Overcoming Internal and External Barriers for the Innovative Development of Businesses

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Abstract

Recent years have become a stress test for Russian innovative business due to increased internal and external barriers to development. In order to assess the adaptive capacity of firms and their readiness to continue innovation activities in times of crisis, this paper proposes an approach to identify and systematize the attitude and expectations of the business community towards the changing framework conditions for innovation. The innovation climate is measured as a set of 47 factors combined into 8 groups: markets, competitive environment, material base, availability of human and financial resources, quality of infrastructure, government regulation and social environment. The analysis is based on the results of a specialized survey of 1121 high-tech manufacturing and service firms, conducted between January and March 2022. The results show that business perceptions of framework conditions for innovation and areas of inefficiency vary weakly across industries, but are strongly related to firms' patterns of innovative behavior. Non-innovative firms are the most pessimistic in their assessments. The key barriers to innovation are related to the quality of government regulation and the availability of external financing. The results obtained allow expanding the understanding of the peculiarities of business adaptation to external constraints and formulate some recommendations for innovation policy.

Keywords: business environment; economic crisis; framework conditions for innovation; innovation development; innovation strategies; barriers to innovation; innovation policy

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Introduction

Many countries see the achievement of sustainable economic growth and technological sovereignty as a key strategic goal. For Russia, faced with unprecedented sanctions pressure, other destructive external factors, and internal barriers hindering development, this goal has become critical. The effectiveness of the entire national economy is now under threat along with economic actors' activities and the operation of management systems, models, and tools at all levels.

As international experience shows, in a crisis situation, businesses change their behavioral patterns to adapt, trying to balance growth strategies (strengthening the advantages to increase sustainability, competitiveness, and performance) and survival (keeping the impact of negative external conditions, which are increasingly constraining and occasionally overwhelming, withing tolerable limits). Many companies choose extremely conservative strategies, mainly relying on their own experience in dealing with emerging problems, such as, for example, the pandemic. At the same time adaptation methods and factors affecting their choice are very diverse and depend on organizations' basic characteristics (size, age, activity area), sectoral and cultural/historical specifics, and the features of the national business environment, which determine the conditions for doing business and creating innovations (Paunov, 2012).

The relevant scientific literature is mainly focused on the changing framework conditions for doing business, i.e., the external context of companies' operations. This context cannot be controlled by company management, but it significantly affects management decision-making, in particular the willingness and ability to implement technological solutions, develop new products, and participate in global value chains (Baier, Zenker, 2022; Brancati et al., 2017). The importance of how quickly companies respond to changes, reconfigure their strategies, and adjust behavior patterns is also noted. Both companies and the public authorities responsible for supporting them in the new situation also need overall assessments of the various parameters of the business environment for innovation, and of factors limiting innovation activities.

The concept of the business environment for innovation (innovation climate) is widely used in economic research, but in practice, obtaining relevant comprehensive (quantitative) assessments turns out to be a very difficult task. Among the few tools applied to measure such complex and multidimensional concepts are composite innovation indices (Vlasova, 2023). However, they provide only an aggregated assessment, which does not reflect businesses' view of the current rules of the game and of the status quo.

The proposed approach to analyzing the business community's sentiment regarding the conditions for innovation in Russia is based on a market research methodology (OECD, 2003) and the results of a specialized survey of high-tech manufacturing and service enterprises conducted by the HSE ISSEK in early 2022. The main objective is to assess Russian businesses' adaptive potential, their willingness to restructure and move on within the new economic realities.

Based on the classification of environmental factors affecting innovation development presented in the guidelines for collecting and interpreting innovation data (OECD, Eurostat, 2018), the Russian business community's satisfaction with the current conditions for innovation was assessed. Further, its expectations regarding the possible changes over the next three years were evaluated. Particular attention was paid to the differences in attitudes and expectations, and in the perception of business environment faults between enterprises operating in different sectors of the economy (traditional high-tech manufacturing and service industries), which demonstrate different innovation behavior patterns (engaged or not engaged in innovation and export activities). In particular, to take into account the highly diverse requirements of various company types regarding possible government support measures (Roud, 2018; Vlasova, Roud, 2020), a typology of organizations was used, based on their experience of implementing innovations, participating in export activities, and conducting research and development (R&D).

