Comprehensive Assessment of Potential of the Russian Metallurgical Industry under Sanctions Pressure

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Abstract—This article describes the assessment of the most important economic factors, the influence of which should be considered while developing a strategy for metallurgical production under conditions of sanctions pressure from unfriendly countries. The implementation directions of import substitution are shown, thus allowing the most complete use of the competitive potential of the metallurgical industry on the world stage.

Keywords: global economic crisis, sanctions, demand, import substitution, sources of financing

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Under the current economic and political conditions initiated by high sanctions pressure from unfriendly countries, it is extremely important to determine from the state positions possible directions for the fullest and most efficient use of potential of the metallurgical industry of Russia.

The metallurgical complex occupies an important place in the Russian economy. The contribution of metallurgy to the Russian GDP is about 2.5%, to the value added of the manufacturing industry—18.4%, to the country’s exports—10%, to the export of the processing industry—29.2%, to employment—2.6%. According to the 2019 data (before the economic crisis caused by the pandemic), it accounted for about 8% of industrial production.

In 2021, the ferrous metallurgy of Russia ranked fifth in the world in steel production with a share of about 3.9%, and second in steel pipe production, and third in the world in terms of exports of steel products with a share of 7% [1–3].

Such contribution of ferrous metallurgy to the national economy was provided as a result of the implementation of major investment programs by leading metallurgical companies; in the ferrous metallurgy of Russia, production facilities were created capable of producing a number of products types competitive on the world market: thick-rolled steel from 5000 mills, hot-rolled and cold-rolled steel, including for the automotive industry, sheet metal with zinc and polymer coatings, various types of long products, etc.

In the period from 2001 to 2021, Russian metallurgical companies invested more than 3 trillion rubles in ferrous metallurgy. In 2021, investments amounted to 285 billion rubles. During five years from 2017 to 2021, they increased by 66.6%. During the pandemic crisis, steel production in Russia in 2019–2021 remained essentially at the pre-crisis level (Table 1).

It should be emphasized that in 2021, steel production in Russia reached the highest level in the recent 30 years: 76 million tons. Such high level of production in Russia was provided by the steadily growing share of domestic demand of 65% (Table 2), with systematically large amounts of export (Table 3).

In 2020–2021, the production of metallurgical products was continuously providing high profitability. The return on equity was 23.5% and 31.4%, respectively, and the interest coverage ratio was 3.28 and 5.65, respectively\textsuperscript{1}. Thus, the global economic crisis caused by the coronavirus pandemic affected neither the scale of domestic demand for ferrous metals, nor the amount of exports, nor the contribution of ferrous metallurgy to the national economy [7].

A completely different situation is developing under the conditions of exceptionally high sanctions pressure from the United States and a bloc of unfriendly Western countries. Therefore, the most important task is to develop a strategy and a set of practical measures to maximize the use of potentials of the metallurgical industry in Russia.

\textsuperscript{1} Test Firm. Financial performances /https://www.test-firm.ru/otrasli/24/ Access date July 9, 2022.
Sanction pressure has a great impact on both the size of demand in the domestic market and in export sales. A particularly strong impact will be exerted on the size of demand in the domestic market, due to the termination of work in Russia of a number of foreign companies consuming Russian metal products.

Given the exceptionally high dependence on foreign supplies of some types of machine building products, a number of Russian consumers of metal products will also have to reduce production. In the first 5 months of this year, the average monthly consumption of metal products decreased from 3.6 million tons in January to 3.1 million tons in May 2022.

Imports of goods from the Machinery, Equipment and Equipment group to Russia in 2019–2020 amounted to $146.3 billion, with the total amount of 10926 thousand tons. The most imported products were mainly “nuclear reactors, boilers, equipment and mechanical devices; their parts” (59%), “electrical machines and equipment; sound equipment, television equipment; their parts” (41%) [8].

In January–June, 2021 imports of machinery and equipment in cost terms increased by 38.9% compared to the same period of 2020. The increase was caused by an increase in prices, in particular due to the volatility of dollar rate, and amounts of purchases of electrical and mechanical equipment, optical instruments and apparatuses. Deliveries of cars and trucks to Russia in the first half of 2021 increased 1.8 times in relation to the APPG against the background of a recovery in demand and prices [9].

