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# Financial and Economic Aspects of Export-Import Activity of Russia's Non-Ferrous Metallurgy for 2013–2020 and Its Further Development Trends

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**Abstract.** Non-ferrous metallurgy has a rather high significance for the Russian economy. The industry creates jobs and demand for highly qualified specialists providing a fairly high salary relative to other industries. Non-ferrous metallurgy is not inferior in importance to ferrous metallurgy. The industry's products act as indispensable components in the production of electronics and household appliances, batteries, lighting systems, machine tools and equipment, jewelry, various kinds of wires and cables, kitchen appliances, plumbing and other household items. Non-ferrous metallurgy assumes a higher price for final products relative to ferrous metallurgy and lower production volumes. The purpose of the research is to analyze the key financial and economic indicators of the development of foreign trade activities of non-ferrous metallurgy in Russia, as well as to predict further directions for the development

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of trade turnover in the prevailing new economic conditions. The object of the study is foreign trade relations arising between the Russian Federation and foreign countries regarding the export and import of non-ferrous metals. We use methods such as structural (weight) and dynamic analysis, comparison, systematization, and forecasting. The information base is statistical data on the export-import activities of Russia's non-ferrous metallurgy; Russian and foreign literature on the industry development; Rosstat statistics, as well as information from the annual reports of the largest Russian non-ferrous metallurgy corporations PJSC Rusal and PJSC Nornickel.

**Key words:** foreign trade, export-import operations, sales markets under sanctions, non-ferrous metallurgy, added value of turnover.

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**Introduction to the problems**

Due to the rapidly changing conditions of the external and internal environment, various kinds of new sanctions and restrictions in which the Russian economy is accustomed to function, sustainable socio-economic development can be achieved with certain difficulties.

Russia has a high integration level into the global economy largely playing the role of the first links in international value-added production chains. One way or another, any production begins with resources, materials, energy or, in another way, with raw materials. This is one of the important problems of the Russian economy – raw materials and low-cost relatively cheap exports in exchange for high-tech and science-based expensive imports. By selling large-tonnage raw materials abroad, Russia gives away added value which successfully enriches foreign companies and, accordingly, the economies of other countries.

In the article, we will consider the trends and features of the development of Russia's foreign trade in the non-ferrous metallurgy industry, since this industry is export-oriented and brings foreign currency resources to the country and companies. There are practically no studies related to the foreign trade activities of Russia's non-ferrous metallurgy in the Russian economic literature, and this fact increases the relevance of the article.

Thus, based on the purpose outlined in the abstract, the study will solve the following tasks: to analyze export-import operations, their structure and volume in monetary and physical terms; to consider changes in sales markets and purchases by country; to identify key exported and imported non-ferrous metals, as well as those entities of the Russian Federation that are regions-exporters and importers of non-ferrous metallurgy products to the greatest extent.

**Theoretical overview and extent of elaboration of the topic**

Currently, China has the largest positive balance, and the United States of America has a record negative balance. This is not surprising, as China, characterized by a large population and constantly growing production capacity, is a kind of "factory" for the whole world, while the United States, with an endless emission of unsecured dollars, is a global consumer of material goods that produces much less than it consumes[1]. Since the

[1] Trade balance. Available at: https://www.banki.ru/wikibank/torgovyiy_balans/

beginning of the 21st century, the US trade deficit has ranged from 350 to 730 billion dollars annually[2]. During the same time, the US national debt has grown from 5.6 trillion in 2000 to 30.3 trillion dollars in 2022[3]. Naturally, it is beneficial for the United States to maintain the monopoly of its currency in the global economy for as long as possible. After all, if all countries at once refused dollars and brought them to America on their ships to exchange, then it is already clear that all US property is not worth the money they have launched into the world economy since 1944 after the signing of the Bretton Woods system[4] (Baumann 2015; Bordo, 2014; Dibooglu, 1999). There is a considerable amount of research concerning the huge US government debt, but almost any type of tax policy will be unable to significantly affect its constant increase, and income tax growth for Americans will significantly reduce the purchasing power of their salaries and lead to a decrease in consumption which is also bad for the economy (Birkeland, Prescott, 2007; Chen, Imrohoroglu, 2017).

Turning directly to the research topic, we should note that there are few studies in the economic literature that address the issue of non-ferrous metallurgy turnover.

For instance, E.A. Rastyannikova (the Institute of Oriental Studies of RAS) has conducted an analysis of the world market of non-ferrous metallurgy resources. In the article, the author notes an increase in the volume of world production of non-ferrous metals, primarily due to the growing demand of rapidly developing Asian countries, namely China, India and South Korea. The work shows the dominant role of China in the consumption of all types of ores and concentrates of non-ferrous metals. China imports 78% of the world's production of aluminum ores, 61% of copper ores, 26% of zinc, 50% of lead ores, 86% of nickel, 33% of titanium and 90% of cobalt ores and concentrates. At the same time, China is not among the leaders exporting ores and concentrates of non-ferrous metals (Rastyannikova, 2020).

S.I. Ultan and N.Yu. Rogovskaya cover topics related to the problems of Russia's export potential growth, as well as the methodological foundations of its formation on the example of non-ferrous metallurgy. The authors have systematized indicators for assessing the country's export potential in the world market of non-ferrous metals. These indicators include analysis of the current state of export activity, financial situation, human resources, investment situation, production activity, price factor and business climate (Ultan, Rogovskaya, 2012; Ultan, Rogovskaya, 2013).

In the article, the researcher of the Russian Customs Academy, M.S Zhuravlev examines the conditions for increasing the competitiveness of non-ferrous metallurgy industries within the EAEU member states. The work presents the data on the analysis of the mineral resource base of non-ferrous metals of the member states, as well as the import and export of non-ferrous metallurgy products of the EAEU member states. The paper outlines the main trends of cooperative engagement in the field of non-ferrous metallurgy, among which are: the formation of a supranational mechanism for coordinating the industry, the development and normative regulation of promising forms of mutually beneficial industrial cooperation and subcontracting, various financial support tools, the development of industrial and innovative infrastructure (Zhuravlev, 2018).

The researchers of VolRC RAS also speak about the development features of the world and Russian metallurgy, both ferrous and non-ferrous. The monographs and articles have analyzed the

[2] The United States – Trade balance. Available at: https://ru.tradingeconomics.com/united-states/balance-of-trade

[3] The US national debt in 2022 exceeded $ 30 trillion. Available at: http://global-finances.ru/gosdolg-ssha/

[4] Why did General de Gaulle send a ship with dollars to the USA in 1965. Available at: https://finance.rambler.ru/markets/40113848-zachem-v-1965-godu-general-de-goll-otpravil-v-ssha-korabl-s-dollarami/

financial and production results of large Russian metallurgical corporations, and reviewed the distribution and dividend policy (Ilyin, Povarova, 2019; Pechenskaya-Polishchuk, Malyshev, 2021a; Pechenskaya-Polishchuk, Malyshev, 2021b; Ilyin et al., 2021).

