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AN EMPIRICAL STUDY ON STATUS AND POTENTIAL OF SINO-RUSSIAN BILATERAL TRADE

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Abstract. *This paper uses trade intensity index and trade complementarity index for statistical analysis of Sino-Russian bilateral trade status, adopting the bilateral trade data from 2006 to 2016, and uses the extended trade gravity model for empirical analysis of influencing factors on bilateral trade flows and trade potential respectively under the circumstances of invariable and improved terms of trade. We find that even if the fluctuations of Sino-Russian bilateral trade volume and growth rate are strong, the intensity and complementarity are both evident and there is a relatively large space for bilateral trade development. Furthermore, it could be effective to develop bilateral trade through improving informal-system at a family degree. We also give some policy suggestions in terms of cooperative mechanism, trade structure, FTA (Free Trade Area) and culture communication, on the basis of former empirical research.*
Keywords: *Sino-Russian bilateral trade; trade status; trade potential; gravity model*

ЭМПИРИЧЕСКОЕ ИССЛЕДОВАНИЕ СОСТОЯНИЯ И ПОТЕНЦИАЛА РАЗВИТИЯ КИТАЙСКО-РОССИЙСКОЙ ДВУСТОРОННЕЙ ТОРГОВЛИ

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Аннотация. *В данной работе авторы применяют индексы интенсивности и взаимодополняемости торговли для статистического анализа китайско-российской двусторонней торговли на основе данных о двусторонних торговых сделках с 2006 по 2016 г. Также авторы использовали расширенную гравитационную модель торговли для эмпирического анализа факторов, влияющих на потоки двусторонней торговли и торгового потенциала в неизменных и улучшенных условиях.*
Авторы отмечают, что даже при сильных колебаниях объемов и темпов роста российско-китайского товарооборота интенсивность и взаимодополняемость являются очевидными, а возможности для развития двусторонней торговли относительно велики. Кроме того, можно было бы эффективно развивать двустороннюю торговлю путем совершенствования неформальной системы. Авторы также делают некоторые политические предложения в отношении механизма сотрудничества, структуры торговли, зоны свободной торговли и культурной коммуникации на основе прежних эмпирических исследований.
Ключевые слова: *китайско-российская двусторонняя торговля; торговый статус; торговый потенциал; гравитационная модель*

MODEL

1. INTRODUCTION

China and Russia are not only the most crucial geopolitical powers in the Asian area, but also two of the largest emerging economics in the world today. The volume of Sino-Russian bilateral trade reached 69.53 billion dollars with a year-on-year growth rate of 2.2%, which seems to be a contrarian growth against the slow economic recovery and sluggish growth of global trade. Further, China has been the first trade partner of Russia for several years and Russia is one of China's main sources of import energy and high-tech products. With the development of One Belt One Road (OBOD) initiative, the total trade has increased with fluctuations. It is worth noting that Russia is an important partner and the total import and export volume of Sino-Russia bilateral trade is the sixth one among the partners of OBOD, which takes up 7.3% of the total trade volume of China's foreign tradeunder the Belt and Road initiative. But the proportion of energy or raw material products could usually be close to or even over 50%, which means the trade structure between China and Russia is relatively simple[1].

So, what is the potential for trade between China and Russia? How can we promote economic and trade cooperation between these two countries? Many scholars have made a detailed analysis on trade between China and other countries due to the rapid development of China's foreign trade. Sun Jinyan (2015) has argued Sino-Australian trade size, complementarity and potential are all expended through utilizing trade intensity index and Global Model to analyze. Jin Zhuiqiao (2015) has investigated the trade status, predicted the potential of Sino-Korean trade and concluded that it could be possible to expand bilateral trade and economic cooperation. At the same time, the research on Sino-Russian related issues has been paid more and more attention. Kang Chengwen (2014) has done empirical research on commodity structure, Relative Revealed Comparative Trade Advantage Index and Trade Complementarity Index of Sino-Russian and Russo-Japanese bilateral trade and the outcomes are positive. Developing Sino-Russian FTA should not only solve current problems, but also seek new and beneficial cooperation opportunities (Jia Haojie, 2015). Further, Li Yang (2017) has hold the view point that the strategic docking of One Belt One Road and Eurasian Economic Union could promote Sino-Russian cooperation.

From the perspective of analyzing the trade potential, there are lots of scholars have used Gravity Model to do empirical studies and modify this model. Luo Laijun (2014) has studied the directionality and asymmetry of the Gravity Model. Yu Yan (2014) has utilized the Gravity Model to do quantitative analysis in order to get the key elements of China's import-export trade. Gao Zhigang (2015) has built Stochastic Frontier Gravity Model and used Frontier 4.1 software to investigate the Sino-Pakistani trade efficiency and measure the potential. Tan Xiujieand Zhou Maorong (2015) has studied the trade potential of the countries along the "maritime silk road" using stochastic frontier gravity model, and analyzed the influencing factors. Then they argue that the trade efficiency of the 21st Maritime Silk Road continues to improve, and China's exports still have great potential. Wang Liang (2016) has investigated the fundamental situation of economy development, trade intensity and complementarity, and built the Stochastic Frontier Gravity Modelto estimate the trade potential, non-efficiency degree and other influencing factors of the Silk Road Economic Belt. Ding Janping (2016) has put the Gravity Model of scale effect in trade cost and analyzed the development potential of different industries through scale economical characteristics.

