Study on Trade Complementarity and Trade Potential between China and Kazakhstan in the Background of "One Belt and One Road"

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Abstract: *In 2016, Kazakhstan will start the second Five-Year Plan of "development strategy from 2010 to 2020". Under the background of "New Silk Road" in China and the new situation of strategic adjustment of economic structure in Kazakhstan, the paper re-examines the potential for Sino-Kazakhstan trade. Based on trade data between China and Kazakhstan from 2002 to 2014, by making use of trade complementarity index, trade specialization coefficient and other tools, the author analyzes trade complementarity between China and Kazakhstan, makes clear the basis for trade between the two countries. By adopting the relevant data between China and 30 partner countries, the author establishes gravity model to study on the trade potential between China and Kazakhstan to make clear the market space between the two countries. Studies show that: China has a comparative advantage in labor and capital-intensive products, while Kazakhstan has a comparative advantage in resource-intensive products; trade complementarity between the two countries on products with the comparative advantage is very strong, but the bilateral trade complementarity is still in the initial stage of transfers of inter-industry surplus and deficiency; it is estimated by the gravity model that the potential of trade between China and Kazakhstan belongs to "great potential type" and there is an increasing trend in terms of trade space. Accordingly, the author proposes countermeasures to increase investment cooperation between China and Kazakhstan and create new modes of cooperation.*

Keywords: China; Kazakhstan; trade complementarity; gravity model; trade potential

1. Introduction

China is located in the eastern part of the "New Silk Road", while Central Asia is located in the middle section of "new Silk Road" with weak development; with a geographical dependence, the economic and trade activity of the two regions is the engine of "Silk Road Economic Zone". Therefore, China should make Kazakhstan as a breakthrough in promoting economic and trade cooperation between China and Central Asian countries.

First, the geopolitical position of Kazakhstan is of importance. Kazakhstan is the country with the largest population in Central Asia and the two countries have a total border of 1533 kilometers. Kazakhstan is also the only country in Central Asia to establish a comprehensive strategic partnership with China. China can make use of the radiating capacity of the Kazakhstan market to push forward with the whole of China. Sub-regional deep-seated cooperation. Second, Kazakhstan is rich in natural resources. At present, the proved recoverable oil reserve of Kazakhstan is 4 billion tons and the recoverable natural gas reserve is 300 billion cubic meters; it has more than 1,200 kinds of mineral raw materials and more than 90 kinds of mineral deposits, of which the total world reserves of tungsten, uranium and chromium are respectively, 50%, 25% and 23%. The arable land area of Kazakhstan is 20 million hectares or more and is an important agricultural production base, so it has the reputation of "granary" in Central Asia. Third, Kazakhstan is the country with the fastest growing economy in Central Asia. Kazakhstan's gross national

product in 2014 was 212.2 billion US dollars, equivalent to the sum of the other four countries in Central Asia. At the same time, Kazakhstan is also the country with the highest per capita income in Central Asia and the national purchasing power has exceeded the level of moderately developed countries. Fourth, Kazakhstan's investment environment is better. Kazakhstan has a good social order, rich resources, the fastest economic development and stable political situation. It is the country with the largest FDI memory in Central Asia, attracting 80% of foreign direct investment in Central Asia. Kazakhstan has always insisted on the opening-up policy in investment and continuously improved the investment environment. Fifth, China and Kazakhstan have complementary economic structures. Kazakhstan's economic structure is single. The energy industry and its exports play an important role in economic development, while the manufacturing industry is relatively backward and is in the initial stage of industrialization; however, China is in the rapid development stage of middle industrialization, as an important exporting country of the transport, textiles, food, machinery manufacturing, telecommunications and new energy and other industries, while it has a huge demand for energy and mineral resources; therefore, both sides can achieve trade complementarity.

At present, domestic scholars have done a lot of research on China's foreign trade relations. In terms of the Sino-Kazakhstan trade, Zhang Henglong and Zhou Yuancheng (2015) analyzed the Sino-Kazakh trade liberalization in the context of "One Belt and One Road". [1] Qin Fangming and Sun Qinggang (2014) analyzed the

economic and trade dependence between China and Kazakhstan. [2] Bi Yanru and Shi Bo (2010) measured the trade potential between China and the five countries in Central Asia before 2006. [3] In the study of trade complementarity, Du Li and Xie Hao (2011) conducted a systematic analysis of the strength and nature of Sino-US trade complementarity. [4] Zhang Qiuli (2013) studied on trade complementarity between China and Central and Eastern European countries. [5] In the application of trade gravity model, Zhang Haisen and Xie Jie (2011) analyzed the factors and potentials that affect the agricultural trade between China and Africa. [6] Tian Hui and Jiang Chenchun (2012) studied on the role of national cultural distance in China's foreign trade. [7]. However, under the background of the "New Silk Road" and the strategic transformation of Kazakhstan, China has not reexamined the trade relations and trade potentials between China and Kazakhstan and made further study systematically.

In 2016, Kazakhstan starts the second five-year plan of "2010-2020 Development Strategy" therefore, in the context of "New Silk Road" and the new situation of Kazakhstan's economic restructuring strategy, to re-examine the Sino-Kazakhstan trade potential is of practical significance.

2. The realistic basis of Sino-Kazakhstan Trade Cooperation

(I) The scale of trade
The total Sino-Kazakhstan bilateral trade volume in 2014 and 2002 was RMB 2.245 billion Yuan and RMB 195 million Yuan; the total trade volume increased by nearly 11 times in 13 years. Between 2002 and 2014, the four indicators including the percentage of China's import from Kazakhstan in China's total imports, the percentage of China's export to Kazakhstan in China's total exports, the percentage of Kazakhstan's import from China in Kazakhstan's total imports and the percentage of Kazakhstan's export to China in in Kazakhstan's total exports are shown in Figure 1:
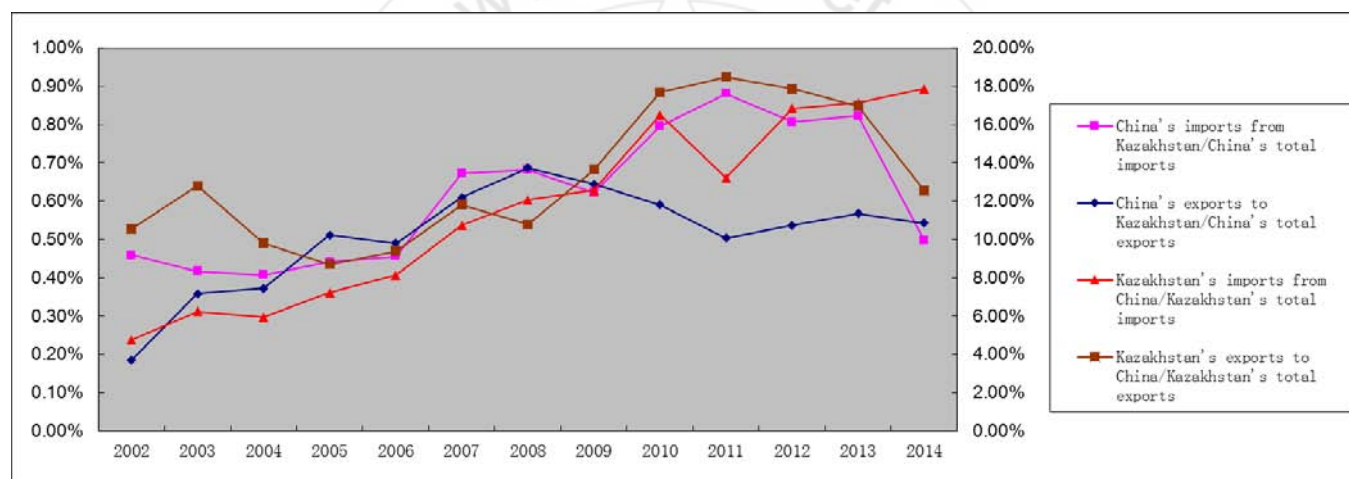
Figure 1: The percentages of Sino-Kazakhstan import and export volumes in the two countries

