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Assessment of Small and Medium-Sized Enterprise Development at the Regional Level

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Abstract. In the current context, there is a growing need to assess the development of small and medium-sized enterprises (SMEs) in the constituent entities of the Russian Federation, particularly regarding their contribution to ensuring the country's technological sovereignty. Such an assessment is essential for identifying reserves for regional development and formulating informed management decisions aimed at enhancing economic resilience amidst external challenges. The scientific problem addressed in this study stems from the need to bridge the methodological gap between existing approaches to assessing SME development (which do not fully account for the specific properties of SMEs that influence their potential in this area) and diagnostics of the level of regional technological sovereignty (which often overlook the role of the SME sector as a factor in its reinforcement). The aim of the work is to conduct a comprehensive assessment of SME development at the regional level as a component of the economic environment capable of contributing to the strengthening of state technological independence. Achieving this aim required elucidating the theoretical and methodological foundations and formulating assessment principles, as well as developing and testing a methodological toolkit using empirical data from the constituent entities of the Northwestern Federal District. Various types and combinations of scientific methods were employed in preparing the study, ranging from general scientific to specialized economic methods. A particular place is occupied by methods of economic sociology – a targeted expert survey and interviews – which made it possible to form an information array that served as the basis for testing the developed methodological toolkit. The approbation of the author's toolkit made it possible to compile a ranking of regions by the level of innovative activity of SMEs (this ranking is of particular significance since innovative activity is fundamental in the context of the task of strengthening technological sovereignty); identify the factors and directions through which small and medium-sized enterprises in regions with a relatively low level of SME innovative activity can contribute to ensuring technological sovereignty; assess the level of adaptation of small and medium-sized enterprises to conditions of constant changes in the external environment; and forecast the possibility of achieving partial technological sovereignty, including through the contribution of regional small and medium-sized enterprises.

Key words: small and medium-sized entrepreneurship, region, technological sovereignty, innovative activity, assessment, ranking, forecast.

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Introduction

The entrepreneurial sector plays a vital role in the economies of most countries with market and mixed economic systems. From this perspective, entrepreneurship should be regarded as one of the elements of Russia's economic system, contributing to GDP formation, job creation (including high-tech employment), and addressing socio-economic objectives at various levels of governance.

The Russian model of economic development is dominated by large businesses, particularly in the extractive and manufacturing industries. This stems from the historical specificities of the country's economic system formation and the need to address large-scale economic challenges in the period following the dissolution of the USSR.

Contemporary economic conditions, including sanctions pressure, bring to the forefront the issue of balanced development across all entrepreneurship sectors, including small and medium-sized enterprises (hereinafter – SMEs). At the same time, the share of SMEs in the Russian economy remains significantly lower than in developed countries: according to the Ministry of Economic Development data for 2023, it amounted to 21.7% of GDP[1]. For comparison, in OECD countries this indicator exceeds 50%, reaching 60% in the USA and Finland, and 70% in Italy[2].

Despite their relatively modest share in GDP, the SME sector possesses development potential and can make a certain contribution to strengthening technological sovereignty[3] (Alekseev, 2024; Bartalevich, Makhkamova, 2023; Zainutdinov, 2015; Ivanov, 2025; Kuvalin et al., 2024; Terebova, Borisov, 2019; Araujo et al., 2021; Eldridge et al., 2021; Rogers, 2004). In particular, small and medium-sized enterprises:

– undertake highly specialized and high-risk functions that often fall outside the interests or operational capabilities of large businesses (Egorova, Bushansky, 2024, p. 313; Ivanov, 2025);

– demonstrate high adaptability and responsiveness to new opportunities, facilitating the introduction of technological innovations (Rogers, 2004, p. 143);

– frequently generate products with a high degree of novelty, in contrast to large enterprises whose innovations are often aimed at optimizing internal processes rather than radically renewing production (Terebova, Borisov, 2019, p. 56).

Both global and Russian experience illustrate the potential of SMEs as a factor in intensifying innovation processes:

– in North Brabant (The Netherlands), the formation of a high-tech cluster of small enterprises helped overcome industrial recession (Zainutdinov, 2015, p. 116);

– in the Ruhr region (Germany), vertical cooperation between large holdings and specialized small businesses ensured technological modernization and a way out of systemic crisis (Zainutdinov, 2015, p. 117);

– in Kuzbass, targeted program support for over 500 SME projects facilitated the diversification of a mono-industry economy, employment growth, and technological transformation of coal regions (Zainutdinov, 2015, p. 117).

The examples presented above illustrate the potential contribution of SMEs to strengthening state technological independence; however, realizing this potential depends on a complex of factors related to the economic development of specific territorial entities. It is important to consider that in Russian realities, the level of small and medium-sized business involvement in addressing the task of achieving technological sovereignty varies significantly depending on regional specificities. The high heterogeneity of socio-economic and scientific-technological development across regions (Sidorov, 2025; Ustinova et al., 2025) creates diverse conditions for SME development, which directly affects the capacity of enterprises in different territories to contribute to strengthening the aforementioned type of state sovereignty.

It is precisely the existence of such profound interregional disparities that determines the relevance of this study. An objective need arises for

[1] Contribution of SMEs to the Russian economy exceeds 34.5 trillion rubles. Ministry of Economic Development of the Russian Federation. Available at: https://economy.gov.ru/material/news/vklad_msp_v_ekonomiku_rossii_prevysil_345_trln_rubley.html (accessed: 29.04.2025).

[2] Contribution of SMEs to the Russian economy grows to 21%. Available at: https://clck.ru/3EaEWu (accessed: 29.04.2025).

[3] The study (Ivanov S.L. (2025). Entrepreneurship as a factor in ensuring technological sovereignty: Modern development trends. Obshchestvo i ekonomika, 8, 33–57. DOI: 10.31857/S0207367625080033) reveals the essence of the concept of "technological sovereignty" and identifies approaches to its formation and provision; substantiates the role of entrepreneurship as one of the factors in strengthening state technological sovereignty; examines and describes the specifics of the contribution of individual categories of entrepreneurial firms (according to the "size" criterion) to ensuring technological sovereignty at the federal and regional levels.

developing an assessment system that would help to analyze the current level of SME sector development in regions, taking into account its potential contribution to strengthening the country's technological sovereignty.

The scientific problem of the study lies in the following aspects:

1) most approaches to assessing SMEs at the regional level presented in the scholarly literature do not account for their essential characteristics that determine the contribution to technological sovereignty (e.g., propensity for innovation and adaptability to external shocks caused by economic sanctions); moreover, such approaches do not reflect the interregional differentiation of SME operating conditions determined by the aforementioned characteristics, which is important not only for scholarly analysis of the SME contribution to the formation of national technological sovereignty but also for developing differentiated regional policy measures aimed at identifying and stimulating "growth points" of technological development in the SME sector, taking into account the specificities of individual territories; optimizing the allocation of support resources (financial, infrastructural, human) across regions based on the actual potential of local enterprises, etc.;

2) existing approaches to diagnosing the contribution of regions to achieving national technological sovereignty, by focusing on macrostructural components, often ignore the role of the SME sector as one of the factors in its strengthening.

