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ACHIEVEMENT OF TECHNOLOGICAL SOVEREIGNTY: GLOBAL AND RUSSIAN EXPERIENCE

Specialty: 5.2.5 World Economy

Abstract of the dissertation
for the degree of
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The relevance of the research topic lies in the fact that in the current realities of global economic development, scientific and technological advancements, technologies themselves, and innovations have become crucial instruments of geopolitical influence and a means of enhancing states' geo-economic power. Concurrently, contemporary geopolitical and geo-economic contradictions indicate that international cooperation does not always serve as a reliable and effective process of technological exchange and may potentially lead to unilateral dependence on foreign suppliers.

Global trends of regionalization, reshoring, and localization of production (China and India), provoked by geopolitical instability and the consequences of the pandemic, the active implementation and development of new technologies (artificial intelligence, cloud computing, bio- and nanotechnologies, quantum technologies, etc.), as well as the intense competition for intellectual capital and other exclusive resources (between the EU, China, and the USA), require countries to achieve technological sovereignty (hereinafter – TS) based on the implementation of critically important and cross-cutting technologies.

In the context of the world's transition to multipolarity, to achieve TS, states are compelled to actively develop their own innovation systems, define a list of critical technologies to ensure national security, economic growth, and technological independence, while creating favorable conditions for attracting private investment in R&D and industrial production, accelerating the process of innovation commercialization, and establishing an effective intellectual property protection system.

The relevance of the topic of achieving TS in Russia has increased dramatically since the beginning of the Special Military Operation (SMO) in 2022, due to the accumulation of a critical mass of bans and sanctions (although these were applied in the form of a technological embargo long before the reunification with Crimea in 2014). Western countries violated the principles of international cooperation in various fields by imposing unprecedented sanctions (19 packages as of 2025) against Russia, primarily in the high-tech sector. The current geopolitical

situation has significantly complicated Russia's further participation in global value chains, not only because of the sanctions themselves but also due to potential secondary sanctions against "friendly countries" that support Russia in implementing import substitution in various industries. Therefore, achieving TS is not only a crucial goal of scientific and technological confrontation in both military and civilian spheres but also a key instrument for preserving Russia's sovereignty as a whole.

Under these conditions, Russia is forced to rapidly develop and strengthen its industrial and scientific-technological potential, overcoming numerous internal challenges (dependence on raw material exports, a low share of high-tech products in exports, insufficient R&D financing compared to world leaders) to achieve TS, and subsequently technological leadership. This is becoming a promising driver for the transformation of the Russian economy into a high-tech one.

Degree of the topic elaboration: various aspects of achieving TS based on scientific-technological and innovative potentials have been the subject of research by russian authors: S. Yu. Glazyev, S. D. Bodrunov, V. E. Dementyev, G. B. Kleiner, A. A. Afanasyev, E. V. Potaptseva and V. V. Akberdina, A. I. Amosov, E. V. Ponomarenko, V. K. Faltsman and V. V. Glazunova, S. G. Kovalev, as well as by Russian researchers-practitioners and scholars in monographs: D. Yu. Baidarov and D. Yu. Faikov, A. G. Barabashev (authorial team: P. A. Kalinichenko, S. Yu. Kashkin, M. V. Nekoteneva, N. A. Pozhilova, D. V. Ponomareva, A. O. Chetverikov).

Conceptual multi-format models of potential TS achievement are presented by Russian researchers: A. G. Aganbegyan, I. V. Danilin and E. A. Sidorova, A. A. Afanasyev, V. Ya. Pishchik and P. V. Alekseev. Russian problems and potential prospects in achieving TS, and in the long term – leadership – are widely presented in the researches of E. B. Lenchuk, V. I. Filatov, D. R. Belousov.

The process of establishing TS and the economic trends in which it plays a significant role are presented in studies by such foreign authors as: C. March and I. Schieferdecker, M. Kaloudis, J. Edler, F. Crespi, P. Grant, S. Couture and S. Toupin,

M. Mazzucato, J. Lerner and R. Nanda, H. Capapé and P. Rose, D. Mocanu and M. Thiemann.

The internal specifics of individual foreign countries, regions, and integration associations, as well as trends and challenges in achieving TS, are presented by both foreign and Russian authors: N. Bilotta, J. E. Gray, M. Huotari, J. Weidenfeld and C. Wessling, A. V. Chernikova, I. E. Denisova, M. A. Gershman, I. A. Ivanova, T. E. Kuznetsova, O. V. Demidkina, S. G. Privorotskaya, F. J. Brambila Martinez and E. G. Kameneva, I. Yu. Shchedrov, A. A. Baykov, B. A. Kheyfets and V. Yu. Chernova, O. A. Mironova, T. N. Cheklina, V. Yu. Salamatov et al., V. V. Dorzhieva, E. V. Davydenko, M. N. Danyukova, M. V. Myasnikovich, E. V. Oglobina.

