

INSTITUTIONAL CONDITIONS FOR THE DEVELOPMENT OF HIGH-TECH INDUSTRIES IN THE DONETSK PEOPLE'S REPUBLIC

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Abstract The article examines the institutional conditions for the development of high-tech industries in the Donetsk People's Republic in the context of the structural transformation of the regional economy, its gradual integration into the unified economic and legal space of the Russian Federation, and large-scale post-conflict recovery processes. The purpose of the study is to identify, systematize, and theoretically substantiate institutional determinants that define the opportunities and constraints for the formation of a high-tech production mode, as well as to develop directions for institutional design for the sustainable reproduction of innovative potential. The methodological basis was the systemic-institutional approach, methods of historical-economic, comparative-structural analysis, and institutional modeling. The results demonstrate that the trajectory of the region's technological development is formed under the influence of three intertwining factors: informal institutions characterized by high technical literacy and stress resistance of personnel combined with managerial inertia; a scientific and educational base possessing a developed network of universities and industry research institutes with insufficient commercialization of R&D; the critical state of technological infrastructure, requiring an institutionally supported transition to the «Industry 4.0» paradigm and the principles of the circular economy. An analytical matrix of barriers and priority measures has been formulated, including the creation of institutions for technology brokers, unification of the regulatory and legal framework, development of venture financing, implementation of «university–research institute–enterprise» cluster models, and synchronization of educational trajectories with the requirements of the digital economy. The practical significance of the study lies in the scientific substantiation of the need to form a target program for the institutional provision of technological sovereignty of the Donetsk People's Republic, the implementation of which will allow transforming the regional economy into a competitive innovation cluster, organically integrated into the national innovation system of the Russian Federation and ensuring long-term growth based on increasing labor productivity.

Keywords institutional environment, high-tech industries, post-conflict recovery, scientific and production complex, industrial culture, technological modernization

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1 Introduction

The relevance of the study of institutional conditions for the advancement of high-tech manufacturing in the Donetsk People's Republic is due to the necessity of structural transformation of the regional economy under conditions of integration into the unified economic and legal space of the Russian Federation, as well as large-scale recovery processes requiring a transition from an extensive resource-based model to innovation-oriented growth. Despite the presence of significant industrial potential, a scientific and educational base, and a favorable economic and geographical location, the economic system of the Republic is characterized by a critical level of physical and moral depreciation of fixed assets, the destruction of production and social infrastructure during hostilities, as well as institutional fragmentation inherited from the transition period. The scientific novelty of the study lies in the conceptualization of institutional conditions for the development of high-tech industries in the Donetsk People's Republic as a synthesis of the inherited industrial culture, the historically established scientific and production complex, and modern mechanisms of innovation management, which allows overcoming the dichotomy between the need for radical technological modernization and the preservation of the personnel and cultural potential of the industrial type (2025). The purpose of the study is to identify and systematize institutional factors that determine the opportunities and limitations in establishing a high-tech manufacturing sector within the Republic, and in justifying pathways for institutional development that guarantee the sustained renewal of innovative capacity in the post-conflict era of economic recovery.

2 Literature Review

The scientific comprehension of institutional conditions for the growth of high-tech production in the Donetsk People's Republic is based on the analysis of fundamental monographic studies dedicated to structural transformation, strategic planning, and post-conflict recovery of the regional economy.

Contemporary economic thought views the institutional environment as a core determinant of technological development, shaping the efficacy of interaction between formal regulations (legal frameworks, tax policies, government support initiatives, and intellectual property rights enforcement) and informal institutions (professional ethics, industrial culture, network practices of cooperation and trust). In the context of regions undergoing a transition period and recovery after large-scale destruction, studies revealing the role of the historically established scientific and production complex, the specifics of the reproduction of industrial-type human capital, and mechanisms for adapting inherited production traditions to the requirements of the digital economy and new technological modes are of particular importance (Vishnevsky et al., 2011; 2012).

