On the Relationship Between Computer and Information Services and the Development of Global Trade

Yao Gu¹*

¹International Economy and Trade Research Labs of Wanjiang University of Technology, Maanshan, Anhui, 243031, China

*Corresponding author e-mail: guyaio@wjut.edu.cn

Abstract. With the development of society and Internet information, the society has gradually become an information age. In the background of the information age, the correlation and competition between computer information services and international trade have become increasingly prominent. Through the changes of MS index, TC index and CA index, this paper mainly analyzes the connection and competition between computer information services and international trade.

Keywords: Computer and Information Services, Trade in Services

1. Introduction
With the maturity of computer technology and the deepening of global informatization, the world's computer and information service trade are developing rapidly. In 2011, the world's computer and information service trade export value was 249.5 billion U.S. dollars. It has more than quadrupled compared with 2001. The computer and information service industry is an important pillar industry in the era of knowledge economy. It serves the fields of manufacturing, finance, science education and people's daily life, etc. It has a strong industry driving force and radiation. Therefore, the international competitiveness of computer and information service trade will gradually become an important indicator to measure the modernization level and comprehensive strength of a country or region [1].

2. Calculating methods
Competitiveness level measurement methods mainly include three indexes: international market share index (MS index), trade competitive advantage index (TC index) and revealed competitive advantage index (CA index). The change formula of MS index is shown in public notice (1). TC index change formula is shown in public notice (2), CA index change formula is shown in public notice (3):

\[ MSd = \frac{(Ai - Ai - 1)}{(Ai - 1)} \]  \hspace{1cm} (1)

Among them, MSd is the MS index change, a negative number indicates a decline in the index, and a positive number indicates an increase; Ai is the value of the MS index for i products of a country in the current year, and Ai-1 is the value of the MS index in the previous year [2].

\[ TCd = \frac{(Bi - Bi - 1)}{Bi - 1} \]  \hspace{1cm} (2)
Among them, TCd is the change of TC index, a negative number indicates a decline in the index, and a positive number indicates an increase; Bi is the value of the TC index of a country's i products in the current year, and Bi-1 is the value of the TC index in the previous year.

\[
CAd = \frac{(Ci - Ci - 1)}{Ci - 1}
\]

Among them, CAd is the change in the CA index, a negative number indicates a decline in the index, and a positive number indicates an increase; Ci is the value of the CA index of a country's i products in the current year, and Ci-1 is the value of the CA index in the previous year.

Since a single index cannot fully and accurately reflect the international competitiveness level and dynamic changes of a country's computer and information service trade, this article attempts to construct a comprehensive evaluation index of international competitiveness composed of the MS index, TC index, and CA index. The comprehensive index is composed of two parts: competitiveness level (Li) and competitiveness change (Tj), each accounting for 1/2 weight. Competitiveness level (Li) is weighted by MS index, TC index, and CA index \[3\]. The weights are all 1/6; Competitiveness change (Tj) is calculated by weighting the changes of the three indicators, and the weights are all 1/6. Table 1 shows the comprehensive evaluation index of the international competitiveness of computer and information service trade.

**Table 1.** Comprehensive evaluation index of international competitiveness of trade in computer and information services

| Target layer | Basic indicators | (Li) | (Tj) |
|--------------|------------------|------|------|
| International Competitiveness of Computer and Information Service Trade | Export market share (MS) | \(L_1\) | \(T_1\) |
| Competitiveness level (Li) (weight 1/2) | International Trade Competitive Advantage Index (TC) | \(L_2\) | \(T_2\) |
| Change in competitiveness (Tj) (weight 1/2) | Revealed Competitive Advantage Index (CA) | \(L_3\) | \(T_3\) |
| | MS index change (MSd) | \(T_{11}\) | 1/6 |
| | TC index change (TCd) | \(T_{12}\) | 1/6 |
| | CA index change (CAd) | \(T_{13}\) | 1/6 |

According to the comprehensive evaluation index system in Table 1, the comprehensive international competitiveness of a country's computer and information service trade can be calculated by formula (4):

\[
IT = \frac{1}{2}Li + \frac{1}{2}Tj = \frac{1}{2}\sum Li + \frac{1}{2}\sum Tj(i, j = 1, 2, \cdots, n, \text{Weights} 1/6)
\]

