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## State Innovation Policy in the Conditions of Structural Reorganization of the Economy

Rozdon J. Mukhitdinov

The National Research University — Higher School of Economics (HSE University),  
20, Myasnitskaya str., Moscow, Russian Federation, 101000

✉ [rmukhitdinov@hse.ru](mailto:rmukhitdinov@hse.ru)

**Abstract.** Currently, the main role of the state in the implementation of the state innovation policy is to create infrastructure for innovation and to finance new developments and fundamental research. In today's world, the speed of change is increasing, and the role of the state becomes even more important, especially in times of crisis and economic restructuring. State innovation policy can accelerate the pace of development of individual industries, stimulate inter-industry cooperation, and help to remove barriers to innovation (legislative and infrastructural). This study is devoted to the formation of effective innovation policy in the conditions of economic restructuring associated with the economic crisis, heavy international political and economic environment. In order to analyze and make recommendations on innovation policy, such main innovation factors are analyzed as: financing, creation of infrastructure, customer or initiator of innovations, development of competencies, as well as creation of innovation culture. The role of the state in the above factors is paramount. The study analyzes the data presented for the last 5 years and provides forecasts for 2023.

**Keywords:** state innovation policy, factors of innovative development, structural restructuring of the economy, innovations in crisis conditions

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## Introduction

Since the rapid economic growth at the beginning of the 21st century, Russia has been experiencing crises with a cycle of 7–8 years. So, after the global financial crisis of 2008, Russia experienced the crisis of 2014–2015,

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as well as the crisis of 2022, from which, according to optimistic data from the Central Bank, the economy will recover for at least 5 years [1]. Today, in the context of a decrease in the number of able-bodied population and a difficult economic situation, new growth paradigms are needed for the development of Russia in socio-economic terms. One of these paradigms is innovation.

The growing number of innovation clusters, technoparks and special economic zones indicates a successful policy to improve the innovation infrastructure. As an example of a government order for innovations, the GLONASS system, created for military purposes by government order in 1995, can be cited. The development of in-demand competencies and qualifications based on WorldSkills (an international social movement) within the framework of training in digital professions under the Digital Economy program also indicates the participation of the state in this area of innovation policy. The active participation of state funds in venture capital investments of innovative startups in recent years also indicates the maintenance of an entrepreneurial and innovative culture in Russia.

The McKinsey Innovation Practice Analytical Center for Innovation Development has identified 5 key areas for an effective national innovation system for the state:

- The state as a customer of innovations;
- The creator of the infrastructure;
- A source of funding for innovative research;
- Promotion of internationally competitive competencies and technologies;
- Stimulating an innovative and entrepreneurial culture [2].

As the analytical center notes, these areas of the state innovation policy are not only being improved, but also have already had positive results.

This paper examines the indicators characterizing the activities of the state in all 5 areas mentioned earlier, presents a characteristic of the impact of these indicators on innovative output and economic growth. In addition, it emphasizes both the need for state participation in the national innovation system and the need for the state to interact with business and research institutions for more effective implementation of state innovation policy.

The study provides the analysis of the current situation in the field of innovations in Russia, as well as recommendations for improving the state innovation policy.

## **Theory**

According to the theory of innovative public administration, the state is interested in fundamental research and the implementation of innovations as a source of economic development [3]. Based on this, the main goal of the state

innovation policy is the development and implementation of innovative goods, services, methods or utility models [4].

Since innovation is accompanied by high risks, market failures are observed when the benefits for commercial firms are lower than the costs of research and development of innovative products. The state, interested in innovation, with the help of state support mechanisms, levels market failures by providing financial and non-financial support to innovative companies whose technologies are socially important for both the state and society [5].

However, there is a problem of public administration, which does not contribute to effective interaction between the state and innovative business. We are talking about such a problem as the lack of interaction and cooperation. In other words, the state acts only as a regulator and controller. Currently, most countries operate within the framework of the New Public management (NPM) paradigm and provide services to companies with socially important innovations, entrusting business with the implementation and commercialization of innovations to business. However, according to the updated New Public governance (NPG) paradigm, which replaced NPM, the state should interact with business, participate in joint management, joint production or joint implementation of innovations, for more effective use of innovative technologies, since business can put commercial interests above social ones [6].