Note: Percentages of China are in the left hand and percentages of Kazakhstan are in the right hand. The data are from UN Comtrade: http://comtrade.un.org/date.

From 2002 to 2013, the four indicators were in a rising trend with volatility. In 2014, the three other percentages all declined, except for the increased percentage of Kazakhstan's import from China in Kazakhstan's total imports.

As for the import and export volume, whether for import or export, Kazakhstan's dependence on China should be greater than China's dependence on Kazakhstan. In thirteen years, the percentage of the import and export of China to Kazakhstan in China's total import and export has never been more than 1%, while since 2007, the percentage of Kazakhstan's imports and exports to China has been more than 10%. For Kazakhstan, the Chinese market is becoming more and more important; like in 2013, China was still Kazakhstan's largest source of imports and the second largest exporter in 2014.

(II) Trade Structure
In terms of the import and export structure, in 2014, goods Kazakhstan imported from China were mainly mechanical products (42.50%), base metals and products (11.40%), textiles and raw materials (8.10%), plastics and rubber (6.60%), boots, umbrellas and other light industrial products (6.50%) and transport equipment (5.80%), which accounted for 80.90% of Kazakhstan's total imports from China. Among them, the import volume of nuclear reactors, boilers, mechanical appliances and parts in the electromechanical product category and electric machine, electrical gas, audio-visual equipment and accessories were the largest, with RMB 199 million Yuan (26.7%) and RMB 1.17 trillion Yuan (15.8%) respectively, as shown in Figure 2:
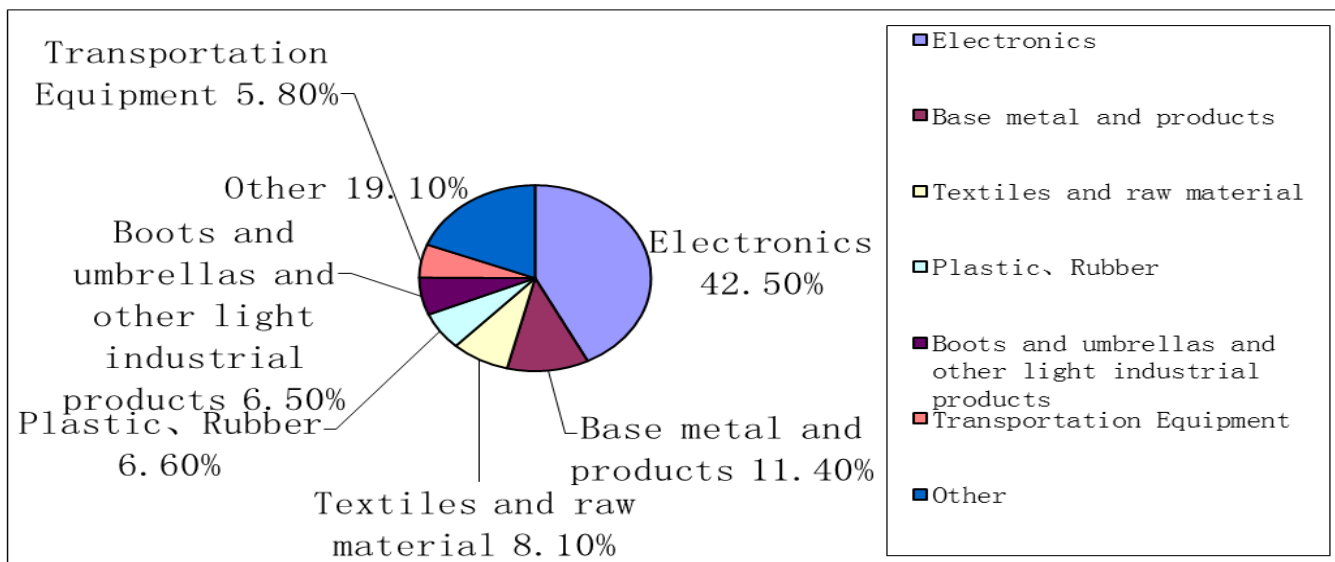
Figure 2: Goods structure of Kazakhstan imported from China

Source: Country Report Network

In 2014, China's imports from Kazakhstan were mainly mineral products (64.90%), base metals and products (19.90%) and chemical products (12.20%), totaling 97% of total imports from Kazakhstan. Among them, imports of fossil fuels, mineral oil and its products and asphalt were the largest, accounting for 52.7% of the total imports from Kazakhstan as shown in Figure 3:
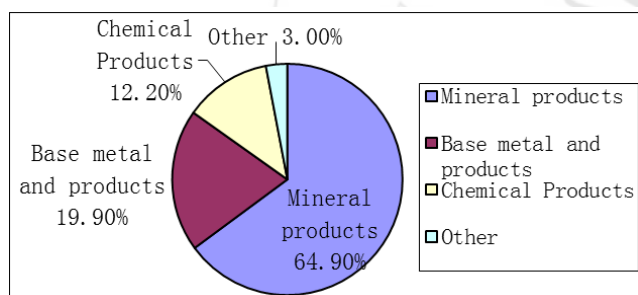
Figure 3: The structure of goods Kazakhstan exported from China in 2014

Data source: country report network

It can be seen that the trade dependence between China and Kazakhstan shows "compound" asymmetry. As for the trade volume, Kazakhstan's dependence on China is relatively large. Although Sino-Kazakhstan trade volume in their respective foreign trade increased year by year, by 2014, Kazakhstan's trade volume for China had accounted for more than 14% of Kazakhstan's total foreign trade, while China's trade volume for Kazakhstan was less than 1% of the China's total foreign trade volume; as for the trade structure, goods of China imported from Kazakhstan concentrate on resource-based products, while goods of Kazakhstan imported from China are mainly labor, capital and technology-intensive processing products. As the substitution the resource-based products is less than industrial products, China's trade dependence on Kazakhstan is larger.

