

Research Article**National innovation system as a model of economic development****Alexander Yu. Anisimov¹, Yuri Yu. Kostyukhin², Oleg O. Skryabin³,****Irina V. Androsova⁴ and Anna V. Zhaglovskaya⁵**

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ABSTRACT

The national innovation system research relevance is defined by the role and scale of innovative processes development in the modern world. The article is aimed at the development of recommendations concerning Russia's transition to an innovative path of development. The leading approach to the national innovation system problem research is a clinical approach, allowing for conclusion about the current state and potential of the national innovation system based on available data. The main results of the paper is methodological recommendations on the transition of Russia to an innovative path of advancing development (innovative projects financing accessibility, building relationships "science-state-business", guaranteed sales of innovative products). The information contained in the article may be useful for specialists in integrated innovative development programs of the Russian Federation; for the support of innovative targeted programs and projects.

Keywords: national innovation system; innovations; management; innovative development; science; state.

JEL Classification Codes - F4

Relevance. At present, NIS concepts have been widely developed in domestic and foreign science directions aimed at exploring the simultaneous development of the national innovation system and public policy, namely: the development of models of scientific and technological progress and the consideration of factors characterizing intellectual and innovative activity in building macroeconomic production functions ; Development of economic growth models taking into account innovation activities; Analysis and modeling of innovation diffusion; Various approaches to the definition and typology of innovation; Research of the dynamics of innovation processes; Analysis of innovation at the enterprise level; Modeling behavior in competitive markets with innovation; Assessment of the role of the regions in the development of the innovation economy and the formation of innovative policies. At the present time, issues of regulatory and legal support for innovation activities at the federal and sub-federal levels still remain unresolved while developing the forms and conditions for the transition to an innovative economy, the strategy of state innovation policy; When developing integrated programs for innovative development of the subjects of the Russian Federation; To justify targeted innovation programs and projects, as well as innovative systems of enterprises.

Novelty. The performed research allowed: 1) to reveal the absence of a single point of view on the essence, structure and functions of the national innovation system; 2) to study in more detail the basic structure of NIS and to allocate corresponding blocks: producing knowledge and training innovative personnel; Creating an innovative infrastructure; Producing innovative product and implementing state policy; 3) to determine that for Russia, the "triple helix" model (science-state-business) is not yet fully formed, but rather represents paired relations: "science-business", "state-science", "state-business". At the same time, science remains a relatively isolated sphere of activity, business - insufficiently motivated to innovate, and the small innovative business sector - undeveloped; 4) identify the conditions under which the Russian economy is able to move to a qualitatively new level of development.

INTRODUCTION

The processes changing the main economic development vector and forming a new type of economy, where knowledge sector is about to play a crucial role, whereas a source of economic growth is knowledge production started developing in the early 21st century [1]. This means that the system of scientific knowledge, new technologies, innovative processes, products and services, as well as new business forms becomes economic growth dominant [2]. Innovations get transformed into a strategic growth factor altering the economic organization of society affecting the structure of social production and stabilizing the social situation in the country. The most intensive process of national innovative systems (NIS) formation is registered in developed economies [3]. The concept of national innovation system began being applied actively since the beginning of the last decade of 20th century in the studies carried out by international organizations within the political programs of individual states. It is no coincidence that the concept which was recently introduced in economics academic researches, almost immediately began being used in the official investigations of public organizations [4].

Currently, NIS concepts are widely practiced in domestic and foreign sciences. They are focused on the study of the national innovation system and state policy simultaneous development, namely, scientific and technical progress models development and account for the factors which characterize the intellectual and innovative activities in the construction of macroeconomic production functions; economic growth models development based on innovations; innovations diffusion analysis and modeling; different approaches to innovations definition and typology; innovation processes dynamics study; innovations analysis at the enterprise level; modeling of behavior in competitive markets with innovations; assessment of regions role in developing innovations economy and shaping innovation policy [5]. At the present time, some issues of regulatory and legal support for innovative activities at the federal and sub-federal levels still remain understudied. It concerns the development of forms and conditions for the transition to an innovative

economy, state innovation policy strategy; elaboration of integrated programs for innovative development of the territorial units of the Russian Federation; targeted innovation programs and projects, as well as enterprises innovation systems justification.

METHODOLOGICAL FRAMEWORK.

The results of fundamental and applied research in the field of innovation, as well as laws and regulations [6], official statistics, articles in specialized magazines and scientific journals served as the basic materials for studying the problems of the national economic system.

