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# Analysis of Measures Administered to Ensure Technological Safety in the Russian Industry

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## ABSTRACT

**The objective** of this study is to analyse the current implemented measures to support technological security in Russian industry. This is due to the necessity to measure the set strategic objectives with the key interim results of their implementation to assess effectiveness and, if necessary, adjust the “roadmap” for stimulating a technological breakthrough in domestic production. The methodological framework of the study relied on a combination of general scientific and specialized **methods** of scientific cognition of economic phenomena and processes. The article analyses the state policy in the context of achieving technological sovereignty of the Russian industrial complex, considering its sector-specific features of operation. It also examines the dynamics of industrial production amid increasing sanctions pressure, and evaluates the import dependency within the sectors of industries, including trends of both reduction and growth in import dependence. Supported by statistical data and current regulatory-legal documents, the given study concludes that reducing import dependency and building domestic production capacity is a long-term, multi-stage process that requires coordinated efforts from both the state and the business community. **The research findings** hold practical value for management personnel at various levels, representatives of the scientific community, and specialists in industrial complex development.

**Keywords:** Russian industry; technological security; import substitution; technological sovereignty; technological breakthrough

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## INTRODUCTION

At present, one of the key components of national security for any state striving for sustainable development, economic independence, and the protection of sovereign interests is technological security.

Its essence lies in a country's ability to maintain control over critically important production processes, infrastructure, and scientific and technological potential, as well as to ensure independence in strategically significant industrial sectors [1, p. 154].

Against the backdrop of a shifting global trajectory, in which globalization is increasingly complemented by new trends such as digitalization, logistics reconfiguration, Industry 4.0 and 5.0, and intensified international technological competition, the vulnerability of the Russian national economy to external influences is growing. The high degree of dependence of domestic industry on foreign technologies, equipment, and components, and consequently the limited capacity of the country to enter international markets for advanced technologies, may destabilize individual sectors of the economy as well as the nation as a whole. In this context, ensuring technological sovereignty has become a priority task of state policy [2].

In recent years, this issue has attracted the attention of numerous Russian and international scholars who have examined technological security from various perspectives, including: the general conceptual foundations of technological progress [3–5]; approaches to the formation of technological sovereignty [6–8] and its provision through the development of industrial innovation based on digitalization [2, 9]; the conceptual framework for methodologies assessing the level of technological sovereignty in order to achieve a technological breakthrough in the national economy [10]; contemporary pathways of import-advancing development as a factor strengthening technological sovereignty [11, 12] and its enhancement through the localization of industrial capacities [13]; and the development of indicators of scientific and technological security [14, 15].

Contemporary scholarly research converges on an important conclusion: in a complex and hostile geopolitical environment, a carefully designed and effectively implemented industrial policy plays a decisive role in ensuring technological security. State support measures for key sectors of the economy, aimed at reducing dependence on external supplies and establishing domestic technological value chains, include stimulating scientific research, promoting the adoption of national innovations, creating conditions for the growth of high-technology businesses, and developing the infrastructure necessary for the localization of production.

The authors of the present study aim to analyze both the current support measures for technological security in Russian industry being implemented at present and the main intermediate results achieved through the execution of strategic initiatives. This objective is driven the need to monitor progress and assess individual stages of the implementation of organizational and technical measures aimed at modernizing industrial production technologies and ensuring a flexible response to deviations from the intended trajectory toward achieving technological sovereignty.

## MATERIALS AND METHODS

The study utilized various statistical materials and data obtained from official governmental online resources, including information provided by the Federal State Statistics Service (Rosstat) and the Ministry of Economic Development of the Russian Federation. Particular attention was also given to the regulatory and legal framework defining strategies for industrial and technological development, as well as measures aimed at ensuring socio-economic sustainability in the Russian Federation.

The methodological foundation of the research consisted of general scientific methods, including analysis, synthesis, generalization, induction and deduction, and abstraction, as well as specialized methods of data analysis and processing. These included statistical methods involving the collection and examination of relevant data and time-series

indicators; methods of comparison and aggregation; sociological methods; logical and comparative analysis; expert assessment techniques; graphical methods, and others. Through the application of these methods, an objective picture of the development of Russian industry, production dynamics, and changes in import dependence was obtained. Furthermore, conclusions were drawn regarding trends in the formation of technological sovereignty and the prospective tasks associated with its strengthening.

