Priorities of personnel policy in the sphere of science

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Abstract. The development in the sphere of science and the results of scientific activity are determined by a complex of factors, where a prominent role belongs to scientific personnel. There was intensive development in the field of science and improvement of scientific organizations activities results. In Russia, on the contrary, a reduction in the number of scientific organizations, and the number of scientists was observed. The purpose of the study is to determine the priorities of personnel policy in the field of science based on an analysis of scientific personnel state in Russia in comparison with large developing countries that are members of the BRICS coalition; search for funds to strengthen the financial position, increase the efficiency of research organizations and the effectiveness of scientific personnel. The influence of science personnel potential on the country's position in global rankings has been proven. The need to revise the priorities for the development of science and the expediency of adjusting the state scientific and technical policy is justified. Conclusions about the need for further transformations in the field of scientific activity, the urgency of finding innovative forms of financial incentives for scientific research to strengthen the material and technical base and human resources of science are made. Further research is recommended to focus on finding innovative ways of state and public regulation, updating the applied economic instruments, and creating attractive working conditions for workers in the field of science.

Keywords: Training of scientific personnel · Financial support of scientific organizations · State scientific policy · Scientific results.

1. Introduction

The prerequisite of the research is the existence of a versatile, objectively manifested relationship between the levels of scientific and technological and socio-economic development. The stable functioning of the national economies in rapidly developing countries is periodically disrupted due to macroeconomic instability arising for various reasons. The impact of crisis situations on the condition of the economy and finances of the state has a multidimensional character, affects the effectiveness of the scientific and technical policy pursued by countries, traditionally attributed to the prerogative of national interests.

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The theoretical basis of the research is the work of Russian and foreign scientists, which comprehensively examines the role of science and technology in society (Abalkin, 2011; Tierney et al., 2005; Roberts, 2017; Hasbulatov, 2020), and focuses on the need to apply a systematic approach to the study of economic development patterns (Kleiner, 2021). Unstable functioning of RAS institutes and branch research institutes was characteristic of the period for the Russian economy market transformations (1990-2000). Scientific organizations have weakened ties with production and universities, partially lost their human resources.

Debatable issues are the effectiveness of scientific research and financial support of scientific organizations as a basis for obtaining high final results (Al-Ghazali, 2021; Molchanov and Molchanova, 2016). Human capital is considered as a key resource for maintaining high rates of economic growth and competitiveness of economic entities in the domestic and foreign markets (Aganbegjan, 2017; Olimpia, 2019). Attention is drawn to the priority of human capital formation and the methodological foundations of its measurement at the micro and macro levels (Lapochkina et al., 2021; Lutz et al., 2017). The existing approaches to the study of human capital are considered in detail (Anikin, 2017; Ivanov, 2013; Bulina et al., 2020), various problems of personnel potential formation in high-tech and knowledge-intensive industries are analyzed (Eskindarov et al., 2020); attention is focused on the role of high-tech products for the development of a globalizing economy, innovative approaches to science and technology management are justified (Uskov, 2020). Russia's position in the global innovation process is characterized by the Global Innovation Index (45 place in 2021). It is formed according to the results of the innovation systems comparative analysis for various countries of the world (132 countries in 2021) (Global Innovation Index, 2022).

The hypothesis of the study consists in understanding the need to differentiate the results of scientific activity: direct (giving impetus to the growth of production efficiency, stimulating leadership, increasing competitiveness on the world stage) and indirect (having a public resonance, manifested by education, social innovation) as well as building a policy for the development of scientific personnel potential on this basis.

The purpose of the research is to identify the priorities of Russia's personnel policy in the field of science. The objectives of the research are to study the existing problems of providing scientific organizations with specialist personnel, identify sources of funds to strengthen their financial position, form recommendations for the use of a systematic approach in the training of scientific personnel based on improving the efficiency of work and the development of financial incentives for the effectiveness of research organizations work.

