

A.R. Kankovskaya, S.A. Tsvetkova

**WAYS OF INCREASING COMPETITIVENESS
OF THE RUSSIAN STEEL INDUSTRY**

А.Р. Каньковская, С.А. Цветкова

**ПУТИ ПОВЫШЕНИЯ КОНКУРЕНТОСПОСОБНОСТИ
РОССИЙСКОЙ ЧЕРНОЙ МЕТАЛЛУРГИИ**

The article analyzes the ways to improve the international competitiveness of the Russian steel industry, the basis of the Russian economy. The concept of sectoral competitiveness is discussed and the methods to evaluate competitiveness in terms of the outcome, i. e. the ability to sell products in certain markets and the quality of existing competitive advantages, are suggested. The application of the proposed methodology enabled us to indicate lower competitive position of the Russian metallurgical enterprises within the last ten years. Thus, the application of a systematic approach to the problem of improving sectoral competitiveness is quite up-to-date. According to this, the effective sectoral innovation system is to be established to provide interaction of economic agents. A key role in it is given to the system of higher metallurgical education as it is reflected in all stages of the innovation cycle, from training highly qualified personnel to the commercialization of research results. We focus on the development of the sectoral innovation system, which is to enable us to increase international competitiveness of Russian steel industry and to determine the direction of development of the Russian system of higher metallurgical education, consistent with the objectives of the sectoral innovation system. As a result, we have ensured the key role of higher education supported by the state in the development of the metallurgical industry innovation system. Due to the role of higher education in innovation and development of the industry we focus on motivation of metallurgical enterprises to build relationships with universities.

SECTORAL COMPETITIVENESS; SECTORAL INNOVATION SYSTEM; STEEL INDUSTRY; FUNCTIONAL CONNECTION; STATE SUPPORT.

Проводится анализ путей повышения международной конкурентоспособности российской черной металлургии – базовой отрасли российской экономики. Рассмотрено понятие «отраслевая конкурентоспособность», предложено оценивать ее с точки зрения достигнутого результата – способности продавать товары на определенных рынках, и с точки зрения имеющихся конкурентных преимуществ. Расчет показателей по предложенной методике позволил сделать вывод об ухудшении конкурентных позиций отечественных металлургических компаний за последние десять лет, несмотря на значительные инвестиции предприятий в модернизацию производства. Обоснована необходимость применения системного подхода к решению проблемы повышения конкурентоспособности отрасли, который предполагает построение эффективной отраслевой инновационной системы, обеспечивающей взаимодействие экономических агентов в ходе генерации, распространения и использования знаний. Ключевая роль в ней отводится системе высшего металлургического образования, активно задействованной на всех этапах инновационного цикла, начиная с подготовки высококвалифицированных кадров и заканчивая коммерциализацией результатов научных исследований. Проведена декомпозиция глобальной цели создания и развития отраслевой инновационной системы, заключающейся в повышении конкурентоспособности российской черной металлургии. Это позволило нам определить направления развития российской системы высшего металлургического образования, соответствующие целям развития отраслевой инновационной системы. Доказана ключевая роль государственной поддержки в развитии системы высшего металлургического образования как элемента отраслевой инновационной системы вследствие особой природы высшего образования и инноваций. Обоснована приоритетность использования инструментов государственного воздействия косвенного характера, ориентированных на побуждение металлургических предприятий к наращиванию связей с высшими учебными заведениями.

ОТРАСЛЕВАЯ КОНКУРЕНТОСПОСОБНОСТЬ; ОТРАСЛЕВАЯ ИННОВАЦИОННАЯ СИСТЕМА; ЧЕРНАЯ МЕТАЛЛУРГИЯ; ГОСУДАРСТВЕННАЯ ПОДДЕРЖКА; ФУНКЦИОНАЛЬНЫЕ СВЯЗИ.

Globalization and acceleration of scientific and technological progress contributed significantly to increased competition in world markets. In

this respect, the problem of gaining the competitive position of domestic producers, both within the country and abroad, is of particular



importance. The prerequisite for the international competitiveness of the national economy is the presence of competitive industries in its structure. Therefore, the development of competitive advantages of basic industries is a priority, with steel industry being one of the most important for the Russian economy.