The results expand our understanding of the factors affecting businesses' adaptation to external constraints, and allowed us to suggest some recommendations for Russian innovation policy. The survey did not cover the sanctions period itself, but, it allowed the authors to assess the initial state of affairs at the surveyed organizations, which is important for understanding their perception of future developments. Secondly, the findings are likely to be relevant to the current circumstances, as supported by the existing literature. Domestic businesses (especially those operating in high-tech sectors) have been facing serious external restrictions since at least 2014[1], and during the pandemic crisis, when they had to find ways to overcome external shocks.

The first section of the paper presents a review of the literature on innovative businesses' diverse behavioural responses to exogenous challenges. The second part describes business environment factors affecting innovation and substantiates the need to measure them to assess companies' adaptive po-

[1] Certain sanctions have been imposed by foreign countries after 2014 too.

tential. The third section describes the methodology and information basis of the study. The fourth presents the results of a comprehensive empirical assessment of the business environment parameters, including the faults noted by the Russian business community. The concluding section discusses the main findings and presents public policy recommendations.

Companies' Innovation Strategies amid Exogenous Shocks

In recent decades, businesses in Russia and other countries have regularly faced various crises that transformed the markets, affected innovation activities, organizations' performance, and so on. Exogenous shocks suppress companies' motivation to innovate in a highly uncertain situation (Spatt, 2020), exacerbated by the unavoidable resource constraints including reduced demand and income, decreased liquidity and limited availability of external financing (Huang, Lee, 2023). Compared to a growth period, the short-term returns from implementing innovations are lower in a turbulent period, which encourages businesses to cut expenditures on relevant R&D (Mand, 2019).

At the same time, crisis periods play an important role in the emergence of new innovation paths. Having to operate in extreme conditions pushes companies to search for new growth strategies (Leduc, Sill, 2013). For example, the 2008-2009 financial crisis became a catalyst for the digitalization of financial services, prompting the development of efficient financial technologies based on big data, artificial intelligence, machine learning, and cloud services. Small innovative businesses, along with companies that have actively invested in innovation in the pre-crisis period, gained a growth momentum (Archibugi et al., 2013).

The most important characteristic of the crises caused by sanctions and pandemic-related restrictions (despite their quite different reasons) was the emergence of numerous gaps in global value chains (Alcorta et al., 2021). Structural changes happen in various industries and negatively affect not only obviously inefficient enterprises, but also competitive companies with high technological potential. For example, due to the sanctions introduced in 2022, more than half of Russian manufacturing enterprises faced problems with logistics, product and service imports, and increased prices for raw and other materials and components (Simachev et al., 2023).

External shocks affected the mood of the business community in different ways, depending on various factors related both to the nature of the crisis itself, the national, industry, and organizational specifics, and the state anti-crisis policy. An analysis of the literature on innovation revealed researchers' high interest in studying the characteristics and conditions of the business environment that affect companies' sustainability during turbulent periods and the choice of corporate adaptation strategies. Important factors include the firms' experience in creating innovations (Archibugi et al., 2013), participating in export activities (Jung et al., 2018), and their R&D potential (measured as R&D expenditures) (Mand, 2019). Despite the cyclical nature of such investments, during a crisis they can help strengthen companies' competitiveness. Other factors identified by researchers may also have a similar effect.

During the 2008 crisis, not only was an increase in R&D expenditures in sectors such as pharmaceuticals, biotechnology, and chemical production noted (Lech, 2011), but also grassroots growth of innovation activity was observed: many companies created technological innovations, every third one introduced process innovations, and one in five invested in product innovation (Paunov, 2012). All other things being equal, low dependence on imports and no participation in export activities can, to a certain extent, mitigate the negative impact of sanctions and other external challenges. On the other hand, innovative and export-oriented companies have a wider range of funding sources, and are less dependent on domestic demand, which frees up additional resources for building effective adaptation strategies and overcoming crisis-related limitations.

Russian business is going through a period of adapting to the new circumstances, searching for the best ways to respond to them. An assessment of corporate behavioral strategies in a situation of major changes shows that the initially neutral, and sometimes even positive, perception of new challenges by top company management contributed to focusing on innovation and market expansion (Simachev et al., 2023). The restrictions associated with the COVID-19 pandemic and the 2022 sanctions pushed Russian businesses to expand their presence on traditional markets and enter new ones and develop promising niches for new products. In particular, service organizations specializing in digital communications actively developed various remote employment formats, and vital online delivery services (Kuzminov, Serkov, 2020). Only about a third of Russian enterprises (mostly not engaged in innovation activities) did not make any effort to adapt either during the acute phase of the COVID-19 pandemic, or during the period of sanctions pressure. Statistical data for 2022 recorded a slight decrease in Russian organizations' innovation activity (11% versus 11.9% in 2021), while they have maintained their relevant expenditures at constant prices, and increased their

[2] https://rosstat.gov.ru/statistics/science#, accessed on: 22.12.2023.

rate (2.1% versus 2%)[2]. During the crisis, businesses changed the focus from pursuing long-term strategic goals to dealing with basic operational objectives, but they continued to see innovation as a factor in maintaining and stepping up their operations.