However, there are some shortages in the existing researches. Firstly, the tools which used in analyzing the status of bilateral trade are simple, not including all measure standards, and there lack researches with latest data. Secondly, when the scholars investigate the influencing factors of trade flows, they only focus on the economic perspective. Thirdly, there are just little diversities in the method used in trade potential study. Thus we try to use different methods to investigate the trade status in Chapter 2 and add both formal and informal system variables into Gravity Model to study the Sino-Russian bilateral trade potential in Chapter 3. In Chapter 4, we summarize the previous results in former parts and give some policy suggestions.

2. THE SITUATION OF SINO-RUSSIAN BILATERAL TRADE

2.1. Sino-Russian Trade Overview

The trade between China and Russia showed big changes between 2006 and 2016 (*Fig. 1*). From general perspective, we could clearly see that the Sino-Russian gross trade volume peaked at 95.27 billion dollars in 2014 and then it decreased to 68.02 bil-

[1] Source: Big Data Report of Trade Cooperation under the Belt and Road Initiative 2017.

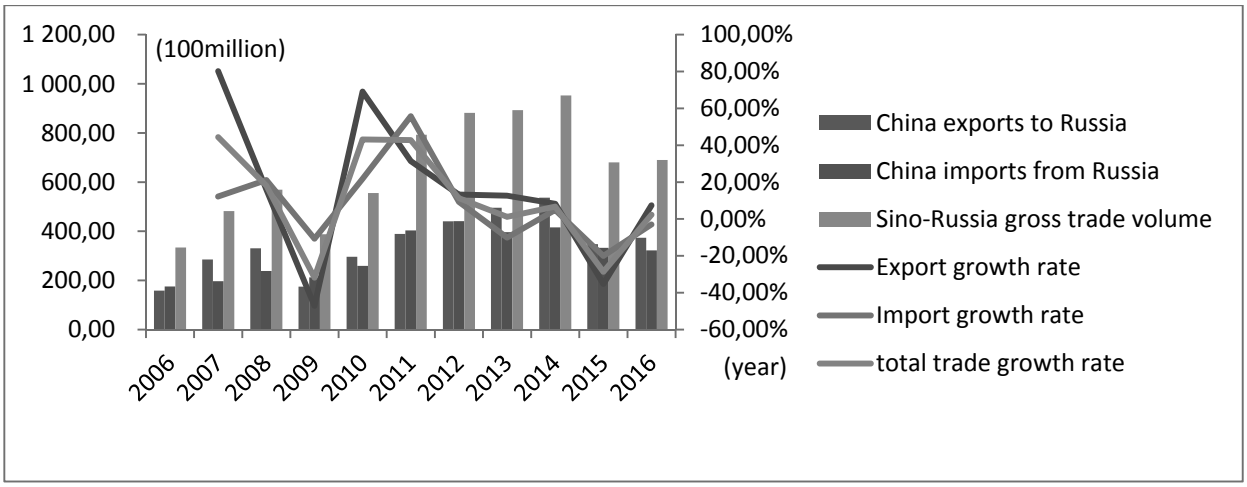

Fig. 1. **Bilitary trade between China and Russia**

Data Source: calculation based on the data drawn from WITS DATABASE (http://wits.worldbank.org/).

lion dollars in 2015 before slightly increasing to 69.60 billion in 2016. In most cases, the quantity of China's export was more than that of import during this period.

The year of 2008, which was a time of financial crisis, seemed to be a turning point.In 2009, all trade volumes reached the lowest level and especially the export growth rate and the total trade growth rate were respectively –47.05% and –31.83%. Overall, three growth rates decreased from 2010 to 2015 after soaringin 2009, and then they recovered in 2016. Based on this, we could hold a viewpoint that there is an uncertain future of the bilateral trade between China and Russia.

2.2. Commodity Composition of Sino-Russian Bilateral Trade

We use *International Trade Standard Classification*, which is proposed by the United Nations, as the fundamental to sort out goods of Sino-Russian bilateral trade. According to this classification method, it divides all commodities into nine parts (SITC 0-SITC 9)[2]. Generally speaking, product cords SITC 0-SITC 4 represent primary products, which are also called resource-intensive products, and product cords SITC 5-SITC 9 represent industrial manufactured products. In the latter classification, SITC 5, SITC 7 and SITC 9 goods belong to capital-intensive or technology-intensive products, and SITC 6 and SITC 8 goods belong to labor-intensive products.

The import and export commodity structures of Sino-Russian bilateral trade are different and advantage products have disparities. The total trade volume of Sino-Russian bilateral trade between 2006 and 2016 is presented in *Table1*. Panel A of Table 1 which regards China as the source country and Russia as the target country, illustrates that commodities, which China exports to Russia, are mainly five categories including SITC 0, SITC 5, SITC 6, SITC 7 and SITC 8, and among these, the trade volume of SITC 8 products specializing in clothing is the most one. In 2016, the largest selling of products was up to 15049 million dollars accounting for 40.3% of total exportations of Sino-Russian bilateral trade. The export trade growth of SITC 7 has changed triple during these eleven years. We regard Russia as the source country and China as the target country in Panel B. The imported products of China from Russia are mainly goods with product code SITC 0, SITC 2, SITC 3, SITC 5 and SITC 6. The largest one, SITC 3 classification, took up approximately 45% to 70% of the total importations and the largest share of it was 71% in year 2014.