The importance of steel industry in the modern economy is determined primarily by the fact that it is a major supplier of construction materials for engineering, construction and power complex. The contribution of steel industry into GDP of Russia is about 1.4 percent. It accounts for about 8 percent of the industrial production and 6 percent of the country's exports. The share of the Russian steel industry in tax payments in all levels of budget exceeds 5 percent. Moreover, as a consumer of goods and services of natural monopolies, steel industry uses 5.3 percent of total electricity consumption and more than 8 percent of total natural gas consumption, and its share in rail freight makes up about 15 percent. Around 3.5 percent of employees in the industrial sector of the Russian economy are employed by the enterprises of steel industry [16]. Changes in the metallurgical production lead to corresponding fluctuations in the index of the industrial production ahead one or two quarters. Thus, we can draw a conclusion that the development of steel industry affects the entire industrial production and, consequently, the economic situation in Russia [4].

Steel industry is one of Russia's key areas in the international division of labour. Today, Russia is the fifth largest steel producer after China, Japan, India and the United States: the share of the Russian steel industry amounts to 4.3 percent of the total global steel production [18, p. 9]. Russia takes the 4th place in net exports of steel products (17.1 million tons) after China (46.8 million tons), Japan (36.1 million tons) and Ukraine (23.0 million tons) [18, p. 25].

The importance of steel industry for the national economy makes it necessary to evaluate its competitiveness and the ways to improve it. However, it should be noted that today there is no single methodology for assessing the level of sectoral competitiveness.

M.I. Gelvanovsky, V.M. Zhukovsky, I.N. Trofimov suggest assessing the sectoral

competitiveness by using a set of indicators, such as labour productivity, specific wages, capital intensity, research intensity, the degree of export or import dependency in the industry, the expansion of the industry (the degree of use of the products of the industry in other sectors of economy) [2].

V. Petrov identifies the following indicators of sectoral competitiveness: the dynamics of the norm and the mass of the profit; the economic growth in the country; the balance of exports and imports of the analyzed industry in comparison with such balances in other countries [8].

A.V. Skubko and T.I. Vlasenko point out the need to analyze the competitiveness of the industry by two factors [1, 10]:

- the competitiveness in the global market, i. e. the ability of goods produced by the industry of the national economy to compete with similar products produced abroad;
- the competitiveness of the industry in the domestic market, i. e. the ability of goods produced by the industry of the national economy to compete with goods imported into the country.

According to I.V. Pungin and V.S. Pungina [9], the criteria for evaluating the competitiveness depend on the purpose of such assessment.

In our study, the increased competitiveness of a particular industry is considered to be the contribution to improving the competitiveness of the economy as a whole. The evaluation is initiated by the state, which aims to improve the living standards of the population. Living standards in the country are largely determined by the productive use of resources, since they depend on the amount of income of owners of these resources. Therefore, industry can be considered to be competitive if the volume of production and sales in it has been in accordance with the trends of the global and national economies for a long period of time.

We believe that the sectoral competitiveness should be assessed in the following way: 1) in terms of the outcome, by which we mean the ability to sell products in certain markets; 2) from the standpoint of the quality of existing competitive advantages. All figures should reflect the dynamics.

We suggest using two indicators to measure the competitiveness of steel industry, both in

domestic and foreign markets: 1) to assess the external competitiveness, the dynamics of exported steel products share in the total steel production should be analyzed; 2) to assess the internal competitiveness, the imported steel products share in the total steel consumption within the economy should be calculated. Based on the data of the World Steel Organization [17], we have calculated these indicators for ten largest steel-producing countries as of 2013 for 2003 and 2012 (Tab. 1).

As it can be seen from Tab. 1, the analyzed period is characterized by the deterioration of the competitive position of the Russian steel industry both in foreign and domestic markets, by 8 percent and 5 percent respectively. The leader of the world's steel production, China, was able to strengthen its export position twice during this period, while significantly reducing its dependence on imports of steel products – from 16.79 percent to 2.05 percent. At the same time, China is still a manufacturer of semi-finished products mainly, importing from abroad high-quality metal products. More than 60 percent of Russian steel exports also make up products with low added value [6]. The closest competitors to Russian steelmakers, in terms of external (about the third of production is exported) and internal competitiveness (the share of imported steel products in domestic consumption is about 13 percent), and export structure (predominance of products with low added value), are Brazilian steel corporations. The last ones continue to distinguish themselves through the world's lowest level of production costs and are able to compete with the world leaders on quality and technologies [6].

