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Economic Models for Institutional Gaps' Elimination in the Framework of Innovation

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ABSTRACT

The relevance of the studied problem in the paper stems from the fact that the study of the issue of co-operative links between science and industry is quite acute at the moment, because it is a weighty problem in overcoming the backlog of Russian level of technological development from the developed countries. The purpose of the paper is to systematize the prerequisites of the gap between the scientific and industrial sectors in the manufacturing sector of Russian economy and give recommendations of economic models, the implementation of which will minimize the institutional gaps. The leading method to the study of this problem is the method of systematization of factors indicating the existence of institutional gaps in the innovation sector of the Russian economy. The paper presents the Russian practice of interaction between science and industry, reveals the national peculiarities of integrative links between science and industry, based on the problems identified as the minimization of institutional gap offers a "triple helix" a model and formed on its basis the model of technological platform. Paper Submissions are of practical value for the government authorities in the development and implementation of federal and regional programs of innovative development, of innovative infrastructure's development, stimulating of innovation, and the use of tools of technological platforms.

KEYWORDS
Integrative cooperation, innovative development, triple helix, the institutional gap, "steering gear", institutional "traps".

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Introduction

The relevance of research

An important task in the development of the national innovation system is to minimize the institutional gaps between science and industry. Under the institutional gap is invited to understand the situation in which the innovation flow from the sphere of science into the sphere of production is not at all stages of movement supported by Institute of Innovation. Study of co-operative relations between science and industry is quite acute at the moment, because it is a weighty problem in overcoming the backlog Russian level of technological development from the developed countries. In countries without going through a period of state monopoly, the predominant part of the research is realized directly by companies manufacturing innovative products. In the pre-crisis period the Russian science production accounted for only 5% of the personnel in Russia, participating in research and development and about 6.5% of the total R & D carried out in the country (Sukhovey, 2009). This makes the bandwidth (transfer of new knowledge from the scientific sphere into the production) of the national innovation system very low, it preserves low cost-effectiveness of the implementation of research and requires additional investment in innovation infrastructure. The institutional gap between science and industry is one of the main reasons that today only 8-10% of innovation projects are commercialized in Russia and demand for R & D results is provided by imports.

The hypothesis of the study is the assumption that technological platforms are effective tools to overcome the current institutional gap in the value chain in the field of innovation and institutional traps of double-stranded innovation interactions in Russian conditions.

Methodological Framework

The theoretical base of research

The theoretical basis of the research is fundamental and applied works of foreign and domestic scientists studying the institutional models and the institutional framework of innovation processes. Object of research is institutional gaps arising between the parties in the framework of innovation. The subject of the study is organizational and managerial relations arising in the process of interaction between science, business and government in the framework of innovative development. The aim of the study is to identify tools to minimize institutional gaps that arise at different stages of the innovation process in the conditions of Russian reality and ways of their solution.

Research Methods

The study is based on the method of systematization of analytical data characterizing the foreign and the Russian economy in the context of innovation, as well as the methods of formalization, of analysis and synthesis. An integrated methodological approach made it possible to achieve the objective results of research.

Stages of research

In the course of the study: 1) the problem of interaction between the participants of the innovation process, implemented in Russia is identified; 2) the evolution of the system of partner interactions is shown; 3) technological platforms as instrument to minimize the institutional gaps in the framework of innovation are proposed and justified.

Theoretical and practical significance of the study results

The theoretical significance of the research is to clarify the role of technology platforms in order to address the institutional gaps in the framework of innovative activity in the Russian economy.

The practical significance of the findings and results of the study lies in the possibility to improve the mechanisms of development and implementation of federal and regional programs of innovative development, use of technology platforms' tools while minimizing the negative effects of institutional traps by government authorities.