We analyze the commodity composition of Sino-Russian bilateral trade in *Fig. 2* and *Fig. 3* using China as the reporter, and draw conclusions as follow: (1) Although the proportion of resource-intensive products kept a low level of 5% to 7% in exceptions of China during 11 years, it was the most popular part of imported goods with more than 80 percent in most years. (2) The expectations mainly relied on industrial manufactured

[2] Product codes SITC 0-SITC 9 separately represent food and live animals, beverages and tobacco, inedible raw materials other than fuel, mineral fuels, lubricants and related raw materials, animal and vegetable oils, fats and waxes, no-listed chemicals and related products, manufactures mainly classified by materials, machinery and transport equipment, miscellaneous manufactured articles and other uncategorized goods and transactions.

Table 1

Total Export-Import Volume of Sino-Russian Bilateral Trade between 2006 and 2016

A. The exportations of China with Russia (million)											
Product Code	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
SITC 0	790	1114	1241	1056	1377	1754	1755	1905	2102	1634	1780
SITC 1	12	12	16	17	20	28	28	26	17	13	14
SITC 2	82	104	146	82	141	248	211	173	202	160	153
SITC 3	142	197	270	89	222	351	294	286	185	177	158
SITC 4	0.43	0.66	1.98	1.85	2.80	5.84	5.61	3.68	4.78	3.08	3.71
SITC 5	741	1228	1632	1019	1551	2074	2248	2509	2837	2115	2194
SITC 6	2704	4482	6528	3256	5511	7501	8499	9318	9888	5954	5777
SITC 7	4359	8321	11587	5441	10472	14831	17543	17524	18171	11690	15049
SITC 8	7001	13070	11652	6543	10308	12093	13473	17846	20272	13010	12151
SITC 9	0.50	0.46	1.89	8.88	6.83	15.75	0.20	0.02	0.22	0.10	60.88
B. The importations of China with Russia (million)											
Product Code	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
SITC 0	1281	1427	1308	1277	1373	1669	1493	1494	1469	1439	1579
SITC 1	0.57	1.97	2.83	1.56	1.94	2.41	2.34	17.08	18.98	20.89	30.83
SITC 2	3485	5001	5758	4338	5313	8567	6864	6056	5554	5272	5760
SITC 3	9464	9354	11947	9386	12848	22923	29522	26880	29719	20191	19021
SITC 4	0.00	0.00	0.02	0.04	0.00	0.35	2.52	7.70	9.06	75.07	194.63
SITC 5	1870	2171	2537	1796	2824	3128	3087	2283	1881	1747	1238
SITC 6	1222	1460	1858	4040	3148	3764	2812	2608	2394	3680	3314
SITC 7	196	224	361	387	331	220	224	187	363	553	691
SITC 8	29	40	55	54	72	84	122	125	127	144	207
SITC 9	7.64	10.24	5.69	2.76	3.31	5.92	9.36	10.33	57.15	135.56	224.13

Data Source: UNCOMTRADE DATABASE (http://comtrade.un.org).

goods (labor-intensive products and capital-intensive or technology-intensive products), while they were comparatively minor in importations. In addition, the decreasing labor-intensive products and increasing capital-intensive or technology-intensive products gradually reached the similar proportion. (3) China's import commodity structure from Russia was relatively fixed, but the structure of exported goods continued to improve. Even if the quantity of capital-intensive or technology-intensive products was slightly below that of labor-intensive ones, it had the tendency to become the highest.

2.3. Sino-Russian Bilateral Trade Intensity

We analyze the trade intensity of Sino-Russian bilateral trade through Index of Trade Intensity[3]. Let us donate export for X and import for M, then the calculation formula is:

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

[3] Index of Trade Intensity (TCD) is an index used to measure the trade intensity of a trade partner. Its value is equal to the ratio of a country's exports to certain trading partner of the country's total exports divided by the rate of the partner' exports accounted for the proportion of total world imports.

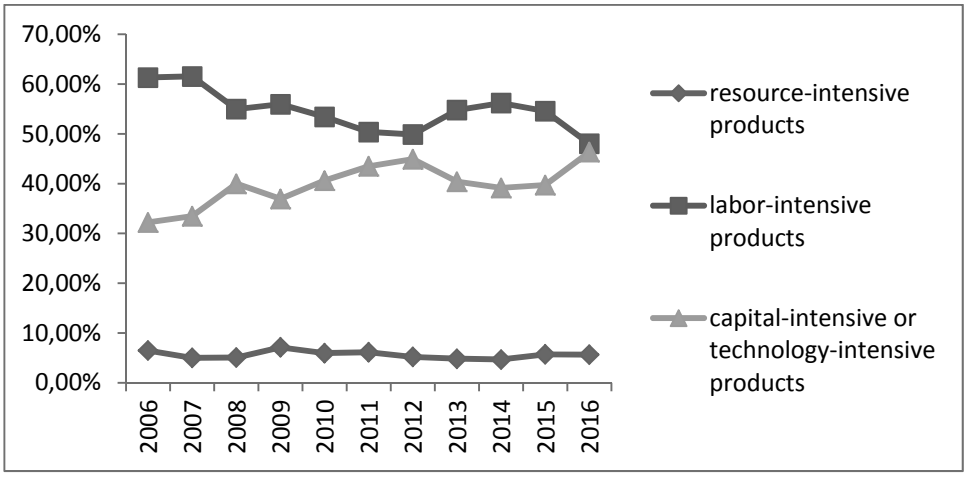

Fig. 2. **Commodity Composition of China's exports to Russia between 2006 and 2016**

