Technological sovereignty of Russia in terms of the global competitiveness: on the case study of choosing a strategy

Evgeniy A. Kapoguzov

Doctor of Economics, Associate Professor
Moscow State University named after M.V. Lomonosov, Moscow, Russia
E-mail: egenk@mail.ru

Abstract. The issue of ensuring technological sovereignty is becoming increasingly relevant under the sanctions restrictions. The article discusses the possible alternatives to the economic development of manufacturing industries in Russia: the strategy of inclusion into global value chains, and the concept of «technological autarky». The paper analyzes the domestic scientific papers in terms of the «technological sovereignty». On the basis of economic and food security approach understanding of Russian manufacturers' national independence from the foreign technologies and equipment import appears. The paper also emphasizes the issue of «technological sovereignty» and development of integral and sectoral indicators at the macro and sectoral level based on dependence on foreign technologies and equipment imports on the proximity to the global technological frontier. The author dwells on the mutually beneficial technological cooperation with «friendly countries», in particular with the BRICS countries, as an only alternative in the existing geopolitical realities of the «Technological autarchy» strategy. This cooperation also can include the long-term joint projects.

Keywords: technological sovereignty, value chains, technological border, economic sanctions.

JEL codes: E60, E61, E65, E66, E69

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Introduction

The socio-political problems of Russian technological sovereignty have sharply escalated under the unprecedented sanctions pressure after February 2022. For many years during the post-Soviet period, an implicit contract similar to the deal between the USSR and Germany «Gas in exchange for pipes» was in effect in a number of industries. Russia supplied mainly hydrocarbon raw materials, and technologically developed countries supplied the necessary equipment and technologies into Russia. The purpose of this article is to consider the economic development alternatives from the perspective of Russia's competitiveness in the global markets: 1) Russia's participation in global value chains or 2) orientation to the extreme form of technological sovereignty – «technological autarky» and identification of possible intermediate alternatives to these development strategies. Also, we consider the essence of the «technological sovereignty» concept and possible criteria for its operationalization as the objectives of this paper.

Notwithstanding the years of reforms, including the focus on innovative development in regulatory documents and the abandonment of the «raw material needle», the complexity of Russia's output remains fairly average as the economic complexity index shows. Thus, Russia ranks 51st[1] place out of 133 countries; its highest ranking (28th) was in 2000. The drop in the ranking is explained by the energy resources growing share in exports.

During the post-Soviet period, there have been no significant breakthroughs in technological development despite the active pro-innovation rhetoric and the availability of resource opportunities. We can consider the country's participation in the international division of labor, taking into account existing comparative advantages (in particular due to natural rent) and using the advantages of international technological cooperation as the explanations for this phenomenon. To a large extent, the theoretical basis for such a policy was based on ideas attracting some Russian policy makers from endogenous theories of

1 https://atlas.cid.harvard.edu/countries/186 (Accessed 15.05.2023)

economic growth, in particular the works of F. Aghihon and F. Howitt (Aghihon & Howitt, 2006). They took J. Schumpeter's ideas of «creative destruction» and partially combined them with A. Gerschenkron's concept of the catch-up development benefits (Gerschenkron, 2015). F. Aguillon drew attention to the innovative process described in the Schumpeterian theory which strongly depends on the position of the country in terms of the technological frontier, i.e. the global technological level (Zamulin & Sonin, 2019). Additionally, the proximity to the global technological frontier requires high costs to ensure further growth through innovation, which makes it possible to increase the pace of economic growth through investment costs (Acemoglu et al., 2006). In this regard, there is an «advantage of backwardness» for countries of catching up development. Since the transition to a new technological «frontier» requires not only much more efforts. To achieve this kind of frontier is possible by implementation or imitation of the existing technology. This approach was actively used by East Asian countries. They ensured their own development this way: from catching up to advancing development (Levin & Sablin, 2021).

