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CORONAVIRUS COVID-19 INDUCED THREATS FOR RESEARCH AND DEVELOPMENT IN URAL REGION WITHIN THE FRAMEWORK OF THE NATIONAL PROJECT «SCIENCE»



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Abstract. COVID-19 affects socio-economic circumstances because of declining global GDP, declining capital flows, fewer investment opportunities, and decreased trading. The scientific community has defended all of humanity, studying the virus and inventing vaccines all around the world. It is necessary to prevent a decrease in the scientific activity effectiveness. The study aims to identify the main factors of the COVID-19 pandemic negative impact on the scientific activity of Ural scientific organizations within the national project «Science» framework. The study relies on interviewing the heads of 22 scientific academic organizations in the Yekaterinburg, Russia, in August, 2020, who were asked to name the most serious coronavirus lockdown threats. The author analyzed and structured the survey results. The negative consequences of the coronavirus spread influence on the scientific organizations' activities are highlighted. In this study, we consider the competitive human resources formation in the field of research and development is a serious task in the conditions complicated by the COVID-19 epidemic, the solution of which is developing in three directions: improving the graduate school institute, supporting promising research projects, creating new job.

Keywords: COVID-19; research and development; Ural region; researchers under the age of 39; negative consequences for science.

JEL Codes: D83, F69.

Introduction

A key international event that has a global impact on all spheres of human life is the outbreak of the coronavirus COVID-19, which, according to the statement of the World Health Organization on March 11, 2020, has become a pandemic. The coronavirus pandemic, which forced all countries to take unprecedented measures to prevent its proliferation, influenced its economics functioning. As the result the governments of different countries had to start using all available resources to maintain sustainability. There is no doubt that the outbreak will have deep and lasting socio-economic impacts in every corner of the globe (Mukarram, 2020). According to E.L. Keshky et al. (2020), COVID-19 affects socio-economic circumstances because of declining global GDP, declining capital flows, fewer investment opportunities, and decreased trading. Although at the moment all efforts are aimed at limiting the spread of coronavirus. It is extremely important now to analyze the negative consequences of the pandemic impact, among other things, on the implementation of scientific and innovative activities in the Russian Federation, to find out measures for its minimization. The study aims to identify the main factors of the negative impact of the COVID-19 pandemic on the implementation of scientific activity by scientific organizations of the Urals.

1. Theoretical Basis

In modern society a high level of development of science and technology is becoming a source of national wealth and prosperity. To effectively integrate the Russian Federation into the system of world economic relations and overcome a significant technological gap, it is necessary to turn to neo-industrial modernization. In this regard, the processes of development and implementation of long-term scientific and technical policy play a high importance role for each country. Leading economists pay attention to the study of this issue: the results of scientific research have convincingly proved, and world practice confirms this evidence, that the most reliable and strategically sustainable source of socio-economic and general social development remains scientific and technological progress and innovative use of its results (Tatarkin, 2010). For a long time, researchers have used different terms, reflecting in essence the same phenomenon: science and technology policy, science policy, technical policy, innovation policy, technology policy. Some researchers (Vilensky, 1985) identified the introduction of the achievements of fundamental and applied science into production as the main goal of scientific and technical policy. Budavey (1981) understood scientific and technical policy as the set of works of the creation, development, production and application of new technology, as well as the formation of requirements for its future development. Another part of the researchers believed that the main principle of scientific

and technical policy is the operational management of scientific research and development. Allocation of the necessary resources for the development of science will entail the growth of industry and the rise of living standards (Stryukova, 2010). According to Anchishkin (1989), a deep understanding of scientific and technological progress should be transformed into the ability to use various economic instruments, anticipate the reaction to their use and, most importantly, direct the course of development in accordance with the public interest. Carrying out a unified state policy in the field of science implies the development of a unified legal framework, the implementation of state policy outside the country, constitutional recognition and guarantees of the fundamental rights and freedoms of citizens related to science, the adoption and implementation of state programs in the field of science (Ivanova, 2012). In present paper, the term «scientific activity» will be used in its broadest sense to refer to all scientific and innovation spheres.