Special attention was devoted to identifying opportunities for advancing the technological security of Russian industry under current economic conditions.

### SECTORAL SPECIFICS OF INDUSTRIAL ENTERPRISE OPERATIONS UNDER CONTEMPORARY ECONOMIC CONDITIONS

The development of science, technology, and innovative potential as key factors of sustainable socio-economic growth and the provision of technological security in national industry constitutes an important component of the modern strategic national agenda.

In operational, tactical, and strategic planning of measures aimed at enhancing technological sovereignty, it is necessary to take into account the principal sectoral characteristics of industrial companies under current economic conditions:

- Industrial enterprises belong to both the primary sector (extractive industries) and the secondary sector (manufacturing industries) of the economy and are characterized by the high resource intensity of their output.

- The industrial sector faces internal contradictions that pose threats to its development. On the one hand, economic globalization has made enterprises dependent on external environmental factors (suppliers, consumers, competitors, transnational production conglomerates, technological evolution, technology transfer, state and public institutions, and others). On the other hand, unprecedented sanctions hostility toward

Russia limits the country's ability to maintain established technological linkages with Western companies, necessitating logistics restructuring and the expansion of domestic developments in the field of innovative technologies.

- The activities of industrial enterprises are in many cases regulated and supervised by the state, and numerous types of output are subject to certification requirements.

- Most manufacturing enterprises are highly specialized, which increases their dependence on counterparties and prevents them, when necessary, from rapidly shifting to the production of alternative goods.

- The creation of innovative products is a complex process characterized by a diversity of production technologies, product nomenclature, and organizational conditions, highlighting the role of the production component in the sustainable functioning of industrial enterprises.

- Human resources, as well as information support systems for production (especially concerning the latest technological data and information on market dynamics), are significantly more important for industrial firms than for organizations in other sectors of the economy.

- The relocation of an industrial enterprise is difficult due to the challenges associated with its physical movement.

- Contemporary interaction between the R&D sector and manufacturing represents a lengthy cycle — from a technological idea to mass production — which underscores the need for priority measures aimed at increasing the effectiveness of both research organizations and the associated production and technological base.

### MAJOR TRENDS AND PRIORITIES IN THE TECHNOLOGICAL DEVELOPMENT OF INDUSTRIAL PRODUCTION

Both traditional and current objectives of industrial policy require not so much an expansion of production volumes as accelerated advancement in cross-cutting and critical technologies.

In recent years, the Government of Russia has supported scientific developments in the field of laser and photonic technologies, including the launch of projects for the production of photonic integrated circuits. To date, the state has identified such research areas as unmanned aerial systems, medicine, artificial intelligence, space technologies, and others as critically significant.

The sectoral characteristics of industrial production, when monitored, make it possible to identify external and internal factors that negatively affect technological security and to develop adequate measures to prevent or minimize adverse consequences. This, in turn, implies the development of compensatory mechanisms within the broader system aimed at strengthening technological sovereignty.

In this context, public authorities have prepared regulatory and legal acts defining the long-term priorities of state policy. A central document in this regard is the Decree of the President of the Russian Federation No. 309 of 7 May 2024, “On the National Development Goals of the Russian Federation for the period up to 2030 and for

the longer-term perspective up to 2036<sup>1</sup>” (hereinafter referred to as the Decree). The Decree substantiates the necessity of achieving technological leadership, regarded as a condition for strengthening Russia’s international standing and ensuring internal resilience.

In accordance with the provisions of the Decree, particular attention is given to a number of concrete target benchmarks for 2030, reflecting both quantitative and qualitative indicators. The most significant among them include:

- ensuring technological sovereignty in critically important sectors, which involves the development of domestic economic actors and a reduction of import dependence in the high-technology domain;
- creation of new markets and technological niches through the mastery of advanced trajectories of scientific and technological progress;

<sup>1</sup> Decree of the President of the Russian Federation No. 309, 7 May 2024, “On the National Development Goals of the Russian Federation for the period up to 2030 and for the longer-term outlook of up to 2036. URL: <https://www.garant.ru/products/ipo/prime/doc/408892634/>