The Russian steel industry is increasing its raw specialization. The role of «raw material supplier» is enforced by the protectionist policies of a number of importers of the Russian metal and the availability of a large number of steel processing

facilities around the world (rolling, coating, etc.), loaded at only 75 percent. In the long term, global trends such as an increase in prices for raw materials and energy, increased competition in foreign markets, consolidation of steel companies, strengthening of protective measures, etc. may adversely affect the international competitiveness of the Russian steel producers. A gradual increase in export profitability of semi-finished products relative to the profitability of supply of finished products will entail technological backwardness of the Russian steel industry from the metallurgy of competing countries.

In contrast with the external markets, the share of consumption of low value added products in the Russian steel market is minimal, because the main buyers here are not steel mills, but machinery industry, construction, and energy sector. In the future, the growing rolled metal consumption in Russia, predicted at 4 percent per year [7], will encourage an increase in the production of high value added products [3].

Nowadays, the international competitiveness of the Russian steel industry is based on the following factors:

- properly developed iron ore, and fuel and energy base;
- modern facilities for melting pig iron and steel, and manufacturing metal products;
- vertically integrated structures, competitive in foreign markets.

It should be noted that Russian steelmakers' competitive advantage of lower production costs (tariffs for natural gas, electricity, rail transportation, wages), in comparison with their foreign competitors, with comparable product quality and technological level has actually been lost lately. As a result, compared to the level of 2005-2007, the profitability of sales of steel products in 2013 decreased almost threefold – from 25.3 percent to 9 percent [16].

Table 1

Year	Indicator	China	Japan	USA	India	Russia	South Korea	Germany	Turkey	Brazil	Ukraine
2003	Export. percent	3.71	30.52	8.25	15.95	45.96	30.43	55.06	60.89	41.55	71.96
	Import. percent	16.79	4.08	20.11	7.11	9.09	32.69	47.34	53.45	2.93	7.43
2012	Export. percent	7.50	38.67	15.29	10.65	37.89	43.74	60.46	51.99	28.13	73.16
	Import. percent	2.05	8.02	29.13	11.91	13.63	34.42	57.38	40.01	13.22	17.48



Russian steel companies are trying to regain its competitive position by expanding investment programs aimed at development of production facilities and transport infrastructure: thus, in 2012 they invested six times as much as in 2000 [7]. However, the technological backwardness of the Russian steel industry has not been overcome yet, and the competitive position of the Russian metallurgists has lowered. It indicates the need to apply a systematic approach to the problem of improving the sectoral competitiveness. Due to the important role of interactions throughout the innovation process, the increase in the competitiveness of Russian steel industry is impossible without building an effective sectoral innovation system, providing interaction of economic agents in the course of generation, dissemination and use of knowledge. Thus, the global goal of the development of the steel industry innovation system facilitates its international competitiveness.

One of the ways to improve the competitiveness is to reduce the production cost, by increasing productivity. If we compare the productivity of the leading Russian steel companies, such as MMK, Severstal, NLMK and others, with enterprises in Eastern Europe, for example, with the industrial group Arcelor Mittal, the productivity of the latter exceeds the productivity of domestic enterprises in about 1.5-2 times. As compared to the closest competitors of the Russian steelmakers – the Brazilian steel producers, domestic enterprises are lagging behind in 3–4 times in terms of productivity: the above mentioned foreign enterprises demonstrate the performance level of 1300–1500 tons of steel per person against the 300–500 tons of the Russian plants [11].

Improved competitiveness of domestic steel industry also implies higher quality of products manufactured in the country, as a result of increased expenses on research and development (R&D). Intense competition in steel markets forces the world's leading steelmakers to develop their own research centers, to cooperate closely with customers, universities and suppliers of metallurgical equipment on the development of breakthrough technologies that will facilitate the competitiveness of steel products in the world market in the medium and long term. In contrast with the world's leading steel companies, which spend 0.4-1.6 percent of their revenue on R&D

projects, the Russian companies invest ten times less for these purposes – only 0.01–0.02 percent [7].

The development of the innovative activity of metallurgical enterprises is another way to increase the competitiveness of Russian steel industry. Despite the fact that the level of innovative activity of the Russian steel companies is several times higher than the average for the country's economy (25.1 percent vs. 11.1 percent in 2012 [13, p. 55]), and is close to the average value of the Russian high-tech industries (31.3 percent [13, p. 54]), it is still significantly below the level of innovative activity of industrial enterprises in developed countries (55-70 percent) [14, p. 10].

The problems of the Russian steel industry revealed in our study are identical to the problems of the traditional industries of China stated in [5]. Recognizing the recommendations for the development of innovative industries formulated by A.V. Kozlov and Zhang Xia as relevant for Russia, we are going to supplement them with the reference to the very traditional industry.