(III) Investment overview

In 2013, the stock of China's direct investment in Kazakhstan was US $ 6.957 billion Yuan, an increase of 106.53% over 2002. China had the fourth largest share of foreign investment in Kazakhstan, just after the Netherlands, the United States and France. At present, China has registered 2,800 Chinese-funded enterprises in Kazakhstan, ranking third in Kazakhstan's total number of foreign-funded enterprises. 63.7% of China's direct investment in Kazakhstan is concentrated in the mining industry and also in such industries as electricity, telecommunications, insurance, science and technology, but the proportion of investment is relatively small. Kazakhstan's direct investment stock was US $ 140 million, an increase of 49.72% over 2002. However, Kazakhstan's investment in China is still relatively small, ranking relatively low in China's foreign direct investment and mainly concentrated in Xinjiang; the field of investment includes food, leather and building materials.

3. Empirical analysis in Sino-Kazakhstan Trade Complementarity

The section will make analysis on the strength and nature of Sino-Kazakhstan trade complementarity in accordance with the first-level classification standard of the SITC (Rev.3) [In the 3rd version of SITC(SITC.Rev3), the first-level indicator of SITC divides commodities into 10 categories] The strength of trade complementarity is measured by the trade complementarity index and the nature of trade complementarity is measured by trade specialization index.

(I) Analysis on trade integration index

The degree of trade integration refers to the ratio between the proportion of a country's export to the trading partner in its export volume and the proportion of the trading partner's import in the world's total imports. The greater the value, the more close the trade links between the two countries. The formula is as follows:

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

In formula (1), TCD_{ab} refers to the degree of trade dependence between the two countries of a and b; X_{ab} refers to that country a's exports to country b; X_a refers to country a's total exports; M_b refers to the total imports of country b; M_w refers to the world's total imports. If TCD_{ab}

>1, it means that country a's trade dependence on country b is stronger; if $TCD_{ab} = 1$, it means the world's average level; if $TCD_{ab} < 1$, it means that country a's trade dependence on country b is weak. TCD is not a symmetrical index; in general, $TCD_{ab} \neq TCD_{ba}$. The Sino-Kazakhstan trade integration index in 2002-2014 is shown in Table 1:

Table 1: Sino-Kazakhstan trade integration index

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
China to Kazakhstan	1.82	3.23	2.69	3.09	2.50	2.61	2.93	2.81	3.70	2.39	2.19	2.14
Kazakhstan to China	2.33	2.34	1.61	1.38	1.43	1.72	1.53	1.68	1.91	1.91	1.78	1.60

Data source: UN Comtrade: http://comtrade.un.org/date

As can be seen from Table 1: first, from 2002 to 2013, the degrees of trade integration of China vs Kazakhstan and Kazakhstan vs China were both greater than 1, indicating that the trade links between the two countries were close, but in 2014, the degree of trade integration of Kazakhstan vs China was slightly less than 1, indicating its dependence on China was weak. Second, the degree of dependence calculated with China as an exporting country is greater than that calculated with Kazakhstan as an exporting country; besides, the trade intensity index of China vs Kazakhstan shows an upward trend, while the trade strength index of Kazakhstan vs China shows a downward trend.

The measured results of trade integration are in line with the reality. In recent years, the proportion of China's imports in the world's imports has risen much faster and been larger than the proportion of Kazakhstan's exports to China in its total exports. Thus, the trade integration index of Kazakhstan vs China is lower than that of China vs Kazakhstan and shows a downward trend.

(II) Analysis of dominant comparative advantage index
Internationally, the dominant comparative advantage index, or RCA first proposed by Balasa (Balassa, 1965) is used to measure a country's comparative advantage. When RCA $\geq$ 1, it means that the product has the dominant comparative advantage. When 0 <RCA <1, it indicates that the product has a comparative disadvantage. Later, the Japan External Trade Organization (JETRO) made detailed division based on Baraza's criteria. When 1.25＜RCA <2.5, it means that

the product has a strong competitive advantage; when RCA> 2.5, it means that the product has a strong competitive advantage; when 0.8 <RCA <1.25, it means that the product has an average comparative advantage. When RCA <0.8, it means that the product has no competitive advantage. The formula is as follows:

$$RCA_{ik} = (X_{ik}/X_i)/(X_{wk}/X_w) \qquad (2)$$

Among it, RCA_{ik} represents the dominant comparative advantage index of product k of country i; X_{ik} refers to the export value of product k of country i; X_i refers to export value of all products of country i; X_{wk} refers to the export value of product k in the world; X_w refers to the export trade volume of all the products in the world. The dominant comparative advantage indexes of China and Kazakhstan are shown in Table 2 and Table 3:

1. The dominant comparative advantage index calculated with China as the exporting country

Table 2: Dominant comparative advantages of China 's top ten categories of products

	0	1	2	3	4	5	6	7	8	9
2002	0. 78	0. 31	0. 44	0. 28	0. 08	0. 45	1. 17	0. 86	2. 69	0. 05
2003	0. 70	0. 25	0. 38	0. 26	0. 06	0. 41	1. 13	1. 06	2. 28	0. 05
2004	0. 59	0. 24	0. 31	0. 23	0. 06	0. 41	1. 19	1. 14	2. 19	0. 04
2005	0. 57	0. 19	0. 31	0. 19	0. 09	0. 44	1. 21	1. 20	2. 19	0. 06
2006	0. 54	0. 16	0. 24	0. 13	0. 10	0. 44	1. 27	1. 24	2. 20	0. 06
2007	0. 50	0. 15	0. 21	0. 13	0. 06	0. 47	1. 25	1. 28	2. 22	0. 04
2008	0. 44	0. 14	0. 23	0. 14	0. 08	0. 54	1. 34	1. 38	2. 27	0. 03
2009	0. 44	0. 15	0. 20	0. 13	0. 05	0. 45	1. 21	1. 43	2. 12	0. 02
2010	0. 46	0. 16	0. 18	0. 12	0. 05	0. 50	1. 21	1. 44	2. 17	0. 02
2011	0. 46	0. 16	0. 18	0. 11	0. 05	0. 56	1. 29	1. 46	2. 26	0. 02
2012	0. 45	0. 17	0. 17	0. 09	0. 05	0. 53	1. 34	1. 45	2. 40	0. 02
2013	0. 42	0. 15	0. 17	0. 10	0. 05	0. 51	1. 35	1. 44	2. 36	0. 02
2014	0. 42	0. 16	0. 18	0. 12	0. 06	0. 55	1. 40	1. 37	2. 33	0. 02

Data source: UN Comtrade: http://comtrade.un.org/date.

As it can be seen from Table 2: China has obvious comparative advantages in products categories 6, 7 and 8; especially, the RCA index of the 8th category of products has been greater than 2 and close to 2.5 in some years, with strong export competition. The RCA index of category 6 of products increases year by year; the RCA index of category 7 of products grows fastest and continues to be strong.

In terms of the export structure, the export status of China's resource-intensive and labor-intensive products has been stabilized, and labor-intensive products have maintained a clear comparative advantage. Meanwhile, the export status of capital and technology-intensive products begins to rise, reflecting the effect of China's industrial restructuring and upgrading.