Results

The problems of interaction between participants of the innovation process, implemented in Russia are revealed

As part of the researched question it is important to study the structure of financing sources of technological innovation. Big business is little interested in this category of innovation; while for small business the innovation are the key to successful development. Despite the existence of various business support programs in the field of high-tech industries the main source of funding for R & D are the companies' own funds: accumulated and retained earnings, depreciation, share capital, proceeds from the sale of shares, the proceeds from the issue of securities (Figure 1) (Kudryavtseva, 2016).

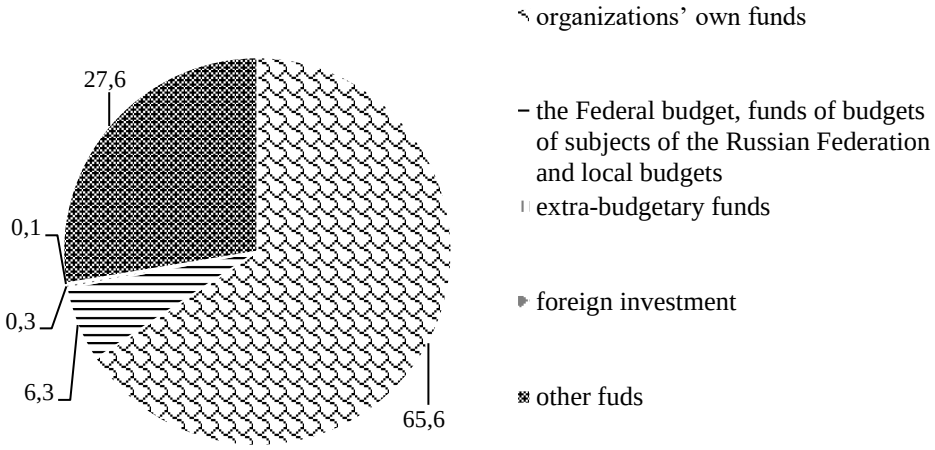
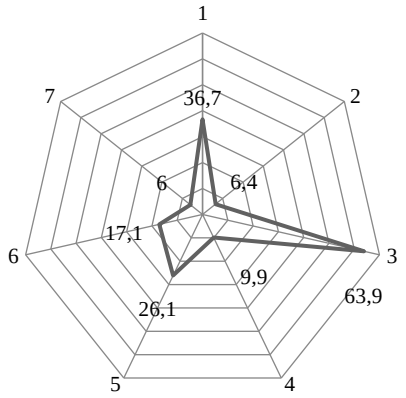


Figure 1. Sources of financing technological innovation in high-tech sectors of Russia, 2014.,% (RY HSE, 2016)

An important problem of Russian science is the low level of demand of the national economy on research and development. The World Economic Forum annually assesses the degree of cooperation of science and business in the field of research and development. According to the evaluation, in 2014 Russia occupied the 45th place out of 140 countries with an indicator of a weighted average of 3.6 out of possible 7 (2011 -. 85 place out of 144 countries with an indicator of a weighted average of 3.4 out of possible 7). In turn, the United States in this rating occupies the 3rd place with the closeness of cooperation between universities and industry - 5,8 (World Economic Forum, 2015). Although the competitiveness of domestic science, preference is given to

the acquisition of existing technologies abroad, which is explained by the relatively low degree of riskiness and lower cost (Figure 2).



1 - research and development, 2 - acquisition of patents and patent licenses 3 - purchase of machinery and equipment 4 - acquisition of new technologies 5 - acquisition of software, 6 - education and training of personnel 7 - Market Research

Figure 2. The share of the manufacturing sector organizations engaged in certain types of innovation activities in the total number of organizations implementing technological innovation by the end of 2014 (RU HSE, 2016)

For the manufacturing sector of the Russian economy in the R & D priorities are the acquisition of machinery and equipment (63.9%) and research and development on their own (36.7%) (RU HSE, 2016). At the same time according to the results of 2014 the largest share of newly introduced innovative products in the total volume of shipped goods, works and services is new just for the organization - 4,9% (in high-tech sectors of the economy). New to the world market in 2014 were only 0.01% of all goods, works and services rendered, whereas in 2013 the rate was 0.04%, in 2011. - 0.9% (RU HSE, 2015).