The fundamental analytical and empirical basis of the research is formed by collected monographs of the State Budgetary Institution «Economic Research Institute» of the Donetsk People's Republic. In the work «Economy of the Donetsk People's Republic: state, problems, ways of solution» (2023), structural disproportions of industry, critical physical and moral depreciation of fixed assets (exceeding 70% in a number of basic industries), as well as institutional fragmentation caused by a long period of transitional management, disruption of cooperation ties, and destruction of infrastructure during combat operations are diagnosed in detail. The authors substantiate the thesis that the recovery of the Donetsk People's Republic economy cannot be reduced to the extensive reconstruction of pre-war production chains, but requires a qualitative redistribution of resources, the creation of effective property institutions, and the introduction of mechanisms that stimulate technological modernization. Special attention in the monograph is paid to the role of the inherited industrial culture of Donbas, which formed a specific type of human capital characterized by high technical literacy, production discipline, stress resistance, and adaptability to complex technological processes. At the same time, it is emphasized that the historically established inertia of management practices and conservatism in the perception of organizational innovations can act

as hidden barriers to the transition to digital and resource-saving technologies, which requires purposeful institutional adaptation.

In the monograph «Strategic Directions for the Socio-Economic Development of the Donetsk People's Republic up to 2033» (2023), institutional aspects are considered through the prism of long-term strategic planning and cluster organization of the economy. The authors demonstrate that the transition from the recovery phase to intensive innovative growth is possible only under the condition of creating a complex institutional architecture, including special economic zones with preferential tax and customs regimes, institutions of technology brokers, business incubators, collective use centers, and digital platforms for the interaction of science, education, and the real sector. The study identifies key barriers to technological transformation: the disconnect of economic links, a deficit of venture and long-term financing, an insufficient level of R&D commercialization, the outflow of highly qualified personnel, and a weak synchronization of educational programs with the demands of high-tech industries. The strategic document substantiates the necessity of transitioning to program-targeted management, implementing regulatory sandboxes, developing offset contract mechanisms, and forming public-private partnerships as a foundation for attracting investment in science-intensive industries (Polovyan & Sinitsyna, 2024; Shemyakina & Ponomarenko, 2023).

The synthesis of the presented sources allows for the systematization of institutional conditions for the development of high-tech industries in the Donetsk People's Republic along three interrelated directions. The first direction covers informal institutions: the industrial culture of the region acts simultaneously as a resource for technological discipline and as a factor of organizational resistance, requiring transformation through mentoring programs, corporate innovation initiatives, and the popularization of engineering and technical professions. The second direction is connected with the legal and regulatory environment: integration into Russian legislation, the introduction of a free economic zone, preferential rates under the simplified tax system (1% and 5%), and the creation of the Industrial Development Fund and the Guarantee Fund form the framework for stimulating innovative activities. However, problems persist with administrative barriers, complex certification procedures, and insufficient protection of intellectual property rights. The third direction concerns the infrastructural and technological base: partial destruction of production facilities, critical depreciation of equipment, and disruption of logistics chains require an institutionally secured transition to new technological modes based on automation, robotics, digital transformation, and the principles of circular economy.

Despite the detailed diagnosis of the current state of the economy and the formation of strategic guidelines until 2033, existing works have not sufficiently developed the mechanisms for operationalizing institutional transformations at the level of individual high-tech clusters, issues of assessing the institutional maturity of regional innovation ecosystems, as well as risk management models under conditions of continuing uncertainty and external sanctions pressure (Sinitsyna et al., 2024). There are no comprehensive studies linking the historically established scientific and production cooperation of Donbas with modern requirements for technological sovereignty, cybersecurity, and the transfer of cross-cutting digital technologies. In addition, issues of institutional support for the commercialization of academic developments, the formation of venture tools, and the adaptation of educational trajectories to the dynamically changing requirements of the market for high-tech products are poorly covered (Polovyan et al., 2018; 2022; 2024).

Thus, the conducted literature review confirms the scientific significance of the study of institutional conditions for fostering high-tech industrial development in the Donetsk People's Republic. Existing monographic works lay a solid analytical foundation, but require development in the direction of detailing institutional design mechanisms, assessing the effectiveness of implemented support measures, and forming adaptive models for managing innovative development in the post-conflict period. This analysis enables us to justify the topicality of the present study, establish its theoretical and methodological framework, and pinpoint avenues for future scientific exploration within the institutional economics of technological modernization in industrial regions.

