

Research on the Trade Structure Between China and the United States under the Background of Globalization

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Abstract. This article explores the changing trends and influencing factors of the trade structure between China and the United States in the context of globalization. With the advancement of economic globalization, the trade relationship between China and the United States has rapidly developed, but it also faces challenges such as imbalance and trade frictions. This article uses the Revealed Comparative Advantage Index (RCA) and Trade Complementarity Index (TCI) to analyze the trade data between China, the United States, and the world from 2009 to 2023, quantifying the comparative advantages and complementarity of the two countries in different commodities. Research has found that China has significant comparative advantages in labor-intensive and technology-intensive products. In contrast, the United States is very competitive in primary products and some capital-intensive products. There is significant trade complementarity between the two countries in multiple commodity categories. Finally, in the context of globalization, countermeasures and suggestions for optimizing and enhancing Sino-US trade were proposed from the perspectives of deepening global value chain cooperation, optimizing trade structure, and expanding diversified markets.

Keywords: Sino-us trade, comparative advantage, complementarity, globalization.

1. Introduction

In the context of globalization, international trade is the key to driving world economic growth. As the largest developing and developed countries, the trade relationship between China and the United States has a significant impact on the global economy. Since China acceded to the WTO in 2001, the trade volume between China and the United States has increased from 80.48 billion US dollars to 664.45 billion US dollars by 2023 [1]. However, the growth of the trade scale also brings about trade imbalances and friction issues. The changes in trade structure between the two countries have received widespread attention from the academic community. This article delves into the trade structure between China and the United States under globalization, analyzes the comparative advantages and complementarity of the two countries in different commodities, and provides corresponding policy recommendations for trade between China and the United States.

Ma&Ning reviewed the development of Sino-U.S. trade over the past two decades and discussing the economic consequences of the Sino-U.S. conflict, it is evident that the trade war has caused significant economic losses to both countries [2]. This paper explores the trade friction between China and the United States under the global value chain division of labor from the perspective of embedded third-party added value in China's exports to the United States. It appears that bilateral trade shocks between China and the United States may have multilateral effects [3]. Deng conducted a comparative study on the trade structure between China and the United States. To better cope with the trade friction between China and the United States, China should formulate corresponding trade countermeasures policies based on the US trade structure and reduce the expectations of US trade policies [4]. Zhang and Liu analyzed the grain trade between China and the United States based on UN Comtrade data from 2002 to 2021 and found that the complementarity of grain trade between China and the United States is significant [5]. Zhang and Zhou used the World Input-Output Table to measure the bilateral trade structure between China and the United States from 2001 to 2014 and found that bilateral trade between China and the United States is complementary [6].

At present, there are three main shortcomings in the literature on the trade structure between China and the United States under the background of globalization. Firstly, domestic scholars mainly analyze the trade structure between China and the United States from a small trade category, such as grain, which cannot be analyzed from a broader perspective. Secondly, domestic scholars lack timeliness in their data on the trade structure between China and the United States. Although some scholars have focused on more recent data, overall, the timeliness of the data is still insufficient. Finally, there is relatively little research on the trade structure between China and the United States by foreign scholars, especially in the context of economic globalization where there is insufficient discussion on Sino-U.S. trade.

This article analyzes the comparative advantages and complementarity between China and the United States in different commodity categories using the Revealed Comparative Advantage Index (RCA) and the Trade Complementarity Index (TCI). The study is based on trade data from 2009 to 2023, aiming to analyze the complementarity of trade between the two countries and propose relevant policy recommendations. The possible innovations of this article mainly include the following two aspects. Firstly, this article collected a large amount of trade data between China and the United States from 2009 to 2023, and conducted a more in-depth study of bilateral trade between China and the United States, ensuring the timeliness and accuracy of the research. Secondly, this article studies the bilateral trade structure between China and the United States in the context of economic globalization, which is a relatively novel perspective.