2. The dominant comparative advantage index calculated with Kazakhstan as the exporting country

Table 3: The dominant comparative advantage of Kazakhstan's top ten categories of products

	0	1	2	3	4	5	6	7	8	9
2002	0. 79	0. 25	2. 36	6. 36	0. 08	0. 25	1. 70	0. 04	0. 02	0. 31
2003	1. 00	0. 20	2. 18	6. 35	0. 13	0. 19	1. 52	0. 04	0. 02	0. 23
2004	0. 71	0. 18	2. 34	6. 17	0. 13	0. 17	1. 40	0. 03	0. 02	0. 21
2005	0. 43	0. 20	2. 10	5. 68	0. 08	0. 18	1. 19	0. 03	0. 02	0. 19
2006	0. 53	0. 16	1. 79	4. 90	0. 09	0. 26	1. 19	0. 04	0. 01	0. 28
2007	0. 80	0. 17	1. 76	5. 17	0. 08	0. 26	1. 24	0. 05	0. 01	0. 20
2008	0. 77	0. 12	1. 77	4. 20	0. 02	0. 26	1. 14	0. 05	0. 01	0. 19
2009	0. 57	0. 14	1. 73	5. 26	0. 12	0. 39	1. 08	0. 03	0. 01	0. 26
2010	0. 55	0. 15	1. 33	4. 98	0. 13	0. 40	1. 00	0. 02	0. 01	0. 29
2011	0. 32	0. 12	1. 59	4. 54	0. 06	0. 30	1. 05	0. 03	0. 03	0. 22
2012	0. 51	0. 17	1. 53	4. 38	0. 09	0. 36	1. 15	0. 04	0. 06	0. 22
2013	0. 46	0. 22	1. 26	4. 80	0. 10	0. 34	0. 81	0. 04	0. 03	0. 12
2014	0. 46	0. 25	1. 34	6. 27	0. 13	0. 33	0. 73	0. 05	0. 03	0. 06

Source of data: UN Comtrade: http://comtrade.un.org/date.

As it can be seen from Table 3: Kazakhstan has a clear comparative advantage in categories 2, 3 and 6, but the export competitiveness is gradually weakening. Among them, RCA index of the third category of products is far greater than 2.5, with a strong competitive advantage; RCA index of the first six categories of products has dropped from 1 to below 1, with the more obvious declined competitiveness.

From the perspective of export structure, Kazakhstan's resource-intensive products have been a clear comparative advantage, while the export status of labor-intensive products has been reduced from a strong competitive edge to the edge of little competitive advantage.

Table 2 and Table 3 show that China and Kazakhstan have a comparative advantage in the sixth category of products, but the trends of the two countries are completely opposite, that is, the comparative advantage of the sixth category of products of China increases year by year, while the comparative advantage of the sixth category of products of Kazakhstan tend to weaken, and it has no competitive advantage in the last two years, indicating that China and Kazakhstan almost have no competition in the first six categories of products. Therefore, on the whole, China and Kazakhstan almost have no overlap in products with comparative advantages, that is, there is no direct confrontation between the two countries in the international market and they are more complementary to each other.

(III) Analysis of trade complementarity index
The trade complementarity index was a measure proposed by the economist Peter Drysdale in 1967. The trade complementarity index for individual products is given by:

$$C_{ijk} = RCA_{xik} RCA_{mjk}$$

(3)

Among it, RCA_{xik} indicates the dominant comparative advantage of product k of country i measured by exports;

RCA_{mjk} refers to the dominant comparative disadvantage of product k of country j measured by imports. Specific formula is as follows:

$$RCA_{xik} = (X_{ik}/X_i)/(X_{wk}/X_w) \qquad (4)$$

$$RCA_{mjk} = (M_{jk}/M_j)/(X_{wk}/X_w) \qquad (5)$$

Among it, X_{ik} and X_{wk} are the export volume of product k in country i and the world; X_i and X_w are the total export volume of country i and the world; M_{jk} is the import volume of product k of country j; M_j is the total import volume of country j. The greater RCA_{xik} (RCA_{mjk}), the larger dominant advantage of country i（j）in product k. When both are large, it means country i has a stronger comparative advantage in product k and country j has a greater comparative disadvantage in product k, so the two countries complement each other in product k; the greater the value of C_{ijk}, the stronger trade complementarity.

On the basis, with trade weight of all kinds of products in the world trade as the weight number, after complementary indexes of individual products are summed up, the comprehensive trade complementarity index of the two countries can be obtained　namely:

$$C_{ij} = \sum_k C_{ij}^k \frac{X_w^k}{X_w} = \sum_k RCA_{xi}^k RCA_{mj}^k \frac{X_w^k}{X_w} \qquad (6)$$

When $C_{ij} > 1$, it shows that the trade complementarity of the two countries is strong; the bigger C_{ij} is, the stronger the complementarity is. When $C_{ij} \leqslant 1$, the trade complementarity between the two countries is weak, and the smaller C_{ij} is, the less obvious the complementarity is. The trade complementarity index between China and Kazakhstan is shown in Table 4 and Table 5:

1. Trade complementarity index calculated with China as an exporting country

Table 4: The trade complementarity index calculated with China as an exporting country

	0	1	2	3	4	5	6	7	8	9	综合
2002	0.81	0.38	0.26	0.35	0.17	0.52	1.52	0.84	1.64	0.00	0.92
2003	0.77	0.25	0.25	0.30	0.08	0.48	1.58	1.04	1.35	0.00	0.95
2004	0.63	0.29	0.19	0.30	0.05	0.40	1.70	1.15	1.18	0.00	0.96
2005	0.63	0.26	0.19	0.18	0.10	0.38	1.87	1.29	1.22	0.00	1.01
2006	0.62	0.21	0.12	0.12	0.07	0.36	1.83	1.40	1.26	0.00	1.03
2007	0.52	0.22	0.11	0.12	0.03	0.37	1.82	1.53	1.33	0.00	1.06
2008	0.50	0.22	0.10	0.12	0.08	0.44	2.24	1.51	1.23	0.01	1.05
2009	0.48	0.21	0.07	0.10	0.05	0.39	2.53	1.53	1.23	0.00	1.08
2010	0.64	0.21	0.06	0.08	0.04	0.54	1.69	1.68	1.77	0.00	1.10
2011	0.71	0.25	0.06	0.09	0.04	0.54	1.71	1.60	2.50	0.00	1.13
2012	0.61	0.24	0.10	0.06	0.03	0.52	2.16	1.70	2.08	0.00	1.14
2013	0.55	0.21	0.07	0.07	0.03	0.51	2.25	1.64	2.08	0.00	1.14
2014	0.61	0.24	0.10	0.05	0.04	0.59	2.07	1.68	2.42	0.00	1.20

Data source: UN Comtrade: http://comtrade.un.org/date

For China, in terms of categories 0, 1, 5, 6, 7 and 8, China's trade complementarity with Kazakhstan is stronger than Kazakhstan's trade complementarity with China. Among it, the trade complementarity index of the first category of products is less than 0.5, which means there is no trade complementarity; the trade complementarity index of the products of categories 0 and 5 is more than 0.5, which means there is certain trade complementarity; the trade complementarity of categories 7 and 8 is strong and the complementarity index is on the rise; especially, the complementary index of the seventh category of products in 2014 reached twice of that in 2002; the complementary

index of category 6,7,8 of products is consistent with the change of RCA index. It should be pointed out that China does not have a comparative advantage in categories 0 and 5 of products, but there exists certain trade complementarity with Kazakhstan in these two products, mainly because Kazakhstan's import volume of these two types of products is larger with a larger dominant comparative disadvantage.