3 Materials and Methods

The methodological basis of the research was the systemic-institutional approach, which allowed for the consideration of the development of high-tech industries not as an isolated technological process, but as the result of the interaction of formal rules (regulatory acts, support programs, public-private partnership mechanisms) and informal institutions (industrial culture, professional traditions, value orientations of labor ethics). The work uses methods of historical-economic analysis to identify the patterns of formation of the scientific and production complex of Donbas, methods of comparative and structural analysis to assess the degree of physical and moral obsolescence of technological bases, as well as methods of institutional modeling for designing mechanisms for technology transfer, protection of intellectual property, and cluster organization of innovative activity. The empirical base consisted of state statistics data, materials from the strategic development programs of the Republic, the results of a SWOT analysis of the regional economy, as well as expert assessments of the dynamics of capital investments, personnel availability, and the state of infrastructure presented in the analytical reports of the research institutes of the Donetsk People's Republic. The study utilizes the principles of dialectical materialism and systemic-structural analysis to reveal causal connections between institutional transformations and human capital status and the rates of technological modernization under conditions of limited financial resources and ongoing security risks.

4 Results

The institutional environment of high-tech manufacturing in the Donetsk People's Republic is a complex, multi-level system of formal and informal rules, norms, and organizations that determine the trajectory of technological modernization and structural transformation of the regional economy. In conditions of post-conflict recovery and gradual integration into the unified economic, legal, and financial space of the Russian Federation, this environment is shaped by the impact of three interwoven factors: the inherited industrial culture, the historically developed scientific and manufacturing complex and the critical condition of technological infrastructure. An analysis of these factors allows us to identify both systemic competitive advantages of the region and institutional barriers that require targeted state and market regulation based on the principles of institutional complementarity and minimization of transaction costs.

The industrial culture of Donbas, which has been forming for more than a century and a half of industrial development of the territory, represents a stable complex of informal institutions that have fixed specific patterns of the reproduction of industrial-type human capital. This cultural and value code is characterized by high technical literacy, production discipline, stress resistance, and the ability to adapt to complex, often extreme technological processes. The historically established attitude toward labor as a socially significant mission as well as the continuity of engineering and technical traditions, create a favorable informal basis for the introduction of capital-intensive and science-intensive production systems. However, in the context of the transition to the «Industry 4.0» paradigm, this culture demonstrates signs of institutional inertia caused by the effect of path dependence. Conservatism in management practices, a gap in generational continuity in the transfer of unique competencies, as well as insufficient motivation for scientific and technical creativity and the adoption of organizational innovations act as hidden barriers to digital transformation. Overcoming these imbalances requires targeted institutional adaptation, including the implementation of corporate mentoring programs, the creation of centers for cultural and technological acculturation, the stimulation of internal innovative initiatives, and the popularization of engineering professions through educational and media channels.

The scientific-technical and production traditions of the region historically predetermined the formation of a unique scientific and production complex, distinguished by a high degree of spatial and functional integration of mining, metallurgical, mechanical engineering, and chemical sectors,

along with academic institutions, industry research bodies, and higher and vocational education institutions. Currently, 16 state universities and several specialized research institutes (in the fields of physics, applied mathematics and mechanics, physico-organic chemistry and coal chemistry, and problems of artificial intelligence) operate in the Republic, and the creation of new infrastructure facilities, such as the Azov-Black Sea Mathematical Center and planned technoparks, has been initiated. This network structure has significant potential for the formation of innovation clusters, centers for collective use, and platforms for technological transfer. However, its effectiveness is currently hampered by a number of institutional imbalances: weak commercialization of R&D results, fragmentation of interaction between educational organizations, research centers, and the real economy sector, as well as the ongoing outflow of highly qualified scientific and engineering personnel. Actualizing this potential requires the creation of technology broker institutions, the implementation of co-financing mechanisms for applied research, the development of cluster models «university-research institute-enterprise», and the integration of republican educational trajectories into federal programs («Professionalitet», «Priority-2030»), which will align the competency demands of high-tech manufacturing with the educational system's provisions.

