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ORIGINAL PAPER

A STUDY OF THE SINO-RUSSIAN PARTNERSHIP FROM THE PERSPECTIVE OF THE IMPACT OF BILATERAL TRADE ON ECONOMIC GROWTH

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Abstract. The article presents the results of a study of the dynamics of key indicators of bilateral trade between the People's Republic of China (PRC) and the Russian Federation (RF). Based on the general statistical indicators of imports and exports between the countries studied from 2013 to 2022, the interrelations within the framework of trade cooperation between China and Russia, as well as Russia's economic growth, are presented. In the process of studying statistical data, the authors used such research tools that, based on empirical experience, show more reliable results. In particular: the VAR model, impulse response, analysis of variance, and other methods for conducting empirical data analysis of Sino-Russian trade volume of imports and exports and Russian economic growth. Based on the results of the use of predictive models, the most appropriate ones were selected from the perspective of choosing optimal models for analyzing/predicting dynamic data series. The results of the study show that Sino-Russian trade plays a role in contributing to the economic growth of the countries. In recent years, in the context of a dynamically changing global economic and financial sphere, there has been an active growth in trade and other financial interaction between countries. To implement the scenarios of progressive development of both countries, it is necessary to maintain the existing growth rates of cross-country trade cooperation aimed at developing key industries in China and Russia. With the introduction of economic and financial sanctions by unfriendly countries, the economies of the countries are reorienting. New ways and channels of international trade are being sought, as evidenced by the data from the time series under study; the key economic paradigm of cooperation between countries is changing, taking into account bilateral adaptation to emerging constraints. Deepening mutual cooperation will contribute to the active development of both countries.

Keywords: economic growth, foreign trade, sino-russian relations, strategic cooperation, VAR model

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ОРИГИНАЛЬНАЯ СТАТЬЯ

ИССЛЕДОВАНИЕ КИТАЙСКО-РОССИЙСКОГО ПАРТНЕРСТВА С ПОЗИЦИИ ВЛИЯНИЯ ДВУСТОРОННЕЙ ТОРГОВЛИ НА ЭКОНОМИЧЕСКИЙ РОСТ

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Аннотация. В статье представлены результаты исследования динамики ключевых показателей двусторонней торговли Китайской Народной Республики (КНР) и Российской Федерации (РФ). На основе общестатистических показателей импорта и экспорта между странами, исследованных за период с 2013 по 2022 годы, представлены взаимосвязи в рамках торгового сотрудничества между Китаем и Россией, а также экономическим ростом России. В процессе исследования статистических данных в работе авторы применяли такие инструменты исследования, которые, исходя из эмпирического опыта, показывают более достоверные результаты. В частности: модель VAR, импульсный отклик, дисперсионный анализ и другие методы для проведения эмпирического анализа данных китайско-российского торгового объема импорта и экспорта и российского экономического роста. По результатам применения прогностических моделей осуществлен выбор наиболее подходящих с позиции выбора оптимальности, моделей анализа/прогнозирования рядов динамических данных. Результаты проведенного исследования показывают, что китайско-российская торговля играет определенную роль в содействии экономическому росту стран. За последние годы, в условиях динамично изменяющейся мировой экономической и финансовой сферы, наблюдается активный рост торговли и иного финансового взаимодействия между странами. Для реализации сценариев поступательного развития обеих стран необходимо поддерживать существующие темпы роста межстранового торгового сотрудничества, направленного на развитие ключевых отраслей Китая и России. С введением недружественными странами экономических и финансовых санкций происходит переориентация экономик стран; осуществляется поиск новых путей и каналов осуществления международной торговли, о

чем свидетельствуют данные исследуемых временных рядов; происходит смена ключевой экономической парадигмы взаимодействия стран с учетом двусторонней адаптации к возникающим ограничениям. Углубление взаимного сотрудничества будет способствовать активному развитию обеих стран.

Ключевые слова: экономический рост, внешняя торговля, китайско-российские отношения, стратегическое сотрудничество, VAR-модель

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Introduction

The relevance of the study on the interaction between China and Russia is caused by the need to adapt the economies of both countries to the new economic formation [1], as well as possible restrictions caused by the unfriendly actions of individual countries in the world and imposed economic and financial sanctions. Dynamically changing trade and financial relations between the two economic powers require a comprehensive analysis of statistical data in order to identify new patterns of development; obtaining a working statistical apparatus to monitor complex development is necessary for further identification of key factors of interaction between the relevant territories of the countries in the world.