2. Trade complementarity index calculated with Kazakhstan as an exporting country

Table 5: Complementarity index calculated with Kazakhstan as the exporting country

	0	1	2	3	4	5	6	7	8	9	综合
2002	0.24	0.03	6.06	4.54	0.11	0.31	1.99	0.05	0.01	0.04	0.95
2003	0.25	0.03	5.89	4.66	0.23	0.20	1.69	0.05	0.01	0.02	0.92
2004	0.22	0.02	7.28	5.07	0.24	0.18	1.29	0.04	0.02	0.01	0.99
2005	0.12	0.03	6.99	4.45	0.11	0.20	1.05	0.04	0.02	0.02	0.96
2006	0.13	0.03	5.57	3.93	0.12	0.28	0.92	0.05	0.01	0.02	0.93
2007	0.19	0.03	6.14	4.46	0.14	0.28	0.92	0.06	0.01	0.01	0.98
2008	0.18	0.03	7.46	3.84	0.04	0.27	0.79	0.06	0.01	0.02	1.06
2009	0.14	0.03	7.03	4.90	0.18	0.38	0.91	0.03	0.01	0.01	1.07
2010	0.15	0.03	5.00	4.69	0.16	0.38	0.72	0.02	0.01	0.07	1.03
2011	0.09	0.03	6.00	4.52	0.07	0.29	0.69	0.03	0.02	0.12	1.12
2012	0.17	0.05	5.63	4.74	0.12	0.34	0.76	0.05	0.04	0.18	1.15
2013	0.17	0.06	4.69	4.88	0.11	0.32	0.51	0.05	0.02	0.14	1.09
2014	0.18	0.08	5.02	8.20	0.12	0.31	0.53	0.05	0.02	0.05	1.33

Source: UN Comtrade: http://comtrade.un.org/date.

For Kazakhstan, Kazakhstan's trade complementarity index for China is greater than China's trade complementarity for Kazakhstan in terms of categories 2, 3, 4 and 9. The trade complementarity indexes of categories 4 and 9 are very small and there is almost no complementarity. The trade complementarity indexes of the second and third categories are very large, which is greatly related with extreme competition advantages of Kazakhstan in these two categories of products. It is worth noting that Kazakhstan's trade complementarity index for category 3 of products in 2014 was 8.2, much larger than that in previous years, mainly due to a 21.6% decrease in world export volume of category 3 of products in 2014.

Table 4 and Table 5 show that during the period of 2002-2014, the complementarity indexes of the two countries were on the rise, with the trade complementarity index calculated by China as the exporting country growing steadily, and the trade complementarity index calculated by Kazakhstan growing with fluctuation; besides, the value of the comprehensive trade complementary index of China is slightly larger than the index value of Kazakhstan in most years.

(IV) Analysis of trade specialization index

The trade specialization index, namely TSC, can be used to measure whether the two countries' trade complementarity is intra-industry complementary or inter-industry complementary. The formula is as follows:

$$TSC_{ij}^{k} = \left(X_{ij}^{k} - M_{ij}^{k}\right) / \left(X_{ij}^{k} + M_{ij}^{k}\right) \quad (7)$$

Among it, TSC_{ij}^{k} means the trade specialization index between country i and country j; X_{ij}^{k} refers to the export volume of product k of country i to country j; M_{ij}^{k} refers to the import volume of product k of country i from country j; that i country from j countries in the k products on imports.

When $-0.25 \le TSC_{ij}^{k} \le 0.25$, it means that the two countries are in the intra-industry complementary state. When $TSC_{ij}^{k} \ge 0.8$ (≤ -0.8), it shows that country i has stronger (weaker) competitiveness in product k and the trade complementarity of the two countries is in the inter-industry complementary state. The other values of TSC_{ij}^{k} indicate that there is no complementary relationship between the two countries in product k.

The trade data between China and Kazakhstan in 2014 is selected to calculate the trade specialization index, as shown in Table 6:

Table 6: Trade specialization index of China and Kazakhstan in 2014

Category	SITC	Product Name	指数	贸易额(美元)	%
Industry Complementarity	07	coffee, tea, cocoa, spices	0.11	4637638	0.02%
	67	Steel	−0.04	788453233	3.51%
		Subtotal		793090871	3.53%
China's competitiveness is strong, Kazakhstan is weak in competitiveness	02	Dairy and eggs	1.00	250500	0.00%
	03	Fish（not a marine）, Crustaceans, Molluscs and aquatic invertebrates	0.89	7108626	0.03%
	09	Miscellaneous food products	1.00	18171394	0.08%
	11	Drink	0.92	823260	0.00%
	12	Tobacco and tobacco products	1.00	1230045	0.01%
	23	Natural rubber（Including synthests and regeneration）	1.00	170964	0.00%
	24	Cork and wood	1.00	490317	0.00%
	41	Animal fat	1.00	172000	0.00%
	43	Animal or vegetable fats	0.83	80967	0.00%
	51	Organic chemical products	1.00	35562926	0.16%
	53	Dyes,tanned teather	0.92	20193309	0.09%
	54	medical products	0.93	10960260	0.05%
	55	Essential oils and fragrances and perfume raw meterials;toilet、polishing and cleaning equipment	1.00	30747405	0.14%
	56	fettilizer	0.82	108664	0.00%
	58	In non-plastic, Primary shape	1.00	96086051	0.43%
	59	Chemical materials and products	1.00	74695061	0.33%
	62	Rubber products	1.00	124474464	0.55%
	63	Cork and wood products（Dose not include furniture）	1.00	30561892	0.14%
	64	Paper,cardboard and pulp articles,Paper or cardboard	1.00	55019030	0.25%
	65	Textile yarn,fabric,finished product	0.99	649352104	2.89%
	66	Non-metallic mineral products	0.98	397751533	1.77%
	69	Made from metal	1.00	582093534	2.59%
	71	Power generation equipment	1.00	165213231	0.74%
	72	Individual industrial machinery	1.00	524613131	2.34%
	73	Metal processing machinery	1.00	54644790	0.24%
	74	General industrial machinery and equipment and machine parts	1.00	777105078	3.46%
	75	Office machines and automatic data processing equipment	1.00	205856852	0.92%
	76	Telecommunications and recording and audio equipment and instruments	1.00	408034380	1.82%
	77	Electrical machinery,instruments and applances,nest and components	1.00	658580452	2.93%
	78	Road vehicles（including air cushion vehicles）	1.00	590744627	2.63%
	79	Other transportation equipment	1.00	47248350	0.21%
	81	Prefabricated buildings, pipeline,heating and lighting devices and equipment	1.00	199348320	0.89%
	82	Furniture and its parts, bed linings, mattress, soft cushions and similar filling products	1.00	135886248	0.61%
	83	Travel goods, handbags and similar containers	1.00	339575085	1.51%
	84	Clothing and clothing accessories	1.00	2675126577	11.91%
	85	shoes	1.00	2234027523	9.95%
	87	Professional、scientific and control instruments and apparatus	1.00	100055602	0.45%
	88	Photographic apparatus, Equipment and supplies,optical products,watches and clocks	1.00	39263780	0.17%
	89	Miscellaneous food products	1.00	432361865	1.93%
	93	Special deals and merchandise are not in kind	1.00	3747885	0.02%
		小计		11727538082	52.23%
Kazakhstan's competitiveness is strong, China is weak in competitiveness	00	Live animals other than the division of animals	−1.00	64000	0.00%
	04	Cereals and cereal products	−0.98	71636286	0.32%
	21	Skin,skin and fur,raw materials	−1.00	87398	0.00%
	26	Textile fiber（except for tops and other combed wool）and its waste（not made of yarn or fabric）	−0.84	12761251	0.06%
	27	Crude oil fertilizer, Minerals and crude oil（not including coal,oil and precious stones）	−0.98	186679272	0.83%
	28	Metal ore and metal scrap	−1.00	1158891883	5.16%
	29	Crude oil and plant material products	−0.95	34710533	0.15%
	33	Oil,petroleum pro ducts and by-products	−0.92	4612626420	20.54%
	34	Natural gas(natural and made)	−1.00	136861338	0.61%
	42	Fixed grease,crude oil,finished product or fractionated	−1.00	6556366	0.03%
	52	Inorganic chemicals	−0.95	1700492670	7.57%
	61	Leather,leather products, no other explanation, and processed fur	−0.98	15028011	0.07%
	68	Nonferrous metals	−0.95	1565731318	6.97%
		小计		9502126744	42.32%
Not complementaary	05	Vegetables and fruits	0.78	222903878	0.99%
	06	Sugar,sugar and honey	0.73	1237418	0.01%
	08	Feed(does not include grains that are not milled)	−0.44	4198147	0.02%
	22	Oil seeds and oily fruits	−0.76	34930115	0.16%
	32	Coal,coking coal and briquettes	0.53	20733405	0.09%
	57	Primary shape plastic	0.75	145110500	0.65%
		小计		429113463	1.91%