Therefore, in order to build an effective national innovation system (NIS), it is necessary to involve both the state and business, and research institutes, as a result of whose interaction fundamental research is commercialized and socially important innovations are created.

### **Literature review**

Public finances should be compared in terms of efficiency with private business. For example, researchers from the United States and Russia conclude that the experience of high-tech countries indicates that the higher the budget costs of innovation and R&D, the lower the productivity of researchers (In Switzerland, Denmark, Singapore and other technological countries). American researchers, using the analysis of data from innovative companies from S&P (American Stock Index) and other open sources over the past 10 years, as well as using the verification method, confirm the cost of government spending on R&D relative to private sector spending [7]. As for domestic works, they often provide examples of the inefficiency of government spending spent on innovation and provide recommendations for more effective cooperation between business and research centers, as evidenced by several examples within the framework of special economic zones and others [8]. Despite this,

the importance of government support and budget expenditures for innovative development should not be underestimated.

It is also important to consider the way budget funds are allocated. So, by far the most common method of allocating funds in Russia is a competition presented in the form of grants for research. The activity of research organizations and institutes depends on the number of grants received and the organizations' ties with industry [9]. The prevalence of government financial expenditures on R&D and research contribute to the construction of vertical links in the national innovation system, which in turn leads to an increase in transaction costs, as well as the establishment of quasi-market or rent-oriented relations instead of market ones [10].

There are a number of researchers who give the leading role in financing research and development to the state. Some researchers believe that government funding should be provided in those industries that are most important to the state.

Researchers often give examples of successfully implemented infrastructure innovation projects and created special innovation zones [11]. They also cite the example of the experience of Russia from 1998 to 2008, where they note the development of innovations in Russia and the role of the state in maintaining the national innovation system during the crisis of 2008 [12]. According to these researchers, the development of individual industries is a priority for the state, which in turn will lead to the growth of related industries and the entire economy as a whole. Several foreign researchers came to the same conclusion, pointing to the complex economic growth in technological countries in the 2010s [13]. The main idea of such studies is to develop the theory of international relations and the concept of global distribution of labor, the meaning of which is that the lack of developments in other areas can be compensated by borrowing existing world experience, while the state should support those industries in which it is interested [14]. However, this kind of relationship building will not only limit the technological development of the country, making it dependent on other countries, but will also contribute to market failures, while disrupting market mechanisms through demand for individual developments and research from the state.

In addition, there are proponents of state financing of innovation and R&D, who argue that the state should support those industries that are least developed and unable to exist without state support [15; 16]. The articles analyze data from open sources to identify connections and analyze secondary data. The research emphasizes that the priority for the state should be to maintain the competitiveness of the country, even without considering the effectiveness of public finances.

On the other hand, some researchers consider the private sector to be a primary component in the development of the national innovation system.

As a rule, these researchers share the idea of the role of the state as a service body, which, if necessary, should participate in the development of innovations on the initiative of the private sector. The theoretical views of these researchers are similar in concept to the previously mentioned New Public management (NPM) paradigm [17]. The ability of the private sector to commercialize innovations makes it dominant in relations within the national innovation system, while the state is inherently less effective relative to the private sector, especially in the field of innovation [18]. Also, in favor of the hypothesis, the researchers provide data for 45 countries, where in most countries, the actual result of government innovation support is lower than expected. Taking this into account, the state should sponsor and provide support in the area in which the private sector is developing [19]. However, what is overlooked here is that some socially important areas do not imply commercialization and profit-making. These industries, without government intervention, can be deprived of business attention, since making a profit is a priority for the private sector. In addition, research in areas where the risk of loss is higher than the social benefit is often not of interest. In this regard, socially important projects should be initiated by the state.