Table

The dynamics of Industrial Production in the Period of 2022–2024

Name of the indicator	Rate of growth (+), decrease (-) by year to the previous years, in %		
	2022	2023	2024
Industrial production, total	+0.7	+4.3	+4.6
Mining and quarrying	-1.5	-1.0	-0.9
Manufacturing industries, including:	+0.3	+8.7	+8.5
•Food industry	+1.6	+5.2	+4.1
•Light industry	+4.5	+11.4	+3.6
•Wood processing industry	-2.0	+1.3	+4.9
•Manufacture of coke and petroleum products	-0.6	+2.5	-2.1
•Chemical industry	-0.3	+4.9	+4.8
•Metallurgical industry	+2.7	+8.7	+7.7
•Machinery and equipment manufacturing	-5.9	+25.0	+19.5
•Other manufacturing activities	0	+7.0	+4.2

Source: Compiled by the authors based on data from the Ministry of Economic Development URL: [https://www.economy.gov.ru/material/file/8aa341310b8d9fb9d1c97ae486d87979/o\\_dinamike\\_promyshlennogo\\_proizvodstva\\_itogi\\_2024\\_goda.pdf](https://www.economy.gov.ru/material/file/8aa341310b8d9fb9d1c97ae486d87979/o_dinamike_promyshlennogo_proizvodstva_itogi_2024_goda.pdf)

- an increase in the industrial production index and gross value added in manufacturing by no less than 40%, reflecting the commitment to modernize the production sector and increase its contribution to the economy;

- Russia's entry into the top ten leading countries worldwide in terms of R&D volume, which implies expanding research capacity and enhancing its efficiency and applied relevance;

- an increase in domestic expenditures on R&D to at least 2% of GDP, with an emphasis on raising the share of private investment to stimulate business innovation activity and its engagement in technological development processes.

One of the most important indicators of the effectiveness of implementing the objectives set out in the Decree is the dynamics of industrial production growth rates disaggregated by sector (see *Table*).

According to the data presented in the *Table*, the industrial production index in 2024 increased by 4.6%, exceeding the growth rates recorded in both 2023 and 2022. This expansion was driven primarily by manufacturing industries, whose output rose by 8.5% despite the relatively high baseline achieved in 2023. A particularly positive contribution came from the machinery and equipment manufacturing sector, which ensured production growth of 19.5% and maintained the strong momentum established in 2023, following the decline in business activity observed in 2022. In that year, output in this segment fell by 5.9%. Overall, the figures reported in the *Table* indicate favourable trends in 2024 relative to the period of economic uncertainty and slowdown triggered by geopolitical developments in 2022.

Against the backdrop of profound external economic changes caused by sanctions pressure, the withdrawal of foreign companies from the Russian market, and the simultaneous strengthening of state import-substitution policies, the Russian economy has demonstrated a stable trend toward reducing industrial dependence on imported materials, equipment, and components, particularly during 2022–2023. This has

been driven by a forced reorientation toward domestic resources and the active implementation of targeted state projects supporting national production. These include preferential financing programs administered by the Industrial Development Fund, aimed at technological modernization and the launch of serial production of domestic substitutes, as well as support from the Ministry of Industry and Trade of the Russian Federation, including within the framework of the cluster investment platform that consolidates enterprise activity in key sectors. In addition, sectoral support measures have been introduced, including subsidies, tax incentives, and preferences for producers focused on strategically important goods [12, 16].

### CHALLENGES IN THE IMPLEMENTATION OF CONTEMPORARY IMPORT-SUBSTITUTION POLICY IN INDUSTRY

In autumn 2024, the Institute of Economic Forecasting of the Russian Academy of Sciences conducted a survey of representatives of Russian enterprises. The results made it possible to assess the dynamics of import-substitution processes in industry since the introduction of sanctions restrictions in 2022 [17]. The findings indicate a gradual improvement in the situation; however, the scale of progress achieved remains far from the desired level.

According to the survey results, 53% of respondents reported the absence of domestic suppliers capable of fully replacing imported technological solutions that have become unavailable due to sanctions (*Fig. 1*). Previously, this problem was reported by 62% of respondents, which suggests a positive trend. Nevertheless, the figures indicate a persistent shortage of critically important production resources in the domestic market.

