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Analysis of the Factors Affecting the Russian-Chinese Trade Structure

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Abstract:- The purpose of this study is to analyze the factors affecting the change in the structure of trade between China and Russia, in particular, to study the influence of technological innovation factors on the structure of trade. Using the method of empirical regression analysis, this article attempts to study the factors affecting the commodity structure of trade between Russia and China, mainly from direct investment, capital labor ratio, Gross Domestic Product and technical innovation indicators. R&D expenditure as a percentage of GDP, the equivalent of full time R&D personnel, and patent authorization selected as technical Innovation Indicators. The results show that the main factors affecting Russian export trade structure to China are the accumulated amount of direct investment by China in Russia, the ratio of capital to labor, the proportion of R&D expenditure, and the main factors affecting Russian import trade structure to China are Russia's GDP, capital labor ratio, R&D expenditure and patent authorization. From the export model, the symbols of explanatory variable coefficients in the model are all positive. Therefore, the growth of these influencing factors can promote the optimization of the structure of trade in goods between Russia and China. Based on the import model, the main factors that affect the import of Russian machinery goods from China are Russia's GDP, capital labor ratio, R&D expenditure and the number of patent authorizations. Russia's GDP and capital labor ratio make a positive contribution to Russian import of Chinese machinery goods. The R&D expenditure and the number of patent authorizations are negatively related to the proportion of machinery imports. It can be seen that the factors affecting the import and export structure are not the same.

Keywords:- *China-Russian Trade; Trade Structure; Affecting Factors.*

I. INTRODUCTION

In recent years, cooperation and development of trade and economic relations between Russia and China are relevant issues for both countries. The structure of the trade is the direct reflection of economic and trade relations, trade interests of the two countries and their position in international division of labor, therefore the study on optimization of trade structure and the analysis of affecting factors has an important realistic meaning. The trade structure between Russia and China does not reflect the economic and technological potential of the two countries. In the increasingly fierce market conditions of international trade competition, it is not suitable for the sustained and healthy development of trade between the two countries.

II. ANALYSIS OF RUSSIA-CHINA TRADE COMMODITY STRUCTURE TRADE

A. Russia's six major categories of goods exports to China

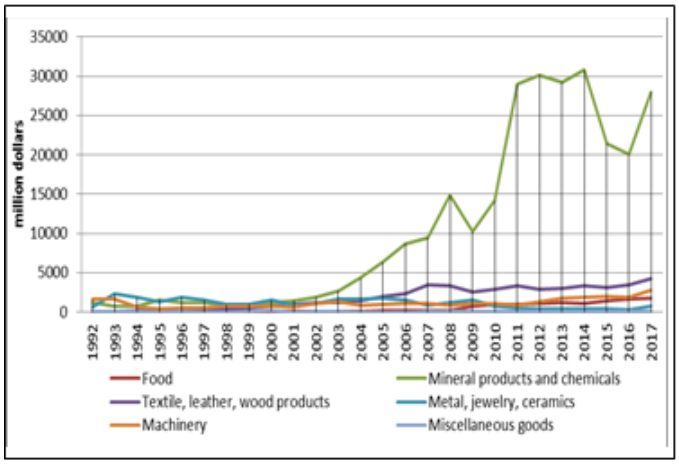

Fig 1:- 1992-2017 Russia's six major categories of goods exports to China

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From 1992 to 2017 years Russian exports to China increased by 10.6 times (from 3526 to 37525 million dollars). Figure 1 shows that the value of export of mineral products and chemical products increased rapidly after 2002, significantly exceeding the export value of other products. Other types of products increased, but the growth rate was small. In 2015-2016, exports of mineral products and chemical products declined due to the instability of the global economy and the decline in world prices of energy and raw materials.

In the 1990s and early 21st century, Russian exports were mainly high value-added products. Currently, low-value-added commodities are dominant. This is due to the significant increase in mining and prices of mineral products (mainly crude oil) from Russia to China. At the same time, the supply of machinery has been significantly reduced, and its exports are irregular, depending on the implementation of major infrastructure projects in China.

In the structure of Russian exports to China, there is a tendency to an increase in the share of raw materials and primary products. In Russian exports to China, the share of mineral and chemical products is significantly ahead and growing. In 2004, it reached 51.89%, which is more than half of all exports, and has continued to grow since then. In 2017, it was 74.53%.