### 3. Calculation results and analysis

#### 3.1. To measure the results

According to the annual data of computer and information service trade released by the WTO website World Trade Statistics Database, the international competitiveness of my country’s computer and information service trade calculated according to the formula, MS index, TC index, CA index and the annual changes of these three indexes are shown in Table 2. The comprehensive level of international competitiveness of computer and information service trade between China and some countries calculated according to the formula is shown in Table 3 [4].
Table 2. International competitiveness level and changes of China's computer and information service trade

|        | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|--------|------|------|------|------|------|------|------|------|------|------|
| MS index | 0.0107 | 0.0145 | 0.0170 | 0.0171 | 0.0228 | 0.0270 | 0.0313 | 0.0335 | 0.0428 | 0.0488 |
| TC index | -0.2795 | 0.0309 | 0.1329 | 0.0627 | 0.2595 | 0.3261 | 0.3278 | 0.3365 | 0.5148 | 0.5190 |
| CA index | -0.2241 | 0.0007 | 0.0565 | -0.0027 | 0.0944 | 0.1297 | 0.1487 | 0.1736 | 0.3021 | 0.3511 |
| MS increase speed | 0.2291 | 0.3632 | 0.1696 | 0.0089 | 0.3281 | 0.1875 | 0.1569 | 0.0710 | 0.2793 | 0.1392 |
| TC increase speed | -2.9421 | 0.3104 | 3.3042 | -0.5284 | 3.1417 | 0.2566 | 0.0052 | 0.0264 | 0.5299 | 0.0082 |
| CA increase speed | -6.5962 | 0.2248 | 78.1487 | -1.0472 | 0.0971 | 0.3735 | 0.1465 | 0.1673 | 0.7399 | 0.1622 |

Table 3. Comparison of international competitiveness index level of computer and information service trade between China and some countries in 2002 and 2011

| Country        | Competitiveness Index | Competitiveness change index | Composite index |
|----------------|-----------------------|-----------------------------|-----------------|
|                | 2002      | 2011      | 2002      | 2011      | 2002 | Rank | 2011 | Rank |
| China          | -0.1643   | 0.3063    | -3.1031   | 0.1032    | -1.6337 | 9  | 0.2048 | 6   |
| Finland        | 0.0703    | 1.4936    | 0.3806    | -0.0203   | 0.2254 | 5  | 0.7367 | 3   |
| Germany        | -0.0878   | 0.0510    | 0.2560    | -0.1534   | 0.0841 | 8  | -0.0512 | 8   |
| India          | 5.6408    | 3.6508    | 0.0389    | 0.1941    | 2.8399 | 1  | 1.9225 | 2   |
| Ireland        | 4.0829    | 5.8958    | 0.0189    | 0.0506    | 2.0509 | 2  | 2.9732 | 1   |
| Spain          | 0.3363    | 0.3791    | 0.1547    | -0.1102   | 0.2455 | 4  | 0.1344 | 7   |
| Switzerland    | 0.2818    | 0.7078    | -0.0218   | 0.0009    | 0.1300 | 7  | 0.3543 | 4   |
| United Kingdom | 0.6504    | 0.5168    | 0.1188    | 0.0102    | 0.3846 | 3  | 0.2635 | 5   |
| United States  | 0.1684    | -0.1000   | 0.2820    | -0.5683   | 0.2252 | 6  | -0.3342 | 9   |

3.2. Interpretation of result

(1) From the MS index, since 2002, the international market share of my country's computer and information service trade has increased year by year, and has increased from 0.0107 to 0.0488, an increase of nearly 5 times within ten years. This figure is a very intuitive reflection. This led to the rapid development of my country’s computer and information service trade. However, from the perspective of the changes in the MS index, the rate of increase in the international market share of my country’s computer and information services fluctuates greatly [5]. The rate of increase in 2003 was 0.3632, which was the highest in ten years; while the rate of increase in 2005 was small compared with other years. Due to the impact of the global financial crisis, my country’s computer and information service trade exports suffered a setback in 2009, and the market share growth was also small. However, after the crisis, the rate of increase in market share in 2010 has risen sharply, indicating that my country's computer and information service trade exports have strong resilience [6].