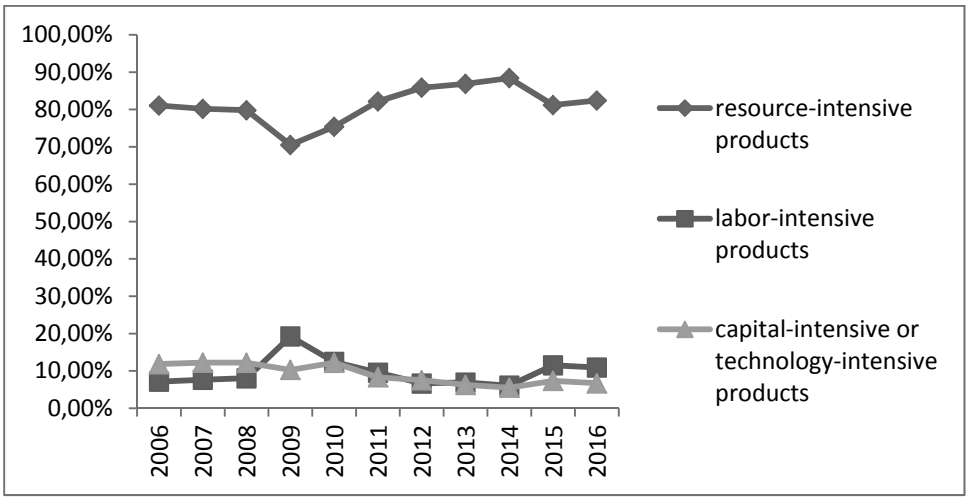

Fig. 3. **Commodity Composition of China's imports from Russia between 2006 and 2016**

Data Source: calculation based on the data from WITS DATABASE (http://wits.worldbank.org/).

Where TCD_{ab} measures the importance of Country b as an export market of Country a, X_{ab} represents the exportations of Country a to Country b, X_a represents the gross exportations of Country a, and M_b and M_w are respectively the importations of Country b and the world. If values of TCD_{ab} and TCD_{ba} are both greater than 1, the two countries act as the vital export market to each other. The higher value indicates that the close links between the two trade countries and the higher level of importance of the country's trading partner as the export market to the report country.

TCD_{CR} donates the importance of Russia as a China's export market and TCD_{RC} is the significance of China as an export market of Russia (*Table 2*). We find that $TCD_{CR} > 1$ since 2006, which illustrates Russia is always an essential export market to China. Although $TCD_{RC} \leqslant 1$ before 2015, it has an upward trend in recent years. It is worth noting that in both 2015 and 2016, $TCD_{CR} > 1$ and $TCD_{RC} > 1$ shows that these two countries become vital partners to each other. Additionally, even if these two indexes have different changing tendency, the phenomenon that $TCD_{CR} > TCD_{RC}$ always exists, which means China depends moreon Russia's market.

2.4. Complementarity of Sino-Russian Bilateral Trade

Under the free trade environment, different countries form division of labor in manufacturing process due to comparative advantages. Based on this, we analyze Sino-Russian bilateral trade complementarity through Revealed Comparative Advantage

Table 2

Sino-Russian Trade Intensity Index between 2006 and 2016

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016
TCDCR	1.43	1.62	1.38	1.05	1.23	1.20	1.22	1.30	1.46	1.34	1.44	1.44
TCDRC	0.97	0.89	0.78	0.94	0.76	0.86	0.90	0.77	0.84	1.01	1/05	1.05

Source: calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/).

Table 3

The Value C_{ij} Calculated by China as the Exporting Country

year	resource-intensive products					labor-intensive products		capital-intensive/technology-intensive products		
	SITC 0	SITC 1	SITC 2	SITC 3	SITC 4	SITC 6	SITC 8	SITC 5	SITC 7	SITC 9
2006	1.26	0.36	0.21	0.01	0.15	1.13	1.68	0.51	1.47	0.11
2007	0.96	0.30	0.16	0.01	0.07	1.09	1.91	0.44	1.66	0.06
2008	0.76	0.26	0.18	0.01	0.09	1.13	2.13	0.49	1.99	0.03
2009	0.88	0.30	0.16	0.01	0.07	1.11	2.03	0.49	1.65	0.03
2010	0.89	0.30	0.09	0.01	0.06	1.13	2.37	0.56	1.76	0.03
2011	0.79	0.28	0.08	0.01	0.05	1.17	2.31	0.58	2.03	0.04
2012	0.73	0.28	0.11	0.01	0.04	1.38	2.68	0.57	2.21	0.00
2013	0.74	0.27	0.11	0.01	0.05	1.41	2.69	0.59	2.13	0.00
2014	0.68	0.28	0.14	0.01	0.04	1.39	2.48	0.61	1.91	0.00
2015	0.66	0.31	0.18	0.02	0.06	1.32	1.94	0.65	1.56	0.00
2016	0.65	0.33	0.17	0.02	0.05	1.27	1.82	0.62	1.42	0.02

Source: calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/).