The official establishment of diplomatic relations between the two countries dates back more than 70 years. During this period, Sino-Russian relations steadily improved, carrying out a historical status shift from "mutually considered friendly countries" to "China-Russia comprehensive strategic partnership of coordination for a new era" [2]. The atmosphere of strategic mutual trust and good-neighborliness was created by the model of the new type of the international relations. China and Russia are each other's largest neighbors and comprehensive strategic coordination partners, as well as major powers of the world and permanent members of the UN Security Council [3]. The interaction of the countries' territories in the field of industry, resource processing, ensuring integrated interaction and the development of national business structures is closely related to the need to ensure the progressive development of both countries [4]. At the same time, it should be noted that these two countries pursue an independent foreign policy, and both consider Sino-Russian relations to be their diplomatic priorities. The development of Sino-Russian relations has a clear historical logic and a powerful internal driving force [5]. Over the past 10 years, cooperation in various fields between the two sides has made great progress and entered a new era.

In 2022, the volume of bilateral trade between China and Russia reached a record 190.271 billion US dollars, an annual increase of 29.3%. China has been Russia's largest trading partner for 13 consecutive years. Sino-Russian economic and trade cooperation has been steadily developing, and the cooperation in energy, investment, communications and other fields has achieved new results, contrib-

uting to the overall development of the two countries. It is important to note that the increase in the share of payments in local currency of the bilateral trade between the two countries has made Sino-Russian relations more autonomous [6].

Looking at the world today, the prospects for the global economy are gloomy and uncertain, and the economic downturn affects both the developed and developing economies, the geopolitical rivalry between major powers continues to be escalating [7]. Russia's special military operation, as well as the pressure and sanctions from the Western countries, have turned Russia's foreign trade strategy "to the east." Therefore, in the context of the new era, deepening the strategic partnership between China and Russia in the new era is the right choice. Judging by the volume of Sino-Russian trade and the economic growth rates of the two countries from 2013 to 2022, Sino-Russian cooperation is a historic achievement and a necessity of the present.

The research materials will be the official reports of the statistical services of Russia and China, containing data characterizing key indicators of world trade. The data presented in this paper on trade between Russia and China are taken from the website of the National Bureau of Statistics [8], as well as from the official website of statistics on bilateral trade between China and Russia [9].

The amount of data presented in official statistical collections (Internet sites) is very extensive. It is necessary to highlight some of the indicators that most reflect the impact of bilateral trade on the growth of the economies of China and Russia to obtain the most accurate and significant results. The existing changes in the data series caused by changes in world trade, the development of regional industrial, logistical and financial ties, as well as changes caused by changes in some aspects of the statistical methodology for accounting for key indicators (data). They require adaptation of existing research models in order to identify the most efficiently working elements of the analysis.

To solve the task in the field of research of complex indicators characterizing international trade and the impact on the main indicators of the development of countries and territories; elements of the regional economy; industry segments of the markets of countries, it is necessary to turn to a set of economic and mathematical methods based on time series by choosing the most appropriate ones

for a specific situation. Having studied the main statistical calculations regarding the parameters of international trade between China and Russia, we will carry out statistical processing of data series. Due to the high variability of the time series data of macroeconomic indicators, logarithmic processing will be performed for all data to make the data relatively stable and eliminate the heteroscedasticity of the time series data.

The impact of foreign trade on the national economic growth has always been an acute issue in foreign trade research [6]. To work out the theoretical and methodological basis of the study, several theories can be selected, but we focus on one of them, which most accurately describes the processes taking place in modern cross-country cooperation. The

foreign trade multiplier theory is an application of the Keynesian investment multiplier theory in foreign trade. The main connotation of this theory is as follows: when the investment multiplier k and the marginal propensity to consume are constant, the increase in national income will be several times higher than the value of the foreign trade surplus, and the number of employed will also double.

Transfer the theoretical postulates to real data and show the result of a study of their application in accordance with the presented theoretical approach. For clarity, we present the main data on trade imports [8] and exports between China and Russia for 2013-2022 (Table 1) [9].

Table 1 / Таблица 1

Data on Trade Imports and Exports between China and Russia for 2013-2022 / Данные по торговому импорту и экспорту между Китаем и Россией за 2013-2022 гг.