This implies that government support for innovation is necessary for the effective functioning of the national innovation system. However, the state, business and research institutions must have equal relations to build horizontal links between each other. Thus, when building vertical links and the predominance of one actor over another, market failures will be created, which will indicate the inefficiency of the NIS [20]. Therefore, to build an effective NIS, the role of the state should not be limited only to service functions, but also imply the possibility of cooperation, joint production and other mechanisms of interaction according to the New Public governance (NPG) paradigm.

Several tools can be used simultaneously as measures of state support for innovative small and medium-sized organizations: grants, program-targeted R&D expenditures, infrastructure grants (incubators, technology parks, zones, etc.), the introduction of tax incentives, minimization of bureaucratic procedures that are necessary for the registration of small and medium-sized businesses, as well as the start of activities, simplification of obtaining financing, etc. [21].

The listed measures of state support for innovative private sector companies can be divided into two categories: indirect and direct. Indirect regulatory measures (tax and monetary) are not a neutral measure and contribute to the development of a knowledge-intensive industry and may be more effective in Russia, since they do not contribute to building horizontal ties both with the provision of state grants and with other support within the framework of targeted programs. Indirect measures of state regulation of the innovation

sphere should be more effective, as they provide small and medium-sized businesses with an independent choice of the direction of technical development. Direct methods of state support in the innovation sphere are usually divided into administrative-departmental and program-targeted. The administrative and departmental method of support manifests itself in the form of direct financing, carried out in accordance with special regulatory legal acts adopted to support innovative companies [22]. Program-targeted methods of government support for innovations imply contractual financing of innovative companies through government targeted programs to support innovations, including in small knowledge-intensive organizations.

A number of researchers note the importance of direct methods of supporting innovative business. Due to the fact that the effect of these mechanisms is easy to calculate, as well as due to the specific goals of state support, which often does not take into account various externalities. Data on targeted programs are usually widely advertised and strictly controlled. Researchers mainly use data from government sources to assess the regulatory impact of government programs and track the achievement of goals [23; 24]. By analyzing individual cases, the researchers conclude that direct methods of supporting the private sector contribute to a clear division of functions, where the state is engaged in coordination, and business is engaged in execution. The differentiation of functions ensures the necessary level of bureaucracy, which must be observed in order to effectively achieve the goals set for business, and also supports the development of industries important to the state [25; 26]. In addition, several researchers have concluded from the results of surveys that direct support methods in the form of cash grants are more attractive for the business itself [27]. It should be noted that there are companies that are created to receive this or that financing, or existing companies change the scope of their activities to receive state financial support, which distorts market mechanisms and, with the development of one industry, stops the development of another industry. Some researchers note that in countries with high levels of corruption, there is also a link between the organizations receiving the grant and the source of funding. As a rule, the results of activities in such cases are checked more loyally [28; 29].

However, in favor of indirect methods of state support for innovations, high redistribution costs are attributed, which are required when forming the budget from which grants will be paid [30]. In addition, the idea that the state should promote the creation of innovative companies by reducing bureaucracy or other methods, stimulating competition and reducing entry barriers has recently become popular. Therefore, innovative companies will have competitive advantages. Note that this idea is very popular in Russia. These researchers rely on international ratings, indices and other indicators that include ease

of doing business and administrative barriers to starting a business in their indices [31; 32; 33]. It is thanks to the improvement of the business climate and the conduct of new business that Russia has consolidated its place in the “Doing business” ratings [34; 35]. The Doing business rating is very important for technologically advanced countries. However, it should be noted that in developed European countries, the economy is based on small and medium-sized businesses. Not only the creation of infrastructure conditions contributes to the development of innovative SMEs, but also the willingness of the population to entrepreneurship, entrepreneurial literacy, as well as support for SMEs not only from the state, but also from industry.

The measures proposed for the accelerated development of the IT industry should contribute to the development of a knowledge-intensive innovation industry and facilitate the replacement of Western technologies. At the same time, indirect methods will not limit existing companies in the development vector and may be more effective.