The foregoing indicates the existence of a methodological gap, highlighting the need for developing an original approach to conducting the stated assessment.

The object of the study is small and medium-sized entrepreneurship as an element of the regional economic system capable of making a certain contribution to ensuring technological sovereignty. The subject of the study is the characteristics and indicators of SME development at the regional level that determine its potential in the context of strengthening technological sovereignty.

The aim of the study is to conduct a comprehensive assessment of SME development at the regional level as one of the components of the economic environment capable of contributing to strengthening the state's technological independence.

To achieve this aim, the following tasks need to be addressed:

1) to elucidate the theoretical and methodological foundations and formulate the methodological principles for conducting such an assessment;

2) to develop and test a methodological assessment toolkit using empirical data from the constituent entities of the Northwestern Federal District (NWFD).

The theoretical significance of the study lies in advancing the methodology for assessing the level of SME development at the regional level, enabling the consideration of their role in ensuring technological sovereignty. The practical significance is determined by the possibility of using the research findings for managerial decision-making in the sphere of SME development at the regional level.

Research methods and materials

In preparing this study, various types and combinations of scientific methods were employed – from general scientific to specialized economic methods. The foundation of theoretical methods comprised analysis, synthesis, induction, deduction, and generalization. Specifically, they were applied in examining the theoretical and methodological basis for assessing the level of SME development as one of the factors capable of influencing the attainment of technological sovereignty, as well as in formulating the methodological principles for conducting such an assessment and developing the corresponding methodological toolkit.

A particular place in the context of this research is occupied by methods of economic sociology – a targeted expert survey and interviews. These made it possible to form an information array that served as the basis for testing the developed methodological assessment toolkit.

The approbation of this toolkit comprises two main stages. The first stage is aimed at compiling a ranking of regions by the level of innovative activity of SMEs using data from a targeted expert survey of heads of innovative companies. At this stage, the following were assessed: the dynamics of company performance across a range of indicators, the conditions of the regional environment for innovative activity, the diversity of directions and the effectiveness of such activity, as well as the level of enterprise adoption of fifth- and sixth-technological-paradigm technologies. To convert the subjective assessments of managers into objective statistical values, a scoring method was employed. Aggregated results for each region were subjected to comparative analysis, which made it possible to rank the territories and identify interregional disparities in SME innovative activity. The second stage involves a qualitative assessment of the potential contribution of SMEs to ensuring technological sovereignty for regions with a relatively low level of innovative activity, using data from interviews with representatives of regional SME development institutions. This stage made it possible to assess the level of SME adaptation to sanctions conditions, identify key adaptation factors, and determine the contribution of both innovative and traditional enterprises to ensuring technological independence.

The information base of the study comprised works by leading Russian and foreign scholars devoted to issues of assessing the level of small and medium-sized enterprise development at the regional level, as well as measuring the level of technological sovereignty and approaches to evaluating its achievement.

Theoretical and methodological foundations and methodological principles for conducting an assessment of SME development in the region as a factor capable of influencing the attainment of technological sovereignty

In contemporary scholarly literature, a substantial body of work devoted to assessing SMEs at the regional level has emerged. Let us examine some of these in more detail.

One relevant tool for applied analysis is the rating assessment developed and tested by D.V. Filippov using the example of municipal districts of the Republic of Sakha (Filippov, 2013). His methodology is based on calculating a composite index through normalization of local criteria and determining their specific weights. The assessment system includes indicators at both the regional and municipal levels. Key indicators included: the share of goods, works, and services produced by small and medium-sized enterprises in the gross regional product; the share of net investments in the total volume of gross investments of small enterprises; the share of those employed in small businesses in the total number of the employed in the economy; small enterprise turnover per capita; and others.

A team of authors led by O.E. Ivanova proposed an analysis methodology based on calculating threshold values of an integral indicator (Ivanova et al., 2014). The assessment is divided into two blocks: analysis of general development parameters (number of enterprises, employees, and wage levels) and assessment of the sector's financial condition (turnover and investments per employee, share of profitable organizations).

An assessment of SME development in Russia's resource-rich regions is presented by I.V. Korchagina. The author supplements standard statistical analysis with the use of the Wilcoxon T-test to assess trends and compares the share of SMEs in the GRP of resource territories with the Russian average indicators. Particular attention is paid to resource productivity and investment potential (Korchagina, 2023).

A comprehensive approach to SME assessment is presented in the work of A.E. Kremin, where the level of development of the sector under consideration is assessed through a system of three criteria: criterion "X" – the level of SME development (turnover of SMEs per employee and

per capita); criterion "Y" – the role of SMEs in the regional economy (share of employment in SMEs, share of investment in fixed capital of SMEs, etc.); criterion "Z" – the effectiveness of state support for SMEs (share of assistance recipients among SMEs, volume of microloans and guaranteed loans) (Kremin, 2022).

In the context of contemporary economic transformations, the methodology of L.V. Glezman is noteworthy, focusing on the dynamics of SME development under new challenges (using the example of the Perm Territory). The study aims to identify factors shaping the contemporary business environment and analyze indices of changes in the number and turnover of SMEs in comparison with all-Russian trends (Glezman, 2022).

Concluding the review is the work of V.V. Petrushevskaya and A.N. Sharyi, who proposed a toolkit combining quantitative indicators and expert assessments. Their methodology stands out from the others in that it takes into account not only the economic performance of SMEs (revenue, profit, employment) but also criteria, properties, and characteristics of the sector that are important for technological sovereignty (Petrushevskaya, Sharyi, 2024). This is the only study among those presented that includes indicators of innovative activity and the volume of innovative product sales in the small business sector.

Thus, it should be emphasized that within the framework of most of the presented studies, the assessment of SME development is based on aggregated indices using traditional quantitative parameters: average number of SME employees, share of employment in SMEs, SME turnover, and investment in fixed capital of SMEs. This approach does not allow for a full assessment of the sector's role in strengthening technological sovereignty, as it ignores the criterion of "innovativeness." An exception is the work (Petrushevskaya, Sharyi, 2024), which applies specific indicators corresponding to this criterion.

For comparison, when assessing the level of SME development in foreign countries, authors typically rely on indicators characterizing the level of innovative activity of enterprises, especially in the context of fifth- and sixth-technological-paradigm technologies (Owalla et al., 2022; Rauch et al., 2020; Vasquez et al., 2021).

Indeed, the innovative activity of SMEs deserves reflection in such assessments, being one of the foundational components for achieving technological sovereignty. This approach is substantiated by the following arguments (Ivanov, 2025):

– the effectiveness of the innovation process in market conditions largely depends on the potential of the entrepreneurial sector (including SMEs) in terms of commercializing R&D; entrepreneurs contribute to the practical implementation of developments, forming a substantial part of the flow of new products and technologies;

– enterprises themselves, alongside research institutes, universities, and others, also conduct scientific research; small innovative enterprises (SIEs) are established at scientific and educational institutions, serving as a crucial linking element between science and production.

