

*Research article***Stimulating the processes of attracting investments in industry of the constituent entities of the Russian Federation****Pavel Ivanov\* and Tatyana Altufeva**

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**Abstract:** The current conditions of the world economy development are characterized by the aggravation of the struggle between countries for technological leadership in the transition to a new technological mode on the basis of Industry 5.0, and the negative impact of barriers in international trade in goods and technologies due to sanctions against Russia, which creates windows of opportunity in the field of ensuring technological sovereignty on its own industrial base. One of the most important factors for the successful implementation of the windows of opportunity for the development of domestic production of high-tech products is the stimulation of the processes of attracting private investments in industrial enterprises of large, medium and small-sized business, including through the formation of an effective system of state support tools. The aim of the article is to improve the processes of attracting industrial investments, specifically in the context of identifying factors that can have a negative impact on the investment activities of Russian enterprises of various size groups by analyzing and adjusting the existing tools of state support for industrial enterprises, including small technology companies, in the constituent entities of the Russian Federation and developing areas for their improvement in order to ensure technological security under the conditions of sanctions. The article studies the features of the investment industrial infrastructure as exemplified by the most industrially developed regions of the Volga and Ural Federal Districts. The insufficient level of investment of small industrial enterprises in comparison to large and medium-sized business has been revealed. It has been found that the sanctions did not affect small and medium-sized business in comparison to large enterprises due to their insufficient role in the production of gross regional product and exports. The efficiency of investment resource utilization in the regions under consideration has been assessed using the data envelopment analysis model oriented on maximization of the result. According to the modeling results, the Republic of Tatarstan and the Sverdlovsk Region have been

identified as efficient regions. The experience of the best practice of these regions has been analyzed, and the tools of key federal and regional development institutions has been considered, including those cofinanced by them as part of joint development projects. Promising directions for stimulating investment processes in the Republic of Bashkortostan and other regions of Russia on the basis of improving the efficiency and effectiveness of their investment industrial infrastructure for the timely implementation of the windows of opportunity to achieve technological leadership have been proposed.

**Keywords:** investments; small and medium-sized business; windows of opportunity; sanctions; industry; institutions of development; Industry 5.0; digital transformation

**JEL Codes:** E22, H25, P25

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**Abbreviations:** VFD—Volga Federal District, UFD—Ural Federal District, DEA—Data Envelopment Analysis

## 1. Introduction

At present, under the conditions of sanctions, the trends to strengthen the policy of technological independence in the production of products necessary to ensure national defense, economic development in priority areas and critical technologies, the production of modern high technology products (this topic is also relevant for modern European studies (Edler et al., 2023)) are increasing. At the Moscow Financial Forum held in September 2023, M.V. Mishustin, the Chairman of the Government of the Russian Federation noted that “the history with sanctions has finally made many countries realize that without their own technological backlog they can easily...be overboard” (Moscow Financial Forum, 2023). The issues of protectionism are raised in the European Union (Reuters, 2023) and the United States (Financial Times, 2022), where each party tries to use its advantages (i.e., lower energy costs and tax benefits in the United States and proximity of consumers and subsidies in the EU) to attract resources for the development of industry in its territory.

The Russian Federation’s integration into global production and technology chains in the 1990s strengthened the consolidation of the raw material character of the Russian economy according to the model of import of technologies in exchange for raw materials. Under the conditions of Western sanctions, this policy has led to the emergence of the danger of technological backwardness of the Russian Federation as an external threat. According to the majority of experts, this threat is primarily faced by insufficiently stable regional systems with high depreciation of fixed assets in the branches of specialization, deficit of breakthrough technologies, difficulty in entering the international market, and lack of qualified personnel for the development of advanced technologies. At the same time, small technology companies (STCs) should become new subjects of technological development in such regional systems, oriented both to integrate into the production and technological chains of large business and to independently deploy knowledge-intensive production.