## Methodology

To assess the state innovation policy in the proposed areas, the following indicators for the last 5 years will be analyzed:

- Share of innovative products in revenue;
- Number of technoparks;
- R&D expenses;
- Expenses for professional retraining and advanced training;
- The volume of venture capital investments.

In addition to these indicators for 5 areas of innovation policy, indicators of government spending on R&D, the volume of production of innovative goods and services, as well as forecasts of government departments by industry and forecasts of the analytical center for innovation and startups “Desight”, a resident of the Skolkovo IT cluster, will also be analyzed.

In addition to recommendations for improving the state innovation policy, the following hypotheses are tested in this study:

H1 — The national innovation system is effective when there is funding from both the state and business;

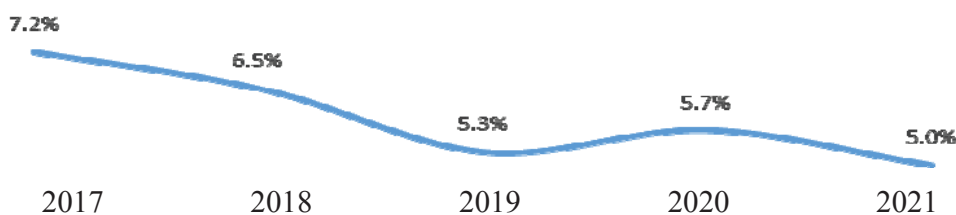
H2 — Indirect measures to support innovative companies in Russia are more effective than direct ones.

## Results

As part of the study, we analyzed the indicators characterizing the activities of the state innovation policy in the above areas.

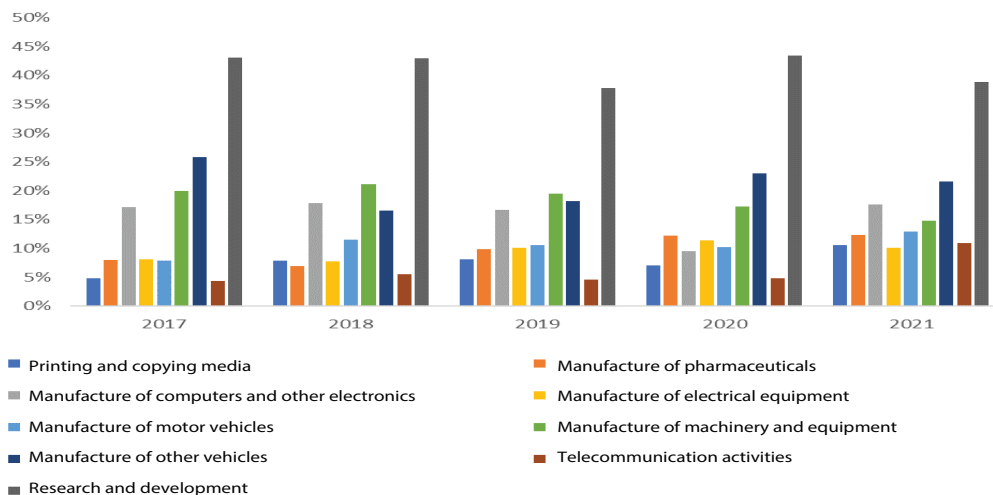
### *The state as a customer of innovations.*

Within the framework of this direction, the indicator of the share of innovative products in the total volume of goods and services was considered. The state, as a customer, should stimulate an increase in the share of innovative goods and services, which makes the economy more competitive and marginal. According to the data for the last 5 years, the average increase in innovative goods is minus 0.5%, which indicates a decrease in the share of innovative goods in the total volume of goods and services produced in Russia (Fig. 1).



**Fig. 1.** Share of innovative goods in the total volume of shipped goods and services according to Rosstat

By sectors of goods and services, the largest share of innovations is present in the scientific field, followed by telecommunications. However, even in these industries, the changes over the past 5 years are insignificant (Fig. 2).



