The Subject Structure of Global Science and Optimization of the Russian Network of Dissertation Councils: Imbalance and Harmonization

N. G. Kurakova[a, b], L. A. Tsvetkova[a], and O. A. Yeremchenko[a]

[a]*Center of Scientific and Technological Expertise, Institute of Applied Economic Research,*
Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia
[b]*Scientific and Technological Unit for Biomedical Forecasting, Federal Research Institute for Health Organization and*
Informatics, Ministry of Health of the Russian Federation, Moscow, Russia
e-mail: idmz@mednet.ru, idmz@yandex.ru, tatrics@mail.ru

Abstract—This paper reviews the results of the optimization of the network of dissertation councils in the Russian Federation in the period between 2013 and 2015. The disciplinary structure of highly qualified scientific personnel in Russia, which is expected to evolve following the optimization, and the subject structure of global science, are compared. For this purpose, the share of publications in the specific subject areas of the Web of Science database is evaluated. The contribution of different domains to the development of scientific fronts based on the Essential Science Indicators data is assessed. The project was aimed at optimizing dissertation councils on the harmonized structure of highly qualified scientific personnel in Russia; the subject structure of global science was determined relying on factual and image data. It is highlighted that the unjustifiably low share of medical dissertation councils and the high share of dissertation councils for economic sciences, which is not in line with global research trends, will remain in Russia by late 2015.

Keywords: dissertation councils, network optimization, research staff, disciplinary structure, Russia, global science, subject structure, volume of publication stream, Web of Science, research fronts, Essential Science Indicators

INTRODUCTION

The effective reproduction of highly qualified scientific personnel in Russia requires modernization of the attestation system, where the optimization of the dissertation council network is one of the key elements.

The optimization involves the implementation of a specific set of activities: first, the introduction of new, more stringent criteria for assessing the research levels of organizations that are required for the creation of dissertation councils; second, certification of the existing dissertation councils; third, the introduction of scientific performance criteria for members of dissertation councils; finally, optimization of the network of dissertation councils in line with the certification results and the aforementioned criteria [1].

In March 2013, the regulations for the certification of highly qualified scientific personnel in Russia were changed in line with the instructions of the Prime Minister. In line with these changes, the Ministry of Education and Science of the Russian Federation will no longer be entitled to regulate the composition of expert councils of the Higher Attestation Commission

(HAC), which will be a prerogative of the professional community. Members of the HAC expert councils will be elected for a period of 4 years; after this period, at least half of the elected members should rotate. The Candidate of Sciences degree will be awarded by the organization that hosts the dissertation defense [2].

According to the HAC data, it was suggested to optimize 30–40% of the operating dissertation councils based on the results of the monitoring conducted in the Russian federal districts. The optimization of the dissertation-council network is addressed by the HAC on the basis of the following principles: preservation of dissertation councils at top research institutes, higher-education institutions, and academic schools in view of the scientific activities pursued by their members; compliance with the priority areas of science and technology; and the adequacy of the dissertation-council network for attestation of highly qualified scientific personnel in certain subjects in a given region [3].

In line with the orders of the Ministry of Education and Science of the Russian Federation, the activities of 602 dissertation councils were suspended in December 2013. In July, October, and November
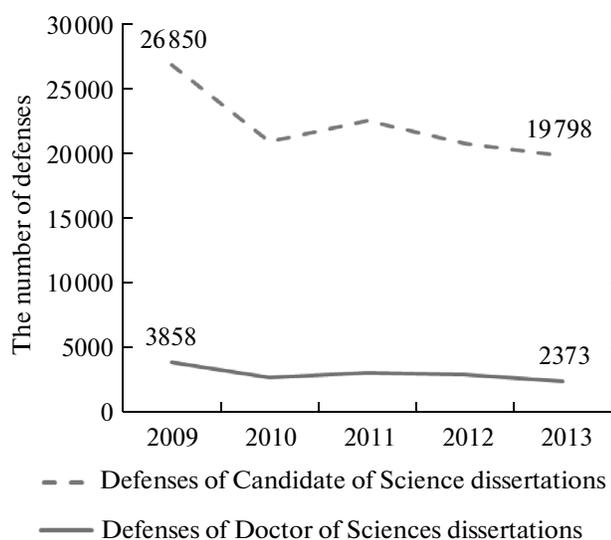
Fig. 1. The number of defended Candidate and Doctor of Sciences dissertations in 2009–2013. (Source: www. Science-expert.ru).

2014, 752 dissertation councils were abolished; the operations of 157 councils were suspended, while 433 dissertation councils were recommended to merge. In late October 2014, following the decisions taken at the HAC plenary session, the activities of 325 dissertation councils that operate on the basis of the Russian Academy of Sciences, the Moscow State University, the Peoples' Friendship University, and other universities and research organizations in Russia were discontinued. As a result, the reduction in the number of dissertation councils in Russia can be summarized as follows: 3161 and 2785 councils were abolished as of January 1, 2013 and January 1, 2014, respectively; as of January 1, 2015, 2700 dissertation councils were abolished; of these, the activities of 292 councils were suspended; 358 councils will cease their activities by May 15, 2015. Dissertation councils that are to be abolished cease their activities within half a year from the date of the issued order. At the same time, it is foreseen to review the applications that are submitted for the creation or restarting of dissertation councils that operate at organizations that are recognized as federal leaders in the declared specialties, dissertation councils for rare or unique specialties, and dissertation councils for