Index (RCA)[4]. If the trade complementarity is obvious, which means intensive export products of a country are suitable for intensive import products of its partner, the development of their trade relationship and their existing production model could be maintained.

The formula for the trade complementarity index of a single product is:

$$Ckij = RCAk\ xi \times RCAkmj, \quad (2)$$

$$RCAk\ xi = (Xki/X_i) / (Xk\ w/X_w), \quad (3)$$

$$RCAk\ mi = (Mk\ i/M_i) / (Xk\ w/X_w). \quad (4)$$

Where XkI and Xkw are separately the exportations of Product k in Country i and the world, X_i and X_w are respectively the total exportations of Country i and the globe, Mk I is the import quantity of Product k in Country i and M_i is the total importations of this country.

According to Product k, if Ckij > 1, the trade complementarity of this kind of products is very strong and if not, the trade complementarity is weak or unobvious. The higher the value of Ckij is, the stronger the trade complementarity is.

We conclude from *Table3* and *Table4:*

(1) From the perspective of the trade complementarity of Chinese exports and Russian imports (*Table 3*), the complementary effects of labor-intensive products (SITC 6 and SITC 8) and partial capital-intensive/technology-intensive products (SITC 7) are relatively obvious, especially the index of SITC 8 is

[4] Revealed Comparative Advantage (RCA) is an index comparing a proportion of a specific kind of export goods in a country's total exportations and the proportion of this kind of goods in the global total exportations.

Table 4

The Value C_{ij} Calculated by Russia as the Exporting Country

year	resource-intensive products					labor-intensive products		capital-intensive/technology-intensive products		
	SITC 0	SITC 1	SITC 2	SITC 3	SITC 4	SITC 6	SITC 8	SITC 5	SITC 7	SITC 9
2006	0.07	0.04	3.75	3.74	0.53	0.84	0.05	0.41	0.12	0.16
2007	0.10	0.05	4.17	4.03	0.58	0.81	0.05	0.43	0.12	0.13
2008	0.06	0.06	4.35	3.66	0.53	0.61	0.05	0.47	0.11	0.17
2009	0.10	0.07	3.72	4.31	0.75	0.86	0.05	0.36	0.12	0.11
2010	0.08	0.05	2.95	3.94	0.34	0.65	0.04	0.36	0.09	0.56
2011	0.09	0.06	2.93	3.58	0.33	0.52	0.03	0.38	0.08	1.29
2012	0.15	0.09	2.90	4.22	0.83	0.59	0.06	0.42	0.11	0.48
2013	0.15	0.09	2.94	4.06	0.78	0.54	0.06	0.39	0.13	0.67
2014	0.19	0.11	3.12	4.74	0.74	0.63	0.06	0.40	0.13	0.59
2015	0.28	0.17	3.73	7.03	0.88	0.66	0.08	0.48	0.16	0.62
2016	0.32	0.18	4.09	8.57	1.02	0.72	0.07	0.40	0.15	1.93

Source: calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/)/

the most evident and its average is around 2. Especially to deserve to be mentioned, numerical values in *Table 3* are relative stable with little fluctuations.

(2) Index of *Table 4* reflects the coincidence degree of Russian exports and Chinese imports. The high numerical values gather in the same kind of products, resource-intensive products. Specifically, the indexes of SITC 2 and SITC 3 are very obvious, which could reach up to 3–4. What's more, the trade complementarity indexes of SITC 3 in 2015 and 2016 are respectively 7.03 and 8.57, which are fairly high coincidence degrees in the bilateral trade field.

In order to further clarify the trade complementarity between the two countries, we calculate the comprehensive trade complementarity (*Table5*) by the following formula:

$$C_{ij} = \sum_k [(RCA_{xik} \times RCA_{mjk}) \times (W_k / W)], \quad (5)$$

where C_{ij} is the index of comprehensive trade complementarity which is a weighted average of all products or all industries, and the weighted factor is the proportion of all kinds of products in the global trade, W_k / W.

In the case of multiple industries, if we don't want to distinguish the exporter, we should first determine the comparative advantages between these two countries. The assumption is that as long as a country has the comparative advantage in one industry, it would be able to export to its partner whose products in that industry are relative inferior.The formula based on this method is:

$$C_{ijt} = \Sigma_a \Sigma_b \{[(RCA_{xia} \times RCA_{mja}) \times (X_{wa} / X_w) + (RCA_{xjb} \times RCA_{mia}) \times (X_{wb} / X_w)]\}, \quad (6)$$

where Σ_a and Σ_b are respectively superior product sets for Country i and Country j, C_{ijt} represents the comprehensive trade complementarity index without distinguishing the export country, X_{wa} and X_{wb} are global exportations of industry a and b. And we investigate the comparative advantages before.