In 2019, the fleet of high-tech machine tools was almost completely formed from foreign-made equipment: 88% of CNC metal cutting machines, 91% of CNC forging and pressing equipment, and 97% of machining equipment (electric erosion, laser, plasma, ultrasonic and other machine tools). Deliveries from abroad of high-tech machines, equipment, vehicles have always accounted for almost half of all imported goods. This is due to the

### Table 1. Steel production in Russia and the largest producing countries of the world

| Countries | Production, million tons | Share in the world |
|-----------|--------------------------|--------------------|
| Year      | 2018 | 2019 | 2020 | 2021 | 2018 | 2019 | 2020 | 2021 |
| World production, including | 1827 | 1875 | 1879 | 1951 | 100.0 | 100.0 | 100.0 | 100.0 |
| Russia | 74.1 | 73.1 | 74.0 | 75.6 | 4.1 | 3.9 | 3.9 | 3.9 |
| China | 928.3 | 995.4 | 1064.8 | 1032.8 | 50.8 | 53.1 | 56.7 | 52.9 |
| India | 109.3 | 111.4 | 100.3 | 118.2 | 6.0 | 5.9 | 5.3 | 6.1 |
| Japan | 104.3 | 99.3 | 83.2 | 96.3 | 5.7 | 5.3 | 4.4 | 4.9 |
| USA | 86.6 | 87.8 | 72.7 | 85.8 | 4.7 | 4.7 | 3.9 | 4.4 |
| South Korea | 72.5 | 71.4 | 67.1 | 70.4 | 4.0 | 3.8 | 3.6 | 3.6 |
| Germany | 42.4 | 39.6 | 35.7 | 40.1 | 2.3 | 2.1 | 1.9 | 2.1 |

Table 2. Dynamics of domestic demand for finished rolled products in Russia, million tons

| Countries | Year |
|-----------|------|
| 2017 | 2018 | 2019 | 2020 | 2021 |
| Russia | 37.3 | 37.4 | 41.2 | 42.4 | 44.1 |

Table 3. The largest exporters of metal products in the world, million tons

| Countries | Year |
|-----------|------|
| 2018 | 2019 | 2020 | 2021 |
| Russia | 33.3 | 28.5 | 27.7 | 32.6 |
| China | 68.8 | 63.7 | 51.4 | 66.2 |
| Japan | 35.8 | 33.1 | 29.8 | 33.8 |
| Republic of Korea | 30.1 | 30.0 | 27.6 | 26.8 |
| Germany | 26 | 24.1 | 21.2 | 23.9 |
| Ukraine | 15.1 | 15.6 | 15.2 | 15.7 |
| India | 11.1 | 13.4 | 17.1 | 20.4 |

Table 4. The largest net exporters* of metal products, million tons/rating position

| Exporting countries/year | Year |
|--------------------------|------|
| 2021 | 2020 | 2015 |
| Russia | 27.6/3 | 26.4/1 | 24.5/3 |
| Japan | 28.3/2 | 24.8/2 | 34.9/2 |
| Republic of Korea | 12/7/6 | 16.1/3 | 9.5/6 |
| Ukraine | 14.4/5 | 13.9/4 | 16.9/4 |
| China | 38.4/1 | 13.5/5 | 98.4/1 |
| India | 14.5/4 | 12.1/6 | Importer |

Source: developed by the author on the basis of data of domestic [1–3] and world [4–6] production.

* Net exporter is a country or a territory, the cost of exported goods of which is higher than that of imported goods in a predefined time period. Net importer is a country or a territory, the cost of imported goods of which is higher than that of exported goods and services in a predefined time period.
need and high demand from Russian manufacturers for foreign technologies and equipment that are not yet manufactured in Russia or are inferior in price and quality to foreign analogues [10].

