0, it indicates that the country has a comparative advantage in the service trade. If the CA index is less than 0, it indicates that the country has no comparative advantage in the service trade (Zhuang Rui and Fang Ling, 2013). The higher the index, the stronger the international competitiveness of country's service trade. Conversely, the lower the index, the weaker the international competitiveness of the country's service trade.

4.2. Comparative Analysis of International Competitiveness

4.2.1. Comparison of Market Share MS

As can be seen in Table 2, the export market share index of China's telecommunication service trade shows an upward trend from 2009 to 2019, indicating that China's service trade occupies a gradually increasing share in the world market, and its competitiveness in telecommunication service trade is gradually enhanced. The export market share index rose from 1.39 in 2009 to 2.71 percent in 2019, the largest increase among the three countries. On the other hand, South Korea's export market share index of communications service trade is on the decline, with its global market share falling from 0.64 percent in 2009 to 0.59 percent in 2019, weakening its competitiveness in the communications service trade. Japan's telecommunication service trade shares in the world market are basically around 1%, showing a trend of substantial growth in 2017, and market share reached 2.14%. Overall trend performance is stable and on the rise. However, the international market shares of China, Japan, and South Korea are not high and their competitiveness in the international market is not strong.

Table 2. Comparison of Market Share of Telecommunication Service Trade

Unit: \$100 million

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X_w World	860.36	843.53	935.34	947.87	975.51	1015.90	929.93	926.68	910.07	947.14	884.09
X_i China	11.98	12.20	17.26	17.93	16.72	12.94	16.54	17.02	17.81	20.98	23.97
Japan	6.68	7.35	7.60	9.68	9.16	13.84	10.01	12.75	19.50	12.61	14.30
Korea	5.55	6.00	5.81	6.00	6.47	5.54	6.57	6.05	5.22	6.31	5.17
MS China	1.39%	1.45%	1.85%	1.89%	1.71%	1.27%	1.78%	1.84%	1.96%	2.22%	2.71%
Japan	0.78%	0.87%	0.81%	1.02%	0.94%	1.36%	1.08%	1.38%	2.14%	1.33%	1.62%
Korea	0.64%	0.71%	0.62%	0.63%	0.66%	0.55%	0.71%	0.65%	0.57%	0.67%	0.59%

Notes: $MS = X_i/X_w$. MS represents the market share index of telecommunication services, X_i represents the total export volume of telecommunication services in country i , and X_w represents the total worldwide export of telecommunications services.

Data Source: Statistical calculation based on UNCTAD database.

4.2.2. Comparison of trade competitiveness TC index

Table 3. Comparison of TC Indices for Telecommunication services Trade

Unit: \$100 million

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X_i China	11.98	12.20	17.26	17.93	16.72	12.94	16.54	17.02	17.81	20.98	23.97
Japan	6.68	7.35	7.60	9.68	9.16	13.84	10.01	12.75	19.50	12.61	14.30
Korea	5.55	6.00	5.81	6.00	6.47	5.54	6.57	6.05	5.22	6.31	5.17
M_i China	12.10	11.37	11.91	16.47	16.29	10.10	10.55	11.82	18.02	15.77	17.82
Japan	11.24	10.25	9.73	11.84	13.57	20.82	16.98	19.48	18.68	18.24	14.10
Korea	8.89	8.92	9.26	9.54	10.49	7.89	7.21	7.21	7.20	7.99	8.53
TC China	0.00	0.04	0.18	0.04	0.01	0.12	0.22	0.18	-0.01	0.14	0.15
Japan	-0.25	-0.16	-0.12	-0.10	-0.19	-0.20	-0.26	-0.21	0.02	-0.18	0.01
Korea	-0.23	-0.20	-0.23	-0.23	-0.24	-0.17	-0.05	-0.09	-0.16	-0.12	-0.24

Notes: $TC = (X_i - M_i)/(X_i + M_i)$. X_i is the export volume of telecommunication services in country i , and M_i is the import value of telecommunication services in country i .