A pressing issue for half of those surveyed remains the increase in production costs and, consequently, the rise in producer prices. This is largely driven by growing domestic demand in the context of the withdrawal of imported goods

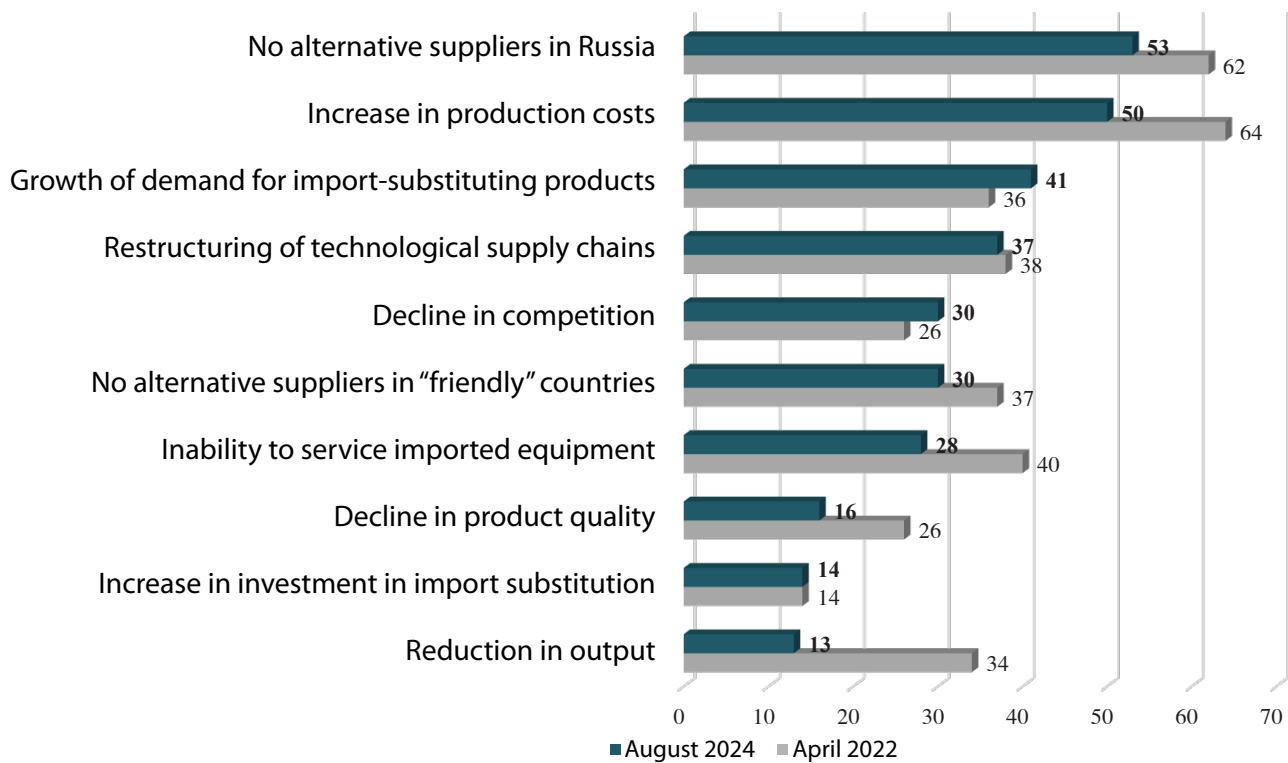


Fig. 1. The Consequences of Import Restrictions, which Affected Enterprises, % of Russian Industrial Enterprises

Source: Compiled by the authors according to [17].

from the market. An additional factor intensifying inflationary pressure has been the supply of products from partners in so-called "friendly" countries, which is often accompanied by inflated pricing.

Thus, according to the survey results, despite certain positive shifts toward import substitution, structural constraints and price-related risks continue to represent serious challenges for Russian producers.

According to official statistics, in 2023 the share of expenditures on imported products within the overall structure of production costs amounted to 7.6%, whereas in 2021 this indicator reached 12.1%. However, it should be emphasized that this trend exhibits a differentiated character across industrial sectors (Fig. 2).

The greatest progress in reducing import dependence has been observed in sectors that simultaneously demonstrated substantial growth rates in industrial production. The most pronounced positive changes were recorded in the

computer manufacturing sector: in 2023, the level of import dependence declined by 17.5 percentage points, indicating significant structural shifts in the production base.