The Role of the Business Environment in Innovation Development

Among the many prerequisites for corporate innovation and conditions for its productivity, business environment characteristics attract particular attention in the literature. They are listed in the Oslo Manual, which are guidelines for collecting and interpreting innovation data (OECD, Eurostat, 2018). While remaining beyond the control of company management, these factors significantly affect management decisions regarding the implementation of innovations. A productive environment for innovation is defined by geography (company location), market parameters, and knowledge dissemination and exchange mechanisms (human resources, availability of financial resources, and infrastructure), specific features of government regulations, and the public sphere.

Stable demand for company products and the possibility of market expansion (which determine potential profits) are among the key external factors of increasing corporate innovation expenditures, and more generally, of coming up with an "innovative response" to changing operating conditions (Paunov, 2012). In a situation of economic shock, business activity and consumer demand decline, which requires reviewing and restructuring competition and marketing strategies. During the pandemic enterprises in various industries (in particular, pharmaceuticals) significantly expanded their product lines and developed an online economy, increasing sales on existing markets and entering new ones (Huang, Lee, 2023). A no less important aspect is entering foreign markets. Diversification and international openness tend to increase returns on innovation, and open access to additional resources (Panwar et al., 2022).

The most important business environment characteristic is the level of competition. However, its connection with innovation activity is not very clear (Aghion et al., 2018; Negassi, Hung, 2014). Competition is a key incentive to search for new strategies and growth sources, among which technological or organizational innovations hold a special place (Camps, Marques, 2014; Baranov, Dolgopyatova, 2013). At the same time, too strong or too weak competition sometimes can suppress companies' innovation activity due to increased costs, market barriers, or a lack of incentives.

Cooperation can contribute to strengthening competitive advantages during a recession, for example, in the form of joint R&D, or digital interactions via marketplaces or digital platforms (D'Agostino, Moreno, 2018). Joining forces allows for not only reducing the risks and costs of implementing innovations, but also speeding up their development. The decisive factors for stepping up cooperation during a crisis are the macroeconomic dynamics and the financial stability of individual organizations and the industry as a whole.

Another important component of the innovation climate is infrastructure, which provides mutual benefits for players in the educational, scientific, industrial, and other sectors (Gorzelany-Dziadkowiec et al., 2019). Transport, energy, information and communication (including the internet), and social (housing, healthcare, education, etc.) infrastructure is a vital aspect of successful entrepreneurial activity, and of establishing links between key participants in the commercialization of R&D results (Dezhina, Saltykov, 2004).

In addition to markets and infrastructure, another factor in businesses' rapid adaptation to new economic realities and stepping up innovation is access to resources - material (equipment, production space, raw and other materials, etc.), human (first of all, highly skilled workers and professionals to support critical business processes), and financial ones. Although resources are controlled by management, the possibilities of attracting, accumulating, and distributing them largely depend upon the economic situation and government policy.

The results of numerous studies confirm that during a crisis, companies' survival and innovation activities, including R&D, are positively correlated with the availability of public financial support in the form of grants and subsidies (Becker, 2015; Jung et al., 2018). Access to borrowed funds (bank loans, bond issues, leasing, export credit agencies' resources) and venture financing significantly affect the resource potential of business organizations (Peia, Romelli, 2022).

The social context, including the public's interest, and level of confidence in new technologies, and S&T development generally, significantly affect business and innovation activity. Although as a rule, society tends to have a positive opinion of science and technology's contribution to socioeconomic progress (Naor et al., 2015), during crises this attitude often changes, and it does so in different ways for different population groups. Since various kinds of recessions are becoming increasingly unpredictable and their consequences more difficult to manage with traditional anti-crisis measures (e.g., monetary ones), the distrust of economic agents and government departments and affiliates (consulting, informational, expert, intermediary agencies), the number of company decisions are growing. The level of openness to new technologies and innovations, and people's attitude toward them are directly

Table 1. **Sample Structure**

Parameters	Number of organisations in the sample	Number of organisations in weighted sample
Organisation size		
Small (< 50 employees)	724	10 688
Medium (51–250)	280	2666
Large (> 250)	116	669
Economy sector		
High-technology manufacturing industries	486	3088
Services	635	10 945
Organisation type		
Non-innovative	286	2 411
Innovative, non-exporting	632	8048
Innovative, exporting	203	3574
Innovative, conducted R&D	820	10 396
Total	1121	14 033

Source: authors.

related to the latter's standard of living and education, the perception of technological innovations' capabilities and ease of use, usefulness, and reliability (Pishnyak, Halina, 2021). The public sector's demand for innovation also plays an important role (Patanakul, Pinto, 2014).