The complementary relationship between China and Russia is consistent with the stability of the factor endowment and these two countries' comparative advantages (*Fig. 4*).To be more specific, resource-intensive products have the highest values which would reach up to more than 3 and they always take up the majority of Russian exportations to China.

According to the outcomes of *Table 5*, all indexes of Chinese exports to Russia are over 1. Albeit to some values less than 1, the indexes of Russian exports to China increase in general. The integral index (*Table 6*) without export country distinction shows that the volume increased before 2012 which is a year with the highest number of 2.16 and then decreased

Table5

Index of Comprehensive Trade Complementarity

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Russia as the target country	1.01	1.07	1.14	1.04	1.10	1.14	1.27	1.25	1.20	1.09	1.04
China as the target country	0.89	0.92	0.97	0.95	0.93	0.98	1.07	1.04	1.10	1.15	1.18

Source: calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/).

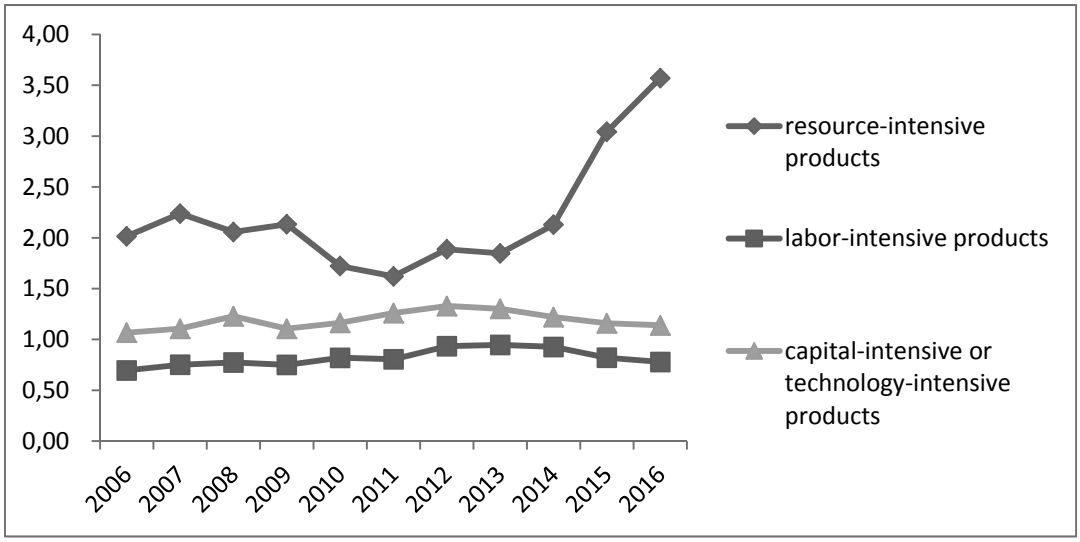

Fig. 4. **Complementarity Index of Chinese and Russian products**

Source: Calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/).

Table 6

The Comprehensive Complementarity Trade Index without Distinguishing export country

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
C_{ijt}	1.68	1.77	1.93	1.78	1.87	1.97	2.16	2.12	2.11	2.01	1.98

Source: calculation based on data downloaded from WITS DATABASE (http://wits.worldbank.org/).

slightly. On the whole, the comprehensive index is relatively high, which means, in spite of imports and exports, the complementarity of Sino-Russian bilateral trade is very strong.

3. THE POTENTIAL OF SINO-RUSSIAN BILATERAL TRADE

The former statistical study indicates that China and Russia have strong trade relationship during these ten years and trade intensity shows an upward tendency. In addition, Import and export products of these two countries have different commodity compositions due to comparative advantages. The complementarity of resource-intensive products strengthens, whereas that of the other two categories is almost invariable. Taken together, we should further investigate the potential of Sino-Russian bilateral trade.

3.1. Model, variables and sample

The thought of Gravity Model initially comes from Newton's law of gravitational attraction and it has been a main method of studying the international trade, economic behavior and influencing factors. The classical gravity model assumes that the scale of economic cooperation among countries is directly proportional to the total economic volume and is inversely proportional to its geographical distance. The majority of current researches introduce variables, such as whether they are both members of the

Table 7

The names, meanings, expected symbols and data sources of variables

Name	Expected symbol	Meaning	Data Sources
lnYCt	positive	The logarithm of GDP of Chinain year t after using GDP deflator to correct (eliminating price factors)	WDI of World Bank Database
lnYFt	positive	The logarithm of GDP of a foreign countryin year t after using GDP deflator to correct (eliminating price factors)	WDI of World Bank Database
APEC	positive	Whether trade partners are members of APEC (0,1)	The APEC official website
lnDISTCF	negative	The logarithm of the spherical distance between capitals of importing and exporting countries	Distance calculator on the website www.geobytes.com
lnDPICF	negative	Institutional differences between trade partners	Dow & Kautarant (2006)
lnDLANCF	negative	Linguistic differences between trade partners	Dow & Kautarant (2006)
lnDCULCF	negative	Cultural differences between trade partners	Hofestede (2001)
lnDRELCF	negative	Religious differences between trade partners	Dow & Kautarant (2006)