However, in a number of industries, a persistently high — and in some cases increasing — level of dependence on external supplies has been noted. This applies, for example, to the coal industry, where mining equipment is produced in insufficient volumes. The pharmaceutical sector also remains among the most sensitive to external technological constraints. The industry continues to exhibit a high dependence on imports of pharmaceutical substances, laboratory equipment, and packaging materials [18].

In addition to the challenges identified above, the need to intensify industrial support measures is driven by the following crisis-generating factors:

- the longstanding priority given to the dominant development of the fuel and energy complex compared with manufacturing sectors

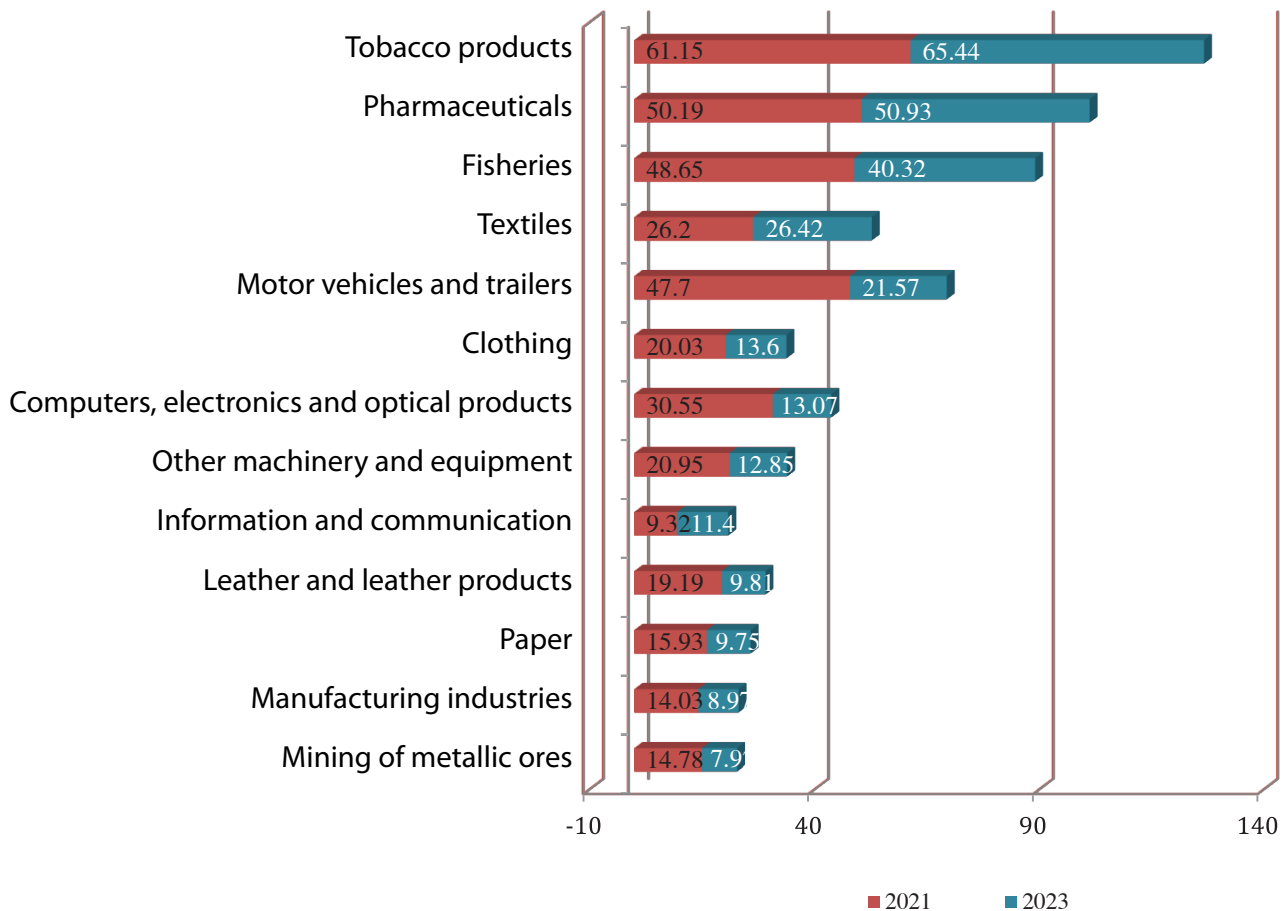


Fig 2. Changing Import Dependence in the Sectors of the Russian Economy, in %

Source: [18].

under the previous model of the international division of labour;

- the insufficient level of innovative production within the structure of the national economy, which limits further opportunities for import substitution;
- the slow pace of renewal of obsolete production assets, particularly their active components;
- inadequate volumes of real investment in high-technology sectors;
- sluggish dynamics in the development of high-tech industries and a shortage of labour possessing the required skills;
- the emergence of strong destabilizing external factors and challenges that require both timely and constructive intervention by public authorities and an active response from business

structures in order to strengthen the country's technological sovereignty.