Years / Годы	Amount (US Dollars: billion) / Сумма (доллары США: миллиард)	IM(R) (US Dollars: billion) / Импорт (РФ) (доллары США: миллиард)	EX(R) (US Dollars: billion) / Экспорт (РФ) (доллары США: миллиард)	EX-IM / Чистый экспорт
2013	89.21	49.59	39.62	-9.97
2014	95.28	53.68	41.6	-12.08
2015	63.55	34.95	28.61	-6.34
2016	66.11	38.09	28.02	-10.07
2017	84.07	42.87	41.2	-1.67
2018	107.06	47.98	59.08	11.1
2019	110.92	54.13	56.79	2.66
2020	107.76	50.58	57.18	6.6
2021	146.89	67.57	79.32	11.75
2022	190.27	76.12	114.15	38.03

Source: compiled by the authors based on [9] / Источник: составлено авторами на основе данных [9]

Analyzing the import and export data for the selected period of retrospection, it can be concluded that Sino-Russian trade has shown active growth over the past ten years, and net exports have moved into a positive zone and continue to increase, which is evidence of China's activation as a trading partner of Russia. The peak of growth is in 2021-2022, the period when the global financial and economic restructuring of most regional economic systems begins. Caused not only by the technical and informational transition to a new formation, but also by the influence of sanctions and other restrictions of a number of countries and regions aimed at isolating the economies of individual regions and/or groups of countries. It can be seen from the presented statistical data that the greatest activation occurred during periods of transformation of the regional development of individual elements (industries) of countries [10].

The existing aggregated data obtained during the study indicate data differentiation, and it is advisable to link them to individual indicators in order to identify the most significant ones that provide the greatest effect from their changes. Therefore, in this article, taking as a basis the theory of the foreign trade multiplier by J.M. Keynes and based on the analysis of the VAR model, we investigated the relationship between Russia's economic growth and

Sino-Russian trade as interrelated factors [11].

To ensure the successful solution of the tasks set in the work, the gross domestic product of Russia for 2013-2022 (GDP expressed in US dollars) was chosen as a variable of economic growth (Fig. 1) [10].

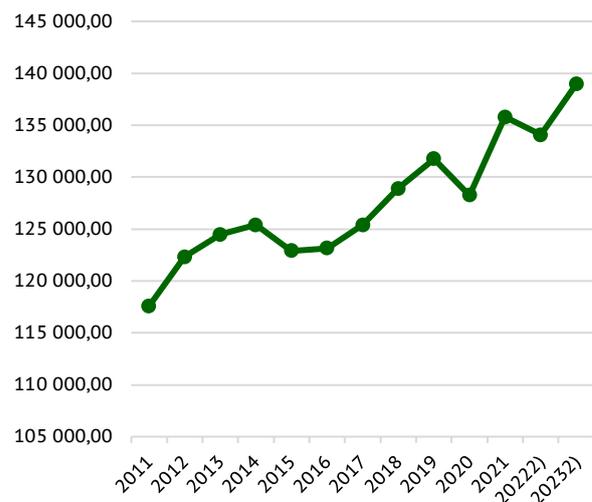


Fig. 1. The Dynamics of Russia's GDP for 2011-2023 (in prices of 2021), billion rubles / Рис. 1. Динамика ВВП России за 2011-2023 гг. (в ценах 2021 года), млрд руб.

Source: compiled by the authors based on [9] / Источник: составлено авторами на основе данных [9]

Other variables were such indicators as: Exports to China (EX(R)) [8], the volume of import and export trade between China and Russia (EX+IM) [9].

To stabilize the time series data, logarithmic processing is performed for all the indicators studied in the article: the logarithms of GDP, exports to China, and imports and exports between China and Russia, respectively, are expressed as LNGDP(R), LNEX(R) and LN(EX+IM). The SPSS PRO software was used for data analysis [12].

Results and Discussion

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Table 2 / Таблица 2

Data Stationarity Test / Тест на стационарность данных

Variable / Переменная	t	P	Critical Value / Критическое значение			In Conclusion / Заключение
			1%	5%	10%	
LnEX(R)	1.362	0.997	-5.354	-3.646	-2.901	unstable
LnGDP(R)	1.466	0.997	-5.354	-3.646	-2.901	unstable
Ln(EX+IM)	1.373	0.997	-5.354	-3.646	-2.901	unstable
DLnEX(R)	-7.151	0.000***	-4.939	-3.478	-2.844	stable
DLnGDP(R)	-3.389	0.011**	-4.939	-3.478	-2.844	stable
D(Ln(EX+IM))	-4.126	0.001***	-4.939	-3.478	-2.844	stable

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

[D] represents the first-order difference of the logarithm of the original sequence.