There are many reasons for the passive conduct of business in R & D. In accordance with the results of a poll conducted by the Russian Union of Industrialists and Entrepreneurs, the main obstacle in the innovation activities of companies is the lack of their own funds (see Figure 3).

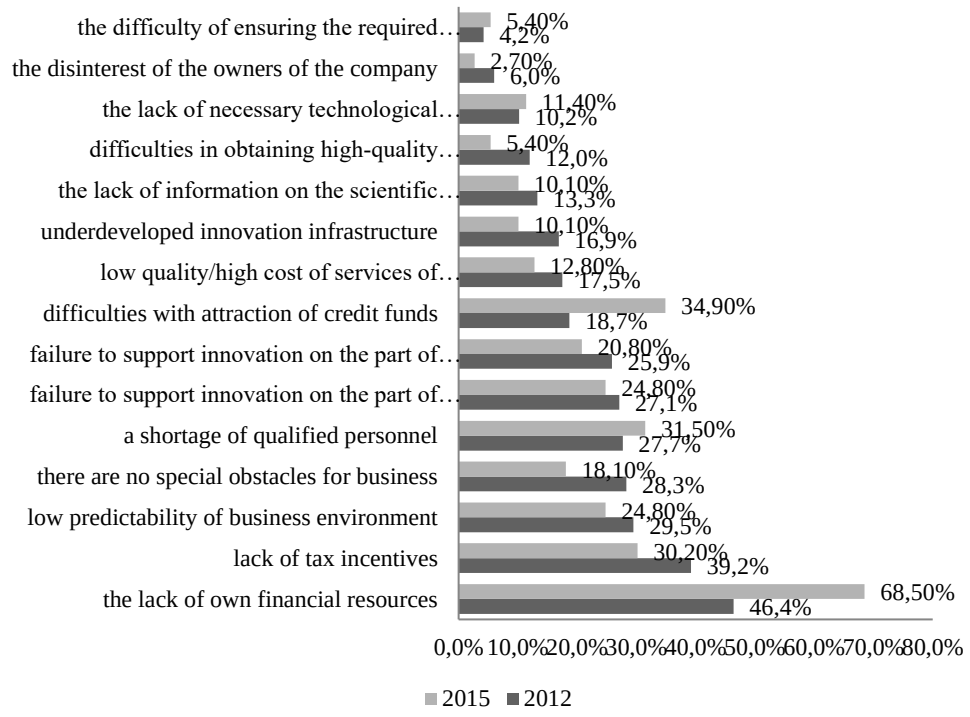


Figure 3. Constraints to growth in demand from the business on R & D in Russia (% of respondents) (RSPP, 2015)

It is necessary to pay attention to such factors as lack of qualified specialists. Despite the increase in the number of researchers with advanced degrees (2008 - 101 thousand people in 2014 - 109 thousand people), the total number of personnel engaged in research and development, is gradually declining (Figure 4).

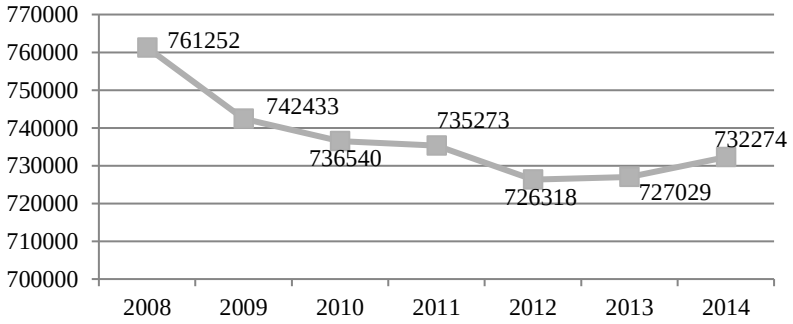


Figure 4. Dynamics of the number of personnel engaged in research and development (pers.) (Rosstat, 2016)

