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INTERACTION "SCIENCE-BUSINESS" IN THE SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT OF THE COUNTRY

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Abstract

In recent years, the state has been strengthening research competencies of leading Russian universities and intensifying their cooperation with the real sectors of the economy in the field of research, development and training. The successful development paradigm of the country, transition from a raw material economy to an innovative one, is based on the human capital. Its improvement can be a response to the challenges of the emerging knowledge economy and the venture science and technology business. The authors focus on the role of universities which act as mediators between science, education and business. This does not diminish the importance of the state and the business sector for the development of research and production cooperation. Characteristic features of the interaction of specialized universities and state-owned companies implementing innovative development programs were identified and described. The theoretical and methodological basis of the article is the general scientific methods. According to the results of the comparative analysis, the main obstacles to a mutually beneficial cooperation were identified. The article reveals the mutually beneficial cooperation mechanisms used by companies. This direction is also complemented by foreign practices of interaction between the state, business and science. The international practices of implementation of training programs were described. The practices of Great Britain, China and Saudi Arabia were considered as examples of success. The degree of participation and the share of the state and business in the structure of research and development funding were analyzed. Effectiveness of interaction between science, innovation and business was assessed.

Keywords: Interaction, state, science, business, universities, state-owned companies.

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1. Introduction

Based on the requirements of the Strategy of Scientific and Technological Development of Russia, the main guidelines of scientific and technological development are as follows: creation of "opportunities to identify talented youth and build a successful career in science, technology and innovation" (Putin, 2016, p. 36); assistance in active interaction of scientists with businesses, society and the state; desire to hold an exceptional position at the world level.

The level of innovative development of the national economy is determined by the quality of human capital developed by the national education system interacting with organizations implementing projects aimed at creating high-tech products.

According to the priority directions of strategic development, the state allocates more funds for research and development. It should be noted that investment in research and production cooperation and training is beneficial for the state, businesses, individuals and society as a whole.

2. Problem Statement

Russia lags behind many states (15 leading innovation economies and 45 EU countries, OECD, BRICS) at different stages of the innovation cycle, especially at the commercialization stage. The strength is its human capital.

Our country has reached the level of the leading countries by the quality of school education and number of people having academic degrees. Russian universities strengthen their positions in individual subject rankings. However, there is a high risk of reducing the quality of this resource and the "brain drain".

There is an outflow of highly cited scientists from the country. The difference between the impact factor leaving and remaining in Russia is one of the highest. Russian scientists who left the country in 2013 had higher (0.94) impact factors which exceeded the average IF of Russian researchers (0.30), researchers returning from abroad (0.54) and foreign researchers (0.30) (RVC, 2017).

Negative dynamics can also be traced in the development of research and production cooperation, "gaps between science, education and business remain: the share of domestic industrial enterprises participating in joint research projects has decreased 1.1 times in the last two years, and 1.3 times for the period of 2010-2016" (RVC, 2017).

It is necessary to develop effective tools and methods for public-private partnerships that provide a balance between interests of the state and businesses and determine the degree and mechanisms of participation in strategic scientific and technological development.

3. Research Questions

Transition to new technological structures and modernization of the economy caused isolation of intellectual capital from human capital as its key element and a basis for modern economic development.

In the era of total competition and high risks, the countries focusing on maximizing the human potential and training highly qualified specialists at play a leading role.

Particular importance is given to universities acting as "producers" of scientific knowledge carriers who are potential innovators – young people who are able to understand and participate in the research

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process, ready to apply achievements of science and technology, create their own enterprises and implement ambitious technology projects.

4. Purpose of the Study

The state of scientific and technological development, the role of science and technology in ensuring a sustainable future is understudied.

The obvious relevance of the topic and its high significance for Russia, debatable aspects of the problem determined the choice of the research subject.

This situation requires focusing on the "science-business" model (Malganova, Saralinova, & Dokhkilgova, 2018) in the strategic direction of the national scientific and technological development and further research.

The search for opportunities to achieve strategic goals of the national scientific and technological development should be aimed at developing effective tools to stimulate and facilitate large-scale interaction of science, business and the state.

5. Research Methods

Based on the analysis of costs of domestic research and development and comparison of the contribution of the state and business to their financing, foreign experience, it was established that the state is the main source of support for Russian science.