2. Data Source and Processing Instructions

2.1. Empirical Analysis of Revealed Comparative Advantage in Sino-US Trade

2.1.1 Model selection

The empirical analysis in this article uses the Revealed Comparative Advantage index proposed by economist Balasa in 1965, The specific calculation formula is shown in Announcement 1:

$$RCA_{x,ki} = (X_{ki} \div X_i) \div (W_{x,k} \div W_x) \quad (1)$$

Among them, $RCA_{x,ki}$ is the competitive status of class k products from country i in the global market, X_{ki} represents the total export volume of k categories of goods from country i, X_i refers to the total export volume of all goods in country i, $W_{x,k}$ and W_x respectively represent the total export volume of k categories of goods and all goods worldwide. When the $RCA_{x,ki}$ index exceeds 2.5, it indicates that the class k products of the country i have strong competitiveness in the global market; When the $RCA_{x,ki}$ index is greater than 1.25 and less than 2.5, it indicates that the class k products of the country i have relatively strong competitiveness in the global market; When the $RCA_{x,ki}$ index is greater than 0.8 and less than 1.25, it indicates that the class k products of country i have a certain market position in the global market, although their competitiveness is not outstanding; When the $RCA_{x,ki}$ index is less than 0.8, it indicates that the competitiveness of class k products in country i is relatively weak in the global market.

2.1.2 The data and calculation results used

This paragraph presents trade data on exports between China, the United States, and the world from 2009 to 2023, sourced from the United Nations Commission on Trade in Goods, Table 1 shows the International Trade Standard Classification.

Table 1. Classification of international commodity trade standards

	Cate gory	Name		Cate gory	Name
Primary products	0	Food and live poultry	Labor- intensive product	6	Rubber, textiles, low-end chemical products
	1	Tobacco, alcohol, and beverages		8	Low-end products
	2	Nonedible food category	capital- intensive product	5	High-end chemical products
	3	Mineral fuels		7	Equipment machinery
	4	Oils and fats		9	Other categories

Table 2. Displays comparative advantage index of various products in China from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	0.44	0.15	0.20	0.14	0.07	0.44	1.22	1.42	2.11	0.03
2010	0.46	0.15	0.18	0.13	0.05	0.51	1.22	1.41	2.14	0.02
2011	0.47	0.16	0.18	0.11	0.05	0.57	1.30	1.46	2.27	0.03
2012	0.44	0.16	0.17	0.09	0.05	0.53	1.31	1.43	2.34	0.01
2013	0.42	0.15	0.17	0.09	0.05	0.52	1.34	1.44	2.35	0.01
2014	0.41	0.16	0.18	0.10	0.06	0.54	1.37	1.36	2.27	0.02
2015	0.40	0.17	0.18	0.12	0.06	0.52	1.36	1.28	2.03	0.02
2016	0.43	0.19	0.18	0.14	0.05	0.52	1.35	1.26	2.00	0.05
2017	0.43	0.18	0.17	0.16	0.07	0.56	1.32	1.29	2.00	0.04
2018	0.43	0.18	0.19	0.17	0.09	0.59	1.33	1.34	1.94	0.04
2019	0.41	0.16	0.18	0.17	0.10	0.56	1.37	1.31	1.91	0.13
2020	0.35	0.11	0.14	0.16	0.10	0.52	1.39	1.31	1.84	0.19
2021	0.33	0.11	0.14	0.12	0.11	0.64	1.26	1.38	1.90	0.25
2022	0.32	0.11	0.17	0.14	0.15	0.71	1.37	1.36	1.90	0.29
2023	0.33	0.13	0.17	0.16	0.17	0.64	1.41	1.34	1.88	0.33

