

Strategy Basis for the Development of Scientific Potential in the Innovative Economy of the Russian Federation

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Abstract. In the Russian economy, science and the academic community are traditionally responsible for creating innovations, which various research institutes and educational organizations graduate and train employees for. The most significant is the postgraduation institute, which has become the third step in the higher education system in the Russian Federation in 2014, also known as highly qualified scientific personnel training. The article discusses the problems of postgraduate study as an institution for the training of highly qualified scientific personnel. The authors examine the relationship between the graduation of scientific personnel and changes in technological patterns, accompanied by ups and downs in economic development. A retrospective analysis of the mechanisms, procedures and tools for training scientific personnel in the Soviet period is carried out, problems and current trends in the functioning of this institution are identified. According to statistics, every year the number of postgraduate students, and especially postgraduate students who has received a Ph.D. degree, is steadily decreasing. The authors of the article have substantiated the relationship between the change of technological modes and the number of highly qualified personnel released and tried to find the explanations for this phenomenon, as well as outline possible solutions to the problem.

1. Introduction

The globalization of society and its intensive development in all life aspects require a high-quality and effective economic development, which would support and, in turn, generate impulses of social development, creating the necessary resource opportunities, conditions and intellectual potential. Sustainable development involves strategic forecasting, which is impossible without scientific research, and the need for higher rates of economic development requires innovations that are actively developed and implemented. The trajectories of socio-economic and sustainable development are linked like DNA spirals. According to this principle - double helix - technological development systems are arranged in countries with knowledge-based economies: first comes the investments in the economy, then in human capital. Russia faces the inverse task of overcoming economic stagnation through investment in human capital. At the same time, the key resource is considered to be intellectual and not material – as in knowledge and, as a result, their carriers with interdisciplinary competencies [1]. It is not catch-up development that is needed, but advancing, that is built on a

platform for generating scientific potential, new knowledge and its transformation into material production. This explains the elevation of the role of the scientific and academic community.

In the Russian economy, science and the academic community are traditionally responsible for creating innovations, the personnel for which are trained by various research and educational organizations. The first place here has the postgraduation institute, which current problems will be the main point of interest in this article.

2. Relevance

Since 2014, following the results of Russia's accession into the Bologna process, postgraduate school has become the third step in the system of higher education in the Russian Federation - the training of highly qualified scientific personnel. At present in the Russian Federation the postgraduation institute is the main structure that trains new scientific personnel. However, according to statistics (Fig. 1), over the past decade, the number of specialists and undergraduates entering graduate school has been steadily decreasing, which leads to a steady decrease in the number of highly qualified scientific and pedagogical staff with academic degrees and titles from year to year.

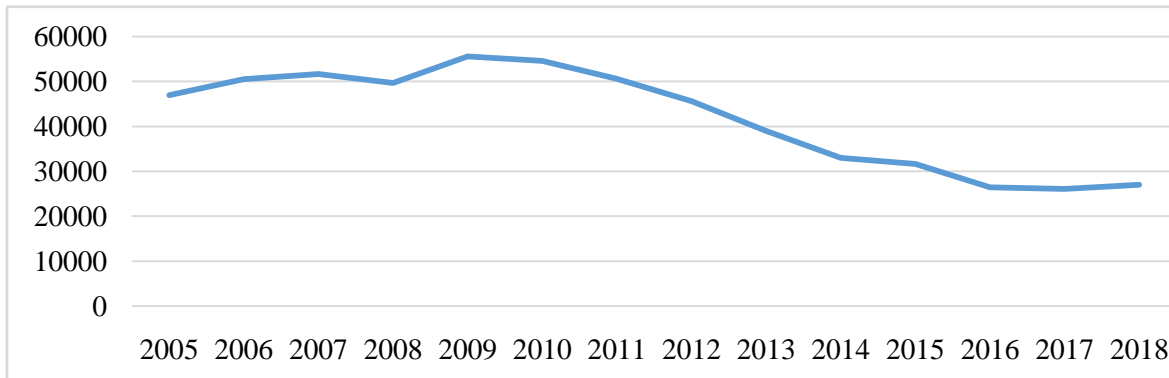


Figure 1. Admission to postgraduate school, people [17].