The analysis made it possible to reveal that it is impossible to suppose that the innovative and scientific-technological development of the state is effective when the investment of business structures in research and development is much less than the contribution of the state.

However, based on the features of scientific and business sectors, it is impossible to shift the resource supply excluding the state from the scientific and production interaction.

The theoretical and methodological basis of the article is the general scientific methods: a systematic, logical approach, comparison, functional analysis, generalization.

6. Findings

Intensive interaction of companies and universities is carried out within the framework of the Government Decree of April 9, 2010 No. 218 "On Measures of State Support for the Development of Cooperation of Russian Higher Educational Institutions and Organizations Implementing Comprehensive Projects on High-Tech Production" (RF Government, 2010).

The state is supporting interaction of scientists, businesses and society.

However, it is impossible to do without skepticism about the effectiveness of interaction between science, innovation and business.

Scientific and technological development of the country is doubtful if degree of the public contribution to the resource supply of research exceeds the contribution of business.

The largest source of support for Russian science is public funds: in 2017, their volume amounted to 674.3 billion rubles, which is 2.4 times more than the 2000 level and 0,4% less than the 2016 level.

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According to the HSE, the share of public funds in the total domestic research and development expenditures increased from 54.8 to 66.2%, but in 2017 there was a slight decrease. Almost 4/5 of the public funds, or 52.6% of the domestic research and development expenditures, are revenues of the federal budget (Ratay, 2018). In general, since 2000, there has been a positive trend in the research and development expenditures covered by the federal budget funds.

Businesses are an important but insufficient source of research funding – 307.5 billion rubles, or 30.2% of the total domestic research and development expenditures. The growth of research and development expenditures by 10.2% compared to 2016 increased the share of business investment by 2.1%. However, an 1.8 increase in similar costs for 2000–2017 did not change the share of business innvestment (Ratay, 2018).

Science depends on the interest of businesses in strategic development. The state of business depends on the current state of science. Thus, the interdependence of business and science is obvious.

Comparison of the public and business contribution to the research and development funding in Russia and abroad demonstrates that in most of the developed countries, business investment dominates: in Japan, the share of business investment is 78.1%, in Taiwan – 77.7%, in China - 76.1%, in the Republic of Korea – 75.4%, in Slovenia – 69, 2%, in Germany – 65.2%, in Switzerland – 63.5%, in the USA - 62.3%, and in Australia - 61.9%. In Israel and Bulgaria, almost half of the domestic costs are covered by foreign funds and more than a third – by the business sector (Ratay, 2018).

Innovation development programs of state-owned companies are included in the interaction process through joint research and various cooperation activities with universities (Gershman, Zinina, Romanov, & Ivanov, 2015).

According to the survey of state-owned companies implementing innovative development programs conducted by the HSE, the most essential function of state-owned universities is educational one (Fig. 01).