The proportion of other categories of products is basically declining. Russia is one of the largest countries in the world and it has abundant natural resources, such as mineral products and oil and gas. With the continuous development of the Russian economy and the great demand for resources, Russia, as a close neighbor of China, has stable import and export channels. Therefore, mineral products and chemical products are still the main commodities exported by Russia to China.

B. Russia's six major categories of goods imports from China

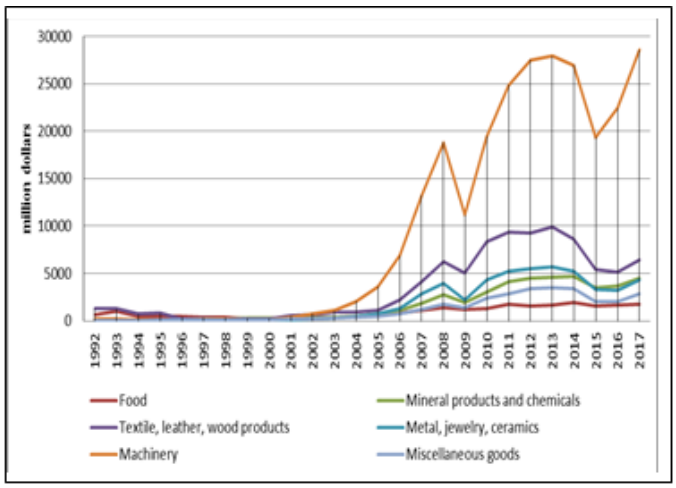

Fig 2:- 1992-2017 Russia's six major categories of goods imports from China

From 1992 to 2017 years Russia's imports from China increased by 20.7 times (from 2336 to 48374 million dollars). At present, China not only imports the country's traditional goods (textiles, leather, etc.), also provides Russia with more and more machinery and technology goods and industrial goods.

The structure of Russia's imports from China maintains the direction of production and consumption. Figure 2 shows that the charts of all six categories of goods are similar in shape. From 1992 to 2013, Russia's six major categories of goods imports from China have been increasing year by year, among them, engunery has the largest increase in trade volume. In Figure 2, we can clearly see that the volume of machinery imports quickly began to grow in 2003 and reached 18.8 billion dollars in 2007 year. However, the financial crises in 2008 and 2014 had a large impact on the amount of machinery imports. In 2009 Machinery imports decreased by 40.6%, but in 2010 exceed the pre-crisis level. In 2015, machinery imports decreased by 28.2%, but it took two years to exceed pre-crisis levels.

Other commodities were also affected by the two financial crises. It can be seen in Figure 2 that the import volume of textile, leather, wood, metal, jewelry, ceramics and mineral products and chemicals increased rapidly after 2005. After the financial crisis of 2014, the imports of these three types of goods did not exceed the pre-crisis levels.

Before 1995, textile, leather and wood products accounted for about 50% of Russia's imports to China, but after the proportion has gradually declined, and it is currently maintained at a level of about 13.28%. Textile, leather, and wood products are labor-intensive products with low technical content. We can also see that Russia's import structure has gradually changed from the fact that the proportion of imports of such products has become smaller.

In the structure of Russian imports, we can see a decrease in the proportion of food and beverages. Food and beverage products are mostly natural resource-rich products, with low levels of processing and low technological content. In addition, in recent years, Russia has become more stringent in the inspection of imported food, so China's imports from Russia have been declining.

The largest share of imports is the share of mechanical products. On the one hand, it may be due to the geographical change in the supply of multinational companies and the transfer of their enterprises from developed countries to China. On the other hand, the improvement of technology and product quality of Chinese enterprises, including through import patents. The share of engineering products exceeded the share of textile products made of leather and wood in 2002 and became the largest export product to Russia.

III. ANALYSIS OF THE FACTORS AFFECTING RUSSIA-CHINA TRADE COMMODITY STRUCTURE

There are many factors that influence the structure of trade. An analysis of the influence of factors on the Russian-Chinese trade structure is important to facilitate the promotion by Russia of a reasonable structure for the import and export of high-tech and capital-intensive products.

A. The construction of regression model

Factors affecting Russia-China trade structure, in this article we use as explanatory variables to examine their impact. As factors affecting the trade structure in this paper we selected: Russia's GDP, Russia's capital-labor ratio, China's cumulative direct investment in Russia, Russia's R&D expenditure as a percentage of GDP, Russian full-time equivalent of R&D personnel and patent authorization.