Data source: Statistical calculation based on UNCTAD database.

As can be seen in Table 3, during 2009-2019, the TC index of China's telecommunication service trade was within the range of (0,0.2), with a slight competitive advantage. The TC index of telecommunication service trade between Japan and South Korea is basically negative, and the value is in the range of (-0.3,0), indicating that both countries have weak competitive disadvantage in the export of telecommunication service trade. From the development of China, Japan, and South Korea over past years, the TC index of the three countries' telecommunication service trade largely fluctuates within a very small range and is relatively stable. China's competitive advantage in the telecommunication service trade is higher than that of Japan and South Korea. However, in 2017, the TC index of Japan's telecommunication service trade turned from negative to positive, and was the highest among the three countries, which turned from weak competitive disadvantage to weak competitive

advantage. South Korea has a relatively obvious competitive disadvantage in telecommunication service trade. The TC index of telecommunication service increased to -0.05 in 2015, approaching the average level of international competition. However, it continued to decline and reached -0.24 in 2019.

4.2.3 G-L index Comparison of Intra-Industry Trade

From the perspective of intra - industry trade, as shown in Table 4, China has the highest degree of intra - industry trade among the three, which has been maintained at a high level for many years. The G-L index of Japan is over 0.8, and the degree of intra-industry trade is high, although it has declined to some extent after 2012. However, the index rose after 2015 and reached 0.99 in 2017. The degree of intra-industry trade in South Korea was relatively low before. Since 2014, the index has been above 0.85, and intra-industry trade has gradually increased. Combined with the TC index, it can be found that the decline of the G-L index of South Korea's intra-industry trade in telecommunication services is caused by the weakening of the net export capacity, and the increase of the index is caused by the enhancement of export capacity.

Table 4. Comparison of TC Indices for Telecommunication Services Trade

		Unit: \$100 million										
Year		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X _i	China	11.98	12.20	17.26	17.93	16.72	12.94	16.54	17.02	17.81	20.98	23.97
	Japan	6.68	7.35	7.60	9.68	9.16	13.84	10.01	12.75	19.50	12.61	14.30
	Korea	5.55	6.00	5.81	6.00	6.47	5.54	6.57	6.05	5.22	6.31	5.17
M _i	China	12.10	11.37	11.91	16.47	16.29	10.10	10.55	11.82	18.02	15.77	17.82
	Japan	11.24	10.25	9.73	11.84	13.57	20.82	16.98	19.48	18.68	18.24	14.10
	Korea	8.89	8.92	9.26	9.54	10.49	7.89	7.21	7.21	7.20	7.99	8.53
G-L	China	1.00	0.96	0.82	0.96	0.99	0.88	0.78	0.82	0.99	0.86	0.85
	Japan	0.75	0.84	0.88	0.90	0.81	0.80	0.74	0.79	0.98	0.82	0.99
	Korea	0.77	0.80	0.77	0.77	0.76	0.83	0.95	0.91	0.84	0.88	0.76

Notes: $G - L = 1 - |X_i - M_i| / (X_i + M_i)$ G-L represents the intra-industry trade index of a country's telecommunications services, X_i is the export value of telecommunications services, and M_i is the import value of telecommunications services.

Data source: Statistical calculation based on UNCTAD database.

4.2.4 RCA Index Comparison

As can be seen from Fig. 4, the RCA index of the telecommunication service trade of China, Japan, and ROK is basically less than 0.8, indicating that the overall international competitiveness of the service trade of the three countries is relatively weak. In a horizontal comparison, the RCA index of Japan is significantly higher than that of China and South Korea, indicating that Japan has a significant comparative competitive advantage compared with China and South Korea. From a longitudinal comparison, China's RCA index has been maintained at the level of 0.18, slightly decreasing in 2013 and 2014, and slowly increasing after 2014. Japan's RCA index showed an upward trend and reached a small peak year of 0.56 in 2017. Korea has maintained steady growth at 0.2-0.25. On the whole, the gap between China and South Korea is not large. Compared with Japan, both countries lack competitive advantages.