At the same time, within the framework of the strategy for achieving technological sovereignty, the auxiliary functions of SMEs not directly related to the creation of innovations should also be taken into account. Although such enterprises are not a source of technological breakthroughs, they provide the necessary infrastructural support and adaptability of the economy. According to a study by N.E. Egorova and S.P. Bushansky, due to their flexibility, small businesses effectively fill market niches and integrate into the production chains of large enterprises, creating conditions for the implementation of import-substituting projects (Egorova, Bushansky, 2024, p. 313). Furthermore, SMEs undertake the tasks of "small-scale logistics", ensuring the saturation of local markets through parallel and direct imports, which supports demand stability

during the transition period. Consideration of these service functions is necessary for a comprehensive assessment of the sector's potential.

Beyond the direct assessment of SME development, a parallel strand of literature warrants attention – one focused on diagnosing and measuring the level of technological sovereignty itself, and, by extension, on developing approaches to evaluate its attainment. This body of work has gained considerable traction in recent years, attracting growing interest not only within the Russian Federation (Glazunova, 2024; Kochina, 2023; Medvedeva, 2024) but also internationally (e.g., Sapir, 2020).

Notably, as V.V. Glazunova points out, "addressing the task of measuring technological sovereignty entails assessing the level of technological advancement of the economy". Moreover, in the researcher's view, "index-based methods fail to provide a precise picture of the level of technological sovereignty" (Glazunova, 2024, p. 22). This underscores the importance of conducting a "qualitative" assessment – specifically, measuring technological sovereignty separately for each technological domain, taking into account the qualitative characteristics of the technologies employed. Particular attention is drawn to the need to consider investments in both new and established technologies within the total investment volume (Glazunova, 2024, p. 29), as well as to assess the significance of imported technologies and the feasibility of their replacement with domestic alternatives (Glazunova, 2024, p. 28).

Following the aforementioned principles, the author developed an algorithm for the comprehensive measurement of technological sovereignty (offering an alternative to index-based assessment methods), which determines the quantitative ratio of technologies, their qualitative characteristics, and degree of novelty (Glazunova, 2024, p. 31).

At the same time, according to N.V. Medvedeva, a contemporary system for assessing the achievement of technological sovereignty should be grounded in "a universal integral approach" and must be formed "on the basis of a set of the most significant measurable indicators that are integrated into a cohesive whole" (Medvedeva, 2024, p. 94). The application of an integral assessment, as the author contends, "provides a comprehensive understanding of the object and enables the compilation of a ranking based on it," with the assessment to be carried out "across the segment of high technologies (critical and cross-cutting)" (Medvedeva, 2024, pp. 94–95).

According to S.K. Kochina's position, diagnosing the level of technological sovereignty development should align with the main strategic "vectors" of the country's technological development (innovation-digital, investment-financial, intellectual-human capital, and material-technical), as well as with the factors and criteria (*Tab. 1*) of the type of sovereignty under consideration (Kochina, 2023, p. 36).

Table 1. Factors and criteria for assessing technological sovereignty (using the example of industrial enterprises)

Factors	Criteria
Sanctions pressure, shifts in the geopolitical landscape, the reorientation of industrial business structures' needs, hypercompetition, transformation of market conditions, inflated consumer demands and expectations	Presence of high-tech enterprises' activities, resource provision (regional, interregional), a low share (or absence) of parallel imports, ownership of critically important technologies, successfully implemented national innovation projects, a low share (or absence) of imported equipment at enterprises, developed production infrastructure, investment in technological competencies, social protection and employee motivation systems, digital security, high intellectual and human capital potential, functioning clusters (ecosystems), digital activity of enterprises, investment attractiveness, state regulation and protection of business entities' interests.
Source: (Kochina, 2023).	

In the author's view, the most appropriate method for conducting diagnostics that yields objective results is an expert survey (Kochina, 2023, p. 36).

Summing up the presented review, it can be concluded that most approaches to assessing SMEs at the regional level found in the scholarly literature do not account for their essential characteristics that determine the contribution to technological sovereignty (e.g., propensity for innovation, among others). At the same time, existing approaches to diagnosing the contribution of regions to achieving national technological sovereignty, by focusing on macro-structural components, often overlook the role of the SME sector as one of the factors in its strengthening.

This methodological gap underscores the need to develop an original approach to conducting the stated assessment – one that would incorporate the foundational research on the level of small and medium-sized enterprise development in regions (Glezman, 2022; Ivanova et al., 2014; Korchagina, 2023; Kremin, 2022; Petrushevskaya, Sharyi, 2024; Filippov, 2013), as well as the specificities of assessing the level and feasibility of achieving technological sovereignty (Glazunova, 2024; Kochina, 2023; Medvedeva, 2024).

The procedure for such an assessment should be grounded in the following methodological principles, which were formulated based on an analysis of the aforementioned studies:

1. The principle of accounting for baseline indicators characterizing various aspects of small and medium-sized enterprise activity in the region. These should include indicators of company performance, as well as indicators characterizing the conditions and factors shaping the regional business environment.

2. The principle of accounting for factors that characterize small and medium-sized enterprises both from the perspective of their innovative component and from the standpoint of properties inherent to SMEs as such (not directly related to innovation); in particular, this may refer to adaptability to sanctions restrictions, among others.

3. The principle of accounting for the potential of small and medium-sized enterprises in the region to master fifth- and sixth-technological-paradigm technologies, as well as critical and cross-cutting technologies (the list of such technologies is approved by Presidential Decree 529 dated June 18, 2024)[4].

4. The principle of accounting for factors and criteria of technological sovereignty (e.g., consideration of shifts in the geopolitical landscape, market conditions, etc.).

5. The principle of combining quantitative and qualitative research methods (including analysis of standardized or normalized statistical indicators, expert surveys, interviews, etc.).

Methodological toolkit for regional assessment of the level of small and medium-sized enterprise development as an element of the regional economic system capable of contributing to ensuring state technological sovereignty

Taking into account the methodological principles proposed in the previous section of the study, a toolkit has been developed that enables a comprehensive assessment of the level of SME development in the context of the task of strengthening technological sovereignty.

This toolkit was tested using the example of regions of the Northwestern Federal District. This choice is justified by the fact that the regions in question possess substantial scientific and technological potential (Ustinova, 2025) and are capable of making a significant contribution to strengthening the state's technological sovereignty. This holds true even though these regions have considerably suffered from the consequences of

[4] On approval of priority areas of scientific and technological development and the list of most important knowledge-intensive technologies: Presidential Decree 529 of June 18, 2024. Available at: https://www.garant.ru/hotlaw/federal/1725998/ (accessed: 19.05.2025).

economic sanctions against the Russian Federation, as key sectors of their economies had long depended on Western supplies of equipment and components. Nevertheless, some regions within this group (e.g., Arkhangelsk Region) have managed to adapt quickly to the new conditions and demonstrate economic growth[5].

The approbation procedure for the authors' toolkit was carried out in two stages.