The active introduction of digital technologies in various areas of activity, increased costs on research and development activities, and increased innovation activities of enterprises ensure the formation windows of opportunity for the transition to Industry 5.0, which stimulates investment in the development of modern high-tech industrial production all over the world, including Russia. At the

state level, strategic priorities in the field of strengthening technological sovereignty, ensuring innovative development of the country are presented in the Strategy for Scientific and Technological Development of the Russian Federation (Decree, 2024), where the following is noted as negative trends of the current state of the economy: inconsistency of tools to support scientific and technological development at various levels (federal, regional, sectoral, corporate), low receptivity of the economy to technological innovations, including due to the disconnection of a single innovation cycle “science (research)-industry (creation of developments)-business (commercialization of technologies”)), concentration of scientific and technological potential in a limited number of regions.

In addition, in the context of investment support for the country’s science and technology development, the following should be noted. First, a rather low level of investment in science and technology development in Russia relative to other countries. According to the World Bank (World Bank Group, 2024), in 2021, Russia’s research and development expenditures amounted to 1.0% of gross domestic product (GDP), while the global average is 2.6% (Israel 5.6%, Republic of Korea 4.9%, USA 3.5%, Japan 3.3%, Germany 3.1%, UK 2.9%, China 2.4%, and EU 2.3%). Second, the last decade of the world economy development is characterized by a tendency for research and development expenditures to grow (from 2.0% in 2013 to 2.6% in 2021), which to a certain extent is caused by the change in the technological mode and active preparation of countries for leadership in it. Unlike the above-mentioned countries, where the share of research and development expenditures in GDP almost all increased over the period under consideration, in Russia the values for this indicator remained at approximately the same level (about 1.0%), even slightly decreasing in 2022 (to 0.9%), which could be partly due to the suspension of Russia’s participation in international scientific projects due to the imposition of sanctions.

The development of Industry 5.0 elements implies the active introduction of robotization and artificial intelligence in various spheres of activities. Currently, Russia lags far behind the leading countries in terms of robotization. According to the International Federation of Robotics (International Federation of Robotics, 2024) in 2022, the average level of robotization in the world was 151 units per 10 thousand people employed in manufacturing industry (leaders-Republic of Korea 1012 units, Singapore 730 units, Germany 415 units, Japan 397 units, China 392 units, USA 285 units, and EU 208 units) and 10 units in Russia (according to the National Association of Robotics Market Participants). It is not difficult to notice that the list of countries that are leaders in robotics almost completely coincides with the countries that have a high share of research and development expenditures, which confirms the need for correct adjustment of state investment support to the industry to ensure technological leadership. In June 2024, at the St. Petersburg International Economic Forum, V.V. Putin, the President of the Russian Federation declared “Russia in a short period of time should join ranks of 25 leading countries in the world in terms of robot density. This means installing more than 100 thousand robots” (SPIEF, 2024).

In this regard, the relevance of the study of the sufficiency of existing measures and tools to support the industry from the point of view of increasing investment activities in modern conditions increases. Since the industry of any country consists of regional production operations, it is important to study the investment infrastructure of industrial support in the regions. In view of the above, the aim of the article is to improve the processes of attracting industrial investments, specifically in the context of identifying factors that can have a negative impact on the investment activities of Russian enterprises of various size groups by analyzing and adjusting existing tools of state support for industrial enterprises, including small technology companies, in the constituent entities of the Russian

Federation and developing areas for their improvement in order to ensure technological security under the sanctions.

## 2. Literature overview

A significant number of publications by both domestic (Samarina et al., 2021; Zelentsova and Spesivtseva, 2022; Topoleva, 2023) and foreign authors (Lee and Malerba, 2018; Davy and Hansen, 2023; Giachetti and Mensah, 2023) are devoted to the issues of effective use of windows of opportunity in the economy. The windows of opportunity are considered as a way to level the technological gap (Kwak and Yoon, 2020; Peng et al., 2023), to increase the competitiveness of enterprises based on their innovative (Guo et al., 2016; Hamdali and Skade, 2023), digital (Xiong et al., 2021; Guo et al., 2023) development, and the use of international experience (Garrido et al., 2023).

In the context of isolation of the Russian economy from Western markets, which entails significant restrictions in the use of economic advantages of globalization and country specialization of labor, the relevance of using the concept of the windows of opportunity in the field of an investment attraction in the industry of the constituent entities of the Russian Federation is increasing. For example, Mitrofanov (2015) distinguishes linear (sequential), cyclic and accidental (suddenly arising) windows of opportunity, as a result of the interaction of which, there is a periodic effect of interference (mutual strengthening or extinguishing of the windows of opportunity due to their overlapping). The windows of opportunity or critical window can be interpreted as an interdisciplinary concept, the specificity of which is largely determined by a particular area of economic activities. Thus, in business, there is a relatively short period of time during which investments in certain technologies and types of innovative products will be particularly productive and significant.