In this regard, a possible way of development is a gradual expansion of Russia's participation in global value chains, and transition from low-value products to higher ones. This strategy used Canada which, according to Simachev et al., is an example for Russia (Simachev et al., 2020 p. 8). On the one hand, Canada is a supplier of raw materials on world markets, and on the other hand, it is the manufacturer of some technologically complex goods. But by these some goods production Canada is at the last stages in global value chains (GVCs). It is believed the developing countries which are not participating in the GVCs could enter the global market only if the product developed and produced by them is competitive one. It was usual for low-conversion products. Indeed, developed countries, as a rule, focused on the design of goods, as well as marketing and after-sale maintenance of production processes. IKEA is a typical example. The brand has traditionally close relations with local suppliers of intermediate resources, and provides cooperation at the production stage. But at the same time the company IKEA is an ultimate principal in terms of interaction with consumers.

These implicit and quite simple strategies of economic development were also used by the Russian authorities in the 2000s. However, its practical implementation, in our opinion, is possible under two ideal conditions. First one is the free access to the global technology market, where advanced achievements of scientific and technological progress are presented and there are no restrictions in technology transfer, engineering services, and staff training opportunities. Second is demand for products created with the help of these technologies in world markets. All its possible either in the case of foreign direct investment, when the subject of technology production and the seller of finished products is the same company (for example, a TNC or a Multinational Corporation (MNC)). In this case, the inflow of advanced production, marketing, organizational and managerial technologies to the country is possible. According to endogenous growth theories, it can promote economic development due to the effects of spillover and learning-by-doing. The second case is the situation when the companies interacting in the value chain are, according to O. Williamson, in a situation of fundamental transformation, i.e. there is a bilateral dependence of counterparties in the context of asset specificity and attitudinal contracting options.

Indeed, this strategy of «naive technological cooperation» actually began to collapse after August 2008 (the situation of «peace enforcement» in Georgia). Those time the first technological restrictions in the possibility of importing foreign technologies for dual-use products occured. However, these restrictions did not affect the key sphere of Russian exports – the oil and gas sector, in which foreign technologies and services of mainly Western engineering companies in the field of oil production, transportation and, partially, oil refining continued to be actively used. The situation has changed significantly since 2014, when sectoral sanctions affected this key area of Russian exports (Nureyev et al., 2017). Also the opportunities for importing technologies have been significantly reduced. According to our research, the impact of sanctions «is expressed in slowing down or stopping the operational processes of business functioning, as well as the need to restructure logistics chains and (or) develop their own production of previously imported components, which leads to an increase in the cost of finished products and lengthening the operational cycle of the business model» (Shkodinsky et al., 2022, p. 84).

However, despite a considerable degradation of the situation with the possibility of a global technological market access, including equipment supplies, the Russian government's attempt to ensure full technological sovereignty has not been realised. The existence of numerous programs for the import substitution development, the support of technological development, the available global technology market provided the tactics of cooperation with countries imposing restrictions on the supply of equipment and technologies to Russia. According to the HSE 2020 report «Russia in Global Production», «the key challenges for Russian structural policy are, in our opinion, not the expansion of the non-resource sector in general (which would be relatively easier to implement due to the extensive growth of sectors within the existing low and medium-sized industries), but rather the renewal and increase added value in existing non-resource sectors, increasing the depth of processing and integration into growing production chains in global production» (Simachev et al., 2020, p. 5).

This strategy of focusing on participation in international scientific and technological cooperation (as an alternative to the strategy of «technological autarky») has clearly manifested in the aviation industry. In this sphere the past decades there have been no obvious breakthroughs and the sanctions restrictions occurred in March 2022 led to a potential collapse of scientific and technological cooperation with former partners (Kapoguzov, 2022). Thus, in the production of Russian Sukhoj Superjet 100 aircraft, which were also exported to Mexico and Kazakhstan, Russia was a participant of the complex global value chains, in particular using hydraulic, braking and oxygen systems from the USA for the production of Russian aircraft, so as the life support systems and control systems from Germany.