Stage I. Given that innovative activity is fundamental in the context of the task of strengthening technological sovereignty (Ivanov, 2025), the first stage involved developing a ranking of innovative activity of small and medium-sized enterprises across regions, based on data concerning:

– the current state of SMEs engaged in research and development, as well as the production of innovative goods, works, and services (in particular, the dynamics of company performance in 2024 compared to 2023 were assessed according to the following indicators: volume of output (goods, works, services), product range, number of employees, volume of investments in development or improvement of activities, etc.; moreover, an assessment was made of regional conditions for conducting innovative entrepreneurial activity (stability of economic conditions, accessibility and quality of regional state programs, level of development of commercial, professional, and physical infrastructure, level of development of the personnel training system for the needs of innovative activity));

– the implementation of scientific, scientific-technical, and innovative activities at small and medium-sized enterprises; the level of adoption by such enterprises of fifth- and sixth-technological-paradigm technologies (identifying what types of work within the innovation process companies undertake, what types of intellectual property they possess, what share of the total volume of goods, works, and services is accounted for by innovative products, etc.).

The ranking was developed based on information gathered through a targeted expert survey[6] conducted with the direct involvement of the author. The initial research concept included the analysis of official statistics in accordance with methodological principle No. 5; however, it subsequently became evident that a synthesis of expert and statistical data was impossible due to fundamental differences in the methodology of data collection.

The calculation of the integral assessment indicator, on the basis of which the ranking was formed, was carried out sequentially: 1) each answer to the questionnaire items was assigned a certain number of points (typically from 1 to 5); 2) the share of points earned for each answer relative to the maximum possible number of points was calculated; 3) the arithmetic mean of the point shares across all questions was computed; 4) using the method of structural grouping, groups of regions reflecting the level of SME innovative activity were identified.

Let us examine the methodology for compiling the ranking using the example of the Vologda Region:

1) An expert assessment was conducted of the dynamics of company performance in 2024 compared to 2023. The assessment was carried out

[5] Aleksandr Tsybulsky: Import substitution is our industrial maturity. Available at: https://rg.ru/2025/06/18/reg-szfo/ot-idei-do-voploshcheniia.html (accessed: 18.06.2025).

[6] For the approbation of stage 1 of our methodological approach, 45 experts were surveyed – heads of small and medium-sized innovative companies from nine regions of the Northwestern Federal District. The representation of experts by region is uniform (five people from each constituent entity under study). To avoid distortion of the accuracy of the assessment results, Saint Petersburg and the Nenets Autonomous Area were excluded from the analysis. Saint Petersburg was excluded as a megapolis and federal city, whose economic scale and concentration of SMEs qualitatively surpass the indicators of other constituent entities of the Northwestern Federal District, which creates a risk of shifting average values with small expert samples. The Nenets Autonomous Area was removed from the analysis due to its narrowly specialized resource-extraction economic model and critically small number of innovative SMEs, which makes it impossible to form a representative group of experts within the established framework (five people per region).

in accordance with the following indicators: volume of output (sales, works, services, etc.); product range; number of employees; volume of investments in development or improvement of activities.

In accordance with the dynamics of change in the indicator assessed by the expert, the following scoring system was applied: 2 points – for indicating significant growth of the indicator; 1 point – for characterizing growth as insignificant or minimal; 0 points – in the case of no growth or negative dynamics of the indicator.

The results of this assessment are presented in *Table 2*.

According to the assessment methodology, a region could receive up to 40 points. The actual result of 17 points corresponds to 42.5% of the maximum possible value.

The results of the assessment of the specified parameter for all regions presented in the study are reflected in *Table 3*.

2) An assessment was conducted of the regional environment conditions necessary for conducting innovative entrepreneurial activity, according to the following indicators: stability of economic conditions; accessibility and quality of regional state programs; financial support (accessibility of financial resources, including grants and subsidies); commercial and professional infrastructure (development of commercial accounting, legal services, and support organizations); physical infrastructure (transport, communications, etc.); education and professional training.

The results of this assessment are presented in *Table 4*.

Table 2. Results of expert assessment of company performance dynamics in 2024 compared to 2023 (using the example of the Vologda Region)

Expert No.	Indicator	Response options		
		Insignificant growth of the indicator (up to 10%) – 1 point	Significant growth of the indicator (more than 10%) – 2 points	No growth or decline in the indicator – 0 points
1	Volume of output (sales, works, services, etc.)		+	
2			+	
3				+
4		+		
5		+		
1	Product range	+		
2				+
3				+
4		+		
5			+	
1	Number of employees			+
2				+
3				+
4		+		
5		+		
1	Volume of investments in development or improvement of activities	+		
2			+	
3				+
4		+		
5		+		

Source: own compilation based on the expert survey.

Table 3. Results of expert assessment of company performance dynamics in 2024 compared to 2023, by region of the Northwestern Federal District

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	15.0	37.5
Vologda Region	17.0	42.5
Kaliningrad Region	13.0	32.5
Leningrad Region	20.0	50.0
Murmansk Region	14.0	43.8*
Novgorod Region	13.0	32.5
Pskov Region	14.0	35.0
Republic of Karelia	10.0	25.0
Komi Republic	11.0	27.5

* The maximum possible score for the Murmansk Region was 32. This is due to the fact that one of the surveyed companies did not operate in 2023.
Source: own calculations based on the expert survey.

Table 4. Results of expert assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity (using the example of the Vologda Region)

Expert No.	Indicator	Degree of satisfaction				
		1 point	2 points	3 points	4 points	5 points
1	Stability of economic conditions				+	
2			+			
3			+			
4				+		
5				+		
1	Accessibility and quality of regional state programs			+		
2				+		
3				+		
4			+			
5				+		
1	Financial support (accessibility of financial resources, including grants and subsidies)		+			
2			+			
3			+			
4				+		
5				+		
1	Commercial and professional infrastructure (development of commercial accounting, legal services, and support organizations)		+			
2				+		
3				+		
4				+		
5				+		
1	Physical infrastructure (transport, communications, etc.)				+	
2				+		
3			+			
4				+		
5					+	
1	Education and professional training			+		
2			+			
3			+			
4				+		
5				+		

Source: own compilation based on the expert survey.

The expert assessment established that the region's potential in the context of the examined parameter was evaluated at a maximum of 150 points. The actual result was 83 points, or 55.3% of the maximum possible.

The results of the assessment of the specified parameter for other constituent entities of the Northwestern Federal District are presented in *Table 5*.

3) An assessment was carried out of the diversity of innovative activity directions implemented at enterprises in the region (*Tab. 6*). According to the survey rules, each expert had the right to select only three priority directions from the proposed list. If an expert indicated more directions, only the first three options were taken into account. This limitation determines the maximum score a particular region can achieve.

Within the overall scoring system, the maximum possible result is 15 points. Based on the assessment results, experts from the Vologda Region accumulated a total of 10 points, which corresponds to 66.7% of the maximum achievable indicator.

The results of this assessment for the remaining regions of the Northwestern Federal District are presented in *Table 7*.