Government interest in the development of science was often caused by external threats. For instance, in the era of Peter the Great, the expansion of areas and access to the seas and the reforms carried out in the country demanded the presence of own raw material base, qualified professionals. During the period of the Stolypin reforms, the government actively financed fundamental research, scientific expeditions, and academic publications in order to stimulate the development of an industry that was lagging at that time. Attention to the issues of science and technology increased in the second half of the 20th century, when the leading directions of scientific and technological progress were determined: further electrification, production automation, space and nuclear projects. And nowadays the COVID-19 epidemic is an important test of the development of scientific culture: the continuous and stable development of scientific culture requires acceptance and respect for science among the whole of society and understanding and tolerance of scientists (Han, 2020).

2. Method and Data

The study relies on interviewing the heads of 22 scientific academic organizations of the Ekaterinburg, Russia in August, 2020. Heads of scientific organizations were asked to name the most serious threats of coronavirus lockdown for organizations under the scientific and methodological guidance of the Ural Branch of the Russian Academy of Sciences (hereinafter – UB RAS). The main areas of research in these organizations are related to theoretical and applied mathematics and mechanics, control processes, physics and chemistry of solids, electrical and thermal physics, heat power engineering, complex problems of mechanical engineering, the theory of metallurgical processes, high-temperature electrochemistry, synthetic organic chemistry, population ecology, immunology, genetics, a comprehensive study of plant, animal, water and soil

resources, the creation of the foundations of rational nature management, geological geophysical study of the geological province and adjacent regions, a complex of sciences about man and society. The formation of these areas is due to the peculiarities of the historical development of academic science in the Urals and the needs of one of the largest industrial regions.

3. Results

After summarizing, analyzing and structuring the results of the survey, the following negative consequences of the impact of the situation with the spread of coronavirus on the activities of scientific organizations in the Urals were identified.

Firstly, decrease in the supply of new scientific knowledge. Scientific organizations, as a rule, have accumulated sufficient material in order to ensure the declared level of publication activity in the current year. However, at present, organizations are experiencing difficulties in obtaining new scientific material, which can negatively affect publication performance in 2021-2020. In particular due to the introduction of a predominantly distant work mode, it is difficult to use sophisticated scientific equipment, international scientific projects have been suspended, and field expeditions are almost impossible.

Secondly, there is a decrease in the effectiveness of scientific work. A number of organizations note that the transition to a distant work mode reduced mobility of scientists, the impossibility of holding face-to-face meetings, seminars, conferences, academic councils, etc. reduced the overall efficiency of scientific work, the quality of articles prepared for publication. Another important aspect is the decline in international scientific cooperation. A lot of international projects were frozen, joint events were canceled or postponed to a later, often indefinite period. At the same time, there is already a tendency towards stagnation of systemic long-term international scientific interactions, a decrease in the interest of foreign partners, and a predominance of interest in local issues. This trend has long-term negative consequences. According to the report of UB RAS, scientific organizations have held 49 international events (conferences, symposia, scientific schools), including 38 in Yekaterinburg (in 2019 – 64 and 44, respectively) (Report of UB RAS, 2020). There is also a positive aspect: most of the events were held in the format of video conferencing, which contributed to an increase in the number of foreign participants (1019 participants).

Thirdly, a number of scientific journals, in which research papers were to be published in 2020, announced the postponement of the release of the next issues, which, in turn, led to the impossibility of accounting for these articles in the statistics of 2020.