In the Russian-Chinese trade commodity structure, mechanical products have high technical and capital factors. Therefore, the proportion of the trade volume of machinery commodities in the volume of Russia-China trade can be used to measure whether the structure of Russia-China trade commodities is developing in the direction of high capital and high technology. Therefore, in this paper we take this proportion as the explained variable of the model.

The Russian and Chinese trade structure and its influencing factors are studied separately from the exports and imports aspects. To avoid possible heteroskedasticity in the regression model and the variability of time series, need to use logarithmic transformation of the variables.

The equation is as follows:

$$lnY_{Ex}=C+lnGDP\beta_1+lnRDP\beta_2+lnFDI\beta_3+lnRDE\beta_4+lnCLR\beta_5+ lnPA\beta_6+\varepsilon$$

$$lnY_{Im}=C+lnGDP\beta_1+lnRDP\beta_2+lnFDI\beta_3+lnRDE\beta_4+lnCLR\beta_5+ lnPA\beta_6+\varepsilon$$

Where, Y_{Ex} represents the proportion of exports of machinery products in Russian exports to China; Y_{Im} represents the proportion of imports of machinery goods in Russian imports from China; GDP represents Russian gross domestic product; RDP represents Russian full-time equivalent of R&D personnel; FDI represents the cumulative amount of Chinese direct investment in Russia; RDE represents the proportion of Russia's R&D expenditure in GDP; CLR represents the capital-labor ratio of Russia; PA represents the number of patent authorization; ε is a random error term.

Because the model involves multiple explanatory variables, these explanatory variables may have an impact on the dependent variables in the economic sense and are difficult to choose. Therefore, in this article we use Stepwise Least Squares Regression (STELS) to select the explanatory variables. The basic idea of this method is to input variables in the regression equations one by one from all the alternative explanatory variables according to their influence on the dependent variable, the degree of significance of the variable or the contribution to the overall significance of the regression equation. This process continues until R^2 cannot be improved.

The raw data used in the model are collected from UN COMTRADE DATABASE, "China Statistical Yearbook (1992-2017)", "Statistics Yearbook of the Russian Federation (1992-2017)", "Statistical Bulletin of China's Foreign Direct Investment (2006-2017)" and related literature. The regression analysis was performed by Eviews software.

The regression results in the export equation are as follows:

Dependent Variable: lnY_{Ex}
Method: Stempwise Regression
Sample: 1992 2017

Variable	Coefficient	Std. Error	t-Statistic	Prob*
C	-6.785431	0.954893	-7.518432	0.0000
lnFDI	0.515488	0.068171	6.816134	0.0000
lnRDE	0.397671	0.199701	1.876585	0.0652
lnCLR	0.736832	0.252701	3.075289	0.0069
R-squared		0.981381	Mean dependent var	1.514567
Adjusted R-squared		0.970127	S.D. dependent var	0.521858
Prob(F-statistic)		0.000000		

Table 1:- Export equation stepwise regression selecting results

The selecting process excludes the variables GDP, RDP, and PA, so in this article we adjusted the export model to:

$$lnY_{Ex}=C+lnFDI\beta_1+lnRDE\beta_2+lnCLR\beta_3+\varepsilon$$

As can be seen from the above figure, the independent variables FDI and CLR are significant within the 5% level confidence interval, and RDE is significant within the 10% confidence interval. The model's R^2 is 0.98, and the adjusted R^2 is 0.97, indicating that the model fits well.

The selecting variables results on the import equation are as follows:

Dependent variable: lnY_{Im}
Method: Stempwise Regression
Sample: 1992 2017

Variable	Coefficient	Std. Error	t-Statistic	Prob*
C	79,56178	31,12566	2,138175	0.0291
lnPA	-11,10532	4,104465	-2,379185	0.0051
lnCLR	0,318339	0,341986	0,729121	0.0401
lnGDP	1,946784	1,985481	0,897094	0.0567
lnRDE	0,711839	0,732465	0,864562	0.0693
R-squared		0,844271	Mean dependent var	1,741124
Adjusted R-squared		0,821878	S.D. dependent var	1,038142
Prob(F-statistic)		0,000051		

Table 2:- Import equation stepwise regression selecting results

After stepwise regression selecting, the variables RDP and FDI were excluded, so in this paper we adjusted the import model to:

$$lnY_{Im}=C+lnPA\beta_1+lnCLR\beta_2+lnGDP\beta_3+lnRDE\beta_4+\varepsilon$$

As can be seen from the above figure, the independent variables PA and CLR are significant within the 5% level confidence interval, and GDP and RDE are significant within the 10% confidence interval. The model's R^2 is 0.84 and the adjusted R^2 is 0.82, indicating that the model fits well. The model as a whole passed the significance test.