The drop in demand from Western investors in the Russian Federation under the sanctions will be compensated by the opening of the windows of opportunity in the domestic market, which is likely to affect the structure of the mergers and acquisitions (M&A) segment rather than its volume. To understand this process, the experience of the impact of the economic crisis of 2007–2008 on M&A processes in Greece, which has been reviewed in detail in (Giannopoulos et al., 2023), is extremely useful. In this country, more M&As in 2011 involved mergers and acquisitions of banks (probably due to recapitalization procedures) and fish farms (an industry long struggling to survive) (Giannopoulos et al., 2023). It is likely that companies that engage in M&A during economic downturns will have increased shareholder value due to factors such as industry strength and efficiency, as well as a decrease in the value of distressed assets, and will be able to increase their investment activities.

The algorithm for assessing new windows of opportunity for enterprises in the region includes the following stages. At the first stage, the urgent needs of the region in import substitution of products by large, medium, and small-sized enterprises are identified, and these needs are compared with the technical projects available in the *investment portfolio* of the region, forming a list of projects ready for investment. The next stage consists in studying the operational capability and readiness of the region's enterprises to implement import substitution projects, in particular, based on analyzing their innovation activities. At the same time, in the context of the 2011 financial crisis, the role of assessing a company's risk tolerance has increased, both from the auditor's point of view and from the point of view of its own managers. Moreover, according to well-known experts, the level of disclosure of information on risks depends to a large extent on the industry in which the company operates. On the basis of interdisciplinary approach consisting in the application of psychological theory (egocentric) in

accounting research, a high role of human factor on risk-based investment decisions has been established (Elmarzouky et al., 2022). At the last and final stage, by comparing the region's needs for import substitution of products and technologies (stage 1) and the readiness of its enterprises to invest in them (stage 2), the optimal timing and duration of opening the windows of opportunity" for the implementation of investment projects that meet the region's needs are determined (Dunlap et al., 2023).

Under the conditions of the new world order, the ability of industrial enterprises of all sizes to take advantage of the opening window of opportunity in connection with the mass withdrawal of foreign brands from the Russian market is conditioned by the potential admissibility of catching a specific period of time, favorable for making investments in the production of import substitution types of products and industrial technologies, organizational innovations, etc. while eliminating the risks of possible complications (Perez and Soete, 1988; Shinkevich et al., 2010).

Methodologically, the determination of the moment of opening the window of opportunity is based on the definition of the most favorable correlations of starting positions for the technological breakthrough of industrial enterprises, first, with the long-wave patterns of technological development (within the framework of the concept of Industry 5.0) and second, with the increasing degree of disruption of international logistics chains, the shortage of imported raw materials, components and ingredients (Dementyev, 2009; Glazyev, 2018).

### 3. Materials and methods

The methods of statistical and comparative analysis, as well as linear programming have been used as research methods. To assess the efficiency of investments in regional industry, we used the output-oriented data envelopment analysis (DEA) model (Zhu, 2014), which allows assessing the potential for growth of the result at the current level of resource utilization (Equation 1):

$$z_0 = \max z + \varepsilon \left( \sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right). \quad (1)$$

Under the following restrictions:

$$\begin{aligned} \sum_{j=1}^n \lambda_j x_{ij} + s_i^- &= x_{io}, \\ \sum_{j=1}^n \lambda_j y_{rj} - s_r^+ &= z y_{ro}, \\ \lambda_j &\geq 0. \end{aligned}$$

where  $j = 1..n$ ;  $r = 1..s$ ;  $i = 1..m$ .  $y_{rj}$  is the  $r$ -th output of the  $j$ -th object,  $x_{ij}$  is the  $i$ -th input of the  $j$ -th object,  $s$  is the number of outputs,  $m$  is the number of inputs,  $s_i^-$ ,  $s_r^+$  is the slacks (leftovers), and  $z_0, \lambda_j$  is the required parameters.