Finally, an important business climate component is government regulation and administrative barriers. The country's economic policy as a whole, and its specific elements including tax and customs legislation, the quality of the judicial system, and the activities of control and supervisory authorities largely determine businesses' innovation behavior patterns (Pakhomova et al., 2015). The intellectual property protection regime also plays a special role. As foreign experience shows, in industries with a high patent activity, companies tend to be less sensitive to exogenous shocks, therefore, during recessions they continue to implement their pre-crisis strategies and do not decrease innovation activity (Archibugi et al., 2013; Fabrisio, Tsolmon, 2014). With insufficient level of intellectual property protection, copying and imitation proliferate, while an adequate protection system guarantees income from inventions and innovations, i.e., financial stability, including in a turbulent external environment.

Thus, the results of numerous studies indicate that the environment in which companies operate is one of the most important factors in their innovation development. It sets the rules of the game, defines the opportunities for, and barriers to, adapting the business to changes in its operating conditions.

Methodology and Data

The analysis conducted as part of this study is based on the results of a specialized survey of innovation behavior of Russian enterprises conducted in January-March, 2022 by the National Research University Higher School of Economics Institute for Statistical Studies and Economics of Knowledge. The methodological basis of the survey was market research, which reveals, through structured interviews, managers' attitudes and expectations regarding the current situation at their organizations, and their plans for the next three-year period. The empirical basis of the analysis was data on 1,121 enterprises operating in high-tech manufacturing industries (OKVED 20, 21, 26, 30) and the service sector (OKVED 61, 62, 63)[3] employing more than 10 workers.

The sectoral structure of the sample is due to the fact that the selected sectors of the Russian economy have a high level of innovation activity: in 2021, 17.4% in manufacturing, 44.5% in traditional high-tech industries (pharmaceuticals, electronics, chemical products, vehicles), and 10.5% in services. The sample is stratified, and representative in terms of the criteria applied to normalize it for empirical analysis, taking into account the actual parameters of the Russian economy (Ruslana Bureau Van Dijk data was also used).[4] The general structure of the sample is presented in Table 1. The survey tool was harmonized with the international standard for measuring innovation activity, and in addition to questions about the framework conditions for it, included questions on new product and/or business process development by companies over the previous three years (innovation activity), R&D expenditures, and export operations.

Based on the identified characteristics of the respondent companies, a typology was developed, which allowed for assessing their adaptation potential on the basis of their innovation behavior patterns. The following organization types were considered in the course of the empirical analysis: 1) non-innovative companies (have not introduced any new products over the previous three years); 2) innovative, but not engaged in export activities (in 2021); 3) innovative and exporting firms; and 4) innovative companies which have conducted R&D (incurred expenditures on R&D conducted in-house and/or jointly with third-party organizations in 2021). This classification allowed the authors to identify barriers that

[3] OKVED codes: 20 - Production of chemical substances and chemical products; 21 - Production of medicines and materials used for medical purposes; 26 - Production of computers, electronic and optical products; 30 - Production of other vehicles and equipment; 61 – Telecommunication-related activities; 62 - Computer software development, consulting services in this area, and related services; 63 - Information technology-related activities.

[4] https://www.bvdinfo.com/, accessed on 11.04.2022.

Table 2. **Business Environment Factors Affecting Companies' Innovation Activities**

Factor groups	Number of factors	Description
Markets	5	Stable demand for company's products, opportunities to enter new markets and expand presence on the current ones
Competitive environment	6	Stability of competitive advantages, factors in obtaining and retaining them, cooperation opportunities
Materials and equipment	4	Material production factors: floor space, access to raw materials, supplies, and equipment, including imported ones
Human resources	6	Availability of workers specializing in various business processes (production, administration, marketing and sales, logistics, new product development, etc.)
Financial resources	7	Availability of one's own resources, and access to external funding sources (credits, loans, leasing, venture investments, government support)
Infrastructure	6	Quality of infrastructure (transport, energy, social, information and communication, etc.)
Government regulation	9	Economic policy and its specific elements (tax and customs regulation, judicial system quality, intellectual property protection, etc.)
Social environment	4	The level of trust between partners, businesses and the state; the public's interest in new technologies; public sector's demand for innovation

Source: authors.

hinder stepping up innovation, depending on Russian businesses' level of maturity.