Head of the Laboratory of the Institute of Economic Forecasting RAS, I.A. Budanov has reviewed the plots concerning the management of the development of the global metallurgical market and the industry development based on social guidelines. The research examines the imbalances of the metal market and the conflicts of market participants. The work shows the interrelation of the processes of metallurgy development and the features of the management mechanism of industrial flows of products, resources, capital. The paper highlights the specifics, advantages and disadvantages of the mechanisms that determine the processes of sectoral development (Budanov, 2020).

In addition, I.A. Budanov has proposed an approach to forecasting sectoral development under the influence of processes in the social sphere, considered the contradictions associated with the influence of metallurgical production on the formation of socio-economic conditions in the country. The author has shown that social factors played a significant role in making decisions on the establishment of metallurgy enterprises and the management of the metal market. The main social functions performed by metallurgy are highlighted (Budanov, 2021).

It is worth saying that the previous issues of the journal *Economic and Social Changes: Facts, Trends, Forecast* present some articles, devoted to export-import topics. The authors of Vologda Research Center studied the possibilities of economic growth of Russia's entities on the basis of the development of non-commodity exports. The researchers studied the evolution of views on the role of export activity in economic growth. In addition, a scientifically based methodological approach was developed to assess the real share of non-commodity exports of Russia's regions in the total volume of products shipped abroad, as well as the author's approach to the classification of non-commodity exports (Gulin et al., 2018). Scientists of Volgograd State University considered the development of methodological approaches to assessing the effectiveness of import substitution in Russia. Their methodology was tested on the example of food products. The authors identified the processes that inhibit import substitution in the food industry, and its positive trends, confirming the effectiveness of import substitution. The optimal structure of commodity resources is calculated ensuring the full achievement of the effectiveness of import substitution of food products (Litvinova et al., 2019).

The study by Russian authors, published in English, presents an analysis concerning the trade of the countries of the Eurasian Economic Union with external partners. The authors have noted that the growth and stability of exports of the EAEU countries are due to the stable situation in demand for petroleum products and non-ferrous metals. In a sense, this export structure was inherited from the Soviet Union, when the bulk of exports were energy resources and metals (Ayuchatova et al., 2013).

The English-language literature presents a research, devoted to the study of import dependence of non-ferrous metallurgy in India. The author notes that the most significant metals for the development of engineering industries are copper, aluminum, lead, zinc and tin. They are the basis for the proper functioning of the manufacturing industry, as well as for other sectors such as agriculture, trade, transport and defense. In this regard, import substitution and cheaper production of these non-ferrous metals will have the most favorable effect on the Indian economy (Leela, 1979).

A team of Chinese scientists notes that forecasting prices for non-ferrous metals is crucial for investors, politicians and researchers. Accurate and reliable forecasting of prices for non-ferrous metals is a difficult but necessary task due to strong fluctuations and irregular cycles in metal prices. To investigate the effectiveness of forecasting the proposed model, we have conducted extensive experiments using daily future prices for zinc, copper and aluminum on the London Metal Exchange (LME), we have included six modern methods. The results of the experiment demonstrate that the proposed model has excellent performance for forecasting prices for non-ferrous metals (Liu et al., 2020).

**Research results**

In the foreign economic activity of any country, the turnover refers to the total volume of exports and imports, shown in monetary or physical (weight) terms[5].

The data of the Federal Customs Service, affecting the export and import of Russia's metallurgical products, state a reduction in total trade turnover from 62.5 to 50.7 billion dollars (or 19%) in the period from 2013 to 2020. The largest share in the export-import trade in metals falls on ferrous metallurgy products, which amounts to 255.7 billion dollars (60%) for the period. The turnover of key non-ferrous metals is: copper is 45.5 billion dollars (10.7%); nickel – 24.2 billion dollars (5.7%); aluminum – 60 billion dollars (14.1%). The total volume of foreign trade in copper increased from 5.8 to 7.2 billion dollars (+24%); trade in nickel and aluminum decreased by 23 and 26%, respectively (*Tab. 1*).

Speaking about the production structure, among the key non-ferrous metals, here we can also note the aluminum predominance. In just eight years, the aluminum turnover in Russia's foreign economic activity has reached almost 30 million tons, which

Table 1. Financial structure of the turnover of Russia's metallurgical industry by the main groups of metals and products from them

| Period | Copper | | Nickel | | Aluminum | | Ferrous metals and products* | | Other non-ferrous metals and products** | | Total, billion dollars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | billion dollars | % | billion dollars | % | billion dollars | % | billion dollars | % | billion dollars | % | |
| 2013 | 5.8 | 9.3 | 4.1 | 6.5 | 8.8 | 14.1 | 37.7 | 60.3 | 6.1 | 9.8 | 62.5 |
| 2014 | 5.9 | 9.9 | 4.2 | 7.0 | 7.8 | 13.1 | 36.4 | 60.9 | 5.5 | 9.2 | 59.8 |
| 2015 | 4.9 | 11.0 | 2.7 | 6.1 | 7.9 | 17.6 | 25.0 | 56.1 | 4.1 | 9.1 | 44.6 |
| 2016 | 3.7 | 9.4 | 2.1 | 5.3 | 6.5 | 16.4 | 23.4 | 58.9 | 4.0 | 10.0 | 39.7 |
| 2017 | 5.5 | 10.5 | 2.2 | 4.1 | 7.7 | 14.5 | 32.5 | 61.5 | 4.9 | 9.3 | 52.8 |
| 2018 | 6.2 | 10.1 | 2.7 | 4.5 | 7.8 | 12.8 | 38.6 | 63.3 | 5.7 | 9.4 | 61.0 |
| 2019 | 6.3 | 11.3 | 3.1 | 5.6 | 7.0 | 12.7 | 33.4 | 60.3 | 5.6 | 10.1 | 55.4 |
| 2020 | 7.2 | 14.2 | 3.1 | 6.2 | 6.5 | 12.9 | 28.7 | 56.6 | 5.2 | 10.2 | 50.7 |
| **Total:** | **45.5** | **10.7** | **24.2** | **5.7** | **60.0** | **14.1** | **255.7** | **60.0** | **41.1** | **9.6** | **426.5** |
| 2020 to 2013, times | 1.24 | 1.53 | 0.77 | 0.95 | 0.74 | 0.92 | 0.76 | 0.94 | 0.84 | 1.03 | 0.81 |

* This category includes: rolled products, bars, corners, cast iron, ferroalloys, waste and scrap of non-ferrous metals, iron, unalloyed steel in ingots and primary forms, etc.
** Tin, zinc, lead, precious metals (tungsten, titanium, cadmium, bismuth, molybdenum, tantalum, antimony, zirconium, etc.), cermets, spoons, forks, knives, locks, accessories, fasteners, etc.
Source: own calculation according to the data of the Federal Customs Service.