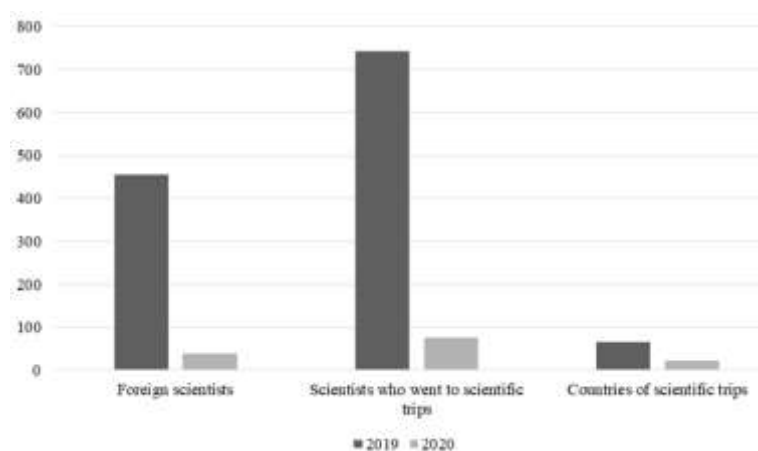
Moreover, at the beginning of the lockdown, there was a threat of damage or destruction of scientific installations, loss of biological collections, etc. Prompt actions of the heads of the scientific organizations allowed to reduce this risk. Also, there was a threat of consumables becoming unusable. Due to the transition to a distant work mode and, consequently, a decrease in the intensity of work on laboratory equipment, it was predicted that previously planned consumables with a short storage time would become unusable, as well as further re-purchase of materials of this category.

The next threat is the difficulty with updating the scientific equipment park. With the spread of coronavirus infection around the world, the stagnation of the world economy, the depreciation of the ruble in relation to the exchange rates of the countries exporting modern scientific equipment, difficulties with fulfilling the plans to update the scientific equipment park were predicted.

In the context of restrictive measures to slow down the spread of coronavirus, the activities of many dissertation councils were suspended, the defense of dissertations was postponed to a later date. These factors negatively affect the development of the human resources of scientific organizations.

Also, difficulties in coordinating activities to carry out work on grants from scientific foundations, work on «mega-grants» (full-time presence in host organizations of foreign leading scientists in the current conditions is extremely difficult) were predicted. During 2020, 38 foreign scientists were admitted to the scientific organizations UB RAS, in 2019 – 456. In 2020, 76 employees of scientific organizations UB RAS went on scientific trips to 23 countries, while in 2019 742 employees went to 65 countries (Figure 1).

Fig. 1: Foreign cooperation in scientific organizations of UB RAS 2019-2020¹



¹ Report of the Ural Branch of the Russian Academy of Sciences, 2020

Finally, there was serious concern about the impossibility of fulfilling obligations under the contracts and, accordingly, the loss of income from income-generating activities. In the context of a general decline in economic activity, a number of organizations were expressing concern about the possibility of terminating existing business contracts for the performance of work / provision of services for which scientific organizations act as executors.

It is obvious that all of the above negative consequences, which are relevant for scientific organizations not only placed in Ekaterinburg, but for the whole Russia, can affect a decrease of the rate of implementation of the national project «Science» (Passport of the national project, 2018) and, consequently, the development of a neoindustrial economy (Zakharova, 2020), in particular in relation to the following targets:

1.1. The place of the Russian Federation in terms of the share in the total number of articles in the areas determined by the priorities of scientific and technological development in publications indexed in international databases;

1.2. The place of the Russian Federation in terms of its share in the total number of applications for a patent for an invention filed in the world in areas determined by the priorities of scientific and technological development;

2.1. The number of Russian and foreign scientists working in Russian organizations and having articles in scientific publications of the first and second quartiles, indexed in international databases (thousand people);

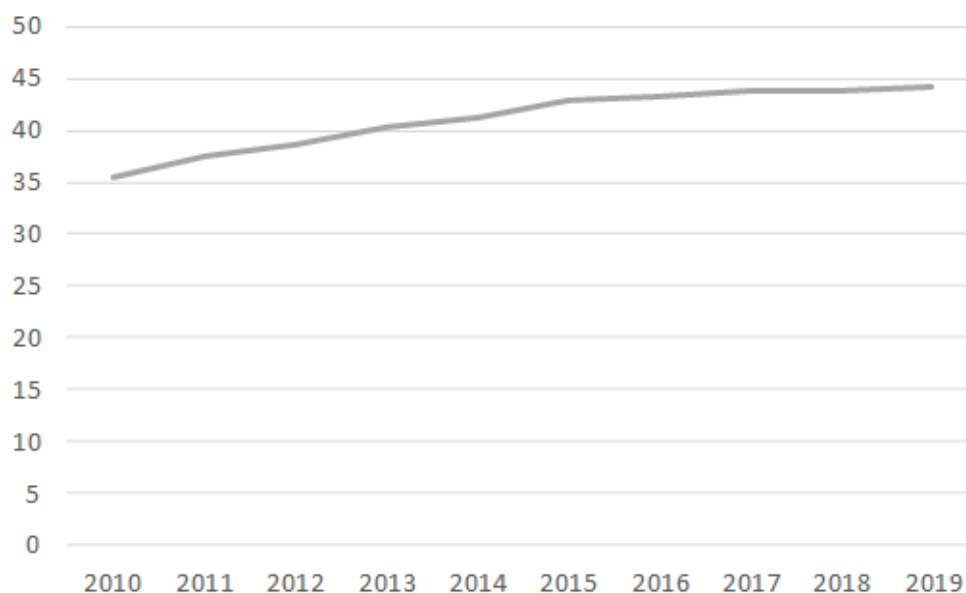
3.2. Internal costs of research and development from all sources to the growth rate of gross domestic product.