B. Empirical results

In order to test the effect of the model in the long run, and to avoid false regression caused by non-stationary time series, in this paper we use ADF unit root test was used to test the stability of each variable before co-integration analysis. After the ADF stationarity test, at a significant level of 10%, the ADF values of LnYEx, LnYIm, LnGDP, LnFDI, LnRDE, LnPA, and LnCLR are all higher than the critical value. There is a unit root, which is a non-stationary sequence. The first-order difference sequence is tested. By comparing the ADF value with the critical value at 10%, it is found that the ADF value is lower than the critical value and passed the stationary test, that is, LnYEx, LnYIm, LnGDP, LnFDI, LnPA, LnRDE, and LnCLR are all first-order single integers (I (1)), To meet the premise of co-integration technology analysis.

Co-integration test is a method used to test whether there is a long-term equilibrium relationship between non-stationary variables. We use the Johansen test to examine the long-term equilibrium relationship between the structure of Russia's exports to China and other explanatory variables.

Null hypothesis	Eigenvalue	Trace statistics	5% critical value	Prob*
None*	0,990724	84,24506	33,87687	0,0000
At most 1*	0,938671	50,24702	27,58434	0,0000
At most 2*	0,652398	19,02056	21,13162	0,0962

Table 3:- Results of Johansen cointegration test

As can be seen from the table, in the cointegration test, the trace statistic of r = 0, r≤1 is more than the critical value of 5%, and the trace statistic of r≤2 is less than the critical value of 5%, so r = 0, r≤1 is rejected, accept r≤2. Therefore, there is a cointegration relationship between the explanatory variables and the explanatory variables in the model, and there are at most two cointegration equations. We estimate the standardized cointegration relationship for the first cointegration vector as follows:

$$LnY_{Ex}=-0.054+1.525LnFDI+0.471LnRDE+0.857LnCLR+\varepsilon$$

The above co-integration results show that China's direct investment in Russia, Russia's R&D expenditure as a percentage of GDP, and Russia's capital-labor ratio all contribute positively to Russia's exports of machinery products to China. Among them, the largest coefficient has China's direct investment, for each additional unit of direct investment, will increase the proportion of exports of machinery products by 1.525 units. The second is Russia's capital-labor ratio, each increase of one unit will promote proportion of machinery products in Russia's export to China by 0.857 units. Finally, the proportion of Russia's R&D expenditure to GDP. For each additional unit, the proportion of machinery exports increased by 0.471 units.

Next, we use the Johansen test to examine the long-term equilibrium relationship between Russia's import trade structure from China and other explanatory variables. Similarly, there is a cointegration relationship between the explained variables and the explanatory variables in the model, and there are at most two cointegration equations. We estimate the standardized cointegration relationship for the first cointegration vector as follows:

$$LnYIm=1.739-0.982LnRDE+2.171LnGDP-0.907LnPA+2.332LnCLR+\varepsilon \quad (6)$$

The above co-integration results show that Russia's GDP and capital-labor ratio both contribute positively to Russian machinery imports from China. Specifically, for each additional unit of Russia's GDP, it will increase by 2.171 units. As for the proportion of imports of machinery products, each additional unit of capital labor ratio increases 2.332 units of machinery imports. The R&D expenditure and the number of patent grants have a negative correlation with the proportion of imports of machinery. It means that each increase in R&D expenditure will reduce the proportion of imports of machinery goods by 0.982 units, and each increase in the number of patent authorization will reduce the proportion of machinery imports by 1.907 units.

IV. CONCLUSION AND RECOMMENDATION

The problems in the product structure of Russia-China trade have not been improved for a long time, which will inevitably directly affect the improvement of the level and quality of Russia-China trade, and it is not conducive to the long-term stable development of Russia-China trade. Therefore, Russia and China should take measures to adjust the structure of import and export commodities so as to continuously optimize the structure of Russia-China trade commodities. Based on the analysis of the influencing factors of Russia-China trade structure in this paper, we find that the factors that influence Russia's export trade structure to China include China's direct investment in Russia, Russia's labor capital ratio and Russia's R&D expenditure. The factors affecting Russia's import trade structure with China include Russia's GDP, capital-labor ratio, Russia's R&D expenditure and the number of patents authorization. Therefore, based on these factors, we put forward the following suggestions to improve the product structure of Russia-China trade.