[5] The foreign trade turnover. The system of turnover indicators. Available at: https://spravochnick.ru/vneshneekonomicheskaya_deyatelnost/vneshnyaya_torgovlya/

Table 2. Production structure of the turnover of Russia's metallurgical industry by the main groups of metals and products from them

| Period | Copper | | Nickel | | Aluminum | | Ferrous metals and productions* | | Other non-ferrous metals and products** | | Total, thousand tons |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | thousand tons | % | thousand tons | % | thousand tons | % | thousand tons | % | thousand tons | % | |
| 2013 | 781 | 1.4 | 265 | 0.5 | 4,067 | 7.3 | 49,446 | 89.2 | 874 | 1.6 | 55,433 |
| 2014 | 806 | 1.4 | 246 | 0.4 | 3,556 | 6.3 | 50,563 | 90.2 | 886 | 1.6 | 56,057 |
| 2015 | 879 | 1.6 | 234 | 0.4 | 3,953 | 7.0 | 50,572 | 89.7 | 758 | 1.3 | 56,396 |
| 2016 | 761 | 1.3 | 232 | 0.4 | 3,939 | 6.9 | 51,094 | 89.9 | 777 | 1.4 | 56,803 |
| 2017 | 941 | 1.6 | 248 | 0.4 | 3,859 | 6.4 | 54,494 | 90.2 | 879 | 1.5 | 60,421 |
| 2018 | 989 | 1.5 | 250 | 0.4 | 3,719 | 5.7 | 59,068 | 91.0 | 918 | 1.4 | 64,944 |
| 2019 | 1,067 | 1.8 | 274 | 0.5 | 3,463 | 5.8 | 53,675 | 90.4 | 899 | 1.5 | 59,378 |
| 2020 | 1,230 | 2.2 | 264 | 0.5 | 3,438 | 6.1 | 50,210 | 89.6 | 900 | 1.6 | 56,042 |
| **Total:** | **7,454** | **1.6** | **2,013** | **0.4** | **29,994** | **6.4** | **419,122** | **90.0** | **6,891** | **1.5** | **465,474** |
| 2020 to 2013, times | 1.57 | 1.56 | 1.00 | 0.99 | 0.85 | 0.84 | 1.02 | 1.00 | 1.03 | 1.02 | 1.01 |

* This category includes: rolled products, bars, corners, cast iron, ferroalloys, waste and scrap of non-ferrous metals, iron, unalloyed steel in ingots and primary forms, etc.
** Tin, zinc, lead, precious metals (tungsten, titanium, cadmium, bismuth, molybdenum, tantalum, antimony, zirconium, etc.), cermets, spoons, forks, knives, locks, accessories, fasteners, etc.
Source: own calculation according to the data of the Federal Customs Service.

is 6.4% of the total turnover of the country's metallurgical industry. The total copper turnover amounted to 7.5 million tons (1.6%), and nickel – 2 million tons (0.4%). Over the period 2013–2020, the total volume of export-import copper sales in Russia increased by 57% due to increased supplies to Kuwait and China, as well as increased purchases from Germany and Finland. The nickel turnover in 2013 and 2020 had approximately equal values (about 265 thousand tons), but it was the smallest in 2016 (232 thousand tons), which was caused to a greater extent by a 2.4-fold decrease in exports to the Netherlands compared to 2013. The reduction in aluminum turnover by 15% is due to a decrease in exports to the USA and the Netherlands by 77 and 60%, respectively, as well as a 10-fold reduction in imports from Kazakhstan.

We should say that ferrous metallurgy products, having a natural large tonnage and lower cost in comparison with non-ferrous metals, consistently occupy about 90% of the total turnover (*Tab. 2*).

Let us consider in more detail the dynamics of export-import sales of key non-ferrous metals. The data of the Federal Customs Service allow concluding that the total copper export, both in financial and production indicators, significantly exceeds its import. In 2013–2020, copper exports amounted to 38.6 billion dollars and 6.4 million tons, which is 5.6 and 6.2 times more than its imports. The biggest difference was typical for 2015, when copper exports accounted for 90% of its turnover. This situation is associated with a reduction in copper imports and its appreciation, which occurred as a result of sanctions restrictions and the fall of the ruble in 2014 due to the Ukrainian conflict and the accession of Crimea to the territory of the Russian Federation. Despite the fact that the average cost of an exported ton of copper for 8 years was 10% lower than the imported ton, or 604 dollars, the reduction in the average cost of a ton of imported copper was 37%, and the export cost was 18% over the study period. In addition, positive changes include the excess of the average cost of a ton of copper exports over its imports, starting in 2017, which indicates the effectiveness of import substitution (*Tab. 3*).

Table 3. Dynamics of copper export-import sales in Russia for 2013–2020

| Period | Copper export | | | Copper import | | | Ratio of export and import | | |
|---|---|---|---|---|---|---|---|---|---|
| | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton |
| 2013 | 4,980 | 686 | 7,259 | 825 | 94.4 | 8,739 | 6.0 | 7.3 | 0.8 |
| 2014 | 4,930 | 742 | 6,644 | 975 | 64.4 | 15,140 | 5.1 | 11.5 | 0.4 |
| 2015 | 4,470 | 824 | 5,425 | 447 | 54.8 | 8,157 | 10.0 | 15.0 | 0.7 |
| 2016 | 3,270 | 692 | 4,725 | 461 | 68.5 | 6,730 | 7.1 | 10.1 | 0.7 |
| 2017 | 4,720 | 780 | 6,051 | 813 | 161 | 5,050 | 5.8 | 4.8 | 1.2 |
| 2018 | 5,380 | 857 | 6,278 | 788 | 132 | 5,970 | 6.8 | 6.5 | 1.1 |
| 2019 | 5,220 | 886 | 5,892 | 1,030 | 181 | 5,691 | 5.1 | 4.9 | 1.0 |
| 2020 | 5,650 | 945 | 5,979 | 1,560 | 285 | 5,474 | 3.6 | 3.3 | 1.1 |
| **Total:** | **38,620** | **6,412** | **6,023** | **6,899** | **1041.1** | **6,627** | **5.6** | **6.2** | **0.9** |
| 2020 to 2013, times | 1.13 | 1.38 | 0.82 | 1.89 | 3.02 | 0.63 | 0.60 | 0.46 | 1.31 |
| Source: own calculation according to the data of the Federal Customs Service. | | | | | | | | | |

Under the conditions of sanctions and the high dollar exchange rate, nickel sales increased by 9%, while the value of transactions decreased by 20%, at the same time, nickel imports decreased by more than 10 times. The negative aspect is the increase in the cost of an imported ton of nickel by 3.5 times, while export nickel fell by 27% per ton. Nevertheless, the revenue from the sale of Russian nickel for 8 years amounted to 23.2 billion dollars, which is 22.6 times more than the cost of imported nickel. The total weight of exported nickel was slightly less than 1.97 million tons, which is 46.1 times more than the weight of imported nickel into the country. The key in the structure of exports of nickel products in Russia is unprocessed nickel, which has a lower added value compared to imported nickel matte and agglomerates. Thus, Russian non-ferrous metallurgy corporations producing nickel have a high potential in import substitution, as well as in the nickel export of higher added value (*Tab. 4*).