When  $z_0^* = 1$  and zero leftovers (slacks), the object is considered efficient. Furthermore,  $z_0^* > 1$  object is not efficient, meaning there is a solution when a higher result can be achieved at the same level of resource consumption. The DEA model allows forming a reference region for a particular region, by calculating the weighted sum of positive  $\lambda_j^*$ .

The choice of input parameters for the model from the available statistical indicators (reflecting simultaneously all three groups of enterprises: large, medium and small-sized) has been supported by the following considerations:

- the increased level of fixed assets depreciation in many industries in Russian regions as compared to the economy as a whole (while in Russia's industry the depreciation of fixed assets in 2022 amounted to 48.9%, including 52.8% in the extractive sector and 48.0% in all types of economic activities).
- the need to increase investments in the renewal of fixed assets of industry.

In view of the above, the degree of depreciation of fixed assets in industry (In\_1) (2022) and the investment volume in the fixed capital per 1 employed person (In\_2) have been proposed as input indicators. Since the return on investments does not usually occur immediately, and presupposes the presence of a certain time lag, the volume of investments by large and medium-sized enterprises in the regions is taken for 2021 (for the volume of investments by small enterprises, for 2020 due to the peculiarities of presentation of statistical data on them by Rosstat (once every two years)). The resulting indicator was the turnover of all groups of industrial enterprises per 1 employed person in industry (Out\_1) (2022), reflecting net revenues (income cleared of all mandatory payments (taxes, excises, duties, etc.)). Thus, all the indicators used in the DEA model take into account aggregate data for both large and medium-sized and small enterprises. The information base of the research was official statistical data of Rosstat (the Federal State Statistics Service in Russia).

#### 4. Results

The studied regions of the Russian Federation are ranked by economic adaptability under the sanctions in 2022 according to the integral index, including 6 indicators as follows: industrial production index, production index for two types of economic activities (mining and manufacturing), commissioning of residential and nonresidential buildings, volumes of housing commissioning, the level of social and economic and informational support of the regions of the special military operation and the number of international contacts (Table 1).

**Table 1.** Ranking of Russian regions under consideration by economic adaptability in 2022, %.

Place	Region	Total points
3	Republic of Bashkortostan	52
4	Republic of Tatarstan	56
9	Nizhny Novgorod region	156
23	Sverdlovsk region	202
30	Perm region	213
45	Samara region	250

Source: Authors' calculations based on data (Bashinform, 2024).

The leading position of the Republic of Bashkortostan is largely due to effective measures to support small and medium-sized business and the industrial sector of the economy, the preservation of the potential of large-scale industry, including aviation, and a developed system of assistance to mobilized servicemen and their families. The governing bodies of the Republic of Tatarstan managed to maintain high rates of social and economic development and avoid crisis extra factors in the

process of implementing measures to support military servicemen and their families, although the information policy related to the support of the special military operation is less active than in a number of other regions.

The dynamics and structure of investments and value-added of industrial enterprises of the studied regions have been analyzed in order to assess the investment provision of industrial economic activities in them (Table 2).

**Table 2.** Share of industry in fixed capital investments (Inv) and gross value added (GVA) of Russian regions, %.

Region	2010		2015		2020		2022	
	Inv	GVA	Inv	GVA	Inv	GVA	Inv	GVA
Russia, including	39.2	32.7	41.0	31.9	44.6	30.9	40.4	33.6
Perm region	63.1	47.1	73.8	49.1	68.8	50.8	64.0	55.0
Republic of Bashkortostan	41.8	40.4	58.0	35.8	48.6	32.2	52.1	33.4
Republic of Tatarstan	50.0	41.7	64.3	43.2	56.3	40.4	46.4	47.7
Samara region	57.9	42.0	65.4	44.0	51.5	38.2	44.7	41.4
Sverdlovsk region	51.7	38.2	53.3	36.0	35.8	38.7	36.3	36.2
Nizhny Novgorod region	48.2	35.5	40.5	34.7	59.1	31.8	34.1	29.0

Source: Authors' calculations based on the Rosstat data (Rosstat, 2023).