### WAYS FOR ENHANCING STATE SUPPORT FOR RUSSIA'S TECHNOLOGICAL INDEPENDENCE UNDER SANCTIONS PRESSURE

Under the current conditions, state support for domestic industrial enterprises – which often face a shortage of accessible financial resources necessary for technological modernization – has become a strategically important direction of the economic policy of the Russian Federation. In order to mitigate the limitations associated with replacing lost imported supplies and to reduce technological dependence on external sources, the state is developing and implementing a comprehensive set of measures that

includes financial-credit and institutional instruments.

Among these, particular attention should be given to the Special Investment Contract (SPIC), which represents a public-private partnership mechanism aimed at stimulating investment inflows into the national industrial sector and involves the conclusion of a long-term agreement between an investor and the state. Under this framework, the investor assumes obligations to implement an investment project focused on the creation, development, or introduction of industrial products in Russia using advanced technologies. In return, the state commits to ensuring the stability of the regulatory environment and providing corresponding support measures. The initial version — SPIC 1.0 — was introduced at the end of 2014 as an anti-crisis measure in response to deteriorating external economic conditions. In 2019, it was transformed into SPIC 2.0, which is primarily oriented toward the introduction and development of high-technology production, as well as the localization of critically significant technologies. At present, both versions of the contract operate in parallel, allowing for the consideration of the specific features and implementation stages of previously concluded agreements<sup>2</sup>.

Special attention within state support measures is devoted to the development of R&D through the reimbursement of industrial enterprise expenditures. Subsidy programs are also provided, targeting innovative projects characterized by a high degree of scientific novelty and technological complexity. This includes support for projects implemented in partnership with research organizations and higher education institutions<sup>3</sup>.

Programmatic policy documents confirm that a key objective of the state policy of the Russian Federation remains a focus on systematic support

for R&D, which is regarded as the most effective instrument for stimulating industrial development and for creating high-technology, competitive products with a high degree of localization. For instance, under a Government Order of the Russian Federation, enterprises developing innovative projects in priority industrial sectors were allocated 5 billion rubles from the reserve fund. This financing provides for the reimbursement of a portion of expenditures associated with all stages of the innovation-driven production cycle, from procurement to the market introduction of products<sup>4</sup>. Particular emphasis is placed on the development of products capable of substituting imports under external constraints.

### APPROACHES TO DEVELOPING A MECHANISM FOR IMPLEMENTING TECHNOLOGICAL SECURITY SUPPORT MEASURES

When considering the stimulation of technological development in the context of ensuring national technological security, it should be emphasized that this is a complex and multi-level process, the implementation of which depends on consistent efforts in three key directions:

- the identification and priority development of critical industrial sectors with the greatest potential;
- the development and accelerated deployment of competitive domestic technologies;
- the strategic interaction between science and production, ensuring technological leadership under conditions of external constraints [3].

Accordingly, the establishment of an effective mechanism for implementing technological security support measures is associated with the need for:

- the concentration of substantial volumes of diverse resources in knowledge-intensive industries that are critically important for the economy;

<sup>2</sup> Support measures. Ministry of Industry and Trade of the Russian Federation. URL: <https://minpromtorg.gov.ru/merpod> (date of access: 15.05.2025).

<sup>3</sup> Ibid.

<sup>4</sup> Order of the Government of the Russian Federation of 18 October 2023 № 2887-р. URL <http://static.government.ru/media/files/6JD6YkGDstpVGO66rjZ4W7ajlNHrZDPq.pdf>

- breakthroughs in R&D and the scaling of results (prototype solutions) to serial production;
- further digital transformation;
- organizational reforms aimed at creating innovative production capacities, overcoming bureaucratization, and ensuring that the human resource base meets new technological requirements;
- state support for the development of advanced technologies and high-value industrial products;
- legal protection of intellectual activity, among other measures.