Data source: Calculated by the United Nations Commission on Trade in Goods

Table 3. Displays comparative advantage index of various products in the United States from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	1.10	0.53	1.75	0.44	0.78	1.29	0.71	1.00	0.96	2.17
2010	1.13	0.55	1.56	0.49	0.68	1.36	0.72	1.01	0.94	2.26
2011	1.20	0.56	1.43	0.55	0.54	1.31	0.73	1.04	0.91	2.28
2012	1.12	0.54	1.46	0.55	0.48	1.28	0.74	1.04	0.88	2.02
2013	1.14	0.58	1.39	0.58	0.43	1.28	0.75	1.04	0.89	1.81
2014	1.12	0.57	1.44	0.64	0.38	1.24	0.74	1.01	0.86	2.06
2015	1.05	0.62	1.40	0.66	0.38	1.26	0.72	0.96	0.84	2.16
2016	1.03	0.62	1.43	0.73	0.38	1.21	0.73	0.94	0.86	2.07
2017	1.02	0.61	1.33	0.95	0.36	1.20	0.72	0.92	0.86	1.93
2018	1.04	0.59	1.27	1.07	0.37	1.17	0.71	0.89	0.88	1.89
2019	0.98	0.54	1.23	1.13	0.37	1.19	0.70	0.89	0.84	2.04
2020	1.05	0.52	1.37	1.39	0.41	1.19	0.68	0.88	0.83	1.67
2021	1.15	0.50	1.24	1.26	0.35	1.24	0.65	0.86	0.81	1.91
2022	1.05	0.48	1.33	1.39	0.28	1.21	0.63	0.82	0.77	1.99
2023	0.94	0.43	1.15	1.45	0.19	1.25	0.68	0.85	0.82	1.59

Data source: Calculated by the United Nations Commission on Trade in Goods

2.1.3 Empirical result analysis

As shown in Table 2 and Table 3, through the calculation and analysis of the Revealed Comparative Advantage Index (RCA) of various products between China and the United States from 2001 to 2023, there are significant differences in the comparative advantages of the two countries in different product categories.

The RCA index of China's SITC6 (rubber, textiles, low-end chemical products), SITC7 (equipment and machinery), and SITC8 (low-end products) products all significantly exceed 1.25, especially for SITC8 products, where the RCA index has remained around 2.0 for a long time, demonstrating China's strong competitiveness in labor-intensive and technology-intensive products. In contrast, China's RCA index for primary and capital-intensive products such as SITC0 (food and live poultry), SITC1 (tobacco and alcohol beverages), SITC2 (nonedible food), SITC3 (mineral fuels), SITC4 (oils and fats), and SITC5 (high-end chemical products) are all below 0.8, indicating that China's international market competitiveness in these areas is relatively weak.

The United States has shown strong comparative advantages in product categories such as SITC0 (food and live poultry), SITC2 (nonedible food), SITC5 (high-end chemical products), and SITC9 (other). The RCA index of SITC9 products was once close to 2.0, demonstrating the high competitiveness of the United States in these areas. In addition, the RCA index of SITC3 (mineral fuel category) in the United States has gradually increased in recent years, indicating its increasing competitiveness in this field.

2.2. Empirical Analysis of the Complementarity of Sino-US Trade

2.2.1 Model selection

Comparative advantage is mainly used to reveal potential complementary relationships between trading parties. In 1969, Drysdale proposed the Trade Complementarity Index to measure the degree of complementarity between trading parties and the closeness of trade relations. By collecting data on trade factors between China and the United States and calculating the overall trade complementarity based on the theoretical index formula of trade complementarity, an empirical analysis is conducted. For two countries (regions) i and j , the calculation method for the trade complementarity index on a single product k is as follows: Formula 2:

$$TCI_{kij} \equiv RCA_{x,ki} \times RCA_{m,kj} \quad (2)$$

Among them, the calculation method of $RCA_{x,ki}$ has been elaborated in detail in the previous description, while $RCA_{m,kj}$ is the measure of the relative disadvantage of importing class k goods for country j . The calculation method is shown in formula 3:

$$RCA_{m,kj} \equiv (M_{kj} \div M_j) \div (W_{m,k} \div W_m) \quad (3)$$

Among them, M_{kj} represents the specific total import volume of k goods in country j , while M_j reflects the total trade volume of various goods imported by country j . The increase in $RCA_{x,ki}$ indices indicates that country i has a significant competitive advantage in this category of goods; The increase in $RCA_{m,kj}$ index reveals that j country has a relatively large relative disadvantage in this type of commodity. In addition, when the TCI_{kij} value exceeds 1, it means that the two countries have strong complementarity in trade, and the higher the value, the more significant the complementarity between the two countries; On the contrary, if the TCI_{kij} index is less than 1, it indicates that the trade complementarity between the two countries is relatively weak, and the lower the value, the less obvious the complementarity.

2.2.2 The data and calculation results used

This paragraph uses trade data on imports between China, the United States, and the world from 2009 to 2023, sourced from the United Nations Commission on Trade in Goods. According to the calculation formulas of RCA index and TCI index mentioned above, the results shown in Table 4, Table 5, Table 6, and Table 7 can be obtained:

Table 4. Displays comparative disadvantage index of various products in China from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	0.25	0.22	3.68	0.87	1.55	0.94	0.89	1.21	0.73	0.08
2010	0.28	0.23	3.36	0.88	1.30	0.96	0.76	1.15	0.75	0.39
2011	0.30	0.28	3.36	0.90	1.13	0.94	0.70	1.12	0.72	0.82
2012	0.35	0.32	3.29	0.94	1.27	0.91	0.68	1.09	0.73	0.85
2013	0.37	0.30	3.33	0.93	1.04	0.90	0.65	1.10	0.69	1.03
2014	0.40	0.34	3.22	1.01	0.92	0.89	0.73	1.09	0.66	0.96
2015	0.48	0.42	3.16	1.05	0.89	0.88	0.65	1.10	0.68	1.09
2016	0.47	0.44	3.34	1.17	0.83	0.88	0.65	1.09	0.66	0.99
2017	0.46	0.46	3.39	1.20	0.79	0.90	0.62	1.05	0.63	0.93
2018	0.50	0.44	3.09	1.24	0.81	0.88	0.60	1.07	0.59	0.96
2019	0.62	0.44	3.31	1.36	1.01	0.88	0.59	1.02	0.60	0.73
2020	0.68	0.35	3.28	1.46	0.94	0.80	0.71	1.06	0.60	0.25
2021	0.73	0.37	3.17	1.31	0.87	0.77	0.65	1.05	0.57	0.51
2022	0.80	0.37	3.36	1.20	0.73	0.78	0.64	1.01	0.62	0.68
2023	0.78	0.39	3.83	1.48	0.88	0.77	0.62	0.87	0.62	0.77

Data source: Calculated by the United Nations Commission on Trade in Goods

Table 5. Displays comparative disadvantage index of various products in the United States from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	0.69	1.16	0.37	1.23	0.48	0.81	0.82	1.08	1.39	0.92
2010	0.69	1.15	0.34	1.20	0.47	0.81	0.83	1.08	1.41	1.03
2011	0.69	1.12	0.34	1.16	0.52	0.81	0.86	1.11	1.39	0.98
2012	0.69	1.15	0.37	1.01	0.48	0.79	0.89	1.15	1.38	0.81
2013	0.69	1.20	0.36	0.97	0.50	0.79	0.90	1.17	1.44	0.71
2014	0.70	1.20	0.38	0.92	0.52	0.79	0.91	1.16	1.40	0.83
2015	0.71	1.23	0.37	0.77	0.51	0.83	0.91	1.15	1.42	0.88
2016	0.71	1.26	0.37	0.76	0.54	0.84	0.90	1.13	1.41	0.94
2017	0.73	1.30	0.35	0.75	0.55	0.80	0.92	1.13	1.43	1.11
2018	0.75	1.29	0.36	0.71	0.59	0.85	0.93	1.14	1.43	1.16
2019	0.75	1.34	0.34	0.66	0.55	0.89	0.92	1.13	1.42	1.24
2020	0.76	1.36	0.33	0.60	0.51	0.91	0.93	1.09	1.47	1.30
2021	0.80	1.46	0.35	0.66	0.54	0.88	0.98	1.10	1.57	1.04
2022	0.84	1.51	0.37	0.58	0.64	0.91	1.02	1.18	1.60	0.83
2023	0.79	1.32	0.31	0.62	0.80	0.95	0.96	1.19	1.42	0.85