The changed geopolitical situation focused on technological sovereignty in the conditions of the new reality at the highest level. Thus, at the Council of Legislators of the Russian Federation in St. Petersburg on April 27, 2022 President of the Russian Federation V.V. Putin defined the most and «absolutely solvable» tasks ensuring the industrial and technological sovereignty of our country in the near future[2]. Later, at the St. Petersburg International Economic Forum, there was also issue on technological sovereignty: «the cross-cutting principle of development which unites our work is the achievement of true technological sovereignty, the creation of an integral system of economic development independ on foreign institutions for critical components. We need to develop all spheres of life at a qualitatively new technological level and at the same time be not just users of other people's solutions, but have technological keys to the creation of goods and services of the next generations»[3]. At the same time, the President's speech did not concern with the import substitution, but advanced development, the creation of unique technologies and goods (S.P. Korolev's achievements in rocket engineering were used as an example).

However, at the time of the geopolitical confrontation in February 2022 the situation with some branches of Russian manufacturing industry branches is quite different in terms of the possibility of technological sovereignty. According to the HSE report «Russia in Global Production» for the pre-pandemic period (the report was presented at the April 2020 conference), a different strategy was recommended for Russia. Jn the one hand, borrowing of the best practices and available technologies in agriculture (dairy farming is especially noted) was recommended. But on the other hand, «in industries characterized by high renewability and in which Russian firms are relatively technologically developed (pharmaceutical production, certain branches of the mechanical and electrical engineering industry), stimulation, creation, and implementation of domestic breakthrough developments is the crucial one» (Simachev et al. 2020, p. 12). Meanwhile, the number of companies in non-energy sectors located on the technological border was estimated at 2%, and another 15% – as close to the technological border: «proximity is characteristic of large companies, companies controlled by foreign capital (as well as non public sector companies), innovatively active companies engaged into the personnel development» (ibid., pp. 114-122). However, the individual industries of 20% leaders in the pulp and paper exceeds the other companies more than 8 times, and in air transport by more than 6 times. The export and participation in global competition allows Russian companies to improve their competencies.

Main part

2 https://www.pnp.ru/politics/putin-zayavil-o-skoroy-indeksacii-pensiy-zarplat-i-posobiy.html (Accessed 25.11.2022)
3 http://kremlin.ru/events/president/news/68669 (Accessed 25.11.2022)

Technological sovereignty: on the issue of the content of the category

The growing technological gap, the lack of self-sufficiency in many spheres of technology, the aggravation of global contradictions and the intensification of international conflict pose serious challenges to the Russian Federation. The long-term slowdown of economic growth and the need to resist sanctions increases the importance of Russia's technological sovereignty. At the same time, the term is ambiguously interpreted in the domestic literature. At the same time, the meaning of the term is ambiguous, and there is both a substitution of concepts and closely related concepts, such as technological self-sufficiency (Prikhodko, 2021). Let us consider this issue in more detail.

However, the issue of technological sovereignty is considered in terms of the national security. Indeed, scientific and technological development are also highlighted as a strategic national priorities. By Professor V.K. Falcman, technological sovereignty is «the ability of a particular type of economic activity to provide its national economy with its products of appropriate quality, even at the expense of its imports, but subject to the mandatory condition of reimbursement of import costs at the expense of proceeds from the sale of its own exports» (Faltsman, 2018, pp. 83-84). This opinion correlates with the idea of the first variant of the strategy – the country's participation in the GVDC and its benefits in terms of the international cooperation. Meanwhile, the statistically measurable indicator is characterized by the international division of labor. The corresponding indicator for measuring the «scientific and technological sovereignty of the industry (type of economic activity) depends on «export of products as a sign of leadership» and «import of products as a form of borrowing foreign technologies» (ibid., p. 84). Generally, the indicator concerns with the international division of labor and the state of technological sovereignty (in the author's understanding) for enlarged types of activities in Russian Federation. For instance, engineering branch in the period from 2000 to 2016 had a significant gap between exports and imports, while the peak was the «pre-sanction» 2013, when exports was USD 28.8 bn, and imports USD 152.8 bn.