At the same time, large-scale progressive transformations in the industrial sector are associated with a wide range of risks related to scientific, technical, and technological security, including financial, organizational, legal, political, social, and environmental risks, as well as the potential relocation of scientific research abroad. This requires highly professional efforts aimed at preventing such risks and minimizing adverse consequences.

A separate and highly important task is the assessment of technological security through the application of relevant instruments and measures that make it possible to determine the degree of vulnerability and resilience of technical systems to risks and threats. At the level of companies and large industrial enterprises, local regulatory acts are typically adopted to define and govern procedures for assessing technological risks and technological security. As a methodological approach, the systematic implementation of the following stages may be proposed: 1) analysis of the condition of the material and technical base and industrial-technological infrastructure; 2) assessment of human resource capacity for technological security and the level of competencies of responsible personnel; 3) analysis of financing measures and expenditure dynamics related to equipment protection, insurance, and certification in the field of technological security, in particular in accordance with standards such as GOST 12.3.002–75 “Production Processes. General Safety Requirements” and GOST 12.3.047–98 “Fire Safety of Technological Processes,” which regulate

requirements for technological documentation and the training of responsible staff; 4) assessment of the operational effectiveness of technological security systems; 5) ensuring technological compliance; 6) determination of the overall risk level based on qualitative and quantitative assessments (typically ranked as high, medium, low, or negligible).

Contemporary approaches also include the assessment of the maturity of technologies and technical systems, which is recommended particularly in cases where an enterprise has implemented a technological security compliance system. Key aspects of such an assessment include, first, the collection, analysis, and synthesis of data (including information obtained through monitoring); second, comparison with approved regulations and standards (including those established by Rostekhnadzor); and third, the development of recommendations to support decision-making aimed at enhancing the level of technological security. The practical application of this methodology enables proactive responses, the identification of vulnerabilities and additional threats, and the elaboration of measures to minimize or sustainably eliminate them.

The methodological principles for determining the level of technological security include:

1. a preliminary assessment of the degree of critical technology utilization and technological development within industrial enterprises;
2. the development of alternative options and scenarios;
3. the comprehensiveness and integrative character of the evaluation;
4. the potential emergence of new technological threats, including global ones;
5. the availability of the necessary expert competencies.

Thus, ensuring the technological security of Russian industry is possible only through the comprehensive implementation of state policy — integrating the efforts of manufacturers, technology developers, and the scientific community — together with financial support for innovation, which will contribute to the formation of a favourable institutional environment.

## CONCLUSION

The analysis conducted within the framework of this study demonstrates that state policy in the fields of industrial growth, import substitution, and technological sovereignty is based on a comprehensive approach that includes the implementation of support measures for research and development activities in priority sectors and their systematic stimulation. The current vector of Russia's industrial policy is aimed at ensuring a rapid response to external constraints and at forming a resilient domestic scientific and technological base.

Statistical data confirm the presence of positive shifts, including an increase in industrial output and a reduction in import dependence. However, in certain sectors — particularly pharmaceuticals and extractive industries — a high level of technological vulnerability persists, requiring the continuation of targeted modernization and localization policies. Therefore, strengthening technological sovereignty is possible through the activation of such development factors as innovation, digital

sovereignty, the formation of small technology companies, increased budgetary financing of industrial projects aimed at technological independence, the provision of preferential technological loans, special support measures for technological start-ups, and the localization of industrial production.

Taking into account contemporary problems, challenges, and threats, the Government of Russia has adjusted the national strategy for scientific and technological development, on the basis of which national projects aimed at technological sovereignty are being formulated.

The theoretical significance of the present study lies in its contribution to the advancement of knowledge regarding the formation and implementation of programs to ensure the technological security of Russian industry under current economic conditions. The results obtained are of practical value for managerial personnel at various levels, members of the academic community, and business-sector specialists involved in the development of the industrial complex.

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***Authors’ declared contribution:***

**A. N. Ryakhovskaya** – article concept development, problem statement, and research objective formulation.

**A. S. Sharov** – data systematization, interpretation of results.

**P. I. Kheifets** – selection and analysis of literary sources.

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