So, in 2013, 63.5% of employees (mostly young staff) left the scientific organizations of their own accord due to socio-economic issues (RU HSE, 2015). Accordingly, the proportion of the oldest age groups of scientists is increasing:

employees aged over 60 make up 26%. At the same time, the share of entrepreneurs who do not see any obstacles to innovation is increasing: there is a positive trend in the range of 7% (RSPP, 2015)

As it is noted by M. Weber, entrepreneurship initially relies on science and technological innovation. Thus, entrepreneurs are actively encouraged by scientific inventions, creating the potential demand for innovations. Elimination of the existing obstacles in the interaction of science and business is intended to state, as the coordinator of a joint effort.

Evolution of system of partner interactions

Historically partnerships have in the development 3 stages. In the command economy system in relations between the state, business and science the static model was dominated, wherein there was a lack of interaction. There was a prevailing state regulation of economy, business, and science. Lack of competition leaded to low interest from the enterprise to the scientific developments. Monopolies were maintained by ministries and departments and took a strong position in the national economy (Figure 5)

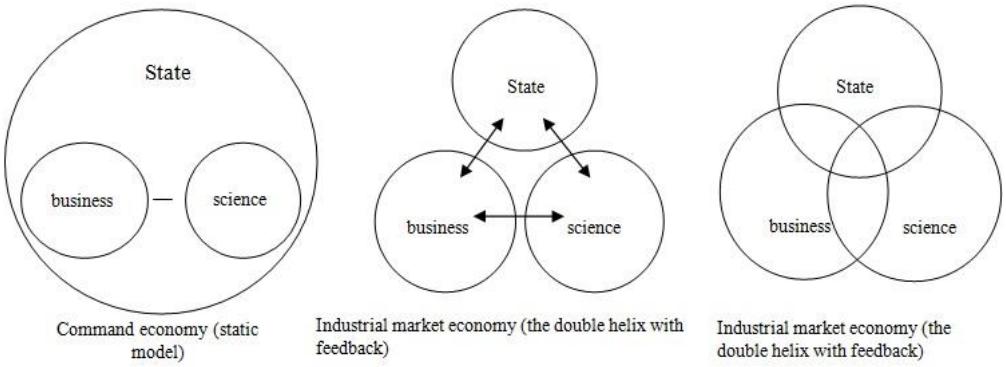


Figure 5. Evolution of the system of partner interactions (Katukov, Malygin & Smorodinskaya, 2012)

The industrial market economy contributed to the emergence of double interactions between these institutions. There are effects of economic agglomeration in a competitive environment. As an example of interaction between government and business serve financial-industrial groups. Science is embedded in industrial production, resulting in well-known inventions intended for production purposes.

During the post-industrial economy the innovative environment appears which is characterized by an interactive co-ordination. The success of innovation depends on the density of synergy interaction of three sectors simultaneously. We are talking about the formation of the cluster alliance, the relationship system in which is described by the model of the "triple helix" (Katukov, Malygin & Smorodinskaya, 2012).

Each of the three institutions of the "triple helix" (universities, business and government) fulfills its function: business fulfills production function; state – the function of regulation of contractual relations between the parties, guarantying the

stability of the interaction and exchange of information; Universities are the source of new knowledge and technologies.

A key role in the "triple helix" model belongs to universities. This is due to the fact that knowledge is becoming a key factor in the competitiveness of the state. Unlike public-private partnership, in which the dominant role is played by the state, "triple helix" puts forward the science in the first place. There is a process of cooperation network of three players: their competencies are combined and acquire the character of interchangeability (fields of circles' overlay in Figure 5).

Institutes mutually interact at every stage of the innovation process. At the initial stage of knowledge generation there is an interaction between the state and science, then in the process of technology Transfer University cooperates with the business, and the result is output to the market jointly by the state and the private sector. Interactions' effectiveness depends on the fact with which the participant of the model they are working. Great importance is the interchangeability of the participants: the science develops the role of companies, business centers - the role of universities, the state - the role of the representative of venture capital financing (Etzkowitz, 2008).