Data source: Calculated by the United Nations Commission on Trade in Goods

Table 6. Complementarity index (TCI) of various products in China from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	0.64	0.13	0.54	0.11	0.15	0.54	1.49	1.31	1.52	0.03
2010	0.67	0.13	0.53	0.11	0.11	0.63	1.47	1.31	1.52	0.02
2011	0.68	0.14	0.53	0.09	0.10	0.70	1.51	1.32	1.63	0.03
2012	0.64	0.14	0.46	0.09	0.10	0.67	1.47	1.24	1.70	0.01
2013	0.61	0.13	0.47	0.09	0.10	0.66	1.49	1.23	1.63	0.01
2014	0.59	0.13	0.47	0.11	0.12	0.68	1.51	1.17	1.62	0.02
2015	0.56	0.14	0.49	0.16	0.12	0.63	1.49	1.11	1.43	0.02
2016	0.61	0.15	0.49	0.18	0.09	0.62	1.50	1.12	1.42	0.05
2017	0.59	0.14	0.49	0.21	0.13	0.70	1.43	1.14	1.40	0.04
2018	0.57	0.14	0.53	0.24	0.15	0.69	1.43	1.18	1.36	0.03
2019	0.55	0.12	0.53	0.26	0.18	0.63	1.49	1.16	1.35	0.10
2020	0.46	0.08	0.42	0.27	0.20	0.57	1.49	1.20	1.25	0.15
2021	0.41	0.08	0.40	0.18	0.20	0.73	1.29	1.25	1.21	0.24
2022	0.38	0.07	0.46	0.24	0.23	0.78	1.34	1.15	1.19	0.35
2023	0.42	0.10	0.55	0.26	0.21	0.67	1.47	1.13	1.32	0.39

Data source: Calculated by the United Nations Commission on Trade in Goods

Table 7. Complementarity index (TCI) of various products in the United States from 2009 to 2023

Year	SITC0	SITC1	SITC2	SITC3	SITC4	SITC5	SITC6	SITC7	SITC8	SITC9
2009	4.40	2.41	0.48	0.51	0.50	1.37	0.80	0.83	1.32	27.13
2010	4.04	2.39	0.46	0.56	0.52	1.42	0.95	0.88	1.25	5.79
2011	4.00	2.00	0.43	0.61	0.48	1.39	1.04	0.93	1.26	2.78
2012	3.20	1.69	0.44	0.59	0.38	1.41	1.09	0.95	1.21	2.38
2013	3.08	1.93	0.42	0.62	0.41	1.42	1.15	0.95	1.29	1.76
2014	2.80	1.68	0.45	0.63	0.41	1.39	1.01	0.93	1.30	2.15
2015	2.19	1.48	0.44	0.63	0.43	1.43	1.11	0.87	1.24	1.98
2016	2.19	1.41	0.43	0.62	0.46	1.38	1.12	0.86	1.30	2.09
2017	2.22	1.33	0.39	0.79	0.46	1.33	1.16	0.88	1.37	2.08
2018	2.08	1.34	0.41	0.86	0.46	1.33	1.18	0.83	1.49	1.97
2019	1.58	1.23	0.37	0.83	0.37	1.35	1.19	0.87	1.40	2.79
2020	1.54	1.49	0.42	0.95	0.44	1.49	0.96	0.83	1.38	6.68
2021	1.58	1.35	0.39	0.96	0.40	1.61	1.00	0.82	1.42	3.75
2022	1.31	1.30	0.40	1.16	0.38	1.55	0.98	0.81	1.24	2.93
2023	1.21	1.10	0.30	0.98	0.22	1.62	1.10	0.98	1.32	2.06