The respondents assessed the conditions for their companies' innovation development using a set of 47 factors broken down into eight groups: markets, competitive environment, material, human, and financial resources, quality of infrastructure, government regulation, and social environment. Business environment parameters were selected taking into account exogenous factors of innovation activities included in the latest edition of the Oslo Manual (OECD, Eurostat, 2018), and on the basis of a review of relevant scientific literature. Their brief description is presented in Table 2.

Company managers assessed each factor's current state and expected dynamics over a three-year period using a five-point Likert scale, where 1 is a negative assessment of the current situation/expected deterioration and 5 indicates a positive assessment/expected improvement. Based on the survey results, specific factors' and factor groups' indices were calculated (the average value for factors with equal weight) as part of assessing the overall business environment for innovation, and a composite sentiment and expectations index (average values for factor groups).

At the first stage, we analyzed how the Russian business community assessed the current situation for innovation activities, and the prospects for the next three years by factor groups and individual factors. At the second stage, business environment faults were identified: potential barriers hindering the acceleration of innovation. The statistical significance of the differences in barriers' assessment by companies displaying different innovation behavior patterns was measured using one-way analysis of variance (ANOVA) (Rueda, 2023). The statistical significance of differences in median cluster values was measured using the Kruskal-Wallis test. Non-overlapping sets of organizations were considered, depending on their involvement in innovation and export activities. The analysis was carried out for all types of economic activities under consideration generally, and at the industry level (traditional high-tech and service industries).

Analysis Results

Business Environment for Innovation: Business Community's Sentiment and Expectations

At the beginning of 2022, the Russian business community assessed the conditions for creating innovations as moderately positive: the sentiment index was 3.47 out of 5 (Table 3). Since the survey coincided with the beginning of the imposition of systemic sanctions against Russia by Western countries, company managers predictably did not expect the situation to improve over the next three years (with some minor exceptions for certain factor groups). However, there were no radically decreased assessments either. This applies both to high-tech manufacturing and service sector companies.

According to the respondents, the barriers currently associated with government regulation (3.19) and availability of financial resources (3.25) hinder innovation development most significantly. As to specific factors, in the financial resources group, companies faced (and will likely continue to face) the biggest problems with attracting external funding, especially from export credit agencies, bond issuers, and venture investors. Businesses are concerned about the quality of the judicial system and the activities of control and supervisory authorities, and, for obvious reasons, major issues with entering foreign markets.

Factor groups related to human resources and infrastructure quality received the highest scores (3.82

Table 3. **Sentiment and Expectation Indices by Business Environment Factor Group and Economic Activity Type**

Factor group	Traditional high-tech		Services		Total	
	Current	Expectations	Current	Expectations	Current	Expectations
Markets	3.52	3.46	3.41	3.38	3.44	3.40
Competitive environment	3.58	3.56	3.53	3.57	3.54	3.57
Materials and equipment	3.63	3.38	3.55	3.29	3.57	3.31
Human resources	4.05	3.83	3.75	3.65	3.82	3.69
Financial resources	3.41	3.36	3.20	3.29	3.25	3.31
Infrastructure	3.86	3.61	3.65	3.43	3.70	3.47
Government regulation	3.27	3.25	3.17	3.11	3.19	3.14
Social environment	3.70	3.68	3.52	3.55	3.56	3.58
Composite index	**3.60**	**3.49**	**3.44**	**3.38**	**3.47**	**3.40**

Note: the composite index provides a generalised assessment of the conditions for innovation activities, and the prospects for their change as perceived by company managers. It was assessed using 47 factors broken down into 8 groups, calculated as their arithmetic mean. Each factor was measured using a five-point scale with 1 meaning negative assessment of the current situation / expected deterioration in three years' time, 5 positive assessment / expected improvement, and 3 neutral assessment / no change..

Source: authors.

and 3.70, respectively), for both current state and expectations. As with a number of other business environment aspects, a slight deterioration is possible for both these groups in the next three years (–0.13 and –0.23, respectively). Regarding business processes, the respondents were most pessimistic about the availability of personnel for product development, including R&D and production or the provision of services. In terms of infrastructure, the respondents positively assessed factors related to communications and the internet and were relatively negative about the availability of social infrastructure: housing, medical services, schools and kindergartens, recreation areas, and the quality and costs of waste disposal services.