Source: compiled by the authors based on [14] / Источник: составлено авторами на основе данных [14]

Based on the presented results of the differentiated values, by comparative analysis of the initial variables LnEX(R), LnGDP(R) and Ln(EX+IM) in Table 1, the corresponding values of t, values of P and critical values at each significant level, it can be seen that the initial variable with a single root is not discarded. If we assume that each row represents non-stationary data, then we can come to an erroneous conclusion. Since P after the first-order difference of each variable is less than 0.05, which

indicates that the sequence is a stationary sequence, that is, rejects the null hypothesis.

Next, we will determine the optimal delay order and check the stability of the VAR model. To create a more accurate vector autoregressive VAR model, it is first necessary to determine the optimal lag order of the model. Determining the optimal lag order can refer to statistics such as AIC, SC, LR, and HQ data. Table 3 shows that the optimal lag order of this model is the 1st order. Therefore, the VAR(1) model must be installed.

Table 3 / Таблица 3

The Chose of the Optimal Delay order of the VAR Model / Выбор оптимального порядка запаздывания модели VAR

Lag	LogL	AIC	SC	LR	HQ
0	26.168	-13.662	-13.596	-13.804	0
1	33.777	-13.958*	-13.839*	-14.762*	0.0*

Note: * Specifies the minimum value.

Source: compiled by the authors based on [12] / Источник: составлено авторами на основе данных [12]

After the VAR model is created, its stability should be checked. According to the root text of AR, all characteristic roots are in the unit circle, and the established VAR(1) model is stable.

Analysis of the impulse response.

The impulse response function measures the effect of a one-unit standard deviation shock from a random perturbation term on the current and future values of an endogenous variable.

This part mainly analyzes the impact of the volume of Sino-Russian trade (DLn(EX+IM)) and the volume of Russian exports to China (DLnEX(R)) on Russia's economic growth (DLnGDP(R)).

Fig. 2 shows that when DLnGDP(R) is affected by one standard deviation from DLnEX(R), DLnGDP(R) does not react in the first period. After that, it grew rapidly and reached a maximum value of 0.31 in the second period, that is, if all other conditions remain unchanged, every 1% increase in Russian exports to China will increase the economic aggregate by an average of 0.31%. In the third period, this positive influence weakens to a negative value, fluctuates around the 0 axis and finally tends to the 0 axis.

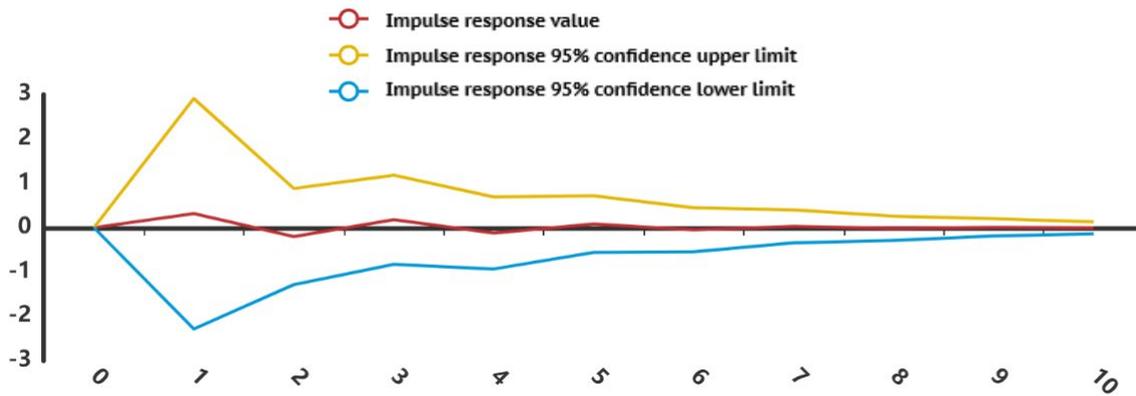


Fig. 2. Response of DlnEX(R) to DlnGDP(R) / Рис. 2. Влияние DlnEX(R) на DlnGDP(R)

Source: compiled by the authors based on [12] / Источник: составлено авторами на основе данных [12]

Fig. 3 shows that when DlnGDP(R) is affected by one standard deviation from Dln(EX+IM), DlnGDP(R) also does not react in the first period, but the trend in the second period is completely unexpected (it drops to a negative value, has a negative effect, then fluctuates around the 0 axis and, finally, it tends to the 0 axis). But looking back at Fig. 4, when Dln(EX+IM) is affected by a standard deviation of one unit from DlnGDP(R), Dln(EX+IM) does not react in the first period, but increases rapidly to a maximum value of

1.55. in the second period. This means that if other conditions remain unchanged, for every 1% increase in Russia's total economic growth, the volume of import and export trade between China and Russia will increase by an average of 1.55%. Then this effect gradually weakens and eventually tends to the 0 axis.