The volume of exported aluminum from Russia in 2013–2020 amounted to 27.5 million tons, which is 11 times more than the total weight of imported aluminum. Total export sales amounted to about 50 billion dollars and exceeded the value of imports by 5 times. The volume of aluminum sales for export decreased by 22%, the mass of exports –

Table 4. Dynamics of nickel export-import sales in Russia for 2013–2020

| Period | Nickel export | | | Nickel import | | | Ration of export and import | | |
|---|---|---|---|---|---|---|---|---|---|
| | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton |
| 2013 | 3,780 | 241 | 15,685 | 289 | 24.5 | 11,796 | 13.1 | 9.8 | 1.3 |
| 2014 | 4,020 | 241 | 16,680 | 164 | 5.3 | 30,943 | 24.5 | 45.5 | 0.5 |
| 2015 | 2,660 | 232 | 11,466 | 70.8 | 1.5 | 47,200 | 37.6 | 154.7 | 0.2 |
| 2016 | 2,020 | 230 | 8,783 | 88.3 | 1.7 | 51,941 | 22.9 | 135.3 | 0.2 |
| 2017 | 2,080 | 245 | 8,490 | 104 | 3.4 | 30,588 | 20.0 | 72.1 | 0.3 |
| 2018 | 2,610 | 248 | 10,524 | 109 | 2.1 | 51,905 | 23.9 | 118.1 | 0.2 |
| 2019 | 2,970 | 272 | 10,919 | 105 | 2 | 52,500 | 28.3 | 136.0 | 0.2 |
| 2020 | 3,020 | 262 | 11,527 | 93.6 | 2.3 | 40,696 | 32.3 | 113.9 | 0.3 |
| **Total:** | **23,160** | **1,971** | **11,750** | **1023.7** | **42.8** | **23,918** | **22.6** | **46.1** | **0.5** |
| 2020 to 2013, times | 0.80 | 1.09 | 0.73 | 0.32 | 0.09 | 3.45 | 2.47 | 11.58 | 0.21 |
| Source: own calculation according to the data of the Federal Customs Service. | | | | | | | | | |

Table 5. Dynamics of aluminum export-import sales in Russia for 2013–2020

| Period | Aluminum export | | | Aluminum import | | | Ration of export and import, times | | |
|---|---|---|---|---|---|---|---|---|---|
| | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton | million dollars | thousand tons | thousand dollars per ton |
| 2013 | 7,010 | 3,612 | 1,941 | 1,780 | 455 | 3,912 | 3.9 | 7.9 | 0.5 |
| 2014 | 6,260 | 3,189 | 1,963 | 1,560 | 367 | 4,251 | 4.0 | 8.7 | 0.5 |
| 2015 | 6,830 | 3,697 | 1,847 | 1,020 | 257 | 3,969 | 6.7 | 14.4 | 0.5 |
| 2016 | 5,570 | 3,678 | 1,514 | 939 | 261 | 3,598 | 5.9 | 14.1 | 0.4 |
| 2017 | 6,420 | 3,554 | 1,806 | 1,260 | 305 | 4,131 | 5.1 | 11.7 | 0.4 |
| 2018 | 6,540 | 3,430 | 1,907 | 1,240 | 289 | 4,291 | 5.3 | 11.9 | 0.4 |
| 2019 | 5,840 | 3,169 | 1,843 | 1,200 | 294 | 4,082 | 4.9 | 10.8 | 0.5 |
| 2020 | 5,460 | 3,174 | 1,720 | 1,070 | 264 | 4,053 | 5.1 | 12.0 | 0.4 |
| **Total:** | **49,930** | **27,503** | **1,815** | **10,069** | **2,492** | **4,041** | **5.0** | **11.0** | **0.4** |
| 2020 to 2013, times | 0.78 | 0.88 | 0.89 | 0.60 | 0.58 | 1.04 | 1.30 | 1.51 | 0.86 |
| Source: own calculation according to the data of the Federal Customs Service. | | | | | | | | | |

by 12%, while imports decreased even more. The cost of buying imported aluminum decreased by 710 million dollars (-40%), and its volume by 191 thousand tons (-42%). Unfortunately, the cost of exported tons of aluminum decreased by 11%, and imported – increased by 4%, as a result of which imported aluminum on average turned out to be 2.2 times more expensive than exported (*Tab. 5*).

Among the main consumers of key non-ferrous metals produced by the Russian Federation, we can highlight the Netherlands. 60.1% of all exported nickel, 36.8% of copper and 14.4% of aluminum are sent to this country. Russia's revenues for 2013–2020 from the copper sale to the Netherlands amounted to 14.2 billion dollars, from the sale of nickel and aluminum – 13.9 and 7.2 billion dollars accordingly.

Despite the EU sanctions, copper supplies to the Netherlands have increased by 2% over 8 years, unlike Germany, where Russian copper exports has decreased by 3 times. In addition to Germany, Belgium has practically abandoned the import of Russian copper.

One way or another, Russia has reoriented its copper sales markets to Asian countries, primarily China and Kuwait. In the 2020 pandemic year, copper sales to these countries were several thousand times more than in 2013. Mostly refined and unprocessed copper went to China, and copper wire went to Kuwait. Especially noteworthy is the increase in the growth rate of copper wire rod in Kuwait. In August 2019, the export of copper wire rod from the Russian Federation amounted to 16.6 thousand tons which is 94.9% more than in July of the same year[6].

In addition to copper, Belgium has also abandoned Russian nickel. Exports to the Netherlands have been reduced three times, and to Ukraine by more than five times. However, active nickel supplies to Switzerland and Finland began. For example, Rusal's partner and shareholder, Glencore trader, is located in Switzerland, and thanks to the European registration, the company can redirect metal to consumers who are afraid of direct purchases in Russia[7]. It is important to note that about 95% of Russia's income from the sale of nickel falls on three countries – the Netherlands, Switzerland and Finland. The key nickel products exported to the Netherlands and Switzerland are raw nickel, to Finland – nickel matte and nickel oxide agglomerates.

[6] Russia continues increasing exports of copper wire rod to Kuwait. Available at: https://ekoprommet.com/news/rossiya-prodolzhaet-narashhivat-eksport-mednoj-katanki-v-kuvejt/

[7] Glencore is back for aluminum. Available at: https://www.kommersant.ru/doc/4314117

All the main consumers of Russian aluminum have reduced their purchases by a total of 48% including: the USA – by 77%, the Netherlands – by 60%, Turkey – by 5%, Japan – by 20% and South Korea – by 15%. During the study period, aluminum sales to these countries amounted to 30.2 billion dollars, the main product is raw aluminum (*Tab. 6*).