The analysis of business sentiment taking into account innovation behavior patterns revealed that companies with actual innovation experience generally assessed the relevant conditions more positively (Table 4).

Non-innovative companies were more pessimistic about the current situation (for high-tech manufacturing enterprises, this indicator value was 3.40, and for service sector - 3.21). Unsatisfactory scores (<3) were also received by certain factor groups in the service sector. As noted in a number of previous studies (see, e.g., Roud, 2018), this suggests that in the absence of actual experience of applying innovations, business environment characteristics become a major factor in making decisions about launching new innovative projects.

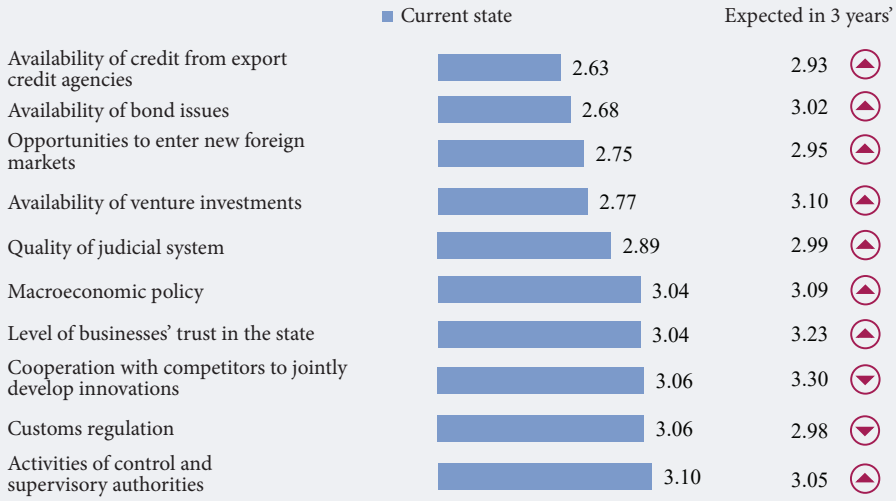
Innovative service companies engaged in export activities assessed the conditions for innovation development moderately positively (3.58). Such companies' managers also demonstrated a relatively high level of satisfaction with the market situation (3.81), in particular the stability of demand, opportunities to step up sales and enter new markets, and consumers' willingness to pay more for technologically improved products and services.

Table 4. **Sentiment Indices by Business Environment Factor Group and Innovation Behavior Pattern**

Factor group	Non-innovative		Innovative, non-exporting		Innovative, exporting		Innovative, conducting R&D	
	Hi-tech	Services	Hi-tech	Services	Hi-tech	Services	Hi-tech	Services
Markets	3.07	2.86	3.51	3.42	3.74	3.81	3.65	3.57
Competitive environment	3.33	3.16	3.71	3.59	3.53	3.65	3.65	3.62
Materials and equipment	3.51	3.30	3.69	3.61	3.61	3.61	3.65	3.60
Human resources	3.89	3.69	4.16	3.77	3.97	3.75	4.10	3.77
Financial resources	3.10	2.92	3.57	3.23	3.35	3.33	3.47	3.27
Infrastructure	3.74	3.47	3.90	3.67	3.87	3.74	3.86	3.67
Government regulation	3.10	2.99	3.39	3.11	3.18	3.22	3.29	3.15
Social environment	3.43	3.29	3.88	3.58	3.58	3.53	3.78	3.59
Composite index	**3.40**	**3.21**	**3.73**	**3.50**	**3.60**	**3.58**	**3.68**	**3.53**

Source: authors.

Figure 1. **Factors with the Lowest Scores in 2022 and Expectations Regarding Changes**



Source: authors.

On the contrary, in the high-tech manufacturing segment, innovative companies operating exclusively on the Russian market assessed the business environment higher (3.73), along with the firms investing in R&D (3.68). The respondents in this group noted a relatively favorable situation with the availability of human resources and infrastructure, trust in business partners and in the state, and the public sector's demand for innovations.