DISCUSSIONS

J. Schumpeter [7], B. A. Lundvall [8], C. Freeman [9] made a significant contribution to the NIS theory. K. Freeman, professor of the University of Sussex (UK), swedish economist B. A. Lundvall and English economist R. Nelson [10] are considered to be the founders of national innovation system formation theory. The scientists have analyzed the development of innovation activities in different countries, and based on this developed the concept of “national innovation system”. The analysis is based on the data earlier obtained by Schumpeter when developing economic dynamics theory; F. Hayek’s findings (his dispersed knowledge concept); D. North institutional theory elements; R. Solow, P. Romer and R. Lucas’ research results. Each of the scientists offered his definition taking into account different elements and interrelations in the national innovation system. In this case all the authors adhere to a single point of view on the definition of methodology and methodological principles among which they singled out the following:

1. knowledge plays a determining role in economic development;
2. competition between economic agents based on innovation seems to be the main factor of economic dynamics initiation;
3. institutional aspect of innovations has a direct impact on their content and structure;
4. changes in social structures lead to stirring up innovations in various spheres;
5. innovation process takes place in special innovative infrastructures.

The Russian researchers, for example A. E. Sergeeva [11], N. I. Ivanova [12] A. A. Gretchenko [13] single out the following NIS characteristics:

- Systemic. This means that the national innovation system is considered as a set of elements which interact with each other in a special way;
- Institutional context. Existing social formal and informal institutions in a certain way influence the pace and scale of innovation;
- National innovation system main functions definition as the spread of the latest discoveries and technologies.

According to a professor L. Oyuuntsetseg, NIS could be considered as “a holistic diversified complex of public, private and non-governmental organizations subjects at various levels and legal, financial, organizational and social institutions, which jointly and severally make their contribution to the reproduction, storage, dissemination and use of knowledge necessary for the development of new products, technologies and services (i. e. innovations) in order to meet individual and social needs and ensure economic growth and sustainable socio-economic development of a country” [14].

Despite the existence of a large number of studies on the national innovation system, there is still no universally recognized definition.

So, C. Freeman argues that the national innovation system is a “network of institutions in the public and private sectors, the activities and interactions of which result in import, modification and spread of new technologies”. According to B. A. Lundvall, “the innovation system is formed by the elements and relationships which interact in the production, distribution and use of new and economically useful knowledge... the national system includes the elements and relationships located within the boundaries of the nation state”. According to R. Nelson, “The national innovation system is a set of institutions the interactions of which dictate the innovative activities of national firms”.

A huge variety of existing definitions shows that to date there is no yet a unified point of view on the nature, structure and functions of the national innovation system. The situation is complicated by the fact that NIS is often

influenced by national features. In the US, for example, in the narrow sense the innovative system is understood as a scientific and technological system including institutes, universities, innovative business, high-tech corporations which in their turn produce new knowledge. As for European school, it understands innovation system in a broad sense as the distribution, acquisition and use of knowledge through learning processes that take place between economic agents, experiments and improvement of technologies and products during their use.

According to the modern interpretation, NIS is considered as one of the theory leading concepts and at the same time the development of innovative practices such as research methodology in the field of development, as well as a mechanism for the implementation of science, technology and innovation policy.

Thus, foreign and domestic scholars attempted to identify the main trends and characteristics of the national innovation system.

RESULTS

According to such Russian experts as G. B. Kleiner [15], O. G. Golichenko [16], I. G. Salimyanova [17], the basic elements of the innovation system can be grouped into six main sections: 1) business sector (companies that produce innovative products); 2) state (government agencies that determine the state innovation policy, ministries, agencies and other funding and regulatory agencies); 3) research sector (universities and research institutes); 4) technologies transfer organizations and other innovation infrastructure elements (industrial parks, innovations commercialization and transfer centers, business incubators); 5) organized civil society (non-governmental organizations affecting innovative development); 6) foreign partners in innovations [18]. Summarizing the data of domestic and foreign researches, in our view, NIS can be defined as a system of ten units: 1) strategy and priorities of innovation policy, 2) regulatory framework for innovative activity development and promotion, 3) innovations infrastructure, 4) knowledge generation and dissemination system, 5) innovative enterprises,