A. Focus on capital and technology investment

The results of the analysis show that increasing Russia's labor-capital ratio and R&D expenditure contributes to an increase in the share of engineering products in exports, that is, improving Russia's export trade structure. International trade is built on the basis of comparative advantage, and the changes in a country's comparative advantage mainly depend on the accumulation of factors and technological progress. The change in the accumulation of factors in a short period of time will not be great, so improving the technical level is the fundamental starting point for optimizing the Russian-Chinese trade commodity structure.

Russia has strong positions in aerospace, nuclear energy, power equipment, mining equipment, metal processing machine tools and other manufacturing industries. The main goal of the Russian government is to promote technological innovation and structural adjustment of the economy. Under the premise of expanding the international market, Russia should increase investment in capital and technology, improve the quality of products, and promote Russia's export to China machinery products, especially high value-added products. Russia should encourage the import substitution of high-tech products, as well as stimulate and support the introduction of new technologies by domestic enterprises, as well as encourage independent innovation activities. Russia should establish special funds to support the introduction and improvement of advanced applied technologies, as well as encourage multinational companies to create research institutes in Russia, support enterprises in creating research and development institutes abroad, and encourage domestic research institutes, schools, enterprises etc. Because it is necessary to start cooperation in the field of technological research and development with multinational companies and always improve their technological development and innovative capabilities.

Russia should encourage enterprises to increase R&D expenditures in technology field, especially investment in R&D of high-tech enterprises, and provide preferential tax regimes to stimulate the export of high-tech products. At the same time, the quality of exported products should be strictly controlled, and manufacturing companies should be strongly recommend to pass international quality certification to produce quality branded products. In this regard, Russia should increase the international competitive advantages of mechanical and electrical products in terms of technical characteristics, quality and prices.

B. Increase Russian-Chinese investment flows

The empirical analysis in this paper shows that direct investment can promote the improvement of the export structure of traded goods, so increasing direct investment between Russia and China is also a way to effectively improve the structure of Russia-China traded goods. Both Russia and China have become developing powers of foreign investment. In the future, the scope of mutual investments should be further expanded to increase the share of capital-intensive and high-tech goods in bilateral trade

and to increase the level of the general structure of trade. Large-scale project cooperation in the field of mechanical and electrical products is an important way to increase the share of mechanical and electrical products and new technologies in Russian-Chinese trade.

For a long time, the export of Russian mechanical and electrical products to China was mainly supported by intergovernmental agreements and large projects and was concentrated in the field of aviation, nuclear energy and power station. Currently, the implementation of a number of large-scale projects of economic and technological cooperation between Russia and China has already been completed or is nearing completion. Russian and Chinese enterprises should further strengthen their relations and deepen cooperation in fields with a competitive advantage, such as energy, nuclear energy, aerospace, telecommunications, electronics, ships and cars, and other areas to promote a number of large-scale projects.

C. Changing the direction of import and export

The obvious complementarity of factors and advantages between Russia and China is the basis of Russia-China inter-industry trade, but it is also the main barrier on the development of intra-industry trade between Russia and China. Russia's main products exported to China are energy commodities, namely mineral products and chemical products. From the standpoint of sustainable development, Russia will further restrict the export of natural resources such as mineral products and actively develop other high-tech industries to replace the large-scale export of natural resources to gain benefits.

Russian imports have not yet become an effective tool for accelerating scientific and technological progress and the production and technological potential of modernized countries. The weakness in imports is that the high-tech products and technical equipment brought by advanced technology do not occupy the main position of imports. China mainly exports home appliances and consumer electronics to Russia. Russia must provide products that are not produced or underproduced by the domestic market. It is also important that the import of finished products gradually replace the import of technologies and components for organizing its production in Russia, while reducing dependence on certain commodity imports through protective measures or import substitution measures.