It is also possible that the level of wages will reduce, and, consequently, it will be a decline in the prestige and attractiveness of scientific activities and as the result the outflow of young, mobile and quickly responding to external changes staff. In the short term, this may affect the achievement of target 2.2. «The share of researchers under the age of 39 in the total number of Russian researchers (percentage)». It is planned that the share of researchers under the age of 39 in the total number of Russian researchers will be 50.1% on 2024. Unfortunately, the situation is far from ideal now.

In 27 academic research organizations under the scientific and methodological guidance of the UB RAS, located in 7 regions of the Russian Federation from the Arkhangelsk region and the Komi Republic in the north to the Orenburg region in the south, the share of researchers in the total number of employees is approx. 50% (Andreeva et al, 2020). The average age of research assistant is 31 years old, research associate – 40 years old, senior research associate – 51 years old, leading research scientist – 60 years old, principal research scientist – 70 years old. The share of research

assistant in the total number is 22%, research associate – 23%, senior research associate – 33%, leading research scientist – 13%, principal research scientist – 9%. According to statistics for the Russian Federation as a whole (the Federal State Statistics Service, 2020), the share of researchers under 39 years old is 43.9%, from 40 to 49 years old – 15.2%, from 50 to 59 years old – 15.8%, from 60 up to 69 years old – 15.5%, from 70 years and older – 9.6%. According to the information obtained from the Federal Statistical Observation Form № 2 «Science», the Federal State Statistics Service calculates the indicator «The share of researchers under the age of 39 (inclusive) in the total number of researchers». Figure 2 shows the dynamics of changes in the share of researchers under the age of 39 in the total number of researchers (in percent) from 2010 to 2019.

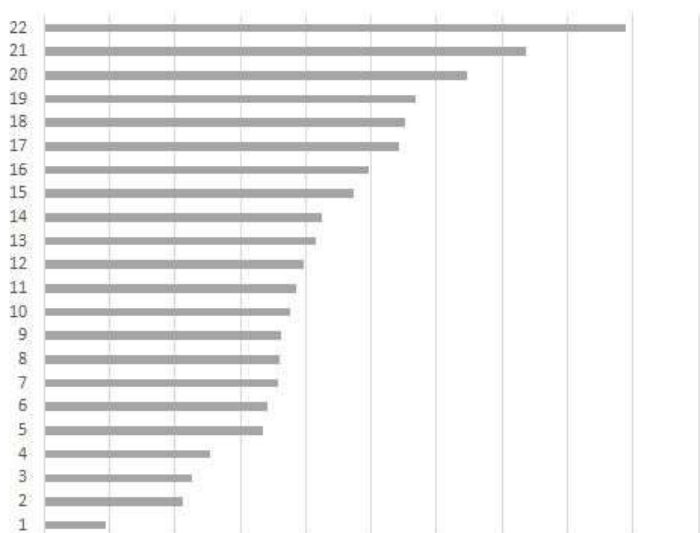
Fig. 2: Share of researchers under the age of 39 in the total number of researchers (in percent)²



Despite a slight increase between 2010 and 2015, in the last five years the growth has practically stopped, and the share of researchers under 39 years old has been less than 45% for at least 10 years. If measures are not taken to develop human resources in the field of research and development, by 2024 the situation can only become worsen. So, for example, Figure 3 shows that as of December 2020, in 16 out of 22 scientific organizations in Ekaterinburg, the share of employees over 65 employed in a scientific organization at their main place of work ranged from 18% to 44%. The names of organizations are deliberately hidden in order to avoid disclosure of confidential information.