Table 5. Results of expert assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity, by region of the Northwestern Federal District

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	80	57.1*
Vologda Region	83	55.3
Kaliningrad Region	115	76.6
Leningrad Region	115	76.6
Murmansk Region	97	64.4
Novgorod Region	81	54.0
Pskov Region	87	54.7
Republic of Karelia	78	52.0
Komi Republic	73	48.6

*The maximum possible score for the Arkhangelsk Region was 140, as one of the experts was unable to assess certain indicators.
Source: own calculations based on the expert survey.

Table 6. Results of expert assessment of the diversity of innovative activity directions implemented at enterprises in the Vologda Region

Expert No.	Types of work performed*							
	A (1 point)	B (1 point)	C (1 point)	D (1 point)	E (1 point)	F (1 point)	G (1 point)	H (1 point)
1	+	+						
2	+	+	+	+	+			
3				+		+	+	
4	+							
5		+						

* A – Research and development work; B – Technological work, production preparation, and industrial testing; C – Acquisition (sale) of patents, licenses, know-how; D – Investment in R&D and innovative activities; E – Certification and standardization of innovative products; F – Marketing solutions for innovative activities; G – Selection and organization of sales markets for innovative products; H – Training and retraining of personnel for innovative activities.
Source: own compilation based on the expert survey.

Table 7. Results of expert assessment of the diversity of innovative activity directions implemented at enterprises (by region of the Northwestern Federal District)

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	11	73.3
Vologda Region	10	66.7
Kaliningrad Region	13	86.7
Leningrad Region	12	80.0
Murmansk Region	11	73.3
Novgorod Region	10	66.7
Pskov Region	9	60.0
Republic of Karelia	10	66.7
Komi Republic	11	73.3
Source: own calculations based on the expert survey.		

4) An assessment was conducted of the range of intellectual property objects held by enterprises in the region. Such an assessment is important for the following reasons: the presence of diverse intellectual property objects (inventions, trademarks, etc.) indicates a comprehensive approach to development, active research activity, and the formation of a strong brand. A broad spectrum of intellectual property objects demonstrates that the enterprise pays attention to both technological innovations and image-related components (logos, product design). Such diversity helps the company strengthen its competitive position, form a unique selling proposition, and ensure protection for its developments.

According to the survey conditions, experts could select no more than three intellectual property objects from the proposed list. This limitation directly affected the maximum possible score from each expert.

The results of this assessment are presented in *Table 8*.

In the existing assessment system, the highest possible score is 15 points. The Vologda Region received 9 points, which constitutes 60% of the maximum possible.

The results of the assessment of the specified parameter for other constituent entities of the Northwestern Federal District are reflected in *Table 9*.

5) The effectiveness of innovative activity of SMEs in the region was assessed based on measuring the share of innovative products in the total volume of goods, works, and services they produce (*Tab. 10*).

The assessment system is based on the percentage share of the company's output, where each range corresponds to a specific number of points. The point distribution is as follows: for a share of output up to 20% – 1 point is awarded;

Table 8. Results of expert assessment of the range of intellectual property objects at enterprises in the Vologda Region

Expert No.	Type of intellectual property objects				
	Patents (1 point)	Author's certificates (1 point)	Trademarks (1 point)	Know-how (1 point)	Other (1 point)
1	+				
2	+		+	+	
3		+	+	+	
4	+				
5	+				
Source: own compilation based on the expert survey.					

from 20 to 40% – 2 points; from 40 to 60% – 3 points; from 60 to 80% – 4 points; for a share exceeding 80% – 5 points.

The maximum possible number of points under this system is 25. According to the assessment results, the Vologda Region received 9 points, which corresponds to 36% of the maximum possible result.

The results of the assessment of SME innovative activity effectiveness for other constituent entities of the Northwestern Federal District are presented in *Table 11*.

Table 9. Results of expert assessment of the range of intellectual property objects at enterprises (by region of the Northwestern Federal District)

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	8	53.3
Vologda Region	9	60.0
Kaliningrad Region	11	73.3
Leningrad Region	7	46.7
Murmansk Region	7	58.3*
Novgorod Region	6	50.0*
Pskov Region	7	46.7
Republic of Karelia	10	66.7
Komi Republic	11	73.3
*The maximum possible score for the Murmansk and Novgorod regions was 12, as one of the experts did not answer the corresponding question. Source: own calculations based on the expert survey.		

Table 10. Results of expert assessment of the effectiveness of innovative activity of SMEs in the Vologda Region

Expert No.	Share of innovative goods, works, and services in total output				
	0–20 (1 point)	20–40 (2 points)	40–60 (3 points)	60–80 (4 points)	80–100 (5 points)
1			+		
2		+			
3		+			
4	+				
5	+				
Source: own compilation based on the expert survey.					

Table 11. Results of expert assessment of the effectiveness of SME innovative activity (by region of the Northwestern Federal District)

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	8	32.0
Vologda Region	9	36.0
Kaliningrad Region	10	50.0*
Leningrad Region	8	32.0
Murmansk Region	7	46.7*
Novgorod Region	8	32.0
Pskov Region	9	36.0
Republic of Karelia	7	28.0
Komi Republic	13	52.0
*Differences in the maximum number of points between regions are due to incomplete expert responses. Thus, the Murmansk Region was assessed on a 15-point scale, while a maximum threshold of 20 points was set for the Kaliningrad Region due to the absence of answers from some specialists to certain questionnaire items. Source: own calculations based on the expert survey.		

6) An assessment was conducted of the level of adoption by small and medium-sized enterprises of fifth- and sixth-technological-paradigm technologies (*Tab. 12*).

The maximum number of points a region could receive for the assessed parameter is 15. The Vologda Region scored 4 points, or 26.6% of the maximum possible.

The results of this assessment for the remaining regions of the Northwestern Federal District are presented in *Table 13*.

The final results of the conducted assessment across all six directions (assessment of company performance dynamics in 2024 compared to 2023; assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity; assessment of the diversity of innovative activity directions implemented at small and medium-sized enterprises; assessment of the range of intellectual property objects at SMEs; assessment of the effectiveness of SME innovative activity; assessment of the level of adoption by SMEs of fifth- and sixth-technological-paradigm technologies) by region of the Northwestern Federal District are presented in *Table 14*.

The calculation of arithmetic mean scores across all assessment directions, combined with the method of structural grouping, made it possible to identify groups of regions according to their degree of innovative activity in the SME sector.

To partition the indicators into groups, we first determine the overall range of values: the minimum value is 41.0, the maximum value is 56.6. In this case, the range of variation is 15.6.

We divide the presented indicators into three groups based on the principle of value proximity:

– Group 1 (relatively low values): 41.0; 42.5; 43.1;

– Group 2 (medium values): 46.6; 49.0; 49.2; 50.9; 52.3;

– Group 3 (high values): 56.6.

Table 12. Results of expert assessment of the level of adoption of fifth- and sixth-technological-paradigm technologies by small and medium-sized enterprises in the Vologda Region

Expert No.	Fifth-technological-paradigm technologies (1 point)	Sixth-technological-paradigm technologies (2 points)
1	+	
2	+	
3	+	+
4		
5		
Source: own calculations based on the expert survey.		