At present, the institutions of the national innovation system and the state innovation policy virtually ignore the existence of outdated technologies and industries, as they are focused on finding and developing innovations in the breakthrough industries. Therefore, one of the urgent tasks of the national innovation system and its sectoral subsystems, including steel industry, is the transfer of production to a qualitatively new level and the transition to the knowledge economy. Thus, as described in detail in [12, p. 75–76], the partnership between businesses, government and universities on the basis of the triple helix, accompanied by the combination of their competences, is vitally important. It allows making an innovative breakthrough and providing the stable sectoral and national competitiveness.

In connection with this, there is an obvious need for the development of the Russian system of higher metallurgical education as a key element of the sectoral innovation system in conjunction with its other subsystems. The Russian system of higher metallurgical education should develop in three directions, consistent with the objectives of the sectoral innovation system:

1. Improving the labour productivity in steel industry by improving the quality of higher metallurgical education (educational and stimulating functions);

2. Improving the quality of steel products by strengthening the research component of higher metallurgical education (research and stimulating functions);

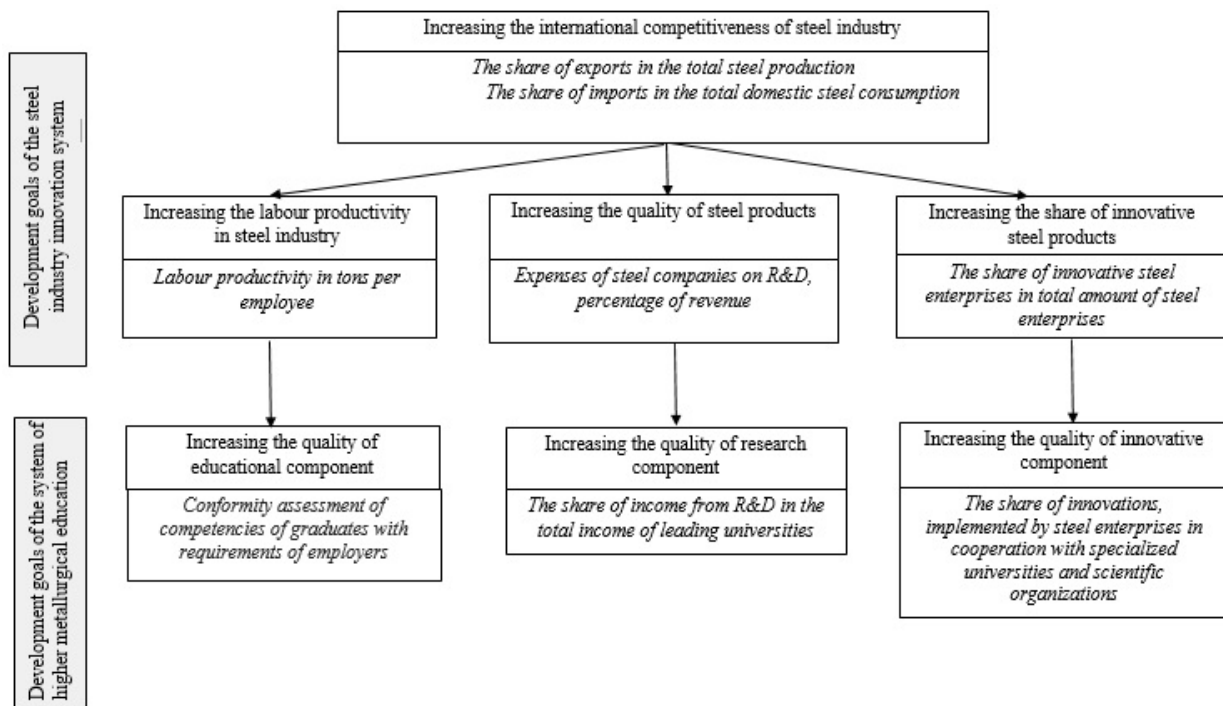
3. Increasing the share of innovative products in total steel production by increasing the innovative component of higher metallurgical education (innovative and stimulating functions).

The goals for the development of steel industry innovation system and the system of higher metallurgical education as an element of the sectoral innovation system are shown in Figure.