Data source: Calculated by the United Nations Commission on Trade in Goods

2.2.3 Empirical result analysis

The calculation results of the Trade Complementarity Index (TCI) show that there is significant trade complementarity between China and the United States in multiple commodity categories. The TCI index of SITC6, SITC7, and SITC8 products exported by China to the United States all exceed 1, indicating that these three types of products have strong complementarity in China's exports to the United States. The TCI index of SITC0, SITC1, SITC5, SITC8, and SITC9 products exported by the United States to China also exceeds 1, indicating that these products have strong complementarity in US exports to China.

It is particularly noteworthy that SITC8 products have shown high complementarity in the import and export of China and the United States, which further confirms the close cooperation between China and the United States in labor-intensive products.

Overall, there is significant trade complementarity between China and the United States in multiple commodity categories, which provides vast space and potential for future trade cooperation between the two countries.

3. Conclusion and Policy Implications

3.1. Conclusion

This article deeply explores the changing trends and influencing factors of the trade structure between China and the United States under the background of globalization by calculating and analyzing the Revealed Comparative Advantage Index (RCA) and Trade Complementarity Index (TCI) of different commodity categories between China and the United States from 2001 to 2023. The research results indicate that China has significant comparative advantages in labor-intensive and technology-intensive products, while the United States exhibits strong competitiveness in primary products and some capital-intensive products. There is significant trade complementarity between China and the United States in multiple commodity categories, especially in labor-intensive and technology-intensive products, which provides a solid foundation for trade cooperation between the two countries. With the continuous development of globalization and international trade, the trade structure between China and the United States is also constantly optimized and adjusted to adapt to the changes and demands of the international market.

Although this study provides an analysis of the trade structure between China and the United States, there are still some limitations, as follows: Firstly, although the Revealed Comparative Advantage

Index (RCA) and the Trade Complementarity Index (TCI) are commonly used indicators in international trade research, they may not fully capture the complexity and dynamics of trade structure. For example, these indicators fail to consider the impact of factors such as trade policies, market access conditions, technological progress, and changes in consumer preferences on trade structure. Secondly, this study did not fully explore the impact of non-tariff barriers (such as technical standards, intellectual property protection, etc.) on Sino-US trade. These non-tariff barriers may play an important role in actual trade and have a significant impact on trade structure.

3.2. Policy Implications

Firstly, China and the United States should deepen cooperation in the global value chain and jointly promote the upgrading and development of the global value chain. China can strengthen cooperation with the United States in high-end areas such as research and development, design, and brand marketing, and enhance the position of Chinese products in the global value chain; The United States can leverage China's manufacturing capabilities to reduce production costs and enhance market competitiveness.

Secondly, China and the United States should continuously optimize and adjust their trade structure in response to changes and demands in the international market. China should continue to enhance the competitiveness of its high-end manufacturing and service industries, gradually reducing its dependence on primary products; The United States should strengthen its investment in high-end technology and innovation to maintain its leading position in the global value chain.

Thirdly, China and the United States should jointly promote the process of trade liberalization and facilitation, reduce trade barriers and tariff levels, and provide a more fair, transparent, and predictable trade environment for enterprises from both countries. This will help promote further development of Sino-US trade and bring greater growth momentum to the economies of both countries.

In summary, as the world's largest developing and developed countries, the stability and development of trade relations between China and the United States have a significant impact on the global economic landscape. Through the above measures, China and the United States can jointly promote the prosperity and development of global trade.

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