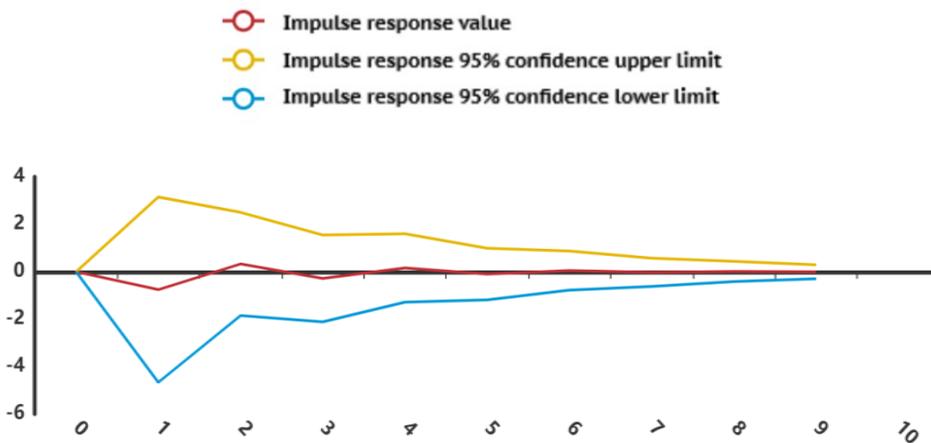


Fig. 3. Response of Dln(EX+IM) to DlnGDP(R) / Рис. 3. Влияние Dln(EX+IM) на DlnGDP(R)

Source: compiled by the authors based on [12] / Источник: составлено авторами на основе данных [12]

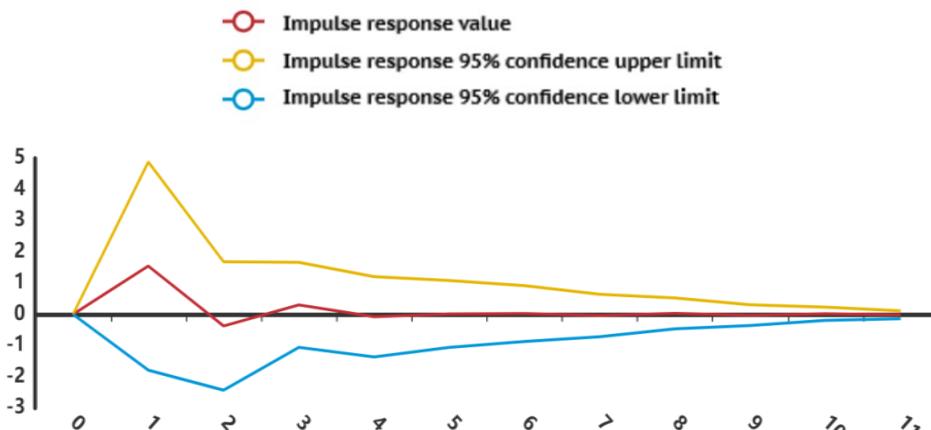


Fig. 4. Response of DlnGDP(R) to Dln(EX+IM) / Рис. 4. Влияние DlnGDP(R) на Dln(EX+IM)

Source: compiled by the authors based on [12] / Источник: составлено авторами на основе данных [12]

The presented statistical calculations indicate that, in general, the growth of Russian exports to China can effectively contribute to Russia's economic growth in the medium and long term. The existing positive trends and the growth of volumes in both physical and relative terms indicate that Russia's economic growth can also effectively contribute to the long-term development of Sino-Russian trade. And in the future, both as a result of structural shifts in regional economic systems and in the process of adaptation to a new financial and economic formation, it will contribute to the integrated development of territories and industries of both countries, bringing cooperation to new levels of growth

and interaction.

To obtain visual results of the work done, we will carry out the decomposition of the variance. The dispersion decomposition can decompose the variance of each variable in the VAR model into each element of the disturbance in order to judge the relative degree of influence of the factors of the element of the disturbance on the endogenous variables in the model.