Over the period of 2010–2022 in Russia as a whole, the share of investments allocated to industrial production remained practically unchanged (growth by 1.2%). Similar dynamics is shown by the share of industries in GVA, which grew by 0.9 percentage points up to 33.6% at the end of the period. Operational data for 2023 indicate gradual recovery of the economy after the 2022 sanctions strikes. GDP growth amounted to 3.6%, while it fell by 1.2% in 2022. The share of industrial investments in 2023 increased by 2 percentage points to 42.4% (yet, there has been no data on the structure of GVA). At the same time, within the industry, the change in the structure of investment and gross value added is in favor of the extractive sector (Inv 15.1–19.3%, GVA 10.4–14.5%) rather than the manufacturing sector (Inv 14.2–17.2%, GVA 16.3–17.7%), which has a higher value added. In the regional breakdown, an increase in differentiation is observed over the studied period as follows: from 1.5–1.9 times in terms of share in investments and from 1.3–1.9 times in terms of share in GVA. As a result, the investment volume per 1 person employed in the industry (excluding small business entities) in 2022 fluctuated from 290 rubles in the Sverdlovsk Region to 668 rubles in the Perm Krai, which correlates with the data on the Inv indicator presented in Table 1.

At present, the main driver of investment development of the Russian economy is large business (Altufeva et al., 2019). The investment activities of small and medium-sized business (SMB) in the industry is lower both due to the still underdeveloped SMB sector in Russia as a whole (the share of SMB in the country's GDP in 2022 was 21.0%, and from 19.9% in the Perm region up to 30.3% in the Sverdlovsk region, as compared to 50–70% in developed countries), and the dominance of activities with a high asset turnover rate (in 2020, the share of small wholesale and retail trade enterprises in the total revenue of small enterprises amounted to 47.6%) and more stable demand (e.g., investments in construction and real estate operations accounted for more than one-third of all investments of small enterprises). In addition, SMB investments are limited due to their insufficient involvement in the supply chains of large holding structures. In comparison with large and medium-sized enterprises,

SMB entities on average in Russia invest 3 times less in industrial development per 1 employed person (604 thousand rubles vs. 188 thousand rubles) (Table 3).

**Table 3.** Investments of large, medium, and small-sized enterprises in industry per 1 employed person in 2020, thousand rubles.

Region	Large and medium-sized enterprises	Small enterprises
Republic of Bashkortostan	372	169
Republic of Tatarstan	585	206
Perm region	616	106
Nizhny Novgorod region	517	132
Samara region	317	199
Sverdlovsk region	258	93

Source: Authors' calculations based on the Rosstat data (Rosstat, 2023).

If in the structure of investments in fixed capital of large and medium-sized enterprises, the industrial sector occupies 44.6%, in the structure of investments in small enterprises it is 15.8%. This share varies by region from 9.2% in the Republic of Bashkortostan to 20.1% in the Nizhny Novgorod Region. This indicates the underinvestment of industrial SMB entities (primarily in the form of fast-growing innovative companies and small technology companies) as a promising direction for the implementation of the opening windows of opportunity under the sanctions pressure. According to the survey of the NAFI Research Center, conducted in June 2022, 62% of Russian entrepreneurs consider sanctions as “good opportunities” (Expert report, 2022. P. 20).

The regions of the best practice (from among the researched ones) in the field of return on investments in industry by the DEA method have been identified. The source and calculated data of this task are presented in Table 4.

**Table 4.** Source and calculated data for the DEA method.

Region	In_1	In_2	Out_1	DMU efficiency	Target Out_1
Republic of Bashkortostan	48.2	0.37	6.5	1.447	9.4
Republic of Tatarstan	39.0	0.57	11.3	1.000	11.3
Perm region	46.6	0.63	6.8	1.874	12.7
Nizhny Novgorod region	53.0	0.39	5.4	1.870	10.0
Samara region	55.8	0.37	5.6	1.789	10.1
Sverdlovsk region	47.5	0.23	7.5	1.000	7.5

Note: In\_1—degree of depreciation of fixed assets in industry, %; In\_2—investment volume in the fixed capital per 1 employed person, million rubles; Out\_1—turnover of industrial enterprises per 1 employed person, million rubles.

Source: Authors' calculations based on the Rosstat data (Rosstat, 2023).