Table 5. RCA Index of Telecommunication Services Trade

		Unit: \$100 million										
Year		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X_w	World	860.36	843.53	935.34	947.87	975.51	1015.90	929.93	926.68	910.07	947.14	884.09
X_i	China	11.98	12.20	17.26	17.93	16.72	12.94	16.54	17.02	17.81	20.98	23.97
	Japan	6.68	7.35	7.60	9.68	9.16	13.84	10.01	12.75	19.50	12.61	14.30
	Korea	5.55	6.00	5.81	6.00	6.47	5.54	6.57	6.05	5.22	6.31	5.17
Y_w	word	162101.81	192713.79	228082.59	231063.58	238363.80	242504.80	215576.65	211293.14	232752.78	256470.95	252459.04
Y_j	China	13451.85	17560.93	20994.28	22502.90	24160.11	25614.34	24921.02	23071.61	24914.36	27581.46	27826.49
	Japan	7015.84	9041.87	9640.10	9355.07	8498.40	8539.92	7875.58	8208.60	8852.08	9322.73	9129.85
	Korea	4360.75	5493.33	6457.74	6510.04	6629.57	6849.93	6242.55	5902.35	6633.96	7039.17	6414.53
RCA	China	0.17	0.16	0.20	0.19	0.17	0.12	0.15	0.17	0.18	0.21	0.25
	Japan	0.18	0.19	0.19	0.25	0.26	0.39	0.29	0.35	0.56	0.37	0.45
	Korea	0.24	0.25	0.22	0.22	0.24	0.19	0.24	0.23	0.20	0.24	0.23

Notes: $RCA = (X_i/Y_i)/(X_w/Y_w)$ X_i is the export value of telecommunication service trade of country i , X_w is the export volume of world telecommunication service trade, Y_i represents all product exports of country i , and Y_w stands for world product exports.

Data source: Statistical calculation based on UNCTAD database.

4.2.5. CA Index Comparison

Table 6 shows that the CA indexes of telecommunication service trade of China, Japan and South Korea are all negative, indicating that the telecommunication service trade of the three countries has no competitive advantage. The CA index of China has always been higher than that of Japan and South Korea, but it has always fluctuated around 0, indicating that although China has competitive advantages over Japan and South Korea, its competitiveness in the international market is weak. Japan's CA index continued to decline after 2012 before recovering slightly in 2017. Although the CA index of Korea is less than zero, it is growing continuously, indicating that Korea lacks an international competitive advantage, but the degree of international competitive disadvantage is decreasing, and the international competitive advantage is gradually accumulating.

The international competitiveness index of telecommunication service trade can be evaluated from three aspects and five indicators. In terms of market share, the export market share index of China and Japan showed an upward trend, while that of Korea showed a downward trend. From the TC and G-L indexes of trade surplus, the international competitiveness of service trade among China, Japan, and South Korea is not strong, and the degree of intra-industry trade in South Korea is relatively low. The proportion of RCA and CA index in export further proves that China, Japan, and South Korea have weak international competitiveness in telecommunication service trade. On the whole, the international competitiveness of China's telecommunication service trade is higher than that of Japan and South Korea, which indicates that China's telecommunication service trade has certain competitiveness in Asia. However, in terms of the proportion of exports, China's RCA index is less than 0.8, and the CA index trends to 0, indicating that China's telecommunication service trade does not have competitive advantages globally. The TC index of China's telecommunication service trade is close to 0, which also indicates that the competitive advantage of China's telecommunication service trade in the world is only close to the average level. Therefore, China is not yet a communications and trade power. In addition, the proportion of China's total trade in telecommunication services to its total trade in services is

not as high as that of Japan and South Korea (see Table 1), which indicates that China's trade in telecommunication services still has great room for improvement. The trade in telecommunication services among the three countries is not in balance. In the future, attention should be paid to maintaining a balanced and stable development of the trade in telecommunication services.