Source of data: UN Comtrade: http://comtrade.un.org/date

Table 6 shows that Sino-Kazakhstan trade is mainly complementary and the complementarity between the two countries is still in the primary stage of the inter-industry transfer. In the Sino-Kazakhstan trade in goods in 2014, the trade volume of complementary goods accounted for 98.09% of the bilateral trade volume of the two countries. The non-complementary trade in goods accounted for 1.91% of the bilateral trade volume. Compared with 2002, the proportion of complementary goods in the total bilateral trade declined slightly but decreased to a small extent (99.61% in 2002). In 2014, the inter-industry complementarity trade volume of China and Kazakhstan accounted for 94.56% of the total bilateral trade volume. The trade volume with intra-industry complementary relationship accounted for 3.53% of the total bilateral trade, which was 1.85 percentage points higher than that in 2002 (1.68% in 2002), indicating that the level of intra-industry trade between China and Kazakhstan has increased between 2002

and 2014, but the scale of intra-industry trade was still small, so the nature of trade complementarity between China and Kazakhstan has not materially changed.

In 2014, in the inter-industry trade between China and Kazakhstan, the two sides have their own advantages. The competitive products of China accounted for 52.88% of the total Sino-Kazakhstan trade, while Kazakhstan's highly competitive products accounted for 42.32%. 99.75% of China's competitive products are industrial products, of which 68.17% are labor-intensive products and 31.58% are capital and technology-intensive products, indicating that China's exports to Kazakhstan are concentrated in industrial products lacking in Kazakhstan. 65.47% of the competitive products in Kazakhstan are resource-intensive products, 16.64 % are labor-intensive products and 7.57 % are capital and technology-intensive products, demonstrating that Kazakhstan's exports to China are mainly energy and metal minerals lacking in China.

4. An Empirical Study on the Influencing Factors and Potential of Sino-Kazakhstan Trade

(I) Model Construction

The traditional model of trade gravity considers that the bilateral trade volume of the two countries is proportional to the total economic output and is inversely proportional to the distance between the two countries, and its basic form is:

$$F_{ij} = A(Y_i Y_j)/D_{ij} \qquad (1)$$

Among it, F_{ij} is the bilateral trade volume between country I and country j; Y_i and Y_j are the gross domestic products (GDP) of countries i and j; D_{ij} is the geographical distance between countries i and j and A is the constant. Since the basic model is non-linear, it is necessary to take the logarithms of the model of both sides and convert it to a linear form.

In order to ensure the robustness of empirical test results, the paper builds the regression model based on the two explanatory variables of economic scale and geographical distance, and then gradually adds other explanatory variables to make regression of the extended gravity model. The four gravitational models constructed in this paper are as follows:

$$LnF_{ij} = a_1 Ln(Y_i Y_j) + a_2 Ln(D_{ij}) + \mu \qquad (2)$$

$$LnF_{ij} = a_1 Ln(Y_i Y_j) + a_2 Ln(D_{ij}) + a_3 Ln(GP_{ij}) + \mu \qquad (3)$$

$$LnF_{ij} = a_1 Ln(Y_i Y_j) + a_2 Ln(D_{ij}) + a_3 Ln(GP_{ij}) + a_4 Ln(I_i I_j) + \mu \qquad (4)$$

$$LnF_{ij} = a_1 Ln(Y_i Y_j) + a_2 Ln(D_{ij}) + a_3 Ln(GP_{ij}) + a_4 Ln(I_i I_j) + a_5 Ln(A_{ij}) + \mu \qquad (5)$$

The meanings, predictive symbols and theoretical explanations of the explanatory variables in the model are shown in Table 7:

Table 7: Introduction of the explanatory variables

Explanatory variables	Meaning	Expected symbol	Theoretical explanation
$Y_i Y_j$	The gross domestic product of the exporting country i and the importing country j (dollar)	+	Response to the export capacity of both countries or regions and import demand . The greater the scale of the economy, the greater the potential export capacity and import capacity, the greater the bilateral trade volume.
D_{ij}	The absolute distance between the exporter and the importing country	−	Representing the level of transport costs, is an important factor hindering bilateral trade
DG_{ij}	The absolute value of the per capita GDP difference between the exporting country I and the importing country j	+ / −	Per capita GDP difference determines the pattern of demand between the two countries. if the income levels of the two countries are similar, the two countries' demand and product are similar, the greater the potential trade volume, so the coefficient of GDP per capita is negative, which is based on the advanced level of national dexelopment of Linde's demand similarity.; if the difference between the two countries' income level is large, the difference between the two countries' product production is bigger, the complementarity may be stronger and the potential trade volume may be bigger. Therefore, the coefficient of GDP difference is positive. Such as the integration of capital and technology-intensive products in developed countries with the resources of developing countries and labor-intensive products
$I_i I_j$	The amount of FDI in the exporting country I and the importing country j	+ / −	The trade effects of international direct investment are mainly substitute and complementary effects. That is, international direct investment may reduce(alternative) trade and may also increase(complementary) trade
A_{ij}	Dummy variable, belong to the AFEC member value 1, otherwise the value of 0	+	The economic cooperation mechanism within the cooperative organization will promote the increase in bilateral trade

(II) Data sources

Based on the size of bilateral trade volume, 30 major trading partners of China were selected as samples and the panel data of China and the 30 partner countries in 2002-2014 were used to analyze the trade potential. 30 countries and regions, including the United States, Hong Kong of China, Japan, Korea, Germany, Australia, Russia, Brazil, Vietnam, Singapore and Kazakhstan were selected as the sample countries. In 2014, the trade volume of these partners with China accounted for more than 77% of China's total foreign trade; the empirical results are more convincing.