According to S.G. Kovalev, «the technological sovereignty of a country is the most important parameter of its reproductive security and historical future. Sovereignty is based on a system of technological processes actually or potentially possessing by the country, using them in the social production of tangible and intangible goods» (Kovalev, 2020). Semantically and morphologically, the concept of «technological sovereignty» includes «independence and the possibility of developing and applying a wide range of domestic and borrowed methods of production on the country economic territory based on government decisions» (Ibid.).

A. Afanasyev denotes the essence of technological sovereignty as «the unhindered realization of national interests in the technosphere, taking into account existing and future threats» (Afanasyev, 2022, p. 2387). Moreover, the criterion for achieving this level of sovereignty is its abstract designation as: «Independent sustainable development of the country in the technosphere as a unity of science, machinery, and technology.» The author believes in further specification of «technological sovereignty in the development of issues of «components of technological sovereignty; mechanisms for ensuring it; qualitative characteristics, and quantitative indicators for assessing the level of technological sovereignty actually achieved, etc.» (ibid., p. 2389)

The issue of technologies use and the import of dual-use products is also relevant. By V.K. Faltsman, «The modernization of the defense industry was almost entirely based on the import of machine tools. Domestic production of machine tools almost did not increase, despite the extremely low level of capacity utilization (17%)» (Faltsman, 2018, p. 86)

The technological sovereignty arise a lot of questions. For instance, S.G. Kovalev considers the desired and achievable degrees of technological sovereignty as a whole so as the individual industries and certain types of technologies; the possibilities of ensuring, achieving technological sovereignty; concepts of advanced technology achievement; conditions of support, neutrality of the external world environment; borrowing or creating own technologies; mechanism for ensuring the technological sovereignty implementation; usual mode of existing economy; using of special, targeted economic mechanisms and approaches, etc. (Kovalev, 2020, p. 35).

However, according to I. Prikhodko, «technological sovereignty is the achieved degree of localization of the global technology creation process, ensuring an impact restricting the freedom of foreign technologies usage by domestic companies unacceptable for these countries on the technological process of partner countries in the process of international technological exchange and cooperation» (Prikhodko, 2021, p. 94). Meanwhile, the author criticizes his own definition, in terms of the costs associated with restrictions on usage the patented technologies.

Thus, the ambiguity of the «technological sovereignty» interpretation requires its further methodological study. In our opinion, it has two options: the adaptation of existing methods applied to similar categories, or the development of an original methodology for assessing the level of technological sovereignty. For the first option, it seems acceptable to use the techniques and developments implemented for the category of «economic security» at the macro and meso levels (at the regional and individual industries levels). In this case, a system of threshold values of the integral indicator of technological sovereignty can be applied at the macro level. For the level of individual industries (within the framework considered by S.G. Kovalev), a situation similar to the previous interpretation of the essence of food security occurs. It correlates with the degree of self-sufficiency (independence from imports) with food[4]. Therefore, the criterion for achieving technological sovereignty is dependence on imports by industry or sub-sector in general and by a specific product group in particular. This dependence is assessed by the Ministry of Industry and Trade of Russia. Indeed, there are some attempts to quantify the dependence on equipment imports, for example, in terms with the fuel and energy complex of Russia (Sayenko & Kolpakov, 2023). Additionally, it suggests the development of a full-fledged methodology which allows assessing the diagnosis of the technological sovereignty both for individual industries and product groups. The integral indicator characterizes the degree of technological sovereignty achievement as independence from the import technologies.

Institutional alternatives to ensuring technological sovereignty

Thus, ensuring technological sovereignty in terms of this particular research raises the question of full technological autarky, when advanced technologies necessary for the production of high-value goods are created within the country or about the possibility of cooperation with «friendly countries» interested in such cooperation allowing us to transfer from global to integration value chains. But there is an issue of providing the «powerful interest» (according to S.G. Kovalev's formulation) for the transfer of advanced technologies still absent in Russian science and industry.