The higher education system is a key element of the national innovation system (NIS); and the system of higher metallurgical education plays a primary role in the steel industry innovation system. The higher educational system is unique in its ability to participate in all the subsystems of the NIS, realizing one or more of its functions within the NIS: educational, research, innovative, and stimulating ones. In contrast with other organizations, e.g. research institutes, innovative enterprises, innovation infrastructures, which are also elements of the NIS and are usually only

responsible for one of the stages in the innovation process (research, commercialization of research results, mass production of innovative products), universities are involved in the implementation of all phases in the innovation cycle, from training highly qualified personnel to commercialization of research results. Since the functions implemented by the higher education system in the NIS are closely linked with each other, the development of the system of higher metallurgical education in the steel industry innovation system should take place in all four functional areas.

We should emphasize a key role of the state support due to the special nature of higher education and innovation. Among the tools of such support, the indirect means of influence, such as tax incentives, development of innovation infrastructure and cooperation are the most effective ones. The reason for that is the fact that they contribute to the creation of the competitive environment, encouraging business entities to improve their performance through continuous innovation. Moreover, these tools boost the development of relationships between the participants of the innovation process.



The goals for the development of steel industry innovation system and the system of higher metallurgical education as an element of the sectoral innovation system

Table 2

Function	Object of support		
	Universities	Enterprises	Universities and enterprises
Educational + stimulating	Priority financing and development of the elite universities (research and federal universities) as educational and research centers (5,2)	Providing tax incentives to the innovative metallurgical enterprises (3,5)	Building technological platforms with participation of universities required (6,0).
Research	Involvement of leading scientists to the research activity of universities (3,2). Priority financing and development of the elite universities (research and federal universities) as educational and research centers (5,2). Priority financing and development of integration of university and academic science (7,4)	State co-financing of research projects, conducted by universities on request of metallurgical enterprises (2,1). Providing tax incentives to innovative metallurgical enterprises (3,5)	Building innovative clusters with participation of universities required (7,9)
Innovative	Establishment of small innovative enterprises at universities to commercialize the research results (4,3). Development of innovation infrastructure of universities (centers of excellence, technology parks, etc.) (5,5)	State co-financing of research projects, conducted by universities on request of metallurgical enterprises (2,1). Providing tax incentives to innovative metallurgical enterprises (3,5)	

In the course of our survey, experts in the field of metallurgy, including specialists and managers of Russian metallurgical enterprises (51 percent), specialized research organizations (37 percent), as well as university lecturers (12 percent), were asked to rank the indirect tools of the state influence, which we selected on the basis of the analysis of current state initiatives, according to the degree of their effectiveness. The opinions of the experts are concordant (the coefficient of concordance is equal to 0.72).

The distribution of the state influence instruments is presented in the decreasing order of their effectiveness in Tab. 2. The values of the average effectiveness within 1–3 correspond to the high level of effectiveness, 4–6 – average, 7–9 – low.

As it can be seen from Tab. 2, for all the functions, the greatest effect, according to experts in the field of metallurgy, is given to the government initiatives, focused on the support of metallurgical enterprises. Stimulating innovation

processes in such a way seems to reflect the needs of the Russian economy, which lacks the demand for innovations [15].

In our view, to develop sectoral innovation strategies and programs it is advisable to focus primarily on the development of the forms and tools of interaction and cooperation between enterprises and universities, which have already proved to be effective. Measures that have been evaluated by experts as less effective can also be used by the government in stimulating innovation activity through the integration of higher education into the innovation system as soon as the appropriate changes in the mechanism of their implementation are introduced. Therefore, these tools should be gradually put into practice, for example, in the form of pilot projects.

Thus, the development of the Russian system of higher metallurgical education is the key element in the development of the sectoral innovation system as it provides the sustainable increase in the international competitiveness of the Russian steel industry in the long run.

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KANKOVSKAYA Alina R. – St. Petersburg State Polytechnic University.

195251. Politechnicheskaya str. 29. St. Petersburg. Russia. E-mail: kankowska_alina@mail.ru

КАНЬКОВСКАЯ Алина Рональдовна – доцент Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.

195251, ул. Политехническая, д. 29, Санкт-Петербург, Россия. E-mail: kankowska_alina@mail.ru

TCVETKOVA Svetlana A. – St. Petersburg State Polytechnic University.

195251. Politechnicheskaya str. 29. St. Petersburg. Russia. E-mail: elisvet@mail.ru

ЦВЕТКОВА Светлана Александровна – аспирант Санкт-Петербургского государственного политехнического университета.

195251, ул. Политехническая, д. 29, Санкт-Петербург, Россия. E-mail: elisvet@mail.ru