Already the first months of 2022 evidence a significant decrease in demand due to these two factors. At the same time, the current situation clearly confirms the need to replace imports of various types of equipment. Ensuring of import substitution will allow the use of metal produced in Russia instead of foreign metal for the production of machine building products, the import of which in imported equipment amounted to 6–7 million tons per year.

For the development of domestic mechanical engineering, and increasing the demand for metal products on this basis, the expansion of the sources of its financing is necessary as much as possible [11]. Under the current conditions, the state financial participation is objectively necessary in development, first of all, of machine-building facilities consuming metal products.

In order to expand the sources of financing for the development of machine building products and, on this basis, increase the demand for metal products, it is necessary to implement a mechanism of public-private partnership, when state bodies, with the involvement of qualified experts, identify potential areas for creating facilities to ensure import substitution. According to specific import substitution options, the possible amount of production, the estimated cost of projects, and their economic efficiency are determined. Thus, a bank of information on specific import substitution projects is being created (sufficient to assess the effectiveness of import substitution projects).

To perform such functions, it is possible to involve a special organization, for example, the Agency for Technological Development under the Ministry of Industry and Trade of Russia or the Analytical Center under the Government of the Russian Federation. Using the information received, private investors can make decisions about participating in the implementation of such projects. The state bodies themselves determine the degree of their participation, determine the mechanisms for ensuring the return of a certain part of the funds in the event of an unforeseen situation, the provision of benefits in the creation and use of project infrastructure, the degree of participation in the sale of products, including for export. We can hope for the participation of state owned companies Gazprom and Gazpromneft in analytical studies of the assessment of metal supplies for the production of steel pipes.

State support for metal consuming industries should become the most efficient way to strengthen the national ferrous metallurgy, and accelerate the pace of economic development in the face of sanctions pressure [12, 13]. At the same time, metallurgical companies themselves must promptly respond to the requests of specific consumers, which in some cases becomes crucial [14, 15].

The most important factor that will have an impact on demand in the domestic market and its provision in the new conditions is the development by state bodies of a mechanism for interaction with the metallurgical industry of Donbass. Since the beginning of 2017, the metallurgical enterprises of the Donetsk and Lugansk People’s Republics have been functioning due to the state participation of the Russian Federation.

Under the current conditions, the sale of metallurgical products of Donbass enterprises is possible almost only in Russia. The sale of products of Donbass enterprises to Russia will significantly affect the size of sales of Russian companies. Under these conditions, Russian state bodies should consider the mutual interests of both Russian metallurgical companies and enterprises of Donbass.

Thus, both factors that reduce the sales market (primarily in the near future) and expand the sales opportunities for metal products as a result of the creation of import substituting capacities will act on the domestic market [15, 16].

The situation is more complicated in the foreign market. In essence, foreign sanctions close exports from Russia to all unfriendly countries. As a result, the principles of free trade are crossed out in favor of politicians. In addition, the EU sanctions measures threaten the export of 3.9 million tons of finished rolled products (sheet and rolled items), 0.2 million tons of pipe products and 4.3 million tons of steel billets, which in value terms, considering the average export prices for these products in 2021, amounted to about US$3.7 billion.

Under the current conditions, it is necessary to quickly restore and, if necessary, to build new production, logistics and trade chains, and at the same time to adapt the tools and capabilities of the financial system to the dramatically changed environment. The country will have to comprehensively restart the industry, replace foreign products.

From May–June, 2022, the increasing volumes of exports of semi-finished products (slabs) in most cases demonstrate negative profitability. With the dollar exchange rate, which was formed in mid–May, 2022, the export price of steel products for China, produced with the participation of blast furnace conversion, almost equaled to its cost price. And the cost of semifinished products produced on scrap ferrous metals (electrical steel) or using ores with a lower than average iron content exceeded China’s export prices.