According to the results of the DEA model calculations, with the source data used for the calculation, only the Republic of Tatarstan and the Sverdlovsk Region can be recognized as efficient constituent entities of the RF (efficiency equals to 1). The values of decision making units (DMUs) for the rest of the regions are more than 1, which, with the output-oriented DEA method, means that they



are inefficient. In this respect, all regions have zero slack values, which indicates the absence of leftovers and full allocation of resources to obtain the target values of the modeled result. The reference region for the Republic of Bashkortostan is a hypothetical region obtained based on a weighted sum of the Republic of Tatarstan (weighted 0.36) and the Sverdlovsk Region (weighted 0.72). Implementation of the best practice of these regions in the Republic of Bashkortostan would allow, at the current level of depreciation of fixed assets and the volume of investments, to ensure the growth of turnover of industrial enterprises per 1 employed person by 45% (up to 9.4 million rubles).

On the one part, these values can be considered as a reference point, potential opportunities (the windows of opportunity) for investment efficiency growth, rather than a direct guide to action, since the model result is formed from the best combination of weighted sums of values by different regions. On the other part, the results obtained allow paying closer attention to the experience of the regions that have demonstrated more efficient utilization of investment resources as promising directions to implement the windows of opportunity.

The main federal institutions of state support of industrial enterprises have been studied. Due to the large number of such institutions in Russia and the impossibility to consider them all within the framework of one article, the most significant of them have been selected as follows:

- The Industrial Development Fund is the key institution for industrial development in the Russian Federation, whose support includes 9 main programs (development projects, components, labor productivity, vehicle components, leasing, marking of goods, formation of a component and resource base, and priority projects in manufacturing and environmental projects) and 4 joint programs implemented with regional industrial development funds (development projects, components, labor productivity, and forestry development projects). The volumes of support range from 5 million rubles to 5 billion rubles under the main programs at the rate of 1–5% for the term of 2–10 years, under joint programs, from 20 up to 200 million rubles at the rate of 1–3% for the term of 3–5 years.
- Within the framework of the Project Finance Factory project, VEB.RF State Corporation provides support for high-tech industries through loans, guarantees and sureties, participation in authorized capitals, financial and guarantee support for exports.
- The Ministry of Industry and Trade of the Russian Federation has been carrying out an industrial mortgage program for the SMB since 2022 (loans for the acquisition or modernization of production facilities secured by real estate). The following figures prove its demand: at the beginning of the program implementation, the Government of the Russian Federation allocated 300 million rubles, but in six months, the volume of applications for participation from business amounted to 17 billion rubles. Due to budget constraints, the Government of the Russian Federation has allocated additional financing for only 1 billion rubles. Another tool, i.e., a special program of preferential loans for manufacturers of priority industrial products, has been implemented since February 2023, but also on a limited scale (1 billion rubles to subsidize interest rates on loans). In addition to these tools, the industry is supported through various budgetary subsidies, special economic zones and territories of advanced social and economic development tax and customs privileges, leasing of land plots without bidding, reduced rates of social contributions, etc. are applied in them), industrial parks, special investment contracts (the possibility of obtaining the status of a sole supplier for enterprises within the framework of public procurement), public private partnerships (concessions). For the convenience of choosing the most appropriate support measures for a particular enterprise, the Ministry has formed a

special navigator, which systematizes more than 2000 support measures (Ministry of Industry and Trade, 2023).