2. Materials and Method

The work examines the organization of scientific activity in the large economies of the rapidly developing BRICS countries with an official data (Russia, Brazil, India, and China). The analysis period is 2000-2020. Sources of information are legislative documents of the Russian Federation, materials of Rosstat (Federal State Statistics Service), OECD, other analytical agencies, scientific works of Russian and foreign scientists. Calculations were carried out according to the purchasing power parity of national currencies against the US dollar in order to achieve comparability of cost indicators. The number of staff was calculated in the equivalent of full employment. This indicator is calculated as the sum of time fractions actually spent by personnel engaged in research and development on their implementation; it is measured in person years. Methods of induction and deduction, statistical groupings, comparative and content analysis, expert assessments were used in the process of analyzing the state of the scientific potential of the BRICS countries.

3. Results

Despite the difficult macroeconomic situation in the global economy, due attention was paid to the financing of scientific research in Russia and other BRICS countries during the analyzed period (2000-2020). It is testified by the positive dynamics of internal expenditures on research and

development, as well as an increase in the volume of allocations from budget resources. The share of GDP spent on financing science allows us to judge the state support (Table 1).

Table 1. Financing of research and development (million US dollars; calculated according to the purchasing power parity of national currencies). *Source*: (Science. Technologies. Innovations, 2022).

	2000 / in % to GDP	2010 / in % to GDP	2020 / in % to GDP
Domestic costs by country			
Russia	10504,4 / 1,05	33080,9 / 1,13	45382,5 / 1,10
Brazil	16589,9 / 1,05	32461,8 / 1,16	36315,5 / 1,16
India	16761,4 / 0,76	41232,6 / 0,79	58721,4 / 0,65
China	32936,6 / 0,89	212138,3 / 1,71	525693,4 / 2,23

Up-to-date information on the structure of research and development costs by sources of funds allows us to reveal the existing approaches of different countries to choosing priorities to support the activities of scientific organizations. The peculiarities of financial resources distribution between sectors of the national economy indicate differences in the ways of covering the costs of scientific organizations (Table 2).

Table 2. Structure of research and development costs by funding sources and science sectors (2020) (%). *Source*: (Science. Technologies. Innovations, 2022).

	Russia	Brazil	India	China
Internal research and development costs				
State funds	67.8	53.6	63.2	20.5
Business sector funds	29.2	43.5	36.8	76.3
Foreign sources	1.8	...	...	0.1
Other national sources	1.2	2.9	...	...
Public sector	32.8	...	56.1	15.1
Business sector	56.6	...	36.8	76.4
Higher education sector	9.8	...	7.1	8.1
Non-profit organizations sector	0.7	...	...	...

State funds occupy leading positions in the total amount of funds in Russia, India and Brazil; while in China, the priority source is the investment of entrepreneurs. Other national and foreign sources of raising funds for scientific activities occupy a relatively low proportion in the BRICS countries. The distribution of financial resources by sector indicates the investment priorities for business sector of science in Russia and China, which indirectly confirms the focus of these countries on the commercialization of research activities. India maintains a high level of investment in the public sector of science. The share of the higher education sector is relatively low in the structure of financial support for science in all BRICS countries. The sector of non-profit organizations of science does not receive significant development due to limited funding (see Table 2).

The state and structure of human resources have a priority role for the development of science. Information on the scientific potential of the BRICS countries is presented in Table 3: number of staff and researchers (in thousands of person years; equivalent to full-time employment). The human resources potential has grown significantly during the analyzed period in Brazil, India and China, which characterizes global trends in this area. In Russia, there was a decrease in these indicators in the science sector due to the reform of research activities organization and a decrease in government funding in the 1990s.

Table 3. Scientific potential of the personnel engaged in research and development (thousands of person years; equivalent to full employment). *Source*: (Science. Technologies. Innovations, 2022).