Accordingly, the number of graduates who have completed graduate school, including those who defended their thesis and received a Ph.D., is also reduced, as shown in Figure 2.

Table 1. Percentage of increase / decrease in the number of applicants for graduate school 2005-2018 [4].

Year	Number of graduate students accepted, people	%
2005	46896	-
2006	50462	8
2007	51633	2
2008	49638	-4
2009	55540	12
2010	54558	-2
2011	50582	-7
2012	45556	-10
2013	38971	-14
2014	32981	-15
2015	31647	-4
2016	26421	-17
2017	26081	-1
2018	27008	4

Table 1 shows the annual percentage by which the number of applicants to graduate school has decreased since 2010.

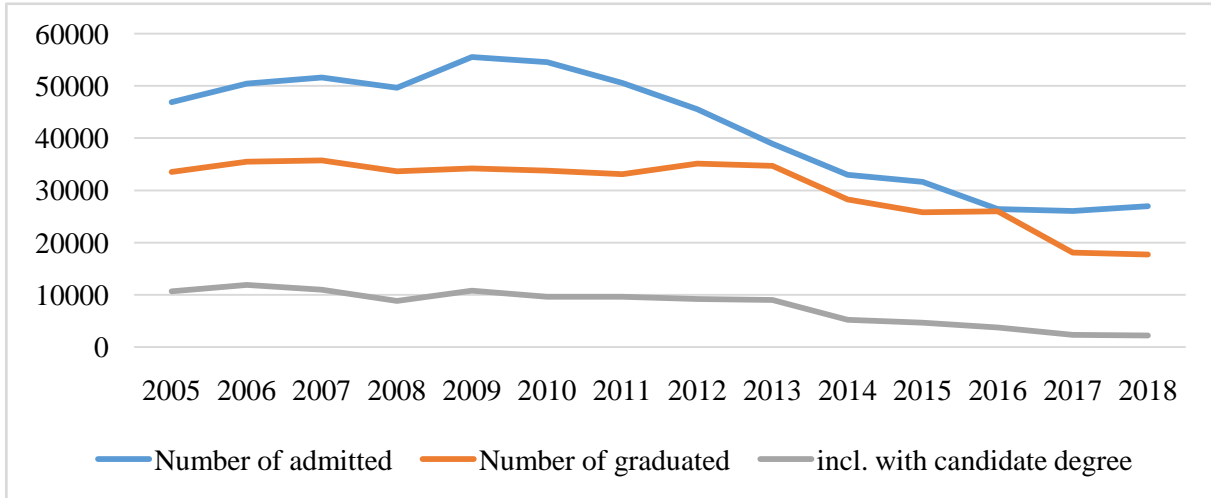


Figure 2. Summary statistics on graduate school indicators, people [17].

However, not only the number of postgraduate students from the total number of enrolled students is reduced, but also the percentage of those who defended their thesis. In 2017, only 1/5 of the total number of graduate students enrolled in educational programs for training highly qualified personnel received a Ph.D.

In the post-Soviet period, the institute of postgraduate school was in crisis due to political instability in the country, because of which funding for the scientific sector decreased and also the size of the scholarship for the full-time postgraduate student decreased sharply (for example, on average for universities, the size of the scholarship for the full-time post-graduate student on the budget in 1995 amounted to approximately 90% of the salary of a young specialist, and in 2010 - 7-8%) [3,6]. In addition, the size of incentive allowances for salaries for the availability of academic degrees and titles has sharply decreased. The completion of postgraduate studies and the defense of the dissertation lost any economic sense for young specialists [2].

Nevertheless, until the USSR collapse, the institute of postgraduate school functioned efficiently and very actively [5], which is confirmed by statistics on the number of students who entered and graduated from postgraduate school in 1950-1990. (Figure 3). It shows the number of candidates of science in each year - their number has steadily increased and reached the level of almost five hundred thousand people to the year 1990.