- The Federal Corporation for the development of small and medium-sized business (SMB Corporation) provides support to innovative SMB entities, fast-growing high-tech companies (gazelles). Since 2019, the SMB Corporation together with the Ministry of Economic Development of the Russian Federation and the Bank of Russia have been implementing a preferential investment-lending program (Program “1764”, 633.2 billion rubles issued in 2022). The Bank of Russia also implements a program to stimulate lending (in abbreviated form: PSL, 232.2 billion rubles issued in 2022). The SMB entities engaged in manufacturing industries can also participate in these programs (in 2022, every fourth loan was issued under the PSL program in this area). Due to sanctions, most of the loans in 2022 were issued as working capital loans (up to 3 years). However, in 2023, the focus will be on lending (for up to 10 years) to investment projects to implement the windows of opportunity for import substitution. For this purpose, support will be in the format of “1764” + PSL. In addition, the SMB Corporation provides guarantee support to the SMB entities and issues umbrella guarantees (215 billion rubles in 2022). On the platform of МСП.РФ (MSP.RF), the Center for Support of Investment Lending was created to simplify the obtaining of loans by the SMB entities (SMB Corporation, 2023).
- The Innovation Promotion Fund, within the framework of the development program provides grant support (15–30 million rubles for 1–2 years, cofinancing at the expense of own funds in the amount of at least 15% of the grant amount is required) to small technology companies to conduct research and development for the production of innovative products. Grants (up to 50 million rubles) are also allocated for solving problems in the field of artificial intelligence. The Fund is a participant in the mechanism of seamless integration of support measures, which ensures the exchange of information between development institutions to reduce the time required to collect information for making decisions on financing.

In addition to federal support, regional development institutions operate in various constituent entities of the Russian Federation as follows: regional industrial development funds, development corporations, innovation funds, agencies for the development of small and medium-sized business, etc. The practice of implementing joint projects of industry support by federal and regional institutions is actively developing. For example, in the Republic of Bashkortostan under the agreement between the federal and regional industrial development funds there are programs of joint financing of supported projects of industrial enterprises for the amount from 20–200 million rubles for a period of up to 5 years at the rate of 3–5% per annum (financing ratio: 90% federal and 10% regional funds). There is also an agreement between the Regional Leasing Company of the Republic of Bashkortostan and the federal Industrial Development Fund, under which loans have been provided to small enterprises of the republic at the rate of 1% per annum in 2023 under the Leasing Projects program. In addition, the Industrial Development Fund of the Republic of Bashkortostan implements the Interregional Cooperation program, which allows providing financial support (from 5 up to 20 million rubles for a period of up to 5 at the rate of 1% per annum, with no cofinancing required) to the republic’s industrial enterprises that manufacture products for companies in the Chelyabinsk region. However, in addition to federal support, internal macroeconomic, financial and budgetary factors, reflecting the state of the regional economy as a whole, have a significant impact on the attraction of investments in industry.

The factors that ensured the leadership of the Republic of Tatarstan and the Sverdlovsk region in terms of investment activities in industry have been identified. The leading positions of the Republic of Tatarstan and the Sverdlovsk region as efficient regions in the field of attracting investments in industry are to some extent associated with the existing fundamental economic conditions that create opportunities for supporting the industry (Table 5).

**Table 5.** Financial and budgetary factors of support of the industrial sector of the regions in 2021–2022, thousand rubles.

Region	Budget sufficiency per capita		Volume of loans issued to industrial enterprises per 1 employed person		GVA per capita	
	2021	2022	2021	2022	2021	2022
Republic of Bashkortostan	50.5	56.5	589.9	503.6	492.5	549.0
Republic of Tatarstan	86.4	107.3	796.8	825.1	883.6	1044.6
Perm region	77.4	81.4	592.4	691.3	695.6	795.8
Nizhny Novgorod region	70.1	85.8	1043.7	1373.3	617.7	739.1
Samara region	75.4	77.4	312.2	419.3	679.8	754.2
Sverdlovsk region	84.5	114.9	868.3	1300.2	721.1	816.1

Source: Rosstat, 2023; Bank of Russia, 2023.

Deterrents to growth for the majority of regions are lower values of budget sufficiency (the volume of tax and non-tax revenues of the consolidated budget of the region per capita) of the territories as a whole in comparison with the leading regions, which reduces the potential opportunities of regional authorities to create favorable conditions for attracting investments (Ivanov, 2021), allocation of budgetary funds to subsidize interest rates on priority investment projects, affecting the volume of business lending. With regard to small and medium-sized business, many studies in different countries are devoted to the issues of modeling the impact of increased funding for science and support for innovation of knowledge-intensive business on strengthening their technological sovereignty. The use of Western models of interaction between small and large businesses based on the theory of comparative advantage is not fully applicable in Russian regions, as many value added chains have been destroyed under the sanctions. There are also high potential risks of losing suppliers of major technology companies (foreign ones, due to new Western sanctions, domestic ones, due to unfair competition of some Russian stakeholders). This determines the objective need in the Russian Federation for growth of public and private investments in small technology companies for their large-scale involvement in the technological renewal of the basic types of economic activities of the constituent entities of the Russian Federation and the development of new critical technologies and innovative products to achieve the goals of strengthening technological sovereignty, increasing the level of robotization in the transition to Industry 5.0 and successful adaptation to sanctions.