In addition to discounts, metallurgists faced a significant increase in logistics costs. The cost of freight from Nakhodka to China has increased 2–2.5 times. At the same time, the ports of Primorsky Krai are physically unable to handle all export cargo from Russia to Asia. At the same time, it is necessary to expand the capacity of BAM and Transsib railway lines.
Because of this, metallurgical companies are forced to ship goods to Asia through the ports of the Black Sea, where freight has also risen 2–3 times due to risks to shipping. The cost of transporting coking coal has increased since 2015, 4 times, for metallurgical products—almost 2 times. As a result of the cessation of imports from Europe and North America, there was a significant increase in the cost of purchasing and delivering basic auxiliary materials: electrodes, ferroalloys, refractories, rolls.

One of the important factors influencing the decision of foreign buyers of Russian steel products is the restrictions imposed by a number of unfriendly countries on insurance and reinsurance of Russian cargo. In connection with the sanctions, companies suffer losses due to the blocking of their entire infrastructure for export services, face the seizure of their goods outside Russia, the growth of other costs, in particular, the cost of financing.

All of the above leads to a sharp decrease in the profits of companies, up to its zeroing. This led to the fact that the short period of super-profits in 2021 was replaced by the opposite financial and economic situation. Companies that are under sanctions have a particular negative impact on themselves.

Considering the factor of high capital intensity of metallurgical production, companies will be forced to carry out significant capital expenditures in the absence of sufficient cash flow/profit for this. At the same time, it is impossible to significantly reduce capital investments for metallurgy without compromising the normal production process [17, 18].

Metallurgical companies during 2020–2022, considering the importance of maintaining stability in the domestic market of metal products, switched to direct long-term contracts in rubles with consumers with a decoupling from external quotations, which allowed to stabilize the situation with prices for metal products in the country.

In accordance with this, it will be necessary to implement measures to adapt tax legislation to the current economic situation in order to prevent potential bankruptcies of metallurgical companies [19, 20].

In addition, unfriendly Western countries (especially the EU, the USA and others) are pursuing a policy of climate and environmental measures aimed at undermining world trade and replacing free market relations with protectionist measures. Within the framework of the Paris Climate Agreement (2015), they are promoting the tax on fossil fuels (gas, oil, coal) in order to increase their prices and provide preferential pricing of renewable energy sources (renewable energy sources: wind, solar, hydropower).

For the most part, the role of these factors has increased after the adoption of the “green deal” by the EU in 2020, which provides for the transfer of industry to carbon-free, in particular, hydrogen fuel, excluding CO₂ emissions into atmosphere. The UN has decided to complete the work on the conversion to carbon neutral emissions by 2050. Russia has guaranteed the completion of these works by 2060 [21].

Moreover, the export of products from third countries to Western countries is also envisaged to be subject to customs duties if their carbon footprint exceeds its level in national products (transnational carbon tax). The tax is planned to be introduced in 2023, but until 2025 inclusive, instead of collecting it, information on total greenhouse gas emissions from the consumption of imported products will be collected. Exporting companies should start paying customs duties starting from 2026, when the mechanism of cross-border carbon regulation will finally come into force. Moreover, the amount of tax is provided for the first two years at the level of 35 €/ton of CO₂, and in subsequent years—at the level of 50 €/ton of CO₂ [21].

At the same time, it should be noted that the transition to “green” hydrogen (clean from CO₂ emissions) produced by the electrolysis of water using electricity obtained from renewable energy sources, adopted by Western countries, is very costly (12 times more expensive than with existing technologies) and puts black metallurgy of Russia in an uncompetitive position.

These sanctions may deprive the industry of its own investment funds. The current situation requires an immediate transition to cheap hydrogen fuel with neutral (zero) CO₂ emissions and restructuring of the industry by diversifying production capacities, fuel composition and iron ore charge.

In this regard, it is necessary to speed up the development of a program for the use of hydrogen in ferrous metallurgy, obtained according to a new one being developed at the Bardin Central Institute for Ferrous Metallurgy, an economically and environmentally efficient technology that ensures the exclusion of CO₂ emissions when sintering blast furnace production is abandoned [22].

The main advantage of Russia in the domestic and foreign markets will remain the competitive advantages of the production of ferrous metals in Russia: its own iron ore, coking coal and natural gas. Not a single country in the world that competes with Russia in foreign markets has a complex of these factors. This fully applies to natural gas and, to a large extent, to iron ore.

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