(2) From the perspective of the TC index, my country's international competitiveness in computer and information service trade has undergone great changes during the ten years from 2002 to 2011. Before 2005, the TC index was relatively unstable, and the value was too small, especially the negative value of the TC index in 2002, indicating a comparative disadvantage. The TC index has risen steadily since 2005, and both are positive. This means that my country is basically in a surplus in the trade of computer and information services and has a certain degree of international competitiveness. The year-to-year changes of the TC index fluctuate greatly, with negative growth in 2002 and 2005, and a sharp decline in the rate of increase in 2008 and 2011, indicating that the
international competitiveness of my country's computer and information service trade has been unstable.

(3) From the CA index, there were large fluctuations from 2002 to 2005, and the international competitiveness was very unstable. It was at a negative value in 2002 and 2005, which shows that my country's development in computer and information service trade is still at the initial stage, the international competitiveness is relatively weak. However, since 2006, the CA index has changed from negative to positive and the index value has been increasing year by year, especially in 2010, the CA index has increased at a rate of 0.7399 \[^7\]. It reflects that while the scale of my country's computer and information service trade is expanding, its international competitiveness is constantly increasing.

(4) From the perspective of comprehensive demonstration indicators, the comprehensive index of my country's computer and information service trade has increased from -1.6337 in 2002 to 0.2048 in 2011, a large increase. However, in 2011, the international competitiveness level (Li) of my country's computer and information service trade was at a low-middle level among the nine target countries compared. Although compared with 2002, the comprehensive index ranking rose from 9th to 6th. However, compared with the world's major computer and information service trading countries, my country's international competitiveness level is quite different, especially when compared with Ireland and India \[^8,9\]. In 2011, my country's composite index was only 6.9% of Ireland and 10.7% of India. From the analysis of the competitiveness change (Ti) of the trade in computer and information services, among the nine countries compared, my country’s competitiveness has increased significantly, from -3.1031 in 2002 to 0.1032 in 2011. The ranking among the target countries was second in 2011 from the last in 2002, indicating that my country's computer and information service trade has developed rapidly and its competitiveness has increased rapidly.

4. Conclusion
In summary, although the international trade of computer information service started relatively late in my country. But I believe that with the rapid development of science and technology, the international trade in computer information services will develop faster. Therefore, in order to accelerate the development of international trade, firstly, we must accelerate the development of advanced computer science. Secondly, we must speed up the development process of the trade transformation and structural adjustment. Lastly, we should strengthen the training and study of personnel in the international trade of computer information services \[^10\]. In this way, we can effectively promote the development of the international trade of computer information services in China.

Acknowledgments
Key discipline construction project of Wanjiang University of Technology in 2019: International Trade, WGXXK19002; University scientific research project of Anhui Provincial Department of education in 2020: Study on the influence of the "One Belt, One Road" trade facilitation level on Anhui's trade flow. SK2020A064.

References
[1] He Jingyan. The Connection between the Development of Computer Science and Technology and Informatization [J]. Computer Products and Circuits,2019:9.
[2] Jiang A Min, Wang Jing, Zheng Shulan, Yu Yang. China's computer and information service trade development status and countermeasures [J]. Foreign Trade and Economic Cooperation,2016:6-7.
[3] Jiang A Min, Wang Jing, Zheng Shulan, Yu Yang. China's computer and information service trade development status and countermeasures [J]. "Foreign Trade and Economic Cooperation",2016:4-5, 2 pages.
[4] Peng Jia, Zhou Ying. Research on International Competitiveness of China's Computer and Information Services Trade [J]. Jiangsu Business Theory,2013:48-50+55.
[5] WAN Li-shu. Development and Informatization of Computer Science and Technology [J]. Commodities and Quality, 2019:236.

[6] Wang Shiyi. China's computer and information service trade development problems and countermeasures analysis [J]. Computer Fans, 2017.

[7] Wang Xiaohong. On the Internal Relationship between Foreign Trade Development and Business English Correspondence [J]. Industry and Technology Forum, 2015:103-104.

[8] YU Yuan-zhi. Discussion on the Relationship between the Development of Computer Science and Technology and Informatization [J]. Science and Informatization, 2019:25,28.

[9] Zhao Jin. The Basic Pattern and New Characteristics of the Development of Global Trade in Services [J]. International Trade, 2015:47-60.

[10] ZHAO Yaxin. Development of Computer Science and Technology and Information Connection [J]. Information and Computer (Theory Edition), 2019:30-31.