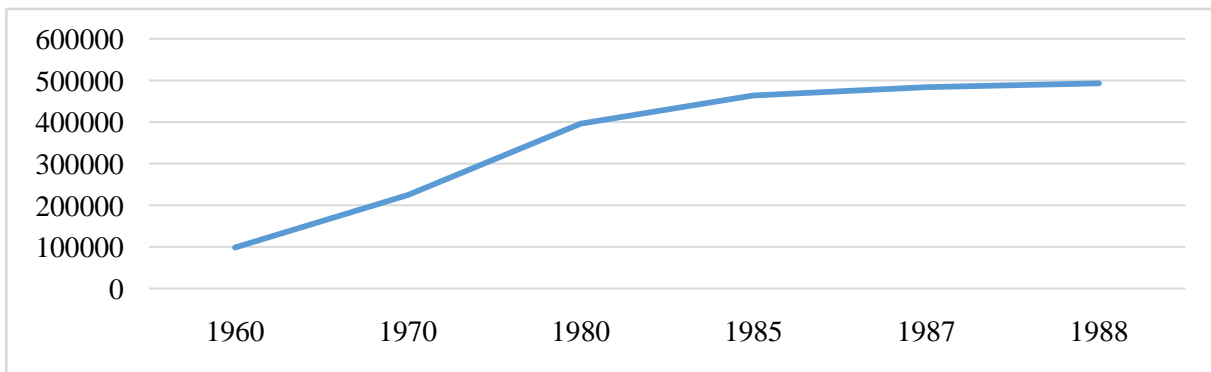


Figure 3. Number of Ph.D. at the end of the year, people [18, 19].

In this regard, it seems extremely important to analyze the historical experience of the functioning of the institute of postgraduate study and compare it with what is happening in this area at the current stage of economic development in Russia.

3. Theoretical part and statement of the problem

The reasons for the drop of popularity in the choice of a scientific path lie in the imperfection of Russian legislation regarding the reproduction of scientific potential. The main law governing the activities of the postgraduate study institute is Federal Law № 273-ФЗ “On Education in the Russian Federation” (hereinafter - the Federal Law “On Education in the Russian Federation”). This law assigned the status of a third-level higher education program (bringing it into line with the same status in European countries) to the postgraduate studies instead of a postgraduate education program. However, this law was not able to improve the situation with the number of people who want to enroll into postgraduate school, since the main problem has not been solved: the system of training scientific and scientific-educational personnel and their certification system are still divided. In other words, in order to obtain a postgraduate diploma and the opportunity to teach at the university, the defense of a dissertation in the dissertation council and, accordingly, obtaining a candidate of science degree is not a mandatory requirement.

Determining the development trends of the training highly qualified personnel system and observing their negative traits, it is necessary to take into account the complex nature of the problems in this area. First, it is highly important to study the problems of the institute of postgraduate studies on the scale of the national economy and a single educational organization. Secondly, it is necessary to reveal the essence of the problems facing the graduate student as the main actor of this institution. Thirdly, it is important to consider the technology of scientific management of a graduate student and propose ways to resuscitate the institute of scientific mentoring and leadership in the framework of graduate school. Fourth, it is necessary to show the imperfection of the system for managing the reproduction of scientific personnel at the organization level and formulate the conceptual foundations of its improvement.

Table 2. Incentives and opportunities of a graduate student.

Criterion	Retrospective (Soviet and early post-Soviet period until about 1995) [14,16]	Modernity
Financial situation	Substantial salary bonus in the presence of a degree	The scholarship is an average of 2500 rubles, which is below the subsistence level
Social status (image of a research scientist)	Raising public status	Social position is leveled by the low level of remuneration of the scientific and pedagogical worker
Career prospects	Open: higher educational institutions, industrial research institutes, institutions of science	Bounded by virtue of the limiting phase in science and education
Access to laboratory testing facilities for the organization of scientific research and experiments	Numerous free partnerships	Difficult entrance to the test sites due to the confidentiality of commercial information, meager research funding, competition for scientific grants, etc.
The role of the supervisor and the structural unit where the work is performed	Leading. Active partner in ongoing research. The motive of public recognition for the graduate student who prepared and defended the results of scientific research	Passive. Lack of incentives and interest in completing the study

Thus, at the moment, it is possible to fundamentally change the institution of graduate school only at the level of state policy. It seems appropriate to increase the number of benefits for graduate students studying on a budgetary basis, or to increase funding in several areas, while providing graduate students with academic mobility opportunities, that is, sharing experience with foreign colleagues. In our opinion, focusing on the preparation of future scientific personnel of researchers is also relevant.