The critical state of technological infrastructure acts as the third, but no less significant, determinant of the institutional environment. Physical and moral depreciation of fixed production assets, the degree of which exceeds 70% in a number of basic industries, combined with the partial or total destruction of industrial facilities and social infrastructure as a result of hostilities, forms serious barriers to the direct scaling of high-tech production according to an extensive scenario. In the present circumstances, economic recovery must go beyond merely replicating pre-war technological value chains. It necessitates an institutionally underpinned technological advancement, driven by automation, robotics, digital transformation, and the principles of a circular economy. Institutional design in a post-conflict context involves the formation of a comprehensive support system, including preferential lending and leasing of high-tech equipment, the creation of business incubators and accelerators, the development of mechanisms for the protection and commercialization of intellectual property, coupled with the proactive utilization of public-private partnership instruments to establish industrial parks and special economic zones offering preferential tax and customs benefits. The most important institutional condition for successful modernization is the synchronization of educational programs with the requirements of new technological standards, the implementation of practice-oriented personnel training models through educational-production clusters, and the creation of a national system for independent assessment of qualifications, which ensures the compliance of human capital with the tasks of high-tech transformation and minimizes the risks of structural unemployment in the transition period.

To systematize the identified institutional conditions, barriers, and priority measures for the development of high-tech industries in the Donetsk People's Republic, a generalized analytical matrix is presented (Table 1).

Table 1 – Analytical matrix of institutional conditions, barriers, and priority measures for the development of high-tech industries in the Donetsk People's Republic

Institutional aspect	Current state in the Donetsk People's Republic	Key institutional barriers	Priority institutional measures
Informal institutions (industrial culture)	High technical literacy, stress resistance, engineering and technical traditions of Donbas, adaptability to complex production cycles.	Inertia in the perception of innovation, conservatism of management practices, generational gap in the transfer of experience, decreased motivation for scientific and technical creativity.	Implementation of mentoring programs, popularization of engineering professions, creation of centers for cultural-technological adaptation, stimulation of corporate innovation initiatives.

Scientific and educational complex	Presence of 16 universities, industry research institutes, design institutes, dissertation councils, historical cooperation between science and production.	Shortage of personnel, weak commercialization of R&D, lack of modern research equipment, outflow of youth.	Creation of technology transfer offices, development of «university–research institute–enterprise» clusters, grant support for applied research, integration into federal programs («Professionality», «Priority-2030»).
Formal legal environment	Transition to the legislation of the Russian Federation, introduction of a Free Economic Zone, tax benefits under the Simplified Taxation System (1%-5%), creation of the Industrial Development Fund of the Donetsk People's Republic, the Fund for Support of SMEs, offset contract mechanisms.	Institutional fragmentation, complexity of registration and certification procedures, insufficient protection of intellectual property rights, administrative barriers.	Unification of the regulatory and legal framework, creation of a «single window» for innovative projects, accelerated patenting procedures, implementation of regulatory sandboxes.
Financial and investment mechanisms	Subsidized lending, microloans (1-5% per annum), state guarantees, federal funding for recovery.	High risks for private investors, deficit of venture financing, limited working capital, low capitalization of SMEs.	Development of direct financing institutions (venture funds, crowdfunding), guarantee mechanisms for innovative projects, co-financing of R&D, leasing programs.
Infrastructural and technological base	Partial destruction of facilities, depreciation of assets >70%, but availability of industrial sites, energy capacities, transport hubs.	Physical depreciation of equipment, disruption of logistics chains, lack of digital platforms, dependence on imported components.	Priority modernization based on «Industry 4.0» principles, creation of industrial technoparks, development of Data Processing Centers and digital infrastructure, component import substitution programs.
Personnel potential	Presence of an engineering and technical school, retraining programs, mobilization of resources through employment centers.	Personnel hunger in IT, robotics, biopharmaceutics, reduction in real wages, migration outflow.	Differentiation of labor remuneration in high-tech industries, target training programs, attraction of specialists from other regions of the Russian Federation, digital employment platforms.

The institutional environment of the Donetsk People's Republic is a dynamic system in a stage of structural transformation. Its effectiveness will be determined by the ability of regional authorities, business, and the scientific and educational sectors to overcome institutional fragmentation, align

formal regulations with informal practices, and establish sustainable mechanisms for the accumulation, commercialization, and diffusion of innovations. The successful implementation of this institutional design will allow not only for overcoming the consequences of destruction and technological backwardness but also for forming a competitive high-tech mode, organically integrated into the national innovation system and providing long-term economic growth based on increasing labor productivity and technological sovereignty.