including large scientific and industrial corporations, high-tech industrial production, 6) institutions in the field of education and vocational training preparing personnel specialized in innovations organization and management, 7) market conditions conducive to innovations 8) marketing and financial components of innovations creation and promotion system, 9) system of interaction with international innovation environment, 10) innovation development mechanism reflecting the system of relationships between these elements. Thus, NIS basic structure contains the blocks producing knowledge and conducting innovative personnel training; creating innovative infrastructure; producing innovative products and carrying out public policies. As a rule, the units interact according to the following schemes –“state-science”, “science-production”, “state-production”. The simplest model of NIS elements interaction boils down to the fact that the private sector is aimed at market innovations and technologies development based on its own research. Whereas the state should promote fundamental knowledge and a set of strategic technologies production, as well as the creation of infrastructure and favorable institutional environment for innovative activity. Various

embodiments of this notional model form the national innovation system.

The transition of the economy to an innovative path of development is only possible when a globally competitive national innovation system –a system of tools, mechanisms and infrastructure to support innovation in all spheres of economy and social life – is formed. In accordance with the best international practices, systematic innovations stimulation and economy sectors technological development, as well as the innovation system fragmentation elimination are largely ensured by the creation of an effective national innovation system.

Figure 1 shows the innovation profile of Russia and OECD countries at year-end 2015.

Official statistics [19, 20] shows that despite the current positive trends and active state policy in the sphere of innovation (the innovations development strategy of the Russian Federation until 2020 “Innovative Russia 2020” and creation of geographically isolated complex (Innovation Center “Skolkovo”)) the following serious obstacles and problems on the way to a strong national innovation system formation can be singled out:

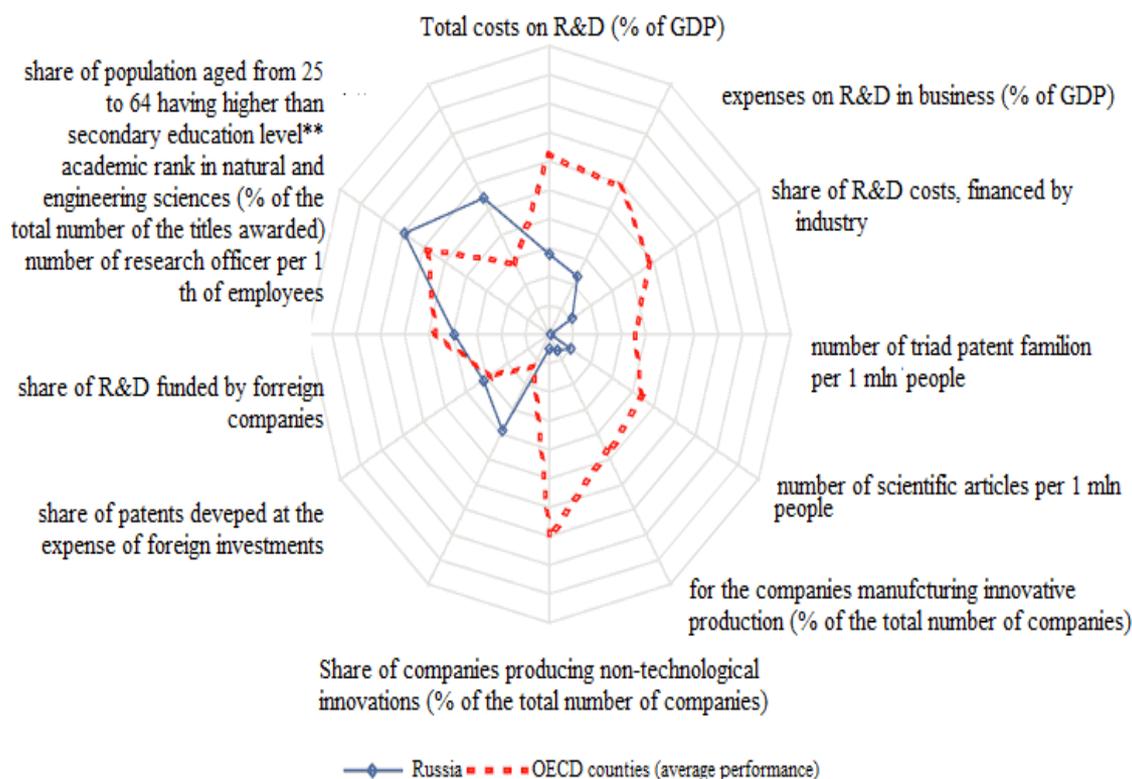


Figure 1 Innovative profile of Russia and OECD countries

1. structural bias in the area of extractive industries, mainly oil and gas and mining industries;
2. almost complete absence of high-tech industries producing consumer goods;
3. state control over the main technologically sophisticated industries, such as government control of nuclear energy;
4. share of fundamentally new developments in the expenditures on technological innovation is about 18%, whereas in OECD countries this share amounts to 33%;
5. number of small innovative companies and start ups is very limited;
6. small number of proprietary advanced technologies (2.6%);
7. more than 90% of the products produced in engineering industry are not competitive with foreign products;
8. share of innovatively active organizations amounts to less than 10%, while the share of expenditure on technological innovations in the total volume of products shipped is slightly higher than 4%;
9. machinery and equipment export is only about 10% of the total number, while the raw export is more than 77%;
10. low R&D funding from the private sector - about 40% in total, while in other countries more than 2/3 of the costs accounts for developments.

It should be noted that in the case of Russia, the model of “triple helix” (science-state-business) is not yet fully formed, it is represented by mostly paired relationships “science-business”, “state-science”, “state-business”. At that, science remains to be relatively isolated scope of activity, business is not enough motivated for innovations, and small innovative entrepreneurship sector is undeveloped. The excessive number of state interventions cripples network interactions development, interferes the emergence of new “bottom” initiatives and their natural development. Therefore, such components as horizontal linkages, intermediaries institution, flexibility of interactions between science and business are necessary for sustainable development of the national innovation system.

CONCLUSION

Scientific value. The conducted research revealed that one of the “bottlenecks” of the Russian innovation system is the connection between the researchers conducted by state institutions and the ones conducted private companies. There are a number of structures designed to fill this gap: technology parks (appeared in the late 1980s), centers for innovations commercialization (appeared in 1996) and technology transfer centers (appeared in 2003). However, despite these efforts, the gap between the public and private research and development sectors is not yet eliminated. The work outlines the conditions under which the Russian economy is able to move to a qualitatively new level of development.

All the segments of the Russian national innovation system cooperate with foreign partners in terms of innovations. The cooperation is implemented through joint ventures, partnerships within the framework of contract researches and joint research projects. An increasing number of foreign companies enter into contracts with the Russian Research Institute for commercial researches. The funds of foreign partners account for about 10% of all Russian expenditures on research and development.

Russia's transition to an innovative path of advancing development is only possible upon the creation of the following conditions:

- Every company which is in a position to develop new technologies in the promising directions of economic growth could have access to cheap long-term loans;
- Any research and development team that creates new technologies can receive funding for the implementation of innovative projects and implementation of the results in industrial production;
- Each company developing new technologies can gain access to credit for the necessary R & D and state-regulated markets for their production distribution;
- Consumers are interested in buying high-tech products of domestic production;
- Economic entities have easy access to the scientific and technical information and would see the prospects for the development in their

field and develop advanced technologies in a timely manner.

Thus, the basic perspective directions of innovative management approach may include: reasonable and conscious selection of enterprise development goals; ensuring the relationship between the company and the external environment, managing and managed subsystems, which determines optimal conditions for functioning and development of economic entities.

Novelty. The research conducted allowed: 1) revealing the absence of a single viewpoint on the essence, structure and functions of the national innovation system; 2) studying in more detail the basic structure of NIS and allocating corresponding blocks: producing knowledge and training innovative personnel; creating innovative infrastructure; producing innovative product and implementing state policy; 3) determining that in the case of Russia, the “triple helix” model (science-state-business) is not yet fully formed, but rather represents paired relations: “science-business”, “state-science”, “state-business”. At the same time, science remains a relatively isolated field, business remains insufficiently motivated for innovations, and the small innovative business sector remains undeveloped; 4) outlining the conditions under which the Russian economy is able to move to a qualitatively new level of development.

RECOMMENDATIONS

The main conclusions and provisions of the research are applicable to addressing the issue of the Russian national innovation system formation. The results can be used in: the process of improving the legal framework of innovation activities at the federal and sub-national levels; the development of forms and conditions for the transition to an innovation-driven economy, state innovation policy strategy; integrated innovative development programs development in Russia; support of targeted innovative programs and projects, as well as innovation systems of enterprises. The research materials may be used in higher education and namely in the disciplines: “Innovative Management”, “Strategic Management”, “Innovation Financing” and

others, as well as in the system of additional vocational training (in-service training, professional retraining programs, MBA programs).

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