Bilateral trade data for China and 30 economies are compiled from UN COMTRADE; GDP data is from the World Bank; the geographic distance is from the CEPII database; GDP per capita different data is from the World Bank; FDI data is from the UNCTADSTAT database.

(III) The empirical results

In this paper, Stata12.1 is used for regression analysis and the empirical result is shown in Table 8:

Table 8: Empirical results of China-Kazakhstan trade gravity model

Explanatory variables	Explained variable: $\text{Ln}(F_{ij})$			
	(2)	(3)	(4)	(5)
常量	-9.278***	-2.47***	3.513***	0.691
	(-5.27)	(-2.04)	(2.69)	(0.58)
$\text{Ln}(Y_iY_j)$	0.720***	0.569***	0.348***	0.399***
	(56.90)	(24.39)	(10.43)	(13.33)
$\text{Ln}(D_{ij})$	-0.802***	-0.788***	-0.847***	-0.648***
	(-4.25)	(-15.10)	(-17.55)	(-13.80)
$\text{Ln}(DG_{ij})$		0.169***	0.096***	0.112***
		(6.72)	(3.93)	(5.15)
$\text{Ln}(I_iI_j)$			0.305***	0.215***
			(8.66)	(6.63)
B_{ij}				0.626***
				(10.30)
R^2	0.7421	0.7694	0.8070	0.8487

Note: 1. In the bracket of Model (2), it refers to the value of z; in the bracket of model (3), (4) and (5), it is the value of t; 2. *** indicates a 1% significance level.

The empirical results show that R2 of the four models is high, the model has good fitting degree, and the signals of explanatory variables are consistent with the theoretical expectation. For the models (3), (4) and (5), although the fixed-effects model is accepted by the Hausman test, the mixed model is used to estimate because the fixed-effects model cannot receive the estimated value of the dummy variable Aij, which does not change with time.

In this paper, the model (5) is used to simulate the trade potential between China and the partner countries and regions. The Hausman test results and the operation results of the model (5) are shown in Fig. 4 and Fig. 5:

Figure 4: Hausman test results of Model (5)

Source	SS	df	MS		
Model	617.901602	5	123.58032		
Residual	110.114039	384	.286755311		
Total	728.015641	389	1.8715055		

Number of obs = 390
F(5, 384) = 430.96
Prob > F = 0.0000
R-squared = 0.8487
Adj R-squared = 0.8468
Root MSE = .5355

lnfij	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
lnyiyj	.399473	.0299595	13.33	0.000	.3405678	.4583783
lndij	-.6480146	.0469615	-13.80	0.000	-.7403485	-.5556808
lndgij	.1121257	.0217609	5.15	0.000	.0693402	.1549113
lniiij	.2149078	.032428	6.63	0.000	.1511491	.2786665
bij	.6263517	.0608251	10.30	0.000	.5067597	.7459437
_cons	.6910816	1.188614	0.58	0.561	-1.645925	3.028089

**Figure 5:** Mixed model results of Model (5)

The equation for model (5) is given by:

$$LnF_{ij} = 0.691 + 0.399Ln(Y_iY_j) - 0.648Ln(D_{ij}) + 0.112Ln(DG_{ij}) + 0.214Ln(I_iI_j) + 0.626A_{ij}$$

The function shows that the factors that have a determining role in promoting the bilateral trade between China and partner countries are APEC membership, economic size of the two countries, the storage capability of FDI and GDP difference per capita; among them, APEC membership has the greatest role in promotion of trade between two countries and the geographical distance has a larger blocking role for trade between the two sides. Specifically, the bilateral trade volume will be increased by 0.399% for every 1% increase in the total GDP amount of the two countries; the bilateral trade volume will be reduced by 0.648% for each 1% increase in the distance between the two countries; the bilateral trade volume will increase by 0.112% for every 1% increase in GDP difference per capita of the two countries; the bilateral trade volume will increase by 0.214% for every 1% increase in the total amount of FDI attracted by the two countries. If the partner country is an APEC member country, the bilateral trade volume will increase by 0.626%.

(IV) China-Kazakhstan trade potential calculation
There are three types of trade potential: potential reengineering type, potential pioneering type and huge potential type. If the ratio of the actual trade value against the theoretical trade value is greater than or equal to 1.2, the trade potential type is "potential reengineering type"; if the two sides want to expand the trade, they need to develop other trade growth points; if the ratio is greater than 0.8 and less than 1.2, the trade potential is "potential pioneering type", that is, the trade potential of the two sides is not fully developed; if the ratio is less than 0.8, the trade potential is "huge potential type", that is, there is a lot of room for growth in bilateral trade.

In this paper, the value of each parameter of China and Kazakhstan in 2002-2014 is substituted into the model (5), the trade value of China-Kazakhstan theory is obtained and the trend comparison chart of the actual value and the theoretical value is drawn as shown in Fig. 6.
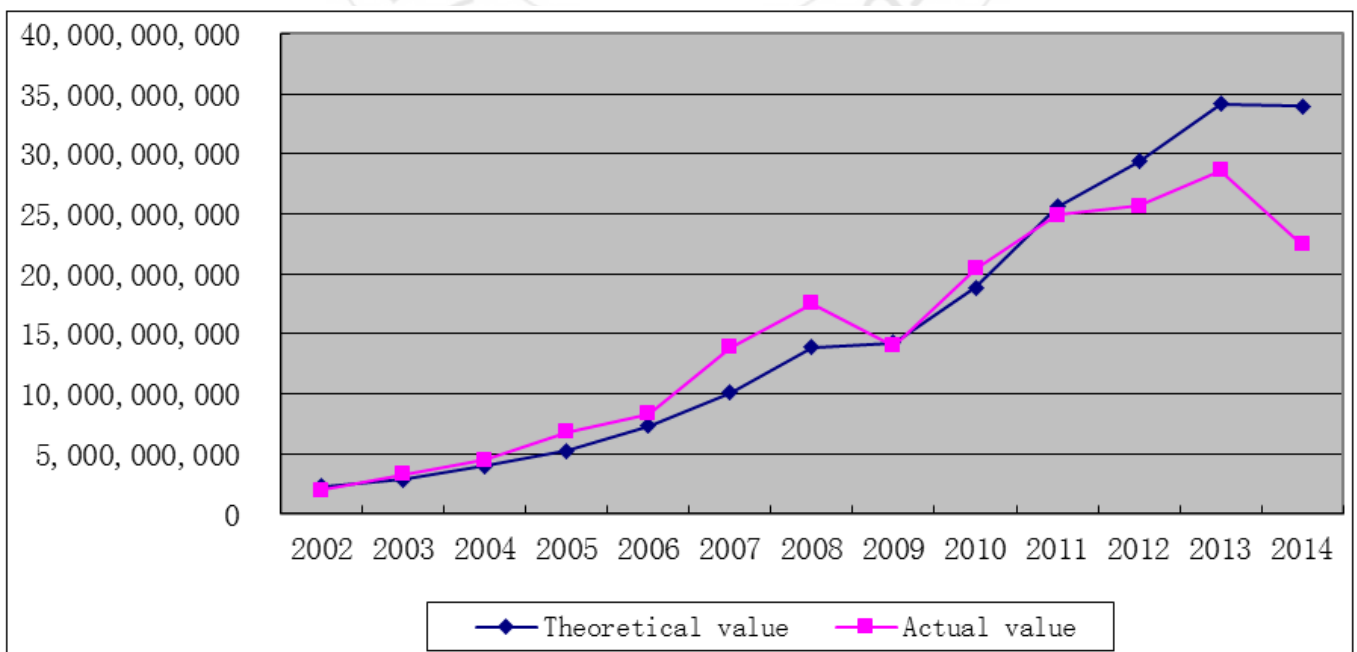
Figure 6: Trends of theoretical and practical values of China and Kazakhstan in 2002-2014