The main copper exporting regions were Krasnoyarsk Krai, the Sverdlovsk and Chelyabinsk oblasts which accounted for 78.5% of all-Russian copper exports. Copper exports from Krasnoyarsk Krai increased by 71% in monetary terms, from the Sverdlovsk and Chelyabinsk oblasts – by 9 and 28%, respectively. Saint Petersburg, which exports 1/10 of all copper in the country, reduced exports by 58% – from 566 to 235 million dollars.

The key nickel exporters in Russia abroad are the Murmansk Oblast and Krasnoyarsk Krai, their share is 94.5% of the All-Russian nickel exports. Production and transport facilities are located in the Murmansk Oblast (Murmansk Transport Branch) assets of PJSC Nornickel. Due to more profitable logistics corridors, nickel exports from Krasnoyarsk Kai stopped and were reoriented to the Kola Peninsula.

Responsible for the aluminum export from Russia were the Irkutsk Oblast, Krasnoyarsk Krai, as well as the Republic of Khakassia, which accounted for 72.3% of all aluminum exports. At the same time, the Irkutsk Oblast and Khakassia, where the assets of PJSC Rusal are located, reduced exports by an average of 39%, and exports from Krasnoyarsk Krai practically did not change (*Tab. 7*).

Table 6. Export of key non-ferrous metals from Russia to the world countries for 2013–2020, million dollars

| **Copper** | | | | | | |
|---|---|---|---|---|---|---|
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | The Netherlands | 36.8 | 1,680 | 1,710 | 14,200 | 1.02 |
| 2 | Germany | 13.6 | 1,150 | 390 | 5,250 | 0.34 |
| 3 | China | 12.1 | 36.5 | 1,800 | 4,670 | 49.32 |
| 4 | Kuwait | 8.0 | 0.2 | 650 | 3,100 | 3250.00 |
| 5 | Belgium | 5.3 | 534 | 0.046 | 2,100 | 0.0001 |
| | Total: | 75.8 | 3,401 | 4,550 | 29,320 | 1.34 |
| **Nickel** | | | | | | |
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | The Netherlands | 60.1 | 3,580 | 1,200 | 13,900 | 0.34 |
| 2 | Switzerland | 19.1 | 0 | 828 | 4,430 | x |
| 3 | Finland | 15.4 | 0.94 | 895 | 3,570 | 952.13 |
| 4 | Ukraine | 1.3 | 86.7 | 15.6 | 311 | 0.18 |
| 5 | Belgium | 0.7 | 19.2 | 0 | 172 | x |
| | Total: | 96.6 | 3,687 | 2,939 | 22,383 | 0.80 |
| **Aluminum** | | | | | | |
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | USA | 17.2 | 1,630 | 376 | 8,600 | 0.23 |
| 2 | The Netherlands | 14.4 | 1,600 | 637 | 7,170 | 0.40 |
| 3 | Turkey | 11.9 | 847 | 802 | 5,960 | 0.95 |
| 4 | Japan | 11.1 | 696 | 559 | 5,530 | 0.80 |
| 5 | South Korea | 5.9 | 394 | 333 | 2,950 | 0.85 |
| | Total: | 60.5 | 5,167 | 2,707 | 30,210 | 0.52 |

Source: own calculation according to the data of the Federal Customs Service.

Table 7. Export of key non-ferrous metals from Russian regions for 2013–2020, million dollars

| **Copper** | | | | | | |
|---|---|---|---|---|---|---|
| No. | Region | Share of region in exports by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Krasnoyarsk Krai | 35.8 | 1,310 | 2,240 | 13,800 | 1.71 |
| 2 | Sverdlovsk Oblast | 28.3 | 1,710 | 1,870 | 10,900 | 1.09 |
| 3 | Chelyabinsk Oblast | 14.4 | 646 | 830 | 5,560 | 1.28 |
| 4 | Saint Petersburg | 10.3 | 566 | 235 | 3,960 | 0.42 |
| 5 | Murmansk Oblast | 5.2 | 251 | 250 | 2,010 | 1.00 |
| | Total: | 94.0 | 4,483 | 5,425 | 36,230 | 1.21 |
| **Nickel** | | | | | | |
| No. | Region | Share of region in exports by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Murmansk Oblast | 53,6 | 720 | 2960 | 12400 | 4,11 |
| 2 | Krasnoyarsk Krai | 40,9 | 2810 | 0,012 | 9470 | 0,00 |
| 3 | Chelyabinsk Oblast | 2,5 | 133 | 3,1 | 570 | 0,02 |
| 4 | Moscow Oblast | 1,2 | 51 | 24 | 278 | 0,47 |
| 5 | Moscow | 0,8 | 42,8 | 14 | 194 | 0,33 |
| | Total: | 99,0 | 3757 | 3001 | 22912 | 0,8 |
| **Aluminum** | | | | | | |
| No. | Region | Share of region in exports by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Irkutsk Oblast | 30.3 | 2,310 | 1,390 | 15,100 | 0.60 |
| 2 | Krasnoyarsk Krai | 24.8 | 1,580 | 1,620 | 12,400 | 1.03 |
| 3 | Khakassia | 17.2 | 1,170 | 727 | 8,600 | 0.62 |
| 4 | Moscow | 4.2 | 98.9 | 399 | 2,100 | 4.03 |
| 5 | Sverdlovsk Oblast | 4.1 | 303 | 235 | 2,030 | 0.78 |
| | Total: | 80.6 | 5,462 | 4,371 | 40,230 | 0.8 |

Source: own calculation according to the data of the Federal Customs Service.

Total copper imports to Russia from the five leading countries increased by 56%, while copper from Finland became the most purchased (+97%). Copper imports from Germany increased by 80%, from China and Italy – by 37 and 55%, respectively. Copper supplies from Kazakhstan decreased by 29% over the period. It is worth saying that more than 90 copper deposits have been explored on the territory of Kazakhstan. The current copper reserves are about 41 million tons, which is about 5% of the world's reserves. The republic ranks 4th in the world in terms of copper reserves after Chile, Indonesia and the USA[8]. On the five main copper importers to Russia for 2013–2020 it accounts for about 52% of all imports, while there is no clear dependence on one country. A certain differentiation of copper imports has a positive impact on the stability of supplies, as well as on the possibility of changing suppliers under any restrictions. The main imported copper products to Russia are: copper waste and scrap, copper matte, copper fittings and couplings for pipes, copper tubes.

Nickel supplies to Russia from key supplier countries decreased by 73% or 118 million dollars during the study period. The main imported nickel products include: raw nickel; nickel fabrics, gratings and grids; nickel matte and agglomerates, as well as rods, profiles and wire. Procurement of nickel products from the United States and France to Russia decreased by 30 and 11%, respectively, of the delivery from Finland has almost stopped; nickel imports from Germany increased by 77% for the period.