5 Discussion

The obtained results indicate that the development of high-tech industries in the Donetsk People's Republic is impossible without the institutional integration of the inherited industrial potential with modern innovation management mechanisms. Unlike post-industrial models, which are solely focused on the service sector and digital startups, the Republic's economy requires the preservation and transformation of its manufacturing core, making the development of mechanical engineering, instrument engineering, and the chemical-pharmaceutical industry a priority, the defense-industrial complex, and new-generation energy a priority. Inherited industrial culture, often perceived as a conservative factor, acts as a resource for technological discipline and readiness to master complex production processes when properly institutionalized, which is especially important in conditions of time deficits and the need for forced import substitution. Historical experience of economic recovery after large-scale conflicts demonstrates that success is achieved not only through financial infusions but also through the ability of institutional systems to accumulate local competencies and direct them toward creating new value-added chains. In the case of the Donetsk People's Republic, this means a transition from extensive reproduction to a cluster model, where high-tech enterprises act as attraction cores for related industries, research centers, and educational organizations. The key institutional challenge remains overcoming the fragmentation of innovation activity management, ensuring transparency in the distribution of state resources, and minimizing administrative barriers for members of the scientific-technical and entrepreneurial community. The practical significance of the study lies in substantiating the need to develop a target program for the institutional provision of high-tech development in the Donetsk People's Republic, which should include measures to create a unified digital platform for interaction between science, education, and industry, implement R&D co-financing mechanisms, support technological sovereignty through the localization of critical components, and form a system for monitoring the effectiveness of the use of state investments in innovation infrastructure. The limitations of the study are due to the dynamics of the macroeconomic environment, continued security risks and incomplete statistics on de-occupied territories, which requires the continuous updating of institutional models and further empirical research to assess the socioeconomic effectiveness of the support mechanisms implemented.

6 Conclusion

In conclusion, it should be noted that the institutional conditions for the development of high-tech industries in the Donetsk People's Republic are formed at the junction of historical continuity and strategic renewal, where the preservation of industrial identity and scientific production traditions is the foundation for a transition to a knowledge economy capable of ensuring technological sovereignty, sustainable economic growth, and improved quality of life for populations in the long run.

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References

1. Digital transformation: opportunities and challenges of managing socio-economic systems. Kursk: ZAO Universitetskaya Kniga; 2025. 221 p.
2. Economy of the Donetsk People's Republic: state, problems, solutions. Donetsk: Institute of Economic Research; 2023. 420 p.
3. Polovyan AV, Lepa RN, Grinevskaya SN. Industrial sovereignty and development of new regions in Russia. *Stud Russ Econ Dev.* 2024;35(2):199-207.
4. Polovyan AV, Lepa RN, Grinevskaya SN. The Donbass economy: state, development trends, and forecasts. *Stud Russ Econ Dev.* 2022;33(2):163-168.
5. Polovyan AV, Lepa RN, Grinevskaya SN. The economy of territories reformed into statehood: the Donetsk People's Republic. *Stud Russ Econ Dev.* 2018;29(1):72-78.
6. Polovyan AV, Sinitsyna KI. Strategic planning for economic development in the context of digitalization: tools, methods, approaches. Moscow: Magistr: INFRA-M; 2024. 304 p.
7. Shemyakina NV, Ponomarenko AA. Investment aspects of strategic development of the industrial and economic complex of the Donetsk People's Republic. *Vestn Inst Econ Res.* 2023;(3):28-39.
8. Sinitsyna KI, Kravets EO, Abdalyan LN. High-tech production as growth points for the regional economy in the context of digitalization. *Ekon Upravl Probl Resh.* 2024;1(12):267-276.
9. Strategic guidelines for socio-economic development of the Donetsk People's Republic until 2033. Donetsk: Institute of Economic Research; 2023. 336 p.
10. Vishnevsky V, Aleksandrov I, Polovyan A. Scenarios of the old industrial regions' development: selecting the methodology. *Environ Dev Sustain.* 2011;13(1):65-78.
11. Vishnevsky VP, Dementiev VV. Theoretical foundations of industrial policy for an emergent economy. *Terra Economicus.* 2012;10(1):27-45.