Figure 6 showed that from 2002 to 2008, the actual value of bilateral trade was greater than the theoretical value of bilateral trade, the ratio rose from 0.84 all the way to 1.27 and the type of potential trade changed from the "potential pioneering" to "potential recreating"; from 2011 to 2014, the actual value was less than the theoretical value, the ratio declined from 0.97 all the way down to 0.66, and the type of potential trade changed from the "potential pioneering" to "huge potential", indicating that China-Kazakhstan trade space is growing.

5. Conclusion and Countermeasures

(I) Conclusion

From the empirical study of Sino-Kazakh trade, the following conclusions can be drawn: first, the trade dependence between China and Kazakhstan is close and China's export dependence on Kazakhstan is relatively large. Second, China has strong comparative advantages in labor-intensive products of categories 6 and 8 and capital-intensive products of category 7, while Kazakhstan has a strong comparative advantage in resource-intensive products of category 2 and 3. Third, the two countries have strong trade complementarity in the product with a comparative advantage; especially, the trade complementarity index of resource-intensive products calculated with Kazakhstan as an exporting country is extremely high; the trade complementarity index of capital and technology-intensive products calculated with China as an exporting country also increases year by year. Fourth, the trade complementarity between China and Kazakhstan is still at the initial stage of the inter-industry transfer. China's imports from Kazakhstan are mainly concentrated in mineral energy products which China lacks. Kazakhstan's imports from China mainly focus on industrial products in which Kazakhstan has inadequate. development. Fifth, based on the model of trade gravity, it can estimate that factor of the FDI quantity, geographical distance and whether it is an APEC member are important for trade between China and Kazakhstan. In recent years, the trade potential type between China and Kazakhstan is "huge potential" and the two countries' trade space has continued to increase. On the basis of trade complementarity, China and Kazakhstan should make full use of the "New Silk Road" and the new opportunities of Kazakhstan's economic strategic transformation to constantly explore ways to promote Sino-Kazakhstan trade growth and readjust the trade structure of Sino-Kazakhstan trade.

(II) Countermeasures and suggestions

1. Strengthen investment cooperation

Kazakhstan is about to start the second five-year plan of the "2010-2020 Development Strategy", with the following specific objectives: first, achieve 100% of the energy self-supply rate to make the proportion of renewable energy and nuclear energy exceed 3 % in energy consumption and make transformation of existing power plants. Second, develop the transportation industry by building 1,400 km of new railways by 2020 to improve the speed and reduce railway freight, thus achieving 40% of the electrification ratio; build and transform 16,000 km of roads; introduce the market competition to the air transport; 15 airports are expected to join the ICAO grade management; achieve 48 million tons of annual cargo capacity in Caspian Port; increase oil and gas pipeline construction efforts to improve energy output capacity. Third, actively construct communications infrastructure to achieve 60% of the computer penetration. Fourth, continue to attract foreign investment in the power industry. There is power shortage in western and southern Kazakhstan and Almaty is the typical area with the most power shortage; Almaty is expected to have a power shortfall of 1.3 million kilowatts by 2020.

China should increase its direct investment in the above-mentioned areas of Kazakhstan, because on the one hand, it can reduce Kazakhstan's reliance on Chinese processed products to protect its national industry and promote its industrial structure and rapid industrialization development; on the other hand, it can promote the transfer of its mature industry and the upgrading of industrial structure in China. In this way, to a certain extent, the trade structure of the two sides can be improved and the inter-industry trade can be transformed into intra-industry trade.

2. Innovation in cooperation model

At present, Kazakhstan has established 10 special economic zones with different leading industries in accordance with three development directions of industrial production type, service type and technology application type. There are seven industrial production special economic zones: the purpose of Astana Special Economic Zone is to accelerate the construction of infrastructure with advanced construction technology. The purpose of Aktau Special Economic Zone is to achieve the promotion of regional development through high-efficiency production, new product development and the use of modern management techniques, and then to lead the country into the world economic system; the main purpose of Pavlodar Special Economic Zone is to develop the metallurgical and metal processing industry; the Special Economic Zone of National Industrial Petrochemical Technology Park focuses on innovative petrochemical production and crude oil deep-processing. The purpose of Orntussteg Special Economic Zone is to establish a cotton textile base; Taraz Chemical Park focuses on the development of production of chemical high-tech products. There are two special economic zones in service type: the Brabi Special Economic Zone focuses on the construction of tourism infrastructure to promote the development of tourism. The purpose of Horgos-Dongdaemun Special Economic Zone is to establish an efficient industrial center and logistics center. There is a technology-based special economic zone: the Special Economic Zone of Innovation Park mainly develops the information technology industry.

China should give full play to the advantages of its industrial system in the light of the different industrial development directions of these SEZs, and carry out the industrial chain transfer; that is, under the guide of leading enterprises,

through the two ways of vertical and horizontal links, integrate all links of the chain to transfer to the host country. It can help Kazakhstan to quickly build the industries it lacks the capacity to build and has weak development and larger investment needs, and then establish a complete industrial system.

3. Actively promote Kazakhstan's accession to the Asia-Pacific Economic Cooperation (APEC)

The Asia-Pacific Economic Cooperation (APEC) is the most influential, highest-level, multilateral and intergovernmental economic cooperation forum in the Asia-Pacific region and is the largest regional economic group organization in the world. APEC covers 40% of the world population; the sum of its member countries' GDP has exceeded 56% of the world's total value and the volume of trade between countries has reached 48% of the total world trade. For the world economy, APEC plays a pivotal role.

The empirical results of the trade potential of China and Kazakhstan show that whether it is the APEC member state is an important factor influencing the trade relations between the two countries. In recent years, Kazakhstan has a strong demand for foreign investment and innovative technologies, while APEC's goal is to facilitate the liberalization of investment and trade, actively carry out cooperative R & D projects and strengthen economic and technological cooperation. China should give full play to its voice as an APEC member country, promote Kazakhstan to join APEC and further promote the economic and trade cooperation between China and Kazakhstan.

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