APEC organization (Jin Zhuiqiao and Yang Fengmin, 2015) or Shanghai Cooperation Organization (Zhang Ying, 2012), on the basis of classical model, while this improvement is limited to the way of explaining foreign trade flows from an economic perspective. Following the phenomenon that institutional factors play an increasingly prominent role in international economic activities, especially after Nos (1990) proposing proposition *system launches trade,* scholars has begun trying to expend the Gravity Model from a system-factor perspective (Kolstad and Wiig, 2009; Jiang Guanhong, 2012). In addition, more and more researches support that the differences of informal systems, like languages, cultures and religions, are also vital determinants (Kan Daxue and Luo Liangwen, 2012; Tian Hui and Jiang Chenchun, 2012; Huang Xinfei, etc., 2013; Song Yimiao, etc. 2015; Liu Hongduo, 2016).Bases on existing studies, we introduce formal and informal systematic factors into our research, such as the differences of systems, languages, cultures and religions.

The modified trade gravity model is as followed:

$$\ln T_{CFt} = \alpha_1 \ln Y_{Ct} + \alpha_2 \ln Y_{Ft} + \\ + \alpha_3 APEC + \alpha_4 \ln DIST_{CF} + \alpha_5 \ln DPI_{CF} + \alpha_6 \ln DLAN_{CF} + \\ + \alpha_7 \ln DCUL_{CF} + \alpha_8 \ln DREL_{CF} + \varepsilon_t, \quad (7)$$

where dependent variables $\ln T_{CFt}$ represent the logarithm of bilateral trade volume between China and another foreign country in the year tand the data source is UN COMTRADE database.

The expected symbol and data source of the explanatory variables are shown in *Table 7*.

We select samples within the scope of the emerging economies because China and Russia both belong to this kind of economic structure and these emerging economics are located on different continents, which show big differences among them. Selecting these countries or regions as samples of Sino-Russian bilateral trade potential, is representative (Jin Zhuiqiao and Yang Fengmin, 2015). And Sample countries and indicators are screened based on data available principles[5]. Based on the two above considering points, we select Vietnam, Turkey, South Korea, Brazil, Indonesia, Indonesia, Indonesia, and Iran as sample countries and the sample spans between 2002 and 2016. So the quantity of effective samples is 135.

3.2. The analysis of Sino-Russian bilateral trade flows

At first, considering the existence of the panel autocorrelation problem and the phenomenon that panel data is sensitive to the variance of sample data, we do panel hetero-variance and autocorrelation test. The outcome of Hausman test indicates that the evaluated outcome of fixed effects model is more ideal than that of random effects model and the former one is suitable

[5] The data of culture differences comes from Hofstede(2001), At first, we should remove the excluded countries and then we select four dimensions of PDI, IDV, MAS and UAI in Hofstede (2001) due to some countries missing IND and LTO indictors. On this basis, we construct culture difference index variables combining the method of Kogut and Singh (1988).

to our research. Then regarding the differences of system, language, culture and religion, and geographical distance would be unchanged over time, we use the least squares dummy variable model (LSDV) and then consider time effects, termed bidirectional fixed effects. Last but not least, we do the multi-collinearity test because there may be some multi-collinearity problems among differences of systems, languages, cultures and religions[6]. The regression results of the model are consistent with rational expectations, the regression coefficients of all variables are highly obvious and we get the empirical equation:

$$\ln T_{CFt} = 2.03\ln Y_{Ft} + 0.89APEC + 0.71\ln Y_{Ct} - \\ - 0.32\ln DLAN_{CF} - 0.29\ln DCUL_{CF} - \\ - 0.16\ln DIST_{CF} - 0.12\ln DPI_{CF} - 0.11\ln DREL_{CF}. \quad (8)$$

3.3. Evaluating the potential

The significant application of trade gravity model is estimating the potential of bilateral trade flows among countries, which means estimating development potential of bilateral trade flows through comparing the actual trade flows and theoretical ones calculated by gravity model.

There are two ways to estimate trade potential. The first one was used by Liu and Jiang (2002) firstly. They used trade gravity model to empirically analyze the main factors determining bilateral trade flows between China and other countries, and proposed methods to measure trade potential by the ratio of real bilateral trade volume (T) and analog value (T*). Then they divided bilateral trade potential among countries into three categories: (1) Potential Remodeling ($T/T^* > 1.2$), the trade potential of trade partners in this kind is limited and there could be a relatively large spacious room for trade development under circumstance of new positive influencing factors. (2) Potential Development ($0.8 < T/T^* < 1.2$), there is still trade potential between trade partners in this kind and it has certain space to expand bilateral economy and trade as well. (3) Potential Huge ($T/T^* < 0.8$), there is a massive trade potential between trade partners in this kind and it is a good choice for the trade partners to remove bilateral trade barriers in order to promote the normal trade development.

Nowadays, the current researches on the potential of China and other countries often use this method such as Bi and Shi (2011) estimated the trade potential between China and East Asian countries, and Li (2013) estimated the goods trade potential between China and Korea.

However, the method of Liu and Jiang (2002) is only used to estimate the relative size of trade bilateral potential under existing trade conditions and it has not estimated concrete values. The study method of Wilson Mann and Otsuki (2003) is different. They got empirical equation through doing gravity model regression of trade flows of APEC members. In addition, they enhanced trade facilitation level below average to the average level and substitute it into the empirical equation for purpose of estimating trade potential result from trade facilitation improvement.