Table 6. CA Index of Telecommunication Services Trade

		Unit: \$100 million										
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
M_{wj}	World	499.40	562.42	670.35	674.83	712.91	823.03	749.13	739.46	740.26	763.07	713.40
M_{ij}	China	12.10	11.37	11.91	16.47	16.29	10.10	10.55	11.82	18.02	15.77	17.82
	Japan	11.24	10.25	9.73	11.84	13.57	20.82	16.98	19.48	18.68	18.24	14.10
	Korea	8.89	8.92	9.26	9.54	10.49	7.89	7.21	7.21	7.20	7.99	8.53
M_w	word	162568.37	192980.36	227703.26	231401.16	236952.88	24240.13	216279.64	211314.72	233113.02	256283.87	252365.27
M_i	China	11648.43	15896.48	19913.28	20997.05	22805.98	23921.16	21151.07	20400.22	23113.81	26609.02	25790.66
	Japan	7077.14	8587.63	10310.40	10705.45	10032.13	10046.31	8267.04	7939.11	8651.33	9518.66	9272.33
	Korea	4049.64	5221.34	6270.29	6277.77	6252.39	6407.56	5486.23	5183.40	6049.14	6639.97	6301.10
RCA	China	0.17	0.16	0.20	0.19	0.17	0.12	0.15	0.17	0.18	0.21	0.25
	Japan	0.18	0.19	0.19	0.25	0.26	0.39	0.29	0.35	0.56	0.37	0.45
	Korea	0.24	0.25	0.22	0.22	0.24	0.19	0.24	0.23	0.20	0.24	0.23
CA	China	-0.17	-0.09	0.00	-0.07	-0.07	0.00	0.01	0.00	-0.06	0.01	0.00
	Japan	-0.34	-0.22	-0.13	-0.13	-0.19	-0.22	-0.30	-0.35	-0.12	-0.28	-0.09
	Korea	-0.48	-0.34	-0.28	-0.30	-0.32	-0.17	-0.14	-0.16	-0.17	-0.16	-0.25

Notes: $CA = RCA - (M_{ij}/M_i)/(M_{wj}/M_w)$ M_{ij} represents the import of telecommunication services in country I , M_i represents the total import in country i in a certain period, M_{wj} represents the total import of telecommunication services in the world market in the same period, and M_w represents the total import in the world market in the same period.

Data source: Statistical calculation based on UNCTAD database.

5. The Counter Measures to Enhance the International Competitiveness of China's Telecommunication Services

Based on the China, South Korea, and Japan telecommunication service trade competitiveness assessment, China's current market share is low, and telecommunication services communications service trade accounts for a proportion of total trade in services lower than Japan and South Korea. As a result, Chinese telecommunication enterprises need to broaden the telecommunication service trade export market as soon as possible, improve market share, and actively improve the quality of service enterprises to enhance competitiveness.

5.1. Strengthen Market Opening and Improve the Technological Innovation Level of China's Communication Industry

The proportion of China's exports in the world's communications services trade is low. In 2009, China's exports accounted for 1.39% of the world's communications services trade exports, but only reached 2.71% in 2019. Although China's information and communications technology have a certain advantage in international competition, relevant enterprises in China still need to continue to strengthen independent research and development and innovation, so as to improve the international competitiveness of service trade, which lays a