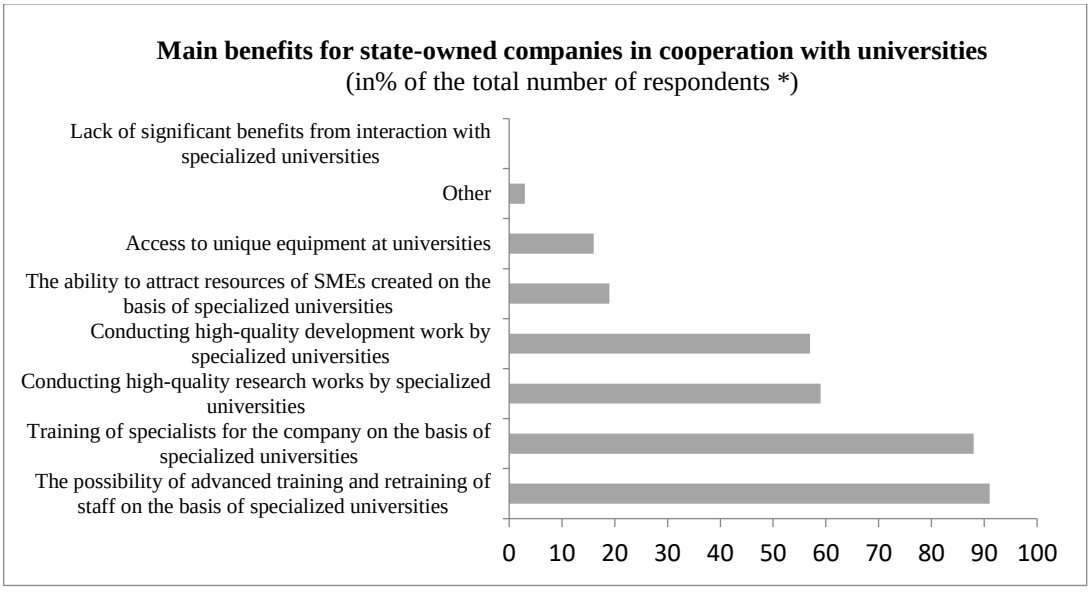

Figure 01. Interaction of state-owned companies with universities: benefits
* Exceeding 100% due to the ability of respondents to give several answers.
Source: The HSE survey of state-owned companies implementing innovative development programs.

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However, along with certain benefits, there are a number of obstacles to interaction of state-owned companies with universities (Fig. 02).

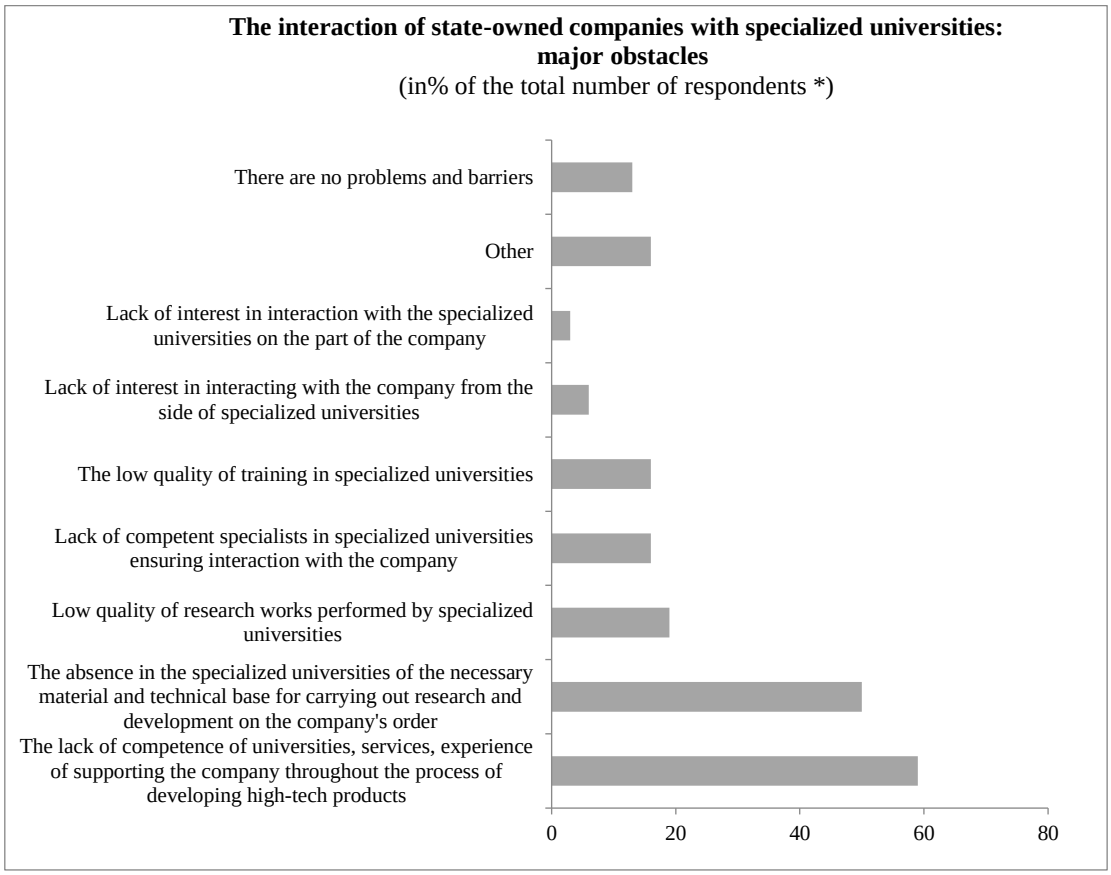

Figure 02. Interaction of state-owned companies with universities: obstacles
* Exceeding 100% due to the ability of respondents to give several answers.
Source: The survey of state-owned companies implementing innovative development programs.