## 5. Conclusions

Thus, the following conclusions can be drawn based on the results of analyzing the state of investment infrastructure in the industry of Russian regions:

1. Economic sanctions against Russia and the transition of the world economy to Industry 5.0 have opened the windows of opportunity for Russian industrial enterprises in the field of import

substitution, development of digital and innovative technologies as promising directions for improving the competitiveness of their business. According to the authors, for the Republic of Bashkortostan, the most promising directions for the implementation of the windows of opportunity are investment in: for large and medium-sized enterprises in unmanned aviation, chemical industry, production of liquefied natural gas, etc., for small companies (in cooperation with large business) in production of electronic and radio electronic products, pharmaceutical production, development of digital solutions based on artificial intelligence (in particular, in the field of computer vision).

2. Stop factors of investment in promising directions of industrial development are general economic uncertainty, relatively high lending rates (limited budgetary funds for subsidizing interest rates), shortage of production personnel, insufficient state support, especially for small industrial enterprises, weak cooperative ties between large corporations and small and medium-sized enterprises.

3. As promising tools for attracting investments, which have not yet found their widespread application, it is necessary to note as follows:

- Offset contracts (state order), which allow industrial enterprises to obtain guaranteed demand for their future products in exchange for investment commitments to the state for the output of products with prescribed properties, volumes and delivery dates, for the state it is an investment attraction into the region, development of domestic production, new job creation, tax deductions to the budget;

- Return to the Budget Code of the Russian Federation the norm on irrevocability of state guarantees of the constituent entities of the Russian Federation, since currently this type of capital attraction is not considered by loan organizations as a reliable tool to secure a loan;

4. Attracting investments into the industry of the Republic of Bashkortostan can activate the deployment of the system of support for fast-growing high-tech industrial enterprises and small technology companies. In this respect, the following is required:

- In terms of fast-growing companies. To form a digitized register of potential fast-growing companies (FGCs) from among medium and small-sized enterprises through their standardized selection (based on the volume of research and development costs, the number of available inventions, patents, utility models and other scientific and technological achievements, as well as the priority directions of development proposed by the applicants for the implementation of the current windows of opportunity);

To introduce the mechanism of “gradient cultivation” of new technology-oriented FGCs in the republic to develop key technologies in order to overcome the consequences of sanctions pressure;

To create the Ufa zone of economic and technological development, specialized in the cultivation of technology-oriented FGCs based on convergence processes of Internet technologies, big data technologies and artificial intelligence with industrial technologies;

To find a possibility of long-term direct financing from the republican budget of a selected group of enterprises/ applicants for the FGC status, supported by the state concierge service, carried out in the interests and at the request of these enterprises;

To provide additional support to high-tech FGCs in the form of subsidies for technological innovations and free-of-charge specialized training programs for technical personnel.

- In terms of small technological companies. To develop tools of state support of innovation activities of small technology companies;

To create a register of small technology companies of the republic;  
 To observe federal and to establish regional privileges on payment of taxes, fees, insurance contributions established by the legislation of the Russian Federation on taxes and fees, and on payment of customs duties in accordance with the customs legislation of the Customs Union within the EAEU and the legislation of the Russian Federation on customs procedures;  
 To provide assistance to small innovative, high-tech companies in terms of implementing their advanced developments at the sites of large industrial enterprises and at all stages of the life cycle of their products.

Potential challenges that may complicate the implementation of these recommendations are as follows: Rather strict criteria for categorizing technological enterprises as small technological companies established at the federal level (without the right to adjust them on the part of regional authorities) and allowing them to qualify for financial support; Tougher conditions for the export of products of Russian small and medium-sized enterprises to foreign markets due to the increasing sanctions pressure of Western countries (including in relation to countries that have not formally imposed sanctions against Russia).

### **Use of AI tools declaration**

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

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### **Conflict of interest**

All authors declare no conflicts of interest in this paper.

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