Research object: changes in the system of international economic relations in the sphere of industrial-technological and innovative development and the achievement of TS, taking shape among the world's leading countries, country alliances, and associations.

Research subject: The content of TS and the methods of achieving it in a multipolar world.

Research aim: To determine the content and specific features of the process of achieving TS in Russia, in the world's technological leader countries, and in their alliances, under the conditions of multipolarity.

To achieve this aim, the following **tasks** were formulated:

- To study the conceptual approaches of Russian and foreign researchers to the concept of "technological sovereignty";
- to identify the theoretical models of achieving TS existing in modern science and to develop a conceptual model for its achievement;
- to determine the specific features of implementing the conceptual model of TS in the European Union and the United States of America; to study the experience of implementing the conceptual model of TS in the People's Republic of China and the Republic of India;

- to analyze the process of forming the TS model in the Russian Federation based on an analysis of stimulating instruments of state industrial policy in the context of the emergence of a multipolar world;
- to identify promising trends, determine key problems, and formulate prospects for overcoming them in the process of achieving TS (and technological leadership) by the Russian Federation, based on foreign experience and its participation in interstate associations (EAEU, BRICS+).

To solve the set tasks, the following methods were applied: *the evolutionary method*, which helped to identify cause-and-effect relationships and patterns in the formation and further development of such a complex economic category as TS in different countries; *the inductive method*, applied to analyze scientific sources and materials in different languages concerning the development and strengthening of scientific-technological, innovative, and industrial potentials in different regions in the current realities of the global economy; *the normative method*, which allowed for a comprehensive study of the regulatory and legal framework for scientific-technological and innovation policy, as well as identifying key instruments and mechanisms for ensuring TS both in Russia and in other regions and associations under consideration; *the method of interpreting statistical data*, which helped to identify patterns and trends in R&D financing in the presented regions of the world, and to trace the correlation between the economic and technological positioning of EU countries in the context of ensuring their sovereignty; *content analysis and case study methods*, which made it possible both to formulate the author's conceptual model of achieving TS and apply it to different countries to identify specific features of the TS achievement process, and to identify key problems, trends, and prospects for implementing the TS achievement process (with an eye towards leadership) at the current stage of Russia's economic development, with an emphasis on cooperation with friendly countries and associations.

The empirical base of the research relies on the analysis of sources such as: analytical studies and materials from both Russian research institutes, institutions, agencies, and international organizations and structures; regulatory legal acts and

documents from both Russian and foreign jurisdictions, including the following countries and interstate associations: the EU, the USA, China, India, EAEU, BRICS+; relevant analytical articles and materials in Russian and foreign languages; analytical materials and data presented on internet resources; strategic documents; dynamic statistical data from the World Bank; data from international and regional rankings; documents and materials from state bodies of the Russian Federation, the EU, the USA, the PRC, and India.

The research area corresponds to the requirements of the following sections of the Higher Attestation Commission (VAK RF) passport for specialty 5.2.5. World Economy: 2. Theoretical foundations of world economy analysis; 18. The role of technological factors in the development of global economic processes; 20. Economy of foreign countries and regions (economic country and regional studies). Comparative studies of national economies in the system of world economic relations; 24. International economic integration.

The scientific novelty of the research is as follows:

1. **A definition of technological sovereignty is proposed**, refined from the perspective of public goods theory (TS – a pure public good: non-rival, indivisible, produced by the state), along with substantive characteristics of this category (macroeconomic, historical, measurable), which broaden its understanding under the challenges of the modern multipolar world. Based on the theory of public goods, the concepts of technological sovereignty (a pure public good) and technological leadership (a mixed good) have been differentiated, which has allowed for a deepening of their theoretical content;

2. based on an analysis of foreign and russian experience, **a conceptual model for achieving TS has been developed**. The content of its elements may differ depending on country-specific features, economic resources, and the country's policy in the scientific and technical sphere. The model's elements are: 1) critical technologies and the potential for their implementation, 2) the regulatory and legal framework for ensuring TS, critical technologies, and scientific-technological and innovative development, 3) the institutional management structure and industrial-

technological potential for ensuring TS, 4) resource provision (natural resources, highly qualified personnel, financing);