This paper comprehensively uses two research methods. At first, use the ratio of real gross trade volume and simulated fitting value to measure the Sino-Russian bilateral trade potential, and the outcome is showed in the *Table 8*.

As data in *Table 8* show, Sino-Russian bilateral trade potential fluctuated around 1 with slightly increasing in recent years. This phenomenon illustrates the whole trade form between China and Russia belongs to potential-development type and there is a relatively large space for their bilateral trade development.

Based on this, we reduce the difference in the Sino-Russian informal system, like linguistic difference and cultural difference, to a certain percentage and then analyze the trade potential brought by the improvement of familiar degree in language, culture and other aspects. Taking year 2016 as an example, if the distance of language or culture between China and Russia could reduce 10 percent, the bilateral trade potential could be promoted 3.2% and 2.9% respectively. Thus, it is effective to promote bilateral trade development through improving familiar degree of language, culture and other aspects.

4. CONCLUSIONS

To sum up, the volatilities of Sino-Russian bilateral trade volume and growth rate are both strong and the future trend is not very clear. The commodity structures of these two countries are different because of comparative advantages. From a trade-balance perspective, China's trade surplus has been shrinking and the balance of trade between China and Russia has improved. Additionally, the complementarity and intensity of their products are relatively evident and

[6] Generally speaking, if VIF>10, there exists severe multiple collinear; if 5 < VIF < 10, there exists a degree of multiple collinear conditions; if VIF<5, there is no multiple collinear. The VIF values in results of the model test are all under 5, which indicates there exists no multi-collinearity problem. In other words, if you do not include the above explanatory variables, there could be a variable-missing problem.

Table 8

Sino-Russian Bilateral Trade Potential

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Trade potential	0.96	1.07	0.99	0.89	1.05	1.04	1.07	1.06	1.06	1.05	1.07

keep steady with slightly increasing trend, and the complementarity of resource-intensive products is the most distinct one, whereas that of the other two categories is almost invariable and at relative low level. What's more, from the potential point of view, the whole trade form between China and Russia belongs to potential-development type and there is a large space for their bilateral trade development. It could be effective to develop bilateral trade through improving informal-system familiar degree. Based on the above empirical analysis, we give following suggestions:

(1) Further deepen the cooperation mechanism.

There are many existing mechanisms of cooperation between China and Russia. Specifically, they are both members of Asian-Pacific Economic Cooperation (APEC), Shanghai Cooperation Organization (SCO), as well as belong to BRICS. One Belt One Road (OBOD) initiative proposed by Chinese president Xi and Eurasian Economic Union proposed by Russia have lots of common interests and cooperation opportunities. The two countries, China and Russia, should not only strengthen the docking and cooperation of existing mechanisms, but also establish some new cooperation mechanisms. They should maintain the comprehensive strategic partnership, start bilateral trade and investment facilitation negotiations, perfect dialogue mechanism, cooperation on more potential fields and develop a long-term and operational outline for economic and trade cooperation.

(2) Gradually improve the trade structure

We found within the former results that export products of both countries have obvious differences and trade complementarity is very evident especially in resource-intensive products. Although comparative advantages determine the type of export products and merchandising the goods with high complementarity is reasonable, strengthening other types of commercial trade could promote the overall development of Sino-Russian trade. The process of optimizing the structure of commodities should be gradual because too fast change could lead to instability of total trade and domestic markets, even the global market. And improving commodity composition does not mean transferring the trade amount of previous high-proportional products to other categories, it is a method to improve the volume of low-proportional products on the basis of original trade situation. In order to seize the cooperation opportunity to seek common development, both countries should strengthen infrastructure construction, such as the construction of pipelines and transportation, which could guarantee the development of transaction and trade.

(3) Strengthen the construction of Sino-Russian free trade area

Establishing Sino-Russian free trade area is a beneficial method to accelerate the development of their bilateral trade and it is a field that worth concerning, negotiating and promoting. We argue that expending the scale of free trade area after succeeding in some particular areas would be an effective measure. Trade partners should negotiate following the principle of reciprocity and mutual benefit. Meanwhile, they should reinforce private transaction. On one hand, it could stimulate each part to participate in Sino-Russian trade to promote the overall trade. On the other hand, it could be conducive to the diversity of products which has the possibility to promote the trade balance.

(4) Enhance the cultural communication

The communications between China and Russia could be traced back to ancient times. The Silk Road gives these two countries chances to indirect with each other and since then the exchanges between China and Russia have not been interrupted. Although they have different languages, civilizations and religions, China and Russia should accept the attitude of mutual understanding to keep the good relations of peaceful coexistence, for sake of common development. Admittedly, enhancing familiarity could be beneficial to the economical development and it is one of the foundations of building trade trust. There are some measures to enhance the mechanism of cultural communication, such as establishing more Confucius institutes, holding Sino-Russian cultural year, exchange of overseas students, holding regular forums and culture events, and promoting development of their tourisms. Moreover, the One Belt One Road initiative is an essential opportunity to constantly improve the scale and level of cultural exchanges between China and Russia.