Then present the main results of calculating the decomposition of the $DLnGDP(R)$ variance in tabular form *Table 4*.

Table 4 / Таблица 4

$DLnGDP(R)$ Dispersion Decomposition Diagram / Диаграмма декомпозиции дисперсии $DLnGDP(R)$

Lag	S.E.	$DLnGDP(R)\%$	$DLN(EX+IM)\%$	$DLNEX(R)\%$
1	0.26	100	0	0
2	0.272	99.315	0.109	0.576
3	0.274	99.097	0.107	0.796
4	0.275	98.918	0.107	0.975
5	0.275	98.837	0.108	1.055
6	0.275	98.799	0.109	1.091
7	0.275	98.785	0.11	1.105
8	0.275	98.78	0.111	1.109
9	0.275	98.778	0.111	1.111
10	0.275	98.778	0.111	1.111

Source: compiled by the authors based on [12] / Источник: составлено авторами на основе данных [12]

Table 4 shows the results of decomposition of the $DLnGDP(R)$ variance in the VAR(1) model. Based on the key data from *Table 3*, it can be seen that $DLnGDP(R)$ itself affects only the first period. From the second period, $DLnGDP(R)$ decreased slightly due to its own influence, and was also influenced by $DLnEX(R)$ and $DLN(EX+IM)$ and finally stabilized at about 98.8%, 0.11% and 1.11%, respectively. Summarizing the data obtained on the analysis of key functions characterizing the main indicators of time series describing trade interaction between countries, it can be seen that Russia's trade exports to China play a certain significant role in promoting the economic development of countries.

Conclusion

Based on the above analysis and conclusions, it can be concluded that Sino-Russian trade activities can contribute to the economic development of both countries. Despite the economic sanctions of unfriendly countries and the need to adapt elements of regional economic systems to new processes of inter-country interaction [14]. China and Russia should continue to maintain a good trade partnership in the new conditions, developing high-tech industries and advanced production [15]. The existing trends in stimulating regional sectors of the economy to export-import operations show positive results, contribute to a faster adaptation of the regional economy to the impact of sanctions and changes in the logistics chains of inter-country interaction. Dynamic progressive development requires the rapid adaptation of analysis methods

from simple quantitative characteristics to the use of complex multifactor models based on dynamic analysis and strategic perspective (the need to ensure progressive development).

The ongoing steps to strengthen cooperation should be aimed at deepening the Sino-Russian comprehensive strategic partnership [16]. Because only integrated interaction can ensure sustained growth and development in the long term.

Based on the analysis of the existing development trends and the processes of adaptation of the regions of the countries to international interaction, it should be noted that both sides should promote economic and trade cooperation both qualitatively and quantitatively. Take full advantage of the driving effect of large interconnection projects, strengthen cooperation in research and innovation between China and Russia, and implement regional cooperation at a higher level and on a deeper scale [17].

As recommendations, it should also be noted that both sides should strengthen the common design and planning at the highest level, expand trade in energy, resources, mechanical and electrical products, increase the stability of the supply chains of the two industrial chains, expand cooperation in information technology, digital economy, agriculture, trade in services and other areas, and also to promote mutual cooperation between traditional trade and new types of trade by region [18]. Additional and simultaneous development to further smooth cross-border logistics and transportation [19].

Let us concretize the recommendations received in the study.

The ongoing transformations in the field of improving inter-country trade relations should be based on the comprehensive stimulation of exports of priority regional industries of the RF subjects, including at the regional level.

According to the basic tenets of modern macroeconomic theory, exports should focus not on raw materials, but on products that have passed the main stages of processing within the country (in order to stimulate domestic employment).

Complexes of support for individual regions show the effectiveness of measures, which is expressed in the increase in the volume and value of exports. This has a positive impact on the regional economy.

Ten years ago, in March 2013, President Xi Jinping, in his speech at the Moscow Institute of International Relations, said: "People live in one global village, in one time and space, where history and reality intersect, a community of destiny".

Ten years later, in the same early spring, when he visited Moscow again, President Xi said at a meeting with President Putin that in the new historical conditions, both sides would view and understand Sino-Russian relations from a broad and long-term perspective, and contribute to the cause of human progress [20]. The integrated development of countries [21] and their regional economies is possible with close integrated cooperation aimed at progressive development in the medium and long term.

Authors' Contribution

The authors have made an equal contribution to the research: collection and analysis of the material; definition of goals and objectives, research methods; formulation and scientific substantiation of conclusions, registration of key research results in the form of an article.

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