Meanwhile, the tasks of ensuring technological sovereignty occur at the governmental level. In accordance with the list of instructions of the President of the Russian Federation following the meeting of the Presidential Council for Strategic Development and National Projects on December 15, 2022, approved by the President of the Russian Federation on January 26, 2023, No. Pr-144, strengthening the technological sovereignty of the Russian Federation is one of the key tasks. It should be achieved in 2023 as the national development goals of the Russian Federation for the period up to 2030. In addition, on February 8, 2023, President of the Russian Federation Vladimir Putin noted the limited time Russia has to create and develop its own technologies in microelectronics, information technology, industry, transport, the development of medicines, new materials, etc. important for the country to ensure technological sovereignty.

However, the development of breakthrough technologies is associated with high uncertainty and risks, so it is extremely important to find promising options for combining resources and competencies. In this regard, the issues of the integration principles use and mechanisms of network coordination, the formation of a conceptual framework to overcome the technological gap through mutually beneficial cooperation, including at the international level, are extremely relevant. One of the promising directions for strengthening the technological independence and self-sufficiency of the Russian Federation is to increase technological sovereignty in the terms of scientific and technical cooperation with the BRICS countries – Brazil, Russia, India, China, and South Africa. Four of the five BRICS countries are top ten largest countries in the world in terms of population, area, and GDP. The leaders of the BRICS countries defined this cooperation goal as a

4 Within the framework of an alternative (updated interpretation), food security is considered from the standpoint of the «harmlessness» of food for public health.

consistent, active, pragmatic, open, and transparent dialogue. Nowadays, Algeria, Bahrain, Egypt, Iran, the UAE and Saudi Arabia have submitted applications for membership to BRICS, as well as 7 others countries declared their potential interest in participating in BRICS in 2022, and can join this partnership in future.

In 2020, the five countries supported India's initiative to adopt the BRICS Countries' Innovation Cooperation Plan for 2021-2024. The activities within the framework of the Plan are designed to intensify cooperation between the BRICS countries in the field of technology transfer to form direct cooperation between the participants of the innovation chain, as well as to ensure the sustainable development of five-sided cooperation in accordance with the new technological order. However, until now, Russia has not developed a concept or a methodological basis for solving strategic challenges on strengthening technological sovereignty in terms of intensifying scientific and technical cooperation of the BRICS countries.

The key issue concerns with the participants' incentives and desire of BRICS partners to share their advanced technological developments and know-how. For instance, China is one of the world's technological leaders in many technological spheres. However, the complicated situation with parallel technological imports for Russia through friendly countries, in conditions of serious lag in certain areas of Russia, there remains only the possibility of building technological cooperation similar to the development of a joint wide-body long-haul airliner CR929 by the Russian United Aircraft Corporation and the Chinese company COMAC. Although these kind of projects are generally long-term, they can be useful for the implementation of current tasks due to the external effects of cooperation and the possibility of applying technological developments in other areas.

Conclusions

The strategic narrative of the Russian economy development evolved from the ideology of «resources in exchange for technology» into a neo-globalist concept of Russia's participation in global value chains. During the analysis of the scientific papers, we proposed an understanding of technological sovereignty as independence from the import of foreign technologies and equipment. Indeed, the issue of developing a methodology of indicators characterizing technological sovereignty, both integral and industrial, requires further study.

Thus, despite the attempts of forced movement under the influence of sanctions towards a strategy of technological import substitution and ensuring technological sovereignty, there is no possibility of ensuring «technological autarchy» in a number of industries. it can inevitably lead to further rejection of the Russian economy from the global technological frontier and simplification of manufactured products, which is clearly manifested in the Russian automotive industry. In these conditions, almost the only available alternative to an autarkic strategy is cooperation with technologically advanced friendly countries, in particular on the basis of already existing institutional structures, such as BRICS, etc. The key idea of this systemic alternative is the need for self-sufficiency in technologies created and developed in the context of multilateral scientific and technical cooperation of the BRICS countries. The use of integration interaction principles, network coordination mechanisms, and a program-project approach will form a conceptual framework for overcoming the technological gap through mutually beneficial cooperation.

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CONFLICT OF INTEREST

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