Table 13. Results of expert assessment of the level of adoption by small and medium-sized enterprises of fifth- and sixth-technological-paradigm technologies, by region of the Northwestern Federal District

Region	Actual score	Share of maximum possible score, %
Arkhangelsk Region	4	26.6
Vologda Region	5	33.3
Kaliningrad Region	3	20.0
Leningrad Region	3	20.0
Murmansk Region	4	26.6
Novgorod Region	3	20.0
Pskov Region	2	13.4
Republic of Karelia	3	20.0
Komi Republic	3	20.0
Source: own calculations based on the expert survey.		

Table 14. Final results of the expert assessment (by region of the Northwestern Federal District)

Region	Results of the expert assessment by each direction* (share of points earned from the maximum possible value, %)						
	1	2	3	4	5	6	Av. %
Arkhangelsk Region	37.5	57.1	73.3	53.3	32.0	26.6	46.6
Vologda Region	42.5	55.3	66.7	60.0	36.0	33.3	49.0
Kaliningrad Region	32.5	76.6	86.7	73.3	50.0	20.6	56.6
Leningrad Region	50.0	76.6	80.0	46.7	32.0	20.0	50.9
Murmansk Region	43.8	64.4	73.3	58.3	46.7	26.6	52.3
Novgorod Region	32.5	54.0	66.7	50.0	32.0	20.0	42.5
Pskov Region	35.0	54.7	60.0	46.7	36.0	13.4	41.0
Republic of Karelia	25.0	52.0	66.7	66.7	28.0	20.0	43.1
Komi Republic	27.5	48.6	73.3	73.3	52.0	20.0	49.2

*Notes:
1 – assessment of company performance dynamics in 2024 compared to 2023;
2 – assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity;
3 – assessment of the diversity of innovative activity directions implemented at small and medium-sized enterprises;
4 – assessment of the range of intellectual property objects at SMEs;
5 – assessment of the effectiveness of SME innovative activity;
6 – assessment of the level of adoption by SMEs of fifth- and sixth-technological-paradigm technologies.
Source: own calculations based on the expert survey.

Rationale for the grouping: the first group contains values close to the minimum indicator (spread of 2.1); the second group includes indicators located approximately in the middle of the range (spread of 5.7); the third group includes a single (highest) value.

Table 15 presents the results of the ranking carried out.

The conducted assessment revealed differentiation among regions in terms of the level of SME innovative activity. The leader among the constituent entities of the Northwestern Federal District is the Kaliningrad Region with a score of 56.6%. An average level of innovative activity (from 46.6 to 52.3%) is characteristic of the Arkhangelsk, Vologda, Leningrad, and Murmansk regions, as well as the Komi Republic. Regions with a relatively low level (from 41.0 to 43.1%) are the Novgorod and Pskov regions, along with the Republic of Karelia.

Analysis of the innovative activity indicators showed that regions demonstrate heterogeneous results across different assessment directions. The success and relative lag of regions in the SME innovative activity ranking stem from a combination of factors identified during the first stage of approbation of the methodological toolkit.

Thus, the Kaliningrad Region (average score based on the expert assessment results – 56.6%) leads due to the highest values in the following parameters: "assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity" (76.6%), "assessment

Table 15. Distribution of regions by level of innovative activity of SME entities

Group	Regions
Regions with a relatively low level of SME innovative activity development	Novgorod Region, Pskov Region, Republic of Karelia
Regions with an average level of SME innovative activity development	Arkhangelsk Region, Vologda Region, Leningrad Region, Murmansk Region, Komi Republic
Regions with a relatively high level of SME innovative activity development	Kaliningrad Region
Source: own compilation based on calculations performed using the results of the expert survey.	

of the diversity of innovative activity directions implemented at small and medium-sized enterprises" (86.7%), and "assessment of the effectiveness of SME innovative activity" (50.0%).

The Murmansk Region (52.3%) achieves its success through high values in the parameters "assessment of the effectiveness of SME innovative activity" (46.7%) and "assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity" (64.4%).

The Leningrad Region (50.9%) maintains its position thanks to the parameters "assessment of company performance dynamics in 2024 compared to 2023" (50.0%) and "assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity" (76.6%), despite low values in the parameter "assessment of the effectiveness of SME innovative activity" (32.0%).

The Komi Republic (49.2%) showed its best result in the parameter "assessment of the effectiveness of SME innovative activity" (52.0%) and a high level in the parameter "assessment of the range of intellectual property objects at SMEs" (73.3%), but has a low value in the parameter "assessment of regional environment conditions necessary for conducting innovative entrepreneurial activity" (48.6%).

The Vologda Region (49.0%) demonstrates stability due to the highest indicator in the district for the parameter "assessment of the level of adoption by SMEs of fifth- and sixth-technological-paradigm technologies" (33.3%) and balanced values across the remaining criteria.

The Arkhangelsk Region (46.6%) occupies a middle position due to a high value in the parameter "assessment of the diversity of innovative activity directions implemented at small and medium-sized enterprises" (73.3%), with a relatively low value in the parameter "assessment of the effectiveness of SME innovative activity" (32.0%).

The Republic of Karelia (43.1%) finds itself in the lower group of the ranking due to the minimum values in the parameters "assessment of company performance dynamics in 2024 compared to 2023" (25.0%) and "assessment of the effectiveness of SME innovative activity" (28.0%).

The Novgorod Region (42.5%) holds an even weaker position in the ranking due to low values in the parameters "assessment of company performance dynamics in 2024 compared to 2023" (32.5%) and "assessment of the effectiveness of SME innovative activity" (32.0%).

The Pskov Region (41.0%) became the outsider due to the lowest value in the parameter "assessment of the level of adoption by SMEs of fifth- and sixth-technological-paradigm technologies" (13.4%), as well as comparatively low scores across other parameters.

Stage II. In the second stage of approbation of the methodological toolkit, using the example of regions with a relatively low level of SME innovative activity, a qualitative assessment was carried out of the role of small and medium-sized enterprises as an instrument for strengthening technological sovereignty from the perspective of factors inherent to SMEs as such, which are not conditioned by their "innovative" nature (see methodological principle No. 2). The assessment was conducted based on interview materials featuring experts – representatives of regional SME development institutions[7].

The first question posed to the experts concerned a subjective assessment of the level of adaptation of SMEs in the region to the conditions of sanctions restrictions. Notably, there was complete consensus among the experts, who agreed that the level of SME adaptation deserves a score

[7] For the interviews, experts were invited from three regions: the Novgorod Region, the Pskov Region, and the Republic of Karelia. The experts represented key institutional structures: the Office of the Business Ombudsman, the Chamber of Commerce and Industry, and the Public Chamber.

of 4 points on a 5-point scale. This is classified as a result "above the average level".

During the study, we asked specialists about the key factors that helped small and medium-sized businesses adapt to the changed conditions. The experts identified several main areas: 1) state support – 66.7% of respondents noted this as the most important factor of adaptation; 2) development of cooperation with enterprises from friendly countries – also 66.7% of respondents pointed to this aspect; 3) internal reserves of companies – 33.3% of experts emphasized their significance; 4) search for new markets for product sales – 33.3% of respondents noted this factor; 5) the market being vacated by foreign investors and manufacturers – 33.3% of specialists named this as a significant condition for adaptation; 6) cooperative ties within the domestic market – another 33.3% of respondents noted this aspect.