According to the results of the comparative analysis, it is obvious that there are more obstacles for mutually beneficial cooperation of state-owned companies with universities.

The study revealed various mutually beneficial cooperation mechanisms used by companies:

- internships in companies;

- participation of company representatives in the development of educational programs;

- creation of specialized university departments;

- targeted training of students on the basis of specialized universities funded by the company;

- attracting representatives of universities to the scientific and technical council and other management bodies of the company's innovative activities;

- participation of company representatives in the boards of trustees of specialized universities;

- organization of specialized exhibitions and other platforms to inform universities about the needs of the company;

- provision of innovative infrastructure facilities by the company;

- assistance in developing innovative infrastructure facilities.

The most promising areas of improving the competitiveness of universities are as follows:

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- creation of innovation competence centers;
- creation of sectoral resource centers for collective use;
- creation of research and educational experimental sites.

Full-fledged training and development of human resources should be based on international experience.

The best foreign examples can be found in Great Britain, China and Saudi Arabia.

Internships in private companies are an example of training specialists.

A free service ("Graduate Talent Pool") allows employers to post internship opportunities for graduates. The program was launched in 2009 to improve graduates' readiness for long-term employment. It offers internship opportunities for UK employers in several economic sectors. Knowledge Transfer Partnerships projects are based on a partnership between a graduate, an employer, and an academic institution to solve short-term business problems. They are partially funded by the government (The guardian, 2011).

The Chinese government has launched large-scale projects, including the Thousand Talents program, to attract professionals who could work in the Chinese system of scientific research and technology (S & T).

Officials send talented youth abroad to receive additional education and research experience, learn leading international standards in science and technological know-how. Thanks to the government support, corporations are improving the value chain by updating production processes.

Chinese state-owned enterprises attract promising employees offering them high wages. In addition, they attract middle-aged employees working in multinational corporations in which they have reached the career top (ChinaBusinessReview, 2009).

In Saudi Arabia, the corporate academy was created. GE company signed a strategic partnership agreement with TVTC Corporation to create a technical academy. 150 graduates of technical universities of Saudi Arabia study at the Academy. Successful graduates are offered the opportunity to start working for the company (Genewsroom, 2011).

It is necessary to ensure the unity of priorities of regional development and interests of the most promising youth by encouraging young people to develop and implement their own projects (RCSS HSE, 2018).

The lack of these mechanisms decreases innovation activity and growth rates of labor productivity. The decline in the university innovation activities constrains economic activities and causes negative dynamics of the GRP.

7. Conclusion

The main competitive advantage of Russia is human capital. The "quality" human capital is able to initiate creation of a new business, launch technological projects, develop new or atypical economic sectors, increase labor productivity, quality of goods and services.

Effective policies that determine actions of public authorities in the field of science and technology should be focused on the support of scientific research and technological developments.

In general, the state support is focused on weak spots in relation to human capital:

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- quality of leading universities;
- increasing the share of the adult population participating in continuing education;
- publications in the journals indexed by the international base WoS;
- reducing the number of migrating scientists.

The efforts have not yet affected the statistics: the gap between the IFs of the Russian and foreign authors increased.

There is a positive trend in education quality indicators. The public measures are aimed to increase the share of people employed in science (at the expense of young scientists) rather than improve the quality of research.

The exception is the Russian National Project "5-100", which contributed to the formation of a significant segment of successful research universities.

In addition, with the support of the state, universities can purchase unique equipment. The access to this equipment has become an incentive for interaction between state-owned companies and the university sector, although one of the problems of cooperation is the insufficient level of development of the material and technical base of universities (RVC, 2017). Despite all the efforts of the state to develop research activities in universities, their educational function for state-owned companies turned out to be more important.

Innovation development of the regional economy requires solution of a set of tasks:

- development of a public-private partnership mechanism that provides a balance between public and corporate interests and determines the degree of participation in research and development investing;
- creation of conditions for the implementation of the innovation cycle, formation of demand for innovations;
- involvement of large businesses in R & D funding;
- development of efficient mechanisms of technology transfer from science to business.

Only science can change society contributing to intellectual values (Malganova et al., 2018).

Sustained growth of regional economies requires cooperation with universities which is characteristic of the USA, Japan, China, EU countries, etc. (Analytical Perspectives, 2010).

The current situation requires implementation of effective instruments to stimulate scientific and production interaction between science, business and society in order to ensure sustainable development of the country.

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