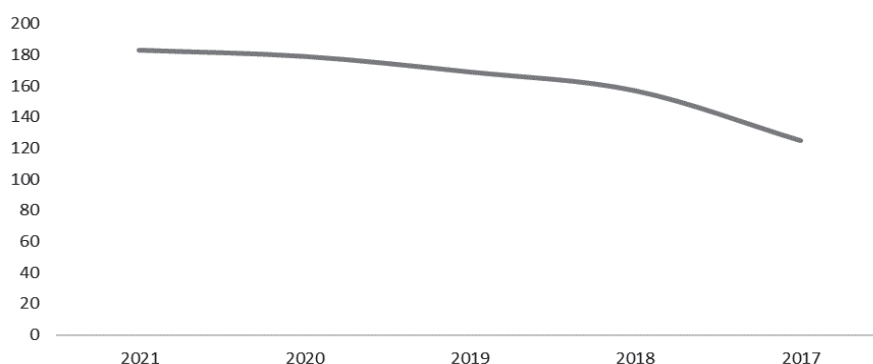
**Fig. 2.** Dynamics of the share of innovative goods by sectors of the economy for 5 years according to Rosstat



It should be noted that even though these data relate to goods and services produced in Russia, most of the innovative products are imported from more technologically advanced countries. However, due to the large number of sanctions, the ban on the import of technologies into Russia, as well as the departure of American and European technology companies, there is a need to replace innovations. For example, government orders, grants and other benefits can act as a substitute.

### *The state as the creator of infrastructure.*

This area can be considered by the number of operating technoparks in Russia over the past 5 years. It should be noted that the number of innovations is growing by an average of 12 units (Fig. 3).



**Fig. 3.** Public spending on infrastructure for innovation

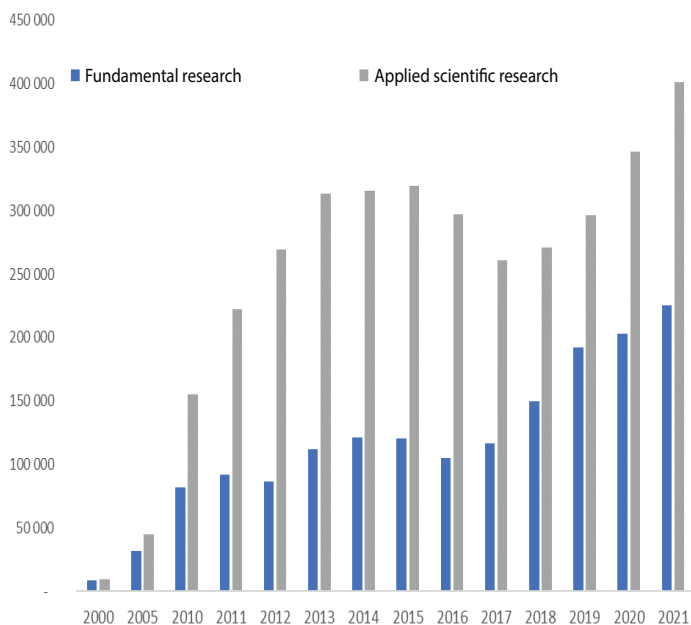
Source: Compiled by the author on the basis of data from the project “Public Expenditures” [36].

### *The state as a source of financing.*

In this area, the indicator of research funding from the federal budget is being considered.

According to the 2022 budget, spending on R&D and research increased by about 1 %. Sanctions and economic restructuring do not significantly affect this area (Fig. 4).

In addition, according to Rosstat, more than 70 % of R&D spending is government-funded, while in Europe and the United States, more than 60 % of research spending is in the private sector. When conducting a correlation analysis between private investment and the volume of innovative goods in Russia, there is a dependence of  $r = 0.67$  for Russia and 0.54 for the United States, which indicates the importance of private investment for Russia. This study confirms the first hypothesis about the need for interaction between the state and private business.