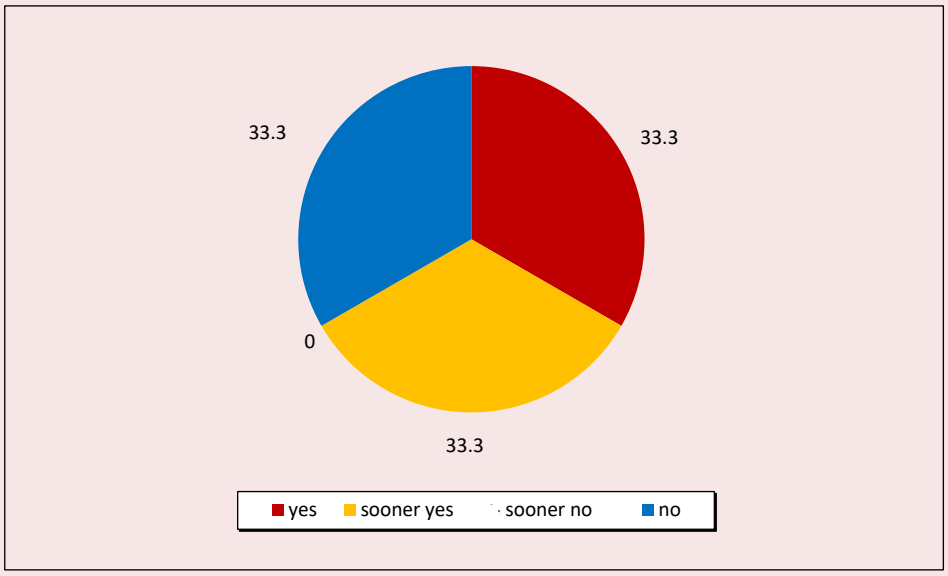
Thus, the majority of experts agree that state support and international cooperation with friendly countries played a decisive role in the adaptation of SMEs in the regions under consideration.

Central to the discussion with experts were questions assessing the role of SMEs in shaping the state's technological independence and identifying the areas of activity within the regional small and medium-sized business sector that hold the greatest potential for addressing the task of ensuring technological sovereignty.

Analysis of the expert assessments revealed a clear division of opinions: two-thirds of the specialists confirmed the significance of the region's SMEs as one of the factors in ensuring technological sovereignty, while the remaining third expressed doubts in this regard (*Fig. 1*).

The experts also identified the main directions that enabled SME entities in the studied regions to contribute to strengthening the type of sovereignty under consideration. As noted by two-thirds of the experts, "at the present moment, the level of innovative activity of regional SMEs does not allow them to contribute sufficiently to ensuring technological sovereignty; in this regard, particular emphasis is placed on traditional small and

Figure 1. Results of the assessment of the significance of regional SMEs as one of the factors in ensuring the country's technological sovereignty



Source: own compilation based on the results of the expert interview.

medium-sized enterprises, which are either partially integrated into the production innovation process with large businesses or perform a number of service functions within the framework of this process". According to the remaining third of the experts, "certain tasks within the framework of achieving technological sovereignty are accomplished not only through the innovative activity of SMEs, for example, when it comes to the development of parallel and partially direct imports within the scope of small-scale logistics".

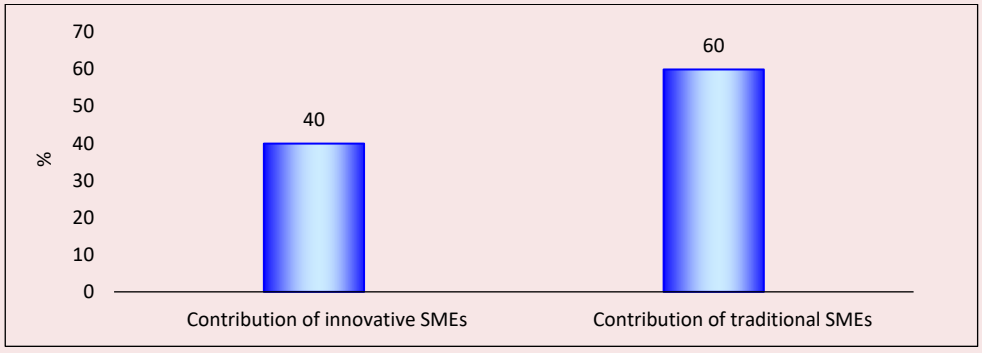
The research methodology involved a subjective assessment by experts of the specific contribution of innovative and traditional SME entities to ensuring technological sovereignty. For the sake of data comparability, the total contribution of SMEs was considered a normalized value (100%). The distribution of shares obtained during the interviews is reflected in the graph (*Fig. 2*).

Analysis of the expert assessments indicates that in regions with low SME innovative activity, the structure of small business contribution to technological sovereignty is shifted toward traditional enterprises. Their significance in this context is rather compensatory in nature: small business acts not as a source of technological breakthroughs, but as a stabilizing element whose role lies in the service support and functional maintenance of existing economic processes.

At the same time, experts pointed to individual regional enterprises in the SME sector that contribute to the development and strengthening of technological sovereignty precisely through innovative activity. This information is presented in the form of excerpts from the interview transcript (*Tab. 16*).

Moreover, it turned out that in the regions under study there are enterprises that already produce (or will be capable of beginning to produce within the next 2–3 years) critical and cross-cutting technologies. Experts classified the following as such technologies: biomedical and cognitive technologies for healthy and active longevity; technologies for the development of next-generation medicines and platforms (biotechnological, high-tech, and radiopharmaceutical drugs); technologies for creating trusted and secure system and application software, including for managing social and economically significant systems; transport technologies for various fields of application (sea, land, air), including unmanned and autonomous systems; technologies for creating new materials with specified properties and performance characteristics; artificial intelligence technologies in

Figure 2. Results of the assessment of the contribution of innovative and traditional (i.e., not related to innovative activity) small and medium-sized enterprises to ensuring technological sovereignty



Source: own compilation based on the results of the expert interview.

Table 16. Information on regional SMEs demonstrating impressive results in the sphere of technological development and contributing to strengthening the country's technological independence

Enterprise name	Region of operation	Contribution to strengthening technological sovereignty (expert commentary)
LLC "ENERGOINFORMICS"	Novgorod Region	Creation of solutions for digitalizing the energy sector, which is particularly important in the context of import substitution and increasing the efficiency of the fuel and energy complex. The company participates in projects related to the introduction of AI in the energy sector.
JSC "ELSI"	Novgorod Region	Development of innovative technologies that can be applied in the defense industry, the IT sector, and other strategic industries. The company demonstrates potential for creating products with high added value.
CJSC "Zavod 'Elbor'"	Novgorod Region	Development of materials with improved characteristics that are used in the manufacturing industry and mechanical engineering. The company's products contribute to enhancing the competitiveness of Russian enterprises.
Source: own compilation based on the results of the expert interview.		

economic sectors, the social sphere (including the sphere of public safety), and public authorities; technologies for creating domestic means of production and scientific instrumentation, among others.