3. as a result of a comparative analysis based on the author's conceptual model, typological features of models for achieving TS in countries with different institutional and resource conditions have been identified. **It has been established that the existing models can be classified as follows**: a) *The Model of Competitive Cooperation (European Union)*, characterized by the priority of supranational competitive cooperation, harmonization of the regulatory framework, and joint financing of large-scale technological projects while maintaining resource dependence on external suppliers and maximizing business community involvement in the innovation commercialization process; b) *The Protectionist Model (USA)*, based on a combination of strict protectionist measures with active attraction of global intellectual resources, viewing technological leadership as a key element of national security; c) *The Adaptation Model (China)*, in which the strategy of borrowing and adapting foreign technologies in the initial stages evolves into the creation of own closed innovation cycles under the dominance of state control over critical resources and production chains; d) *The Balancing Model (India)*, focused not on full-scale import substitution, but on integrating into global production chains as an alternative technological hub, with a gradual build-up of competencies in specific critical sectors;

4. based on the analysis of the Russian model, **a system of interconnected institutional barriers has been identified**, forming a persistent obstacle system on the path from import substitution policy to full-fledged TS (and, prospectively, leadership): 1) *regarding the institutional fragmentation of technology transfer*, it is established that the key obstacle is not the absence of regulatory framework as such, but the dispersion of norms on intellectual property rights across numerous departmental documents, creating an opaque and risky environment for businesses attempting to commercialize innovative developments; 2) *regarding the dualism of strategic planning*, it is proven that the simultaneous use of the concepts "technological sovereignty" and "technological leadership" in documents of

different levels reflects substantive inconsistency, provoking management failures in setting state priorities and allocating budget expenditures; 3) *regarding combating the degradation of the early-stage investment segment*, it is determined that reorientation towards the "East" is one of the key priorities;

5. As a result of analyzing the problems of technological development and integration processes involving Russia, **the transformation of mechanisms for achieving TS (and prospectively, leadership) in Russia has been identified and characterized**, manifesting in two interrelated trends: a) *Structural transformation of the financing model* – it is established that there is a gradual transition from the TS model as a pure public good with dominance of state budget financing (62,6% in 2025) to the technological leadership model as a mixed good with an increasing role of extra-budgetary sources (their planned growth to 43% by 2030); b) *Formation of multi-level integration vectors* – it is established that Russia's international cooperation for achieving TS is implemented along two vectors: enhanced industrial integration within the EAEU (focused on cooperation of production chains and harmonization of technical regulations and legal standards) and strategic scientific-technological partnership in the BRICS+ format (focused on complementary development of critical technologies and reducing dependence on Western suppliers). Three types *of international integration mechanisms ensuring the achievement of TS* have been identified and classified: 1) production-localization mechanisms (localization of production capacities and creation of joint ventures in Russia or other member states of the core association); 2) research mechanisms (joint R&D and exchange of intellectual property results with friendly countries); 3) infrastructure mechanisms (formation of independent payment systems, settlements in national currencies, creation of alternative logistics routes).

Reliability and approbation of results: The key provisions and results of the dissertation research were presented at the following conferences: Scientific Conference Session of the Institute of Public Administration and Civil Service (IPACS) "Public Administration and Development of Russia: Civilizational Challenges and National Interests" (May 20, 2023, Moscow); International

Scientific and Practical Conference "Pedagogy, Psychology and Economics: Contemporary Challenges and Development Trends" (February 8, 2024, Moscow); Plenary Conference of the MAEF–2024 (May 16, 2024, Moscow); Plenary Conference of the MAEF–2025 (June 5, 2025, Moscow); Scientific Conference Session of the IPACS "Public Administration and Development of Russia: Challenges, Strategies and Prospects" (May 20, 2025, Moscow).

Based on the results of the dissertation research, the author published 5 scientific papers with a total volume of 3,93 printed sheets (author's contribution – 2,79 printed sheets), including 4 in peer-reviewed scientific journals recommended by the Higher Attestation Commission of the Russian Federation, and 1 in a scientific journal indexed in international scientific databases and search systems[1].

The structure of the dissertation research corresponds to the logic of scientific research and consists of a table of contents, introduction, three main chapters, conclusion, bibliography, and eleven appendices.

[1] Ponomarenko E. V., Drozhzhin D. I. Theory and practice of innovation systems in Russia and France: comparing the trends // Gosudarstvennaya sluzhba / Public administration. 2023. №1 (141). P. 96–105.
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