Business Environment Faults Hindering Innovation Development

Against the background of moderately positive assessments (overall ones of the current situation, and expectations for the next three years), the respondents were quite worried about certain aspects (see Figure 1), first of all, limited access to external financing. Business environment characteristics related to sources of borrowed capital were also assessed as unsatisfactory, namely the availability of resources from export credit agencies (2.63), bond issues (2.68), and venture investments (2.77). Despite a satisfactory assessment of one's own financial potential (3.77), the business community expected the situation to deteriorate here as well (–0.12). Thus, the already not very favorable state of affairs with financial support for innovation activities is becoming increasingly uncertain.

Companies expect problems with entering foreign markets (2.75), given growing sanctions pressure, the latter are unlikely to become more available in the near future. The respondents were equally pessimistic about the opportunities to cooperate with competitors to conduct R&D and develop innovations (3.06), though under normal circumstances such cooperation makes a decisive contribution to productivity. The inadequate framework conditions for innovation and less-than-perfect government regulation also significantly weaken Russia's innovation potential. Apart from the distrust in the actions of the state (3.04), and the concerns about the overall macroeconomic policy (3.04) the respondents noted a weak judicial system (2.89), ineffective tax (3.15) and customs (3.06) mechanisms, inadequate activities of control and supervisory authorities (3.10), and insufficient anti-crisis support during the pandemic (3.12).

The perception of bottlenecks hindering the increase in innovation activity is not clearly differentiated by sector, but varies considerably depending on companies' behavior patterns. The ANOVA analysis and the Kruskal-Wallis test revealed statistically significant (at 1%) differences between the average values, both for the current state and expectations, of almost all negative factors of the business environment (Table 5). The only exception is quality of judicial system, which the respondents, regardless of their involvement in innovation and export activities, considered to be one of the weakest points of the Russian innovation system.

Innovative companies engaged in export activities were less critical in assessing existing barriers, while managers of non-exporting companies turned out to be more optimistic about their expectations for the next three years. Apparently, having a good position on the domestic market (own niche, stable demand, etc.) gives innovative companies confidence in the future even if economic conditions change.

Conclusions and Discussion

The analysis of the business community's sentiments and expectations regarding the changes in the framework conditions for innovation allowed

Table 5. **Assessment of Business Environment Factors by Organization Type (ANOVA results)**

Factor	Organisation type	Number of observations	Average assessment of current state/expectations	Standard deviation
Availability of credit from export credit agencies	Innovative, exporting	2019	3.01/2.92	1.15/1.05
	Innovative, non-exporting	3736	2.59/3.02	1.05/1.13
	Non-innovative	1487	2.20/2.71	1.09/0.97
	ANOVA		***	
Availability of bond issues	Innovative, exporting	2175	2.90/2.95	1.17/1.01
	Innovative, non-exporting	4066	2.68/3.11	1.00/1.01
	Non-innovative	1606	2.41/2.88	1.02/0.95
	ANOVA		***	
Opportunities to enter new foreign markets	Innovative, exporting	3270	3.49/3.40	1.24/1.23
	Innovative, non-exporting	5379	2.56/2.82	1.32/1.12
	Non-innovative	1830	1.99/2.57	1.14/1.09
	ANOVA		***	
Availability of venture investments	Innovative, exporting	2195	3.10/3.12	1.13/1.11
	Innovative, non-exporting	3981	2.75/3.19	0.93/1.06
	Non-innovative	1531	2.37/2.79	1.04/0.98
	ANOVA		***	
Quality of judicial system	Innovative, exporting	2788	2.87/3.00	1.08/1.01
	Innovative, non-exporting	6439	2.90/2.99	0.99/0.92
	Non-innovative	1945	2.86/3.00	1.06/1.01
	ANOVA			
Cooperation with competitors to jointly develop innovations	Innovative, exporting	3168	3.03/3.37	1.23/0.93
	Innovative, non-exporting	6432	3.18/3.33	1.06/0.91
	Non-innovative	2038	2.70/3.08	1.01/0.89
	ANOVA		***	
Macroeconomic policy	Innovative, exporting	3154	3.04/3.06	1.14/1.20
	Innovative, non-exporting	6879	3.11/3.19	1.06/1.10
	Non-innovative	2029	2.79/2.76	1.03/1.10
	ANOVA		***	
Activities of control and supervisory authorities	Innovative, exporting	3177	3.20/3.21	1.03/1.04
	Innovative, non-exporting	7337	3.10/3.00	0.97/0.97
	Non-innovative	2142	2.96/2.94	0.99/1.00
	ANOVA		***	
Customs regulation	Innovative, exporting	2709	3.18/3.03	1.05/1.06
	Innovative, non-exporting	4950	3.00/2.97	0.79/0.91
	Non-innovative	1662	3.05/2.91	0.84/0.97
	ANOVA		***	
Level of businesses' trust in the state	Innovative, exporting	3305	2.96/3.21	1.18/0.99
	Innovative, non-exporting	7455	3.16/3.32	1.17/1.15
	Non-innovative	2209	2.72/2.94	1.11/1.05
	ANOVA		***	

Note: ***, **, * indicate significance at the level of 10%, 5%, and 1%, respectively. The median value for all factors is 3.00. The results of group comparison using the Kruskal-Wallis test are available upon request.