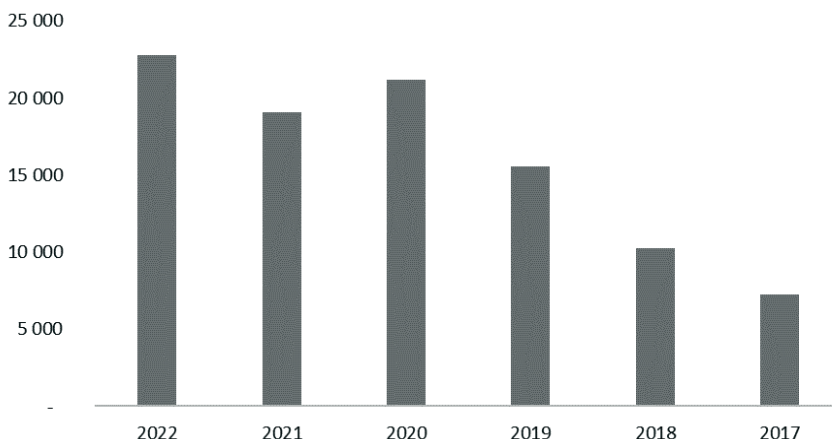


**Fig. 4.** Ratio of types of public expenditures on research and development according to Rosstat

*Creation of new competencies.*

In recent years, several professional retraining programs and the creation of sought-after professions have been launched in Russia in this area. An example is the financing of training for vulnerable categories of persons within the framework of the Digital Economy program, where citizens of a certain category can enroll in popular IT specialties through public services.

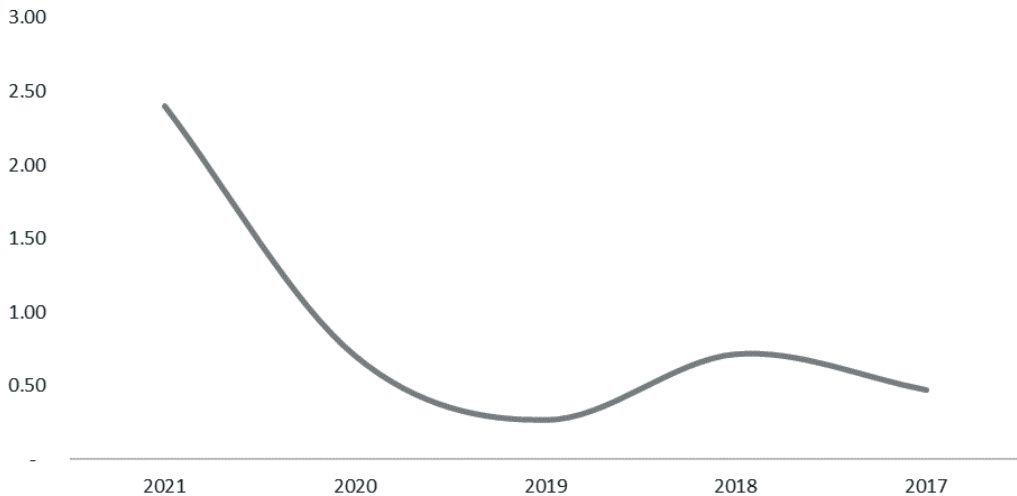
The costs of professional retraining also show positive dynamics and do not depend on sanctions and economic restructuring (Fig. 5).



**Fig. 5.** Expenditures for retraining of personnel for innovative sphere according to the Ministry of Labor and Social Protection

### *Creating an innovative and entrepreneurial culture.*

This area is most often considered through the number of startups, since more small companies and individuals are involved in them, and successful projects motivate society to entrepreneurial activity. In recent years, professional retraining programs for entrepreneurs have been launched in Russia in this area (Fig. 6).



**Fig. 6.** Increase of small enterprises in the activities of the innovation center “Skolkovo”

According to the Skolkovo Desight analytical center, venture capital financing has been increasing rapidly in recent years. However, even though there was a 25 % increase in investments in the 1st quarter of 2022, by the end of 2022, there was a halving in venture capital investments. This change is mainly due to the fact that in the first quarter transactions concluded before 2022 were financed, and 40 % of the total investments were made by foreign companies and funds. In this sector of Russia, in the context of perestroika, it is necessary to increase financing from budget funds.