Today the model of the "triple helix" is considered a classic model of collaboration needed for innovation and applied in the economy in both developed and developing countries and countries with economies in transition (MacGregor & Carleton, 2012). Russia is a country in which the model does not work fully. The domestic economy retains the features of semi-market system, dominated by only the paired relationship with the dominance of the state and the lack of feedback (Figure 6)

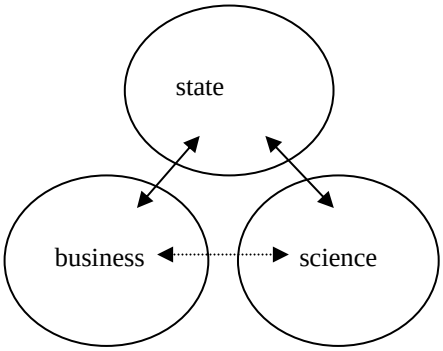


Figure 6. Cross-sector cooperation in the Russian economy: the incomplete double helix (Katukov, Malygin & Smorodinskaya, 2012)

The result of incomplete inter-sector cooperation is the emergence of institutional "traps" - situations preserving inefficient in terms of stability of innovative development of the institutional path, only optimal for two participants - a local optimum ("anti-institute of innovation"), where participants aim to ensure that new technologies do not appear, trap are persisted (Shinkevich, 2011).

Let's consider the trap in double-helical model. There is a direct relationship between the degree of differentiation of the components in the "spiral", related to innovation and the market, and the likelihood of "traps". This regularity to a certain point makes it possible to sustainable development, as these components can perfectly interact in different types of economic activities together. In collaboration "science-business" technology trap occurs as a result of a closed process chain.

Traps in a spiral "state -science" are expressed as "failures" of government support for innovation (Shinkevich, 2011). Cross-sector cooperation with state participation cannot be overcome due to the desire of the state to preserve the vertical relationships with other members of the "spiral", which is contrary to the modern innovative requirements. Therefore, the state cannot overcome such pitfalls. As a priority source of funding, state supports in Russia, first and foremost, a major raw material business. As a result there is a stable local optimum between business and government.

M.V. Shinkevich (2011) connects institutional traps with the existence of a negative transactional effect of innovation development in the manufacturing sector. Manufacturing production are including, chemical technologies which relate to the high-level medium technology sector. The state is interested in supporting not all kinds of production, so the output is a technology platform that combines and high-tech sub-sectors (field of new materials, deeper processing of hydrocarbon raw materials, energy efficiency, energy saving, nuclear energy and so forth.) and low-tech traditional and commodity production (fertilizers, production of petroleum, mining, metal processing, etc.).

Technology platforms - a tool to minimize the institutional gaps in the framework of innovation

Comparing the level of innovation in sectors such as mining, manufacturing, and marketing research, engineering availability of raw materials is observed for raw types of economic activity, as foreign companies are interested just in the feed stream, independent processing of raw materials and production of new products (Figure 7).

R & D in the manufacturing sectors of the economy are low, are depressed in the result of pressure of innovations' developers, sales of obsolete technology and imports of high-tech products. This problem prevents the increase of Russia's position on the world stage (Galimulina et al., 2016). We propose to minimize depression from imports of high technology products and to increase the level of development and, consequently, exports of R & D in the manufacturing sector of the economy through technological platform as a tool for balancing the level of innovation in these types of economic activities. Macro-technologies representing the core of technology platforms will integrate the processes of production, processing and marketing of high-tech products in a single chain, which will increase the level of competitiveness, the volume of Russian exports and eliminate the suppression of the Russian science from the imports.