REFERENCES

[1]. Balassa, Bela. Comparative Advantage, Trade policy and Economic Development [M]. New York University Press, 1989
[2]. Barkova S. A. Russia’s foreign trade relations with the BRICS states [J], Problems of modern economy. 2013. N 16. P. 7–11. (In rus)
[3]. Bruno Van Potte Isberghe, Frank Lichtenberg. Does Foreign Direct Investment Transfer Technology across Borders [J], The Review of Economics and Statistics, 2001 (3):490-497
[4]. Cao Wenjun, Research on Sino-Russian Trade Development under the WT0 Framework [D], Heilongjiang University Heilongjiang University Thesis, 2011
[5]. Chen Chuancheng, Research on the Change of Sino-US Goods Trade Structure and Its Impact on Sino-US Trade [D], Shandong: Master Thesis of Ocean University of China, 2012
[6]. Chen Liu. Analysis and Prospect of Sino-Russian Trade under the “Belt and Road” Strategy ［J］, Business Story, 2016, 29
[7]. Cui Dahu, Analysis and Reflection on China's Foreign Trade Dependence [J]. World Economic Research, 2004 (4): 3-36
[8]. Cui Zheng. Scientific and technical cooperation between Russia and China in the context of innovative development of the BRICS countries. [D] Dissertation. M. : MSU, 2015. (In rus)
[9]. Dariana Komarova, Research on China and Russia trade relations under the background of the Belt and Road Initiative[D], Master Degree Thesis, Dalian University of Technology, 2017
[10]. Ding Zhenhui, Comparative Advantage and Complementarity of Sino-Russian Trade [J], Russia, Central and Eastern European Markets, 2010 (9): 43-49
[11]. Fan Gang, Guan Zhixiong, Yao Zhizhong, Analysis of International Trade Structure: Technical Distribution of Trade Goods [J], Economic Research, 2006 (8): 70-80
[12]. Gao Xin, Research on Sino-Russian Investment Cooperation [D] ,. Jilin: Doctoral Dissertation of Dongbei University of Finance and Economics, 2011
[13]. Grossman，G．，E．Helpman．Innovation and Growth in the Global Economy［M］． MIT Press ，Cambridge，1991
[14]. Grubel H.G and P.J.Lloyd.Intra - Industry Trade:The Theory and Measurement of International Trade in Differentiated Prodect [M].New York:John Wilely.1975.
[15]. Irina, Research on the Competitiveness and Complementarity of China-Russia Trade [D]. Master Degree Thesis, Qingdao University of Science and Technology, 2016
[16]. Karelina E.A, Formation of priorities of Russia-China trade and economic cooperation [J], University Journal No. 9, 2017 (In rus)
[17]. Liu Hongyu, Analysis of Countermeasures to Optimize the Sino-Russian Trade Structure [J], China High-tech Enterprises, 2008 (24)
[18]. Ma Weiyun, Russia's economic situation and prospects [J], China Economic and Trade, 2007 (12): 58-61
[19]. Morena Skalamera. Russia-China energy relations reversed: A new little brother, Geopolitics of Energy Project[J]. Energy Strategy Reviews,2016(08):97-108.
[20]. Nicklas Norling. China and Russia: Partners with Tensions[J]. Policy Perspective,2016(1):33-48.

[21]. Novopashina A. N. Investment cooperation between Russia and China: development problems, Russia and China: history and prospects for cooperation. Materials of the IV International Scientific and Practical Conference. Blagoveshchensk, 2014. (In rus)
[22]. Pan Hongyang, Sino-Russian Trade Commodity Structure and Its Influencing Factors [D], Shandong University of Finance and Economics, 2014
[23]. Rybkin R. Yu. The Main Directions of Russian-Chinese Cooperation: History and Modernity[J], Managnent advice. № 3, 2018 (In rus)
[24]. Sukhodolov Ya. A. Evolution and modern specifics, of the Russian-Chinese trade [J], Izvestiya Irkutskoi gosudarstvennoi ekonomicheskoi akademii, Bulletin of Irkutsk State Economics Academy, 2016, T. 26, №3. C. 357–366 (In rus)
[25]. Tao Haidong, Discussion on the Complementarity of Sino-Russian Oil Trade Cooperation Based on Comparative Advantage Theory [J], Enterprise Economy, 2016, (2): 189-192
[26]. Wan Hongxian, Li Li, Research on Sino-Russian Trade Commodity Structure and Its Influencing Factors [J], Journal of International Business-University of Economics and Business, 2011 (5): 25-34