As for hypothesis 2, according to the data over the past 10 years, there has been an insignificant predominance of the influence of indirect methods on the volume of technology and innovation output. But in times of crisis, this assumption is not fair, since business needs financing more. It is impossible to claim confirmation of the second hypothesis. However, due to unprecedented sanctions and restrictions during 2022, the increased role of government business support mechanisms should be noted.

At the beginning of 2023, the forecasts of the Central Bank and the Government were overestimated in a positive way. Despite the difficulties in the innovation sector, there are no significant failures in the economy and

the Central Bank improves the forecast for a return to pre-crisis indicators and reduces the time frame from 5 years to 3 years. In 2023, domestic reserves are expected to accumulate for the development of technological production and the replacement of departed foreign investors with domestic or investors from friendly countries. By the end of 2023, it is planned to test domestic inventions in the aviation sector, as well as nationalize technology companies operating in Russia with foreign business registration.

### Conclusion

We conclude that the most vulnerable areas of state innovation policy in the context of structural adjustment and crisis are primarily government orders for innovation and the promotion of competitive competencies and technologies. This problem is confirmed by a decrease in innovative products in the total volume of goods and services, restrictions on the import of technologies into Russia, as well as the closure of a number of international organizations, including international certification centers (ACCA, CFA and others). These changes indicate the need to increase government orders, subsidies and grants that facilitate the replacement of foreign technologies and contribute to Russia's competitiveness in the technology market. Also, in the current conditions, it is necessary to maintain a culture of innovation and entrepreneurship, given that more investments were made by foreign companies and funds. The Russian Direct Investment Fund can act as a replacement by increasing participation in venture financing. In view of the confirmation of the hypothesis about the need for interaction between the state and business within the framework of the national innovation system, it is also important to finance small and medium-sized innovative enterprises, carry out measures to establish a dialogue between business and the state, as well as reduce bureaucratic procedures for running and starting a business. As for the hypothesis related to indirect and direct methods of state regulation, this hypothesis has not been confirmed in the context of the structural restructuring of the economy.

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#### Information about the author:

Rozdon J. Mukhitdinov — Postgraduate Student at the School of Politics and Governance, HSE University (Russian Federation) (ORCID ID: 0000-0002-2987-695X) (e-mail: [rmuhitdinov@hse.ru](mailto:rmuhitdinov@hse.ru)).

## Государственная инновационная политика в условиях структурной перестройки экономики

Р.Д. Мухитдинов 

Национальный исследовательский университет «Высшая школа экономики»,  
101000, Россия, Москва, Мясницкая ул., д. 20

✉ rmuhitdinov@hse.ru

**Аннотация.** В настоящее время основная роль государства в рамках осуществления государственной инновационной политики заключается в создании инфраструктуры для инноваций и финансировании новых разработок и фундаментальных исследований. В современном мире скорость изменений растет, а роль государства становится еще более значимой, в особенности в условиях кризиса и в условиях структурной перестройки экономики. Государственная инновационная политика может ускорить темп развития отдельных отраслей, стимулировать межотраслевое сотрудничество, а также помочь в устранении препятствий для развития инноваций (законодательные и инфраструктурные). Данное исследование посвящено формированию эффективной инновационной политики в условиях перестройки экономики, связанных с экономическим кризисом, тяжелой международной политической и экономической обстановкой. Для анализа и выработки рекомендаций по инновационной политике анализируются такие основные инновационные факторы, как: финансирование, создание инфраструктуры, заказчик или инициатор инноваций, развитие компетенций, а также создание инновационной культуры. Роль государства в перечисленных факторах является первостепенной. В исследовании анализируются данные, представленные за последние 5 лет, а также даны прогнозы на 2023 год.

**Ключевые слова:** государственная инновационная политика, факторы инновационного развития, структурная перестройка экономики, инновации в условиях кризиса

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