The postgraduation institute is important not only for graduates who want to build a career in educational and scientific activities, but also for universities, research centers and other organizations involved in science and innovation. Graduate students are scientists who are just starting their way in science, it is them who has the opportunity to influence the development of the state, to offer qualitatively new solutions to existing problems in the industry, corresponding to the scientific interests of a particular graduate student [3,7].

4. The study and its results

Given the very essence of postgraduate school and its role in reproducing the country's scientific potential that directly affects progress and innovation, the authors of the article put forward the assumption that the number of protected graduate students, candidates of science, affects scientific, technical and economic progress, as well as to a large extent increases the number of innovations in industry, economy and other industries [13].

To verify the assumption, several approaches were used to determine innovation periods in the economy, the first of which is Kondratyev's cycles. Nikolai Dmitrievich Kondratiev singled out 4 cycles, to which two more were subsequently added - forecast ones. Table 3 shows the duration of those cycles.

Table 3. The duration of the Kondratiev cycles [9].

Cycle number	Cycle duration	Cycle start	Cycle end
1	40 years	1803	1841-1843
2	46 years	1844-1851	1890-1896
3	54 years	1891-1896	1945-1947
4	36 years	1945-1947	1981-1983
5 (forecast)	37 years	1981-1983	2018
6 (forecast)	42 years	2018	2060

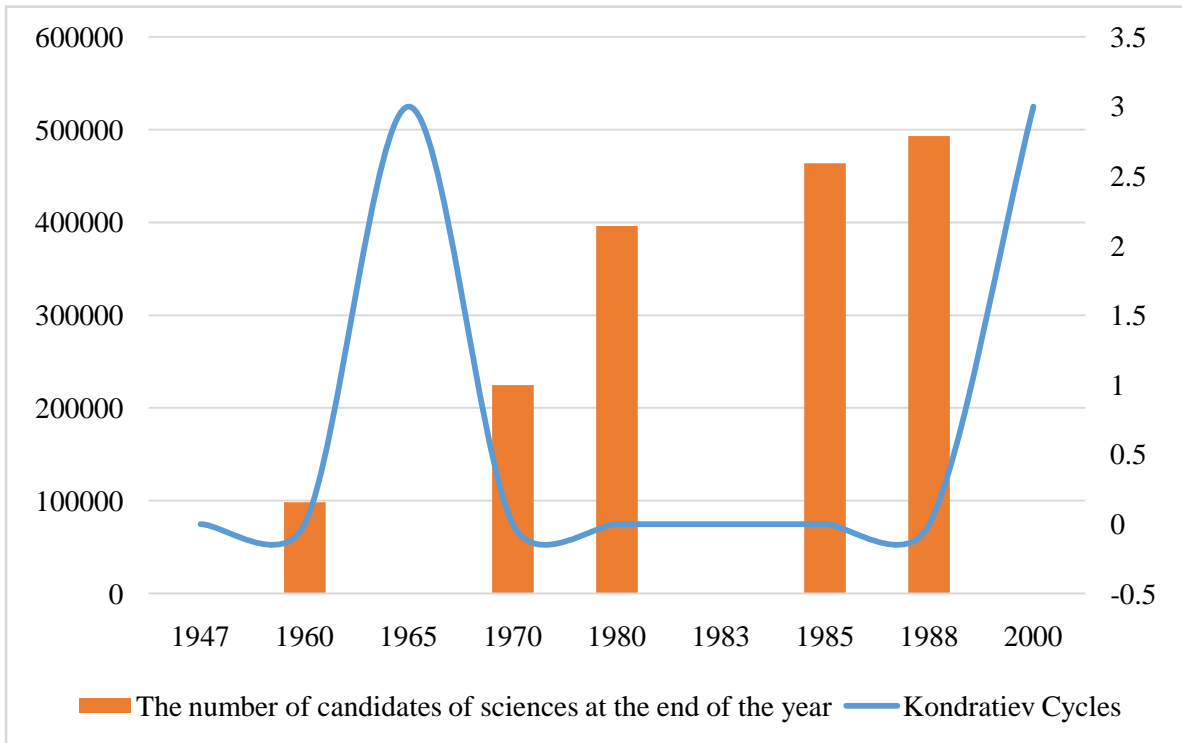


Figure 4. The number of candidates of sciences in relation to the waves of cycles A. Kondratiev.