foundation for expanding the export of telecommunication service trade. First, to break the communications industry monopoly market structure, beginning from introducing market competition strength, gradually change with China mobile, China telecom, and China unicom three division management situation of the market, stimulate domestic enterprise technology innovation, improve the utilization rate of limited resources. And adapt to the international competition of the market system. Cultivate telecommunication service trade enterprises with stronger international competitiveness. Secondly, communication related enterprises should actively undertake offshore service outsourcing and improve the technological innovation level of enterprises. In the process of undertaking offshore service outsourcing, enterprises will have an obvious spillover effect, among which undertaking offshore service outsourcing plays the most obvious role in promoting technological innovation(Wang Xiao-Hong, Meng Li-Jun and Guo Xia, 2020). Domestic telecommunication enterprises in the process of the outsourcing contract execution should take an active part in the party's technology, rules, standards, and other aspects of training.

5.2. Actively Participate in RCEP to Create an Enabling International Environment

China's strict protection of the domestic communication market not only blocks the way for domestic enterprises to enter the international market, it also makes enterprises face more restrictions in foreign markets. Therefore, telecommunication service trading enterprises should be encouraged to actively participate in a more open international market, make full use of global resources and international marketing means, and promote enterprises onto the international stage (Wu Shao-Chen, 2021). China should strive to participate in RECP, vigorously develop the free trade area, and create new conditions for China's telecommunication service trade. China must also actively foster a favorable international environment. For example, in view of the reality that China is accelerating into globalization, leading enterprises in communication should actively cut a figure in international business negotiations, adhere to their own development demands and goals, and integrate into the international market as soon as possible. At the same time, on the basis of improving the domestic telecommunication service trade market, we will give full play to the trend effect and win a better international market for more Chinese telecommunication service trade enterprises.

5.3. Strengthen the Cultivation of Versatile Talents in the Field of Telecommunication Service Trade

Today, with the deepening of globalization, countries attach more importance to human resources, and the competition for talents is more intense. To strengthen personnel training in the field of telecommunication service trade in China, increase the cultivation of international talents, set up education resources sharing platform, realize the efficient configuration education resources, join language courses in the curriculum, and train to adapt to the current communication field of service trade in the majority language, such as English, Spanish, or German. At the same time, China should also focus on service trade of global market competition, join important global markets in the laws and regulations of learning content, improve the communication and understanding of the international legal service trade practitioners to a master level, and improve enterprise in implementing the strategy of going out, as these can be completed in a shorter period of time to adapt to the local market(WangQing,2020). At the same time, it is also beneficial for telecommunication

service trade enterprises to better participate in international negotiations and play a bigger role in the formulation of international telecommunication service trade rules. On the other hand, the current talent training system should be optimized, focusing on the telecommunication service trade management talent and technology research and development talent training(Han Ai-Li,2017). The former is mainly to train more middle and senior talents to know technology and management, and improve the level of telecommunication service trade enterprises to participate in international market competition. The latter is mainly to improve the independent innovation ability of communication enterprises, from market imitators to market leaders with their own core products, and fundamentally improve the export capacity of telecommunication service trade.

6. Conclusion

Based on the existing data, this paper calculates the telecommunication service trade data of China, Japan, and South Korea from 2009 to 2019. Using the five indicators of MS, TC, G-L, RCA, and CA, it was found that the international competitiveness of the telecommunication service trade of China, Japan, and South Korea is weak, but the international competitiveness of China's telecommunication service trade is higher than that of Japan and South Korea. It is competitive only in Asia. Therefore, it is necessary to improve the technological innovation level of China's communication industry, actively participate in the construction of RCEP (Regional Comprehensive Economic Partnership Agreement) to create a favorable international environment, strengthen international cooperation to improve service quality, and increase the training of all-round talents in the field of communication service trade to improve the international competitiveness of service trade.

In data acquisition, it is a challenging task to obtain reliable communication service trade data between China, Japan, and South Korea from 2009 to 2019 based on the current international statistical conditions. In reviewing the data of all parties, individual data were not fully available and alternative methods had to be adopted. Obviously, the explanatory power of alternative data for the evaluation of international competitiveness will have a certain impact.

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