Source: authors.

the authors to assess Russian businesses' willingness to develop innovations against the background of unfavorable external and internal conditions.

A unique database was created on the basis of which the characteristics of the innovation climate were examined as well as key barriers to its improvement at the company level (in our case, high-tech manufacturing and service sectors) and various behavior patterns were illustrated (engaged in innovation and export activities, conducting R&D). Though the survey to collect data for the study was conducted before the imposition of major sanctions restrictions, its results are still applicable for assessing the innovation dynamics and adjusting relevant government policy initiatives. In particular, the findings indicate that managers of Russian companies see potential for improving the innovation climate (at the beginning of 2022, the composite sentiment index in both traditional high-tech and service sectors was at about 3.5 out of 5). However, even before the exacerbation of crisis trends, the surveyed managers did not expect significant improvements over a three-year horizon, among other reasons due to the business environment faults they constantly face in their operations.

The survey results also confirm that in the context of a turbulent external environment and significant delays in the publication of official statistical observation data, regular collection of information about the business community's mood remains relevant. It facilitates feedback between the authorities and society and expands the empirical basis for innovation (and innovation policy) research. The obtained estimates confirm the results of previous studies (Archibugi et al., 2013; Jung et al., 2018) and reveal fundamental differences in the perception of conditions for innovation development by companies that display different innovation behaviour patterns. Organizations not engaged in these activities rate almost all business environment aspects as unsatisfactory (<3). Meanwhile innovative firms that export their products or conduct R&D (especially in high-tech industries) generally tend to be more optimistic in assessing both the status quo and future prospects (between 3.50 and 3.73, respectively).

The business community believes the key factors of achieving stable growth and successfully adapting to external turbulence are the availability of human resources and high-quality infrastructure, first of all, information, communications, and energy infrastructure. In turn, the public's interest in new technologies and innovations allows one to expect high consumer demand for products and services even in times of crisis.

According to the respondents, the rate of adapting to new economic realities may be negatively affected by issues with attracting financing (both borrowed capital, and public funding), limited access to foreign markets, and less-than-perfect public institutions and regulatory systems. The level of direct government participation in the domestic economy, which during periods of turbulence increases even further, is constantly criticized. According to some experts, under the sanctions pressure, authorities are likely to rely on the project model and targeted financing of public sector organizations, including large state-owned companies. As a result, both the timeframe for making management decisions at all levels and the costs of their implementation may increase, while the expected effects, on the contrary, may become less significant.[5]

The study demonstrated that the business community is much more interested in altering the government's role from direct participation in business activities to that of a regulator, who, among other things, would strive to improve the business environment. A quick resolution of a number of systemic issues which determine the rules of the game in the business sector would promote market competition and create more favorable conditions for stepping up innovation activity.

Companies' perception of key business environment faults also significantly differs depending on the level of their involvement in innovation and export activities. For innovative organizations integrated into global value chains, the key barriers are related to the shrinking opportunities for cooperation with competitors in conducting R&D (which is particularly important for high-tech enterprises) and a relatively low level of trust in authorities' actions. Innovative companies' exports are mainly hindered by inadequate customs regulation and problems with attracting external financing (export credit organizations' resources, bond issues, venture investments). In addition to financial constraints, innovation is also hampered by top management's negative perception of the opportunities for entering new, especially foreign, markets.

The identified diversity in assessments of the faults of the business environment for innovation, associated with companies' behavior patterns, provides an empirical basis for developing initiatives to support business during periods of economic instability. Eliminating major faults of this kind may accelerate the real sector's adaptation to innovation development amid external restrictions.

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[5] https://kiozk.ru/article/ekspert/30-let-russkih-innovacij-pocemu-ne-slozilsa-pazl; https://stimul.online/articles/interview/vyyti-s-tekhnologicheskoy-poluperiferii/; https://stimul.online/articles/sreda/nuzhna-dostroyka-innovatsionnoy-sistemy/, accessed on 14.08.2023.

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