A similar comparison was made in relation to S.Yu. Glazyev technological structures. In accordance with the available statistics and the study period, the graph (Fig.5) shows 4 and 5 technological structures.

From the resulting graph, we can conclude that there is an obvious relationship between the development of the fifth technological structure and the development of the institute of graduate school in the USSR. It seems possible to say that the accumulated scientific potential was able to realize itself, which led to a period of growth and widespread fifth technological structure [11].

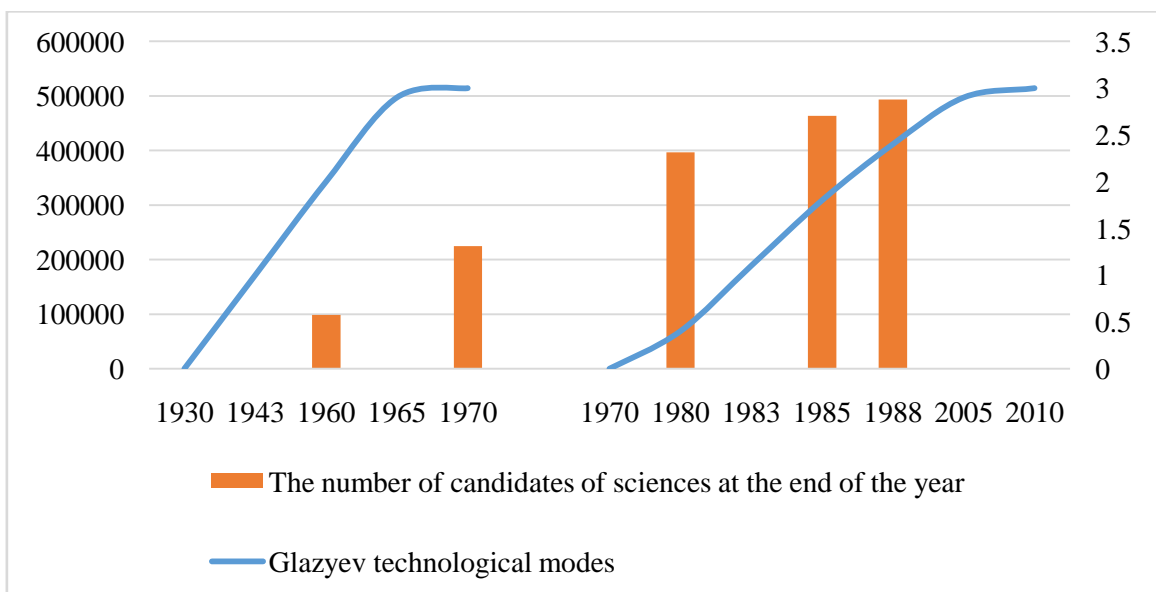


Figure 5. The number of candidates of sciences in relation to technological structures Glazyev S.Yu.

5. Findings

Extending the obtained dependence to the need for a qualitative leap in the development of the Russian economy, the authors have come to the conclusion that the close integration of science, education and innovation as priority factors is highly necessary. For this, in our opinion, it is important to build a strategy for the development of Russian scientific potential at the micro, meso and macro levels. Consequently it is advisable to implement the following set of measures (Table 4).

Table 4. Set of measures for the development of Russian scientific potential.

Level of economic development	Recommendations for the development of scientific potential
macro	<ul style="list-style-type: none"> - the formation of a strategy for the development of scientific potential as a target area for the development of an innovative type of economy; - strengthening the role of public institutions, strengthening international cooperation regarding research; - a change in the financing policy of educational organizations and institutions implementing training programs for highly qualified personnel.
meso	<ul style="list-style-type: none"> - the formation of a space of scientific activity that meets the challenges and needs of the processes of technological and humanitarian transformations through the development of a methodology of economic and interdisciplinary research.
micro	<ul style="list-style-type: none"> - reforming the institute of scientific guidance and mentoring, increasing its role in the training of scientific personnel; - increasing the motivation of young scientists and specialists to conduct various kinds of research; - restoration of the high social status of the Russian scientist, his authority and prestige.

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