[8] Kazakhmys Empire: In whose hands are the copper resources of Kazakhstan. Available at: https://knews.kg/2021/03/14/imperiya-kazahmysa-v-chih-rukah-mednye-resursy-kazahstana/

Table 8. Import of key non-ferrous metals from foreign countries to Russia for 2013–2020, million dollars

| **Copper** | | | | | | |
|---|---|---|---|---|---|---|
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Finland | 12.5 | 189 | 373 | 862 | 1.97 |
| 2 | Germany | 11.9 | 110 | 198 | 820 | 1.80 |
| 3 | Kazakhstan | 10.9 | 105 | 74.6 | 752 | 0.71 |
| 4 | China | 10.3 | 74.7 | 102 | 713 | 1.37 |
| 5 | Italy | 6.3 | 55.5 | 86.3 | 437 | 1.55 |
| | Total: | 51.9 | 534 | 834 | 3,584 | 1.56 |
| **Nickel** | | | | | | |
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | USA | 14.8 | 17.5 | 12.2 | 152 | 0.70 |
| 2 | Norway | 10.1 | 33.5 | 2.5 | 103 | 0.07 |
| 3 | Finland | 9.4 | 88.5 | 0.3 | 96.5 | 0.003 |
| 4 | France | 9.3 | 12.3 | 11 | 94.8 | 0.89 |
| 5 | Germany | 9.1 | 10.2 | 18.1 | 92.6 | 1.77 |
| | Total: | 52.7 | 162 | 44 | 538.9 | 0.27 |
| **Aluminum** | | | | | | |
| No. | Country | Country's share in export, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | China | 29.4 | 467 | 376 | 2,950 | 0.81 |
| 2 | Kazakhstan | 11.1 | 286 | 29.4 | 1,110 | 0.10 |
| 3 | Germany | 10.4 | 169 | 111 | 1,050 | 0.66 |
| 4 | Belarus | 8.7 | 136 | 112 | 875 | 0.82 |
| 5 | Italy | 7.9 | 186 | 66 | 794 | 0.35 |
| | Total: | 67.5 | 1,244 | 694 | 6,779 | 0.56 |

Source: own calculation according to the data of the Federal Customs Service.

Aluminum imports, which is the most popular of the non-ferrous metals purchased, decreased by 44% or 550 million dollars. In the study period, Russia purchased about 30% of all aluminum from China. Imports from Kazakhstan decreased tenfold, from Italy – by 65%, from China, Germany and Belarus – by 19, 34 and 18%, respectively. The key imported products of China are plumbing equipment, kitchen cutlery and household products. Mainly raw aluminum and aluminum scrap were purchased from Kazakhstan. Imports from Germany were represented by hardware products and aluminum foil. Aluminum metal structures, bars and profiles were supplied to the Russian market from Belarus, plumbing equipment and fasteners from Italy (*Tab. 8*).

The main importers of copper products were the Sverdlovsk Oblast and Moscow, where their share amounted to 46.5% of total imports. The volume of imports to the Sverdlovsk Oblast increased 10 times mainly due to copper scrap and cementation copper. Copper purchases to the Kaliningrad and Moscow oblasts decreased by 8 and 49%, respectively. Total imports in monetary terms in five key regions increased from 420 million to 1 billion dollars in 9 years. The main imported products include copper fittings, tubes and pipes, copper matte and scrap, as well as powders and copper flakes.

The key consumers of imported nickel were Moscow, the Murmansk, Yaroslavl and Moscow oblasts. The share of these regions accounted for about 69% of all nickel imported into the country.

In total, the import of this metal during the study period decreased by 4 times. The Murmansk Oblast completely refused to import. The main imported products are nickel matte, agglomerates and untreated nickel. Slightly more than half of the imported aluminum accounts for Moscow and the region, as well as Saint Petersburg. Total aluminum imports decreased by 38% to Moscow, by 76 and 50% to the Moscow Oblast and Saint Petersburg, respectively. The main imported products are plumbing equipment, aluminum foil, aluminum profiles and rods (*Tab. 9*).

There are quite a considerable number of both short-term and long-term prerequisites for the reorientation of markets for non-ferrous metallurgy products from European countries to the Russian market, markets of North Africa, Southeast Asia and other markets in which Russia is connected by economic unions. Let us look at some of them in more detail:

**1. Sanctions pressure from the EU states.**

Since the beginning of the special military operation of the Russian Federation in Ukraine, European countries have imposed sanctions against Russian metallurgy. Despite the fact that ferrous metallurgy suffered to a greater extent, non-ferrous metallurgy was also under attack. For example, PJSC Nornickel has difficulties in transporting palladium. The company transported it on passenger planes, and as a result of the termination of flights between Russia and the rest of the world, Nornickel has to look for alternative routes. We should note that the delivery of non-ferrous metals by sea is also problematic. The UK has banned ships having any relation to Russia from entering its ports.

Table 9. Import of key non-ferrous metals to Russian regions in 2013–2020, million dollars

| **Copper** | | | | | | |
|---|---|---|---|---|---|---|
| No. | Region | Share of region in import by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Sverdlovsk Oblast | 29.2 | 67.1 | 682 | 2,020 | 10.16 |
| 2 | Moscow | 17.3 | 153 | 174 | 1,200 | 1.14 |
| 3 | Kaliningrad Oblast | 8.5 | 35.8 | 32.8 | 585 | 0.92 |
| 4 | Saint Petersburg | 7.7 | 67.6 | 69 | 533 | 1.02 |
| 5 | Moscow Oblast | 6.8 | 97.4 | 49.5 | 467 | 0.51 |
| | Total: | 69.5 | 420.9 | 1007.3 | 4,805 | 2.39 |
| **Nickel** | | | | | | |
| No. | Region | Share of region in import by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Moscow | 26.4 | 41.6 | 38.1 | 270 | 0.92 |
| 2 | Murmansk Oblast | 15.3 | 149 | 0 | 156 | x |
| 3 | Yaroslavl Oblast | 14.7 | 18.6 | 11.8 | 150 | 0.63 |
| 4 | Moscow Oblast | 12.3 | 33.2 | 9.86 | 125 | 0.30 |
| 5 | Belgorod Oblast | 3.9 | 9.42 | 1.48 | 40.3 | 0.16 |
| | Total: | 72.6 | 251.82 | 61.24 | 741.3 | 0.24 |
| **Aluminum** | | | | | | |
| No. | Region | Share of region in import by country, % | 2013 | 2020 | Total for 2013–2020 | 2020 to 2013, times |
| 1 | Moscow | 31.5 | 529 | 329 | 3170 | 0.62 |
| 2 | Moscow Oblast | 12.2 | 190 | 144 | 1230 | 0.76 |
| 3 | Saint Petersburg | 8.4 | 174 | 86.5 | 844 | 0.50 |
| 4 | Leningrad Oblast | 4.5 | 82.6 | 50.1 | 449 | 0.61 |
| 5 | Samara Oblast | 4.2 | 170 | 19.2 | 427 | 0.11 |
| | Total: | 60.8 | 1145.6 | 628.8 | 6120 | 0.55 |

Source: own calculation according to the data of the Federal Customs Service.