² Federal Statistical Observation Form № 2 «Science», the Federal State Statistics Service, 2020

Fig. 3: Share of employees over 65 employed in a scientific organization in Ekaterinburg (in percent)³



It is worth noting that the situation with the age of graduated employees is somewhat better in universities located in the same subjects of the Russian Federation: the average age of a candidate of sciences conducting teaching activities is 48 years old, a doctor – 58 years old. Moreover, such an indicator as the number of thesis defenses (which, undoubtedly, characterizes the fact of the formation of a researcher as a scientific worker) in Russia as a whole has decreased from 9 611 people in 2010 to 1 629 people in 2019. According to the President of the Russian Academy of Sciences A.M. Sergeev (2021), only 9% of graduate students make it to the dissertation defense.

Conclusion

Information in previous section indicates the need to take urgent measures to strengthen human resources, taking into account the threats listed above.

At the moment, within the framework of the federal project «Development of human resources in the field of research and development», by 2024 it is planned:

- to improve the mechanisms of teaching in postgraduate studies in programs for the preparation of scientific and scientific-pedagogical personnel;
- to finance research projects on the priorities of scientific and technological development, at least 50% of which are led by promising young researchers;
- to open centers for the development of competence of leaders of scientific and technical projects and laboratories within the framework of scientific and educational centers;
- create new laboratories led by promising young researchers;

³ Compiled by the author based on interviewing the heads of 22 scientific academic organizations of the Ekaterinburg, 2020

— to form a personnel reserve for filling positions of heads and deputy heads of scientific and educational organizations;

— to increase the proportion of graduate students who have submitted a dissertation for the degree of candidate of sciences for defense;

— to increase the proportion of dissertations, the main scientific results of which are published in at least two articles in scientific journals indexed in international databases.

Accordingly, the formation of competitive human resources in the field of research and development in the conditions complicated by the COVID-19 epidemic is a serious task, the solution of which is developing in three directions: improving the institute of graduate school, supporting promising research projects, creating new jobs.

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ВЫЗВАННЫЕ КОРОНАВИРУСОМ COVID-19 УГРОЗЫ ДЛЯ ИССЛЕДОВАНИЙ И РАЗРАБОТОК, ПРОВОДИМЫХ В УРАЛЬСКОМ РЕГИОНЕ В РАМКАХ НАЦИОНАЛЬНОГО ПРОЕКТА «НАУКА»

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Аннотация. Пандемия COVID-19 влияет на социально-экономические процессы из-за снижения глобального ВВП, сокращения потоков капитала, меньших инвестиционных возможностей и сокращения торговли. Научное сообщество по всему миру направило все силы на изучение вируса и изобретение вакцин. Необходимо предотвратить снижение эффективности научной деятельности. Исследование направлено на выявление основных факторов негативного влияния пандемии COVID-19 на осуществление научной деятельности научными организациями Урала в рамках национального проекта «Наука». Исследование основано на интервью руководителей 22 научных академических организаций Екатеринбурга, проведенное в августе 2020 года, во время которого руководителей попросили назвать наиболее серьезные угрозы коронавируса. Авторами проанализированы и структурированы результаты опроса представителей научных организаций Урала. Выделены негативные последствия влияния ситуации с распространением коронавируса на деятельность научных организаций. В данном исследовании выделены направления для формирования конкурентоспособных кадровых ресурсов в сфере исследований и разработок в условиях, осложненных эпидемией COVID-19, а именно: совершенствование института аспирантуры, поддержка перспективных исследовательских проектов, создание новых рабочих мест.

Ключевые слова: COVID-19; исследования и разработки; Уральский регион; исследователи в возрасте до 39 лет; негативные последствия для науки.

JEL коды: D83; F69.

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