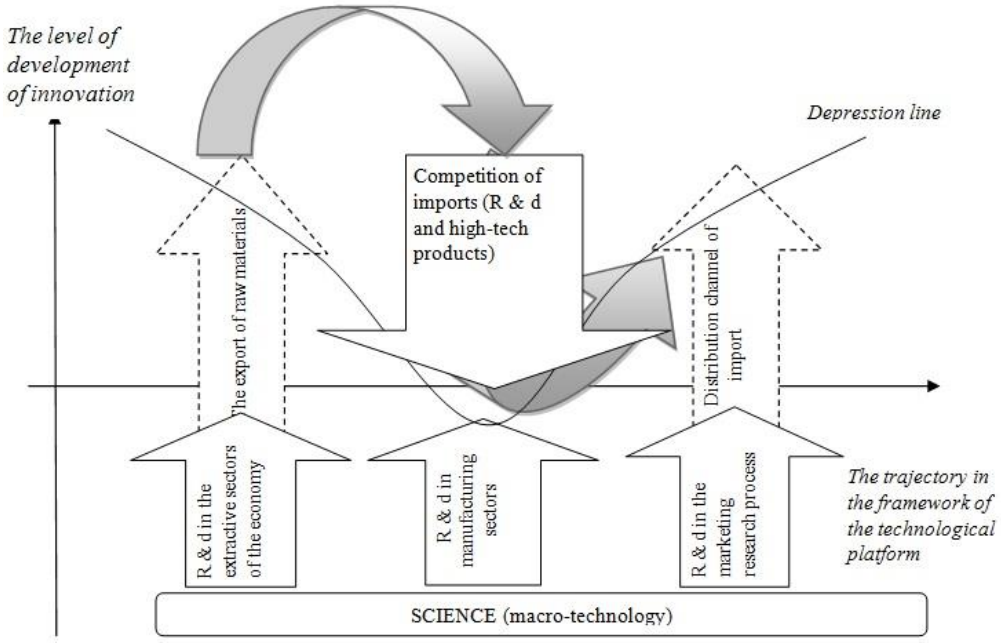


Figure 7. Depression of high-tech sectors of the Russian engineering model (Galimulina, 2015)

Overcoming of institutional traps is possible with third-party's innovative intervention in the framework of double helices. Model of "triple helix" formed the basis of the principles of the formation of technological platforms. Under the technological platform is to be understood communicational tool aimed at stepping up efforts to develop advanced commercial technologies, new products and services, to attract additional resources to research and development based on the participation of all stakeholders (business, science, government, civil society), to improve the legal framework in the field of science and technology, innovation development. Technology platforms, along with other tools, are designed to intensify the interaction between the various actors of the innovation system. The key players are not only scientists and R & D practitioners but also managers, production associations, government authorities, businesses, consumer groups, etc.

Discussions

Bridging the gap between the industrial and scientific sectors is the most important task of formation in Russia of a favorable climate for innovation. In economic literature, this phenomenon is known by the terms "failure", "abyss", "valley of death", in the study are involved scientists like (Hochberg, 2003, Freudenthal & McLaughlin, 2009, Saritas, 2013, Rudnik, 2011, Khokhlov, 1990, Shinkevich, 2011).

M.V. Shinkevich (2011) in his work examines predictors of institutional traps, based on the existence of a negative transactional effect of innovation development in the manufacturing sector. However, it is not specified within what interactions appear these traps (science - business, science - government or business - state) and the attention is not paid to integrative interaction of these institutions within the

framework of the "triple helix" model and solving problems on the identified institutional traps' minimization.

Conclusion

Thus, the model of the "triple helix" and based on it the tool of technology platforms is designed to overcome the institutional gap between science and industry. At the same time the national innovation system in Russia should seek to eliminate the blurring contours of the system, its lack of backward linkages and coordination of actions and to identify the participant clearly who is responsible for the optimal decisions and their implementation. Detailed analysis of the pairwise interaction of Institutes Science - business, science - government, business - the state enabled to reveal the problems inherent in the Russian innovation system and to formulate a set of measures to optimize these interactions that will provide a more complete use of the innovation potential of the Russian Federation.

Disclosure statement

No potential conflict of interest was reported by the authors.

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