This principle may be followed by other EU countries, which in the future will lead to the inability to transport non-ferrous metals on ships[9].

**2. Guarantee of receipt of funds.**

According to the President of the Russian Federation, carrying out foreign trade "in compromised currencies", namely in dollars and euros, is becoming more risky every time[10]. There is a high probability that the correspondent accounts of Russian exporters in European banks may be blocked and Russian companies simply will not receive money.

In early April 2022, the State Duma Speaker Vyacheslav Volodin proposed expanding the list of goods exported for rubles; however, according to NLMK's main shareholder Vladimir Lisin, there are certain concerns that the transition to payments for metals in rubles will simply "throw" Russia out of international markets. The owner of the metallurgical plant claims that logistical problems have already complicated the delivery of products to the consumer. Russian metallurgy has been building relationships with thousands of customers in 70 countries for decades, has been fighting for export markets, where no one is particularly waiting for it, and now it is difficult to imagine what can convince buyers to switch to settlements in rubles and bear currency risks[11].

**3. No carbon footprint tax.**

The active struggle of the EU countries for a favorable environmental situation in the world as a whole has positive motives. In July 2021, the European Commission presented an environmental plan according to which carbon emissions into the atmosphere should be reduced by 55% to 1990 levels by 2030. One of the main requirements is the introduction of a carbon tax in the form of quotas for 1 ton of $CO_2$ emissions from 2026. This tax will have to be paid to those countries that import products of non-ecological enterprises into the European Union.

Naturally, the Russian industry needs to strive for carbon neutrality, since reducing $CO_2$ emissions is a global trend, and not just a whim of the European Union. In addition, countries such as China, Japan and South Korea[12] declare carbon neutrality as a national goal. In the long term for 2026–2030, regulation may lead to the fact that Russian producers with a high carbon footprint will move to other Asian markets, since Asian countries will be unable to quickly follow the example of the European Union, due to the difficulties of implementing regulatory plans[13].

According to Sergey Roginko, Head of the Center for Ecology and Development of the Institute of Europe of the Russian Academy of Sciences, the EU is pursuing an extremely aggressive policy toward traditional sources of fuel and energy, which poses a serious threat to Russian exports, primarily of energy carriers. The annual additional costs of Russian exporters from the introduction of the carbon tax are estimated at 2.1 billion euro for the gas industry, for ferrous metallurgy – 967 million euros, for non-ferrous metallurgy – 348 million euros (Roginko, 2021).

[9] Unpleasant, but not fatal: how metallurgists will be forced to work for the good of the motherland. Available at: https://fedpress.ru/article/2951636?utm_source=yandex.ru&utm_medium=organic&utm_campaign=yandex.ru&utm_referrer=yandex.ru

[10] "Abandon compromised currencies": Putin instructed to transfer gas payments for unfriendly countries to rubles. Available at: https://russian.rt.com/russia/video/980093-putin-gaz-valyuta-rubli

[11] The head of NLMK said that the transition to payments in rubles will throw Russia out of the markets. Available at: https://tass.ru/ekonomika/14280771

[12] Carbon starvation: How can Russia adapt to the EU import tax. Available at: https://trends.rbc.ru/trends/green/cmrm/617a91d89a79477d74afe1e0

[13] The EU is introducing a carbon tax. What is its essence and how it works: Ecology News +, July 15, 2021. Available at: https://finance.rambler.ru/economics/46827367/?utm_content=finance_media&utm_medium=read_more&utm_source=copylink

**4. Preservation of VAT in the federal budget and the absence of customs duties.**

The reorientation of non-ferrous metals sales markets from the European market to meet Russia's needs or to the markets of the EAEU countries will have a positive impact on both federal budget revenues and the cost of the companies themselves. For example, VAT refund on export operations from the federal budget in favor of non-ferrous metallurgy enterprises of Krasnoyarsk Krai (PJSC Nornickel) and the Irkutsk Oblast (PJSC Rusal) for 2006–2021 amounted to about 260 billion rubles. Thus, the change of sales markets would allow saving up to 16 billion rubles in the federal budget annually only in respect of two non-ferrous metallurgy companies. In addition, the absence of export duties for products exported from Russia to the EAEU countries contributes to reducing the companies' costs to pay such duties, which lead to an increase in the production cost. Such expenses reduce taxable profits and, accordingly, income tax receipts to the regions' budgets where companies are based.

**5. Covering domestic demand for non-ferrous metals due to active import substitution.**

The approved action plan for import substitution in Russia's non-ferrous metallurgy industry contains detailed targets regarding the share of Russian products in various trade names by 2024.

According to the document, it is planned to increase the share of Russian production of ores and concentrates of non-ferrous metals: from 0 to 12.9% – for zirconium concentrates, from 0 to 8.2% – for ilmenite and from 0 to 43.1% – for rutile concentrates. With regard to non-ferrous metals, compounds and alloys, it is planned to replace: 50% individual oxides of rare earth metals; lithium hydroxide anhydride – from 0 to 80%, increase the share of tin of own production from 71 to 95%. Among the significant changes in the import substitution of high-grade products, there are plans to cover the import of copper electrode wire and cathode powder by 80%; to fully manufacture aluminum aerosol cans based on DWI technology; to replace the import of aluminum bicycle frames by 50%[14].

Thus, active import substitution in the non-ferrous metallurgy industry will allow the Russian industry to be independent on foreign production chains, as well as to control the entire production cycle without risks.

**Conclusions**

At the end of the study, we will list the key conclusions obtained in the abstract:

*1. Turnover in monetary terms.*

The financial structure of the metallurgical industry turnover in Russia is characterized by the dominance of ferrous metals, which averaged 60% over the period under study, or 32 billion dollars. The key non-ferrous metals in Russia's trade with foreign countries were: aluminum (14.1%), copper (10.7%) and nickel (5.7%), while since 2013 the turnover of nickel and aluminum has decreased by 23 and 26%, respectively, and copper has increased by 24% by 2020.

*2. Turnover in kind.*

The higher level of production volumes of ferrous metallurgy, in comparison with non-ferrous, once again confirms the analysis of trade turnover in weight values. In the period under study, the turnover volume of Russia's metallurgical industry amounted to 465.5 million tons, of which 419.1 million tons or 90% is the turnover of ferrous metals. The aluminum turnover amounted to 30 million tons, copper and nickel – 7.5 and 2 million tons, respectively. The share of these metals in the weight structure was 6.4% for aluminum, 1.6 and 0.4% for copper and nickel, respectively.