Finally, the experts provided a forecast regarding the possibility of achieving partial technological sovereignty, including through the activities of regional SMEs. Below are the responses of some experts:

– "partial achievement of technological sovereignty in the Russian Federation is possible in certain industries within the next five years, provided there is substantial subsidization of manufacturing enterprises by the state";

– "small technology companies (STCs) can act as drivers of breakthrough innovations, especially in the fields of artificial intelligence, bioeconomics, and new materials; the goal of increasing STC revenue sevenfold by 2030 indicates high expectations for this sector";

– "if current levels of support for specialized industries (UAS, microelectronics, etc.) are maintained, partial achievement of technological sovereignty through SME activities is possible within the next 20 years".

The variation in expert estimates of the time-frame for achieving technological sovereignty (ranging from 5 to 20 years) is attributable, in our view, to the following factors:

– level of support: the 5-year forecast is contingent upon substantial subsidization and state support; the 20-year forecast is based on maintaining current (significantly lower) levels of support;

– sectoral specificity: in certain sectors where SMEs are more active, achieving partial sovereignty may be possible faster than, for example, in capital-intensive microelectronics;

– the nature of SMEs: experts differ in their views on who contributes more – innovative SMEs (focus on breakthrough technologies) or traditional ones (focus on filling market niches and adaptation).

Summarizing the obtained data, we can conclude that in regions with relatively low innovative activity of small and medium-sized businesses, SME sector enterprises act as a stabilizing factor. Even without possessing high technological competencies, they maintain the stability of local markets and demonstrate high adaptability to changes. This creates the necessary foundation for further strengthening technological sovereignty, although

the current contribution of such enterprises is driven more by their operational flexibility than by the creation of breakthrough solutions.

Among the key directions that have enabled SME entities in the studied regions to make an indirect contribution to strengthening the type of sovereignty under consideration, it is worth highlighting:

– integration of SMEs into the production innovation process with large businesses, including the performance of a number of service functions within the framework of this process;

– development of parallel and partially direct imports in the context of small-scale logistics.

It is important to note the following. The integration of SMEs into the production innovation process with large businesses is not merely "servicing", but rather the freeing up of resources of large national enterprises from non-core tasks. The outsourcing of service functions to SMEs allows industry leaders to concentrate investments and scientific potential on breakthrough developments, while small businesses ensure the uninterrupted operation of the existing base.

Despite the fact that imports represent a temporary measure, under current conditions they act as a critical condition for the survival of national industries. The activities of SMEs in supplying unique components and consumables prevent technological regression and production line stoppages, creating the "time lag" necessary for domestic developers to create and scale their own full-fledged alternatives.

In particular, even in such a complex industry as microelectronics, SMEs can contribute to technological sovereignty without necessarily creating the final high-tech product from scratch; their role may be realized, for example, through the performance of service and support functions within the innovation process of large corporations (e.g., specialized testing, software development, small-scale logistics of components).

Conclusion

This study has developed a fundamentally new methodology for assessing SME development at the regional level as one of the components of the economic environment capable of contributing to strengthening the state's technological independence, significantly expanding existing analytical approaches.

The system-forming element of the methodology is a set of methodological principles that ensure a comprehensive assessment of SMEs – from baseline performance indicators to the potential for mastering critical and cross-cutting technologies in the context of technological sovereignty tasks. The key distinguishing features of the methodology are: a comprehensive mechanism for integrating economic indicators with indicators of SME innovative development and technological potential; a multifactor assessment of quantitative and qualitative characteristics of entrepreneurial activity (including adaptability to sanctions restrictions and import substitution potential); consideration of regional specificities of SME development; and the inclusion of indicators for the adoption of fifth- and sixth-technological-paradigm technologies.

The practical embodiment of this methodology is the methodological toolkit, which made it possible (using selected empirical data from constituent entities of the Northwestern Federal District) to compile a ranking of regions by the level of innovative activity in the SME sector, as well as to identify the directions through which enterprises in this sector, in regions with low innovative activity, can provide an indirect contribution to strengthening technological sovereignty — not only through the implementation of new developments, but also through other components of their activities that enable maintaining the stability of production chains without a direct link to innovation.

It was established that innovative activity of SMEs in the Northwestern Federal District

demonstrates significant differentiation (the average values of this indicator were 48.5%[8], with a maximum in the Kaliningrad Region – 56.6% and a minimum in the Pskov Region – 41.0%).

It was revealed that the contribution of SMEs to technological sovereignty is realized both through traditional enterprises in regions with low innovative activity and through integration potential in the production chains of large businesses, with state support and international cooperation with friendly countries (66.7%) serving as key factors in enterprise adaptation to external challenges.

Our approach to conducting the assessment can be used to develop measures for stimulating qualitative growth of innovative SME entities by providing regional authorities with detailed information for making informed management decisions. In particular, the differentiation of regions by level of innovative activity makes it possible to tailor support measures, focusing attention on the specific needs of each group.

It also helps formulate specific incentive measures, focusing on the development (or lag in development) of particular areas of SME innovative activity. Furthermore, the approach allows for forecasting resource needs by assessing the level of adoption of new paradigm technologies, which is critically important for ensuring technological sovereignty.

Let us provide concrete examples of proposals for regional policy using the Vologda Region as an example, based on the results of approbation of this approach.

1. Despite its average position in terms of innovative development level, the region demonstrates one of the highest rates of adoption of fifth- and sixth-technological-paradigm technologies in the Northwestern Federal District (33.3%). In this regard, it is advisable for regional authorities to develop a grant support program specifically for small technology companies engaged in the implementation of artificial intelligence and new materials, in order to consolidate leadership in these niches.

2. The region demonstrated strong positions in the range of intellectual property objects (60% of the possible maximum), outpacing many neighbors. Thus, it seems appropriate to introduce regional subsidies for the commercialization of existing patents and know-how. This will help transform "paper" innovations into real product turnover, the share of which currently stands at only 36%.

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[8] The observed excess of the indicator over official statistical values is due to the fact that the study's calculation base was limited to innovative SMEs, rather than all small and medium-sized enterprises.

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Authors' contribution:

1) Anna G. Bezdudnaya – substantiation of the relevance, formulation of the scientific problem, aim and objectives of the study, preparation of the "Introduction" section;

2) Vladimir M. Razumovsky – search for studies on assessing the level of small and medium-sized enterprise development in Russian regions, as well as on assessing the level of technological sovereignty development at the regional level;

3) Semen L. Ivanov – comparative characterization of the studies proposed by V.M. Razumovsky, development of a methodology for assessing SME development at the regional level as one of the components of the economic environment capable of contributing to strengthening the state's technological independence (elaboration of methodological principles for the assessment; development and approbation of an assessment toolkit, including a ranking of innovative activity of small and medium-sized enterprises in regions, as well as a qualitative assessment of the role of regional small and medium-sized enterprises in strengthening technological sovereignty).

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