	2000	2010	2020/per 10,000 employed in the economy	Position of the country in 2020 *
Number of staff by country				
Russia	1007.3	840.0	748.7 / 108	4
Brazil	105.2	243.6	316.5 / 34	11
India	318.4	441.1	553.0 / 12	6
China	922.1	2553.8	4800.8 / 62	1
Number of researchers by country				
Russia	506.4	442.1	397.2 / 57	6
Brazil	51.6	134.3	180.0 / 19	10
India	115.9	192.8	341.8 / 7	7
China	695.1	1210.8	2109.5 / 27	1

* Among the countries of the world

Comparison of specific indicators (the number of staff and the number of researchers per 10,000 employed in the economy) leads to the conclusion that there are differences in the level of scientific potential development in the BRICS countries. These indicators lag significantly behind Russia and China in Brazil and India, which is partly due to the high population size and lower overall indicators of education level according to the ISCED-2011 classification levels (see Table 3). The highest indicator among the BRICS countries is observed in Russia, which reflects, on the one hand, the results of the professional education system, and, on the other, the attention of the authorities to the preservation of human capital during the reform of the national economy in the 1990s–2000s. Besides, Russia has a high proportion of people engaged in the public sector research, which is explained by the functioning of state organizations funded mainly from budgetary funds: institutions of the Russian Academy of Sciences.

4. Discussion

Prominent role in the BRICS strategic documents is assigned to issues of jointly pursued policy in the field of science, the development of scientific and technological activities of the coalition countries (The Strategy, 2020). New challenges are caused by the increase in the "knowledge intensity" of global GDP against the background of a global innovation system formation. Digital transformation creates equal opportunities for the dissemination of innovative technological solutions as a basis for improving the competitiveness and quality of population's life. Differences in the organization of scientific activity and its financial support were revealed based on the results of the analysis of information from the member states of the BRICS Integration Union Differences in the organization of scientific activity and its financial support were revealed based on the results of the analysis of information from the member states of the BRICS Integration Union.

The development of human resources is one of the priority issues of science management in Russia. The work on the preservation and reproduction of researchers' personnel is carried out systematically in various directions: national project "Science" is being implemented (Passport, 2018); network of unique scientific installations of the megascience class is being developed; 10 scientific and educational centers have been created at the level of world standards; wide range of tools are used to support researchers, young scientists and talented students: mega-grants program, grants and scholarships of the President of the Russian Federation, a system of funds to support scientific,

scientific and technical, innovative activities, mechanisms of "career elevators" in the field of research and development.

The potential of scientific knowledge is important for solving the problems of modern society. The activity of scientific organizations created in different organizational and legal forms is possible only with their balanced functioning in the sectoral and spatial aspects with the active use of innovative methods and tools of economic and financial regulation. Higher school sector is becoming an important resource for the development of applied scientific research. The key aspect of solving the personnel problem is to find ways to increase the attractiveness of a scientific career for young people. Coordination of actions between the highest legislative and executive authorities is no less important than the creation of a regulatory legal framework.

Finances from various sources should be used as much as possible to increase the sustainability of scientific organizations work. Budgetary and extra-budgetary financing of the work performed should be arranged. The discussion of the legislative consolidation of lower insurance rates in comparison with the normatively established rules is of interest to scientific institutions (in terms of the remuneration fund for researchers). Commercialization of applied research and the most effective use of budgetary funds in conducting fundamental research should become benchmarks for the growth of financial stability. Special attention should be paid to the differentiation and systematization of measures to support scientific investment funds that are created in order to activate the activities of legal entities and individuals in the field of innovation.

5. Conclusion

It is advisable to structure the research areas and consider them separately, according to the degree of coverage and significance when building a state policy to stimulate the development of science: 1) for the national economy and meeting domestic demand – on the one hand, 2) at the level of the international division of labor and taking into account the needs of a globalizing economy – on the other. Study of stimulating scientific activity practice in different countries of the world on the part of the state and the business community deserves attention. The development of innovative economic and financial instruments to support the human potential of science is possible on the basis of accumulated experience.

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