[14] Order of the Ministry of Industry and Trade of the Russian Federation no. 651, dated March 31, 2015 "On approval of the action plan for import substitution in the non-ferrous metallurgy industry of the Russian Federation". Available at: http://www.consultant.ru/document/cons_doc_LAW_297024/1080c5207773f8f88cca332f1240c1f7e85871c9/

*3. The cost of export and import tons of non-ferrous metals.*

During the period under study, the cost of an export ton of copper decreased by 18%, and an import ton by 37%. The cost of 1 ton of imported nickel decreased by 27%, while the price of imported nickel increased 3.5 times due to an increase in the supply of expensive nickel products (tubes, fittings, couplings, elbows, nickel flanges). The price of 1 ton of aluminum decreased by 11%, and imports increased by 4%.

*4. Key changes in the sales and supply markets of non-ferrous metallurgy products.*

The reorientation from European markets to East Asian markets has been characteristic of the key products of non-ferrous metallurgy in Russia since 2013. Copper exports to Germany decreased by 66%, almost stopped to Belgium, while intensive supplies to Kuwait and China began. The Netherlands, as one of the key countries purchasing non-ferrous metals from Russia, reduced nickel exports by 66% and exports by 60%.

*5. Benefits of changing markets.*

The key advantages of the gradual redirection from European consumers to the Russian market and the EAEU countries' market: absence of sanctions pressure from the EU states; guarantee of receiving funds; absence of a carbon footprint tax; VAT preservation in the federal budget and the absence of customs duties; import substitution development and reduced dependence on foreign supplies.

*6. Contribution to science, novelty and directions of further research.*

The article contributes to the development of applied science and clearly demonstrates the structural transformation of supply and sales markets under sanctions restrictions, or rather its gradual reorientation to East Asian markets on the example of Russia's non-ferrous metallurgy industry.

Systematization of the benefits of the reorientation of sales markets, as the novelty of this study, will allow authorities and businesses to design the necessary measures for further growth in the face of sanctions pressure and restrictions.

It is worth noting that further research will focus on exploring the opportunities associated with the growth of the added value of the products of Russian non-ferrous metallurgy corporations, as well as on the possibilities of import substitution of the most necessary and expensive goods of the industry.

## References

Ayuchatova P.A., Volodina N.V., Dronova O.V. (2013). Trade development trends between Eurasian Economic Community member countries and their foreign partners. *Models, Systems, Networks in Economics, Technology, Nature and Society*, 3(7), 9–12.

Baumann B. (2015). The battle of Bretton Woods: John Maynard Keynes, Harry Dexter White, and the making of a new world order. *Eastern Economic Journal*, 41, 289–291. Available at: https://doi.org/10.1057/eej.2014.18

Birkeland K., Prescott E.C. (2006). On the needed quantity of government debt. *Working Paper* 648, Federal Reserve Bank of Minneapolis.

Bordo M.D. (2014). Tales from the Bretton Woods. *Open Economic Review, Springer*, 25(5), 981–991. Available at: https://doi.org/10.1007/s11079-014-9326-8

Budanov I.A. (2020). Managing the development of metallurgy and global metal market. *Problemy prognozirovaniya=Studies on Russian Economic Development*, 6, 104–118. DOI 10.47711/0868-6351-183-104-118 (in Russian).

Budanov I.A. (2021). Working out social guidelines for the industry development of metallurgy. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 14(5), 85–99. DOI: 10.15838/ esc.2021.5.77.5 (in Russian).

Chen K., İmrohoroğlu A. (2017). Debt in the U.S. economy. In: *Economic Research Forum, Working Paper 1401.* Koc University-TUSIAD Economic Research Forum. Available at: https://doi.org/10.1007/s00199-015-0908-5

Dibooglu S. (1999). Inflation under the Bretton Woods system: The spillover effects of U.S. expansionary policies. *Atlantic Economic Journal*, 27, 74–85. Available at: https://doi.org/10.1007/BF02299179

Gulin K.A., Yakushev N.O., Mazilov E.A. (2018). Promoting economic growth in regions of the Russian Federation by boosting the development of non-resource-based exports. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends,* 11(3), 57–70. DOI: 10.15838/esc.2018.3.57.4 (in Russian).

Ilyin V.A., Pechenskaya-Polishchuk M.A., Malyshev M.K. (2021). *Gosudarstvo i krupnye korporatsii chernoi metallurgii: tendentsii i osobennosti 20-letnego vzaimodeistviya: monografiya* [The State and Large Ferrous Metallurgy Corporations: Trends and Features of 20-Year Interaction: Monograph]. Vologda: VolRC RAS.

Ilyin V.A., Povarova A.I. *Krupneishie metallurgicheskie korporatsii i ikh rol' v formirovanii byudzhetnykh dokhodov: monografiya* [The Largest Metallurgical Corporations and Their Role in the Formation of Budget Revenues: Monograph]. Vologda: VolRC RAS.

Leela P. (1979). Import dependence of the non-ferrous metals industry in India. *Foreign Trade Review*, 13(4), 324–340.

Litvinova A.V., Talalaeva N.S., Parfenova M.V. (2019). Development of methodological approaches to assessing the effectiveness of import substitution in Russia. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends,* 12(4), 67–85. DOI: 10.15838/esc.2019.4.64.5 (in Russian).

Liu Y., Yang Ch., Huang K., Gui W. (2019). Non-ferrous metals price forecasting based on variational mode decomposition and LSTM network. *Knowledge-Based Systems*, 188, 105006.

Pechenskaya-Polishchuk M.A., Malyshev M.K. (2021). Metallurgical corporations and the state: Trends in financial interaction of the last decade. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends,* 14(3), 150–166. DOI: 10.15838/esc.2021.3.75.9 (in Russian).

Pechenskaya-Polishchuk M.A., Malyshev M.K. (2021). Key factors affecting the corporate tax levied from Russian ferrous metallurgy corporations to regional budgets. *Regionologiya=Russian Journal of Regional Studies*, 1(114), 10–36 (in Russian).

Rastyannikova E.V. (2020). Global non-ferrous metallurgy resources market. *Vostochnaya analitika=Eastern Analytics*, 3, 109–130 (in Russian).

Roginko S.A. (2021). Cross-border carbon taxes: For the Russian fuel and energy complex. *Energeticheskaya politika=Energy Policy*, 10(164), 38–47 (in Russian).

Ultan S.I. (2013). Trends and problems of Russia's export potential growth in the world market of non-ferrous metals. In: *Ekonomika Rossii v usloviyakh globalizatsii* [The Russian Economy in the Context of Globalization]. Omsk: Izd-vo OmGU (in Russian).

Ultan S.I., Rogovskaya N.Y. (2012). Industry export potential: Formation and research methodological foundations. *Vestnik Omskogo universiteta. Seriya: Ekonomika=Herald of Omsk University. Series "Economics"*, 1, 26–32 (in Russian).

Zhuravlev M.S. (2018). On the issue of improving the competitiveness of non-ferrous metallurgy of the EAEU member states. *Evraziiskii yuridicheskii zhurnal=Eurasian Law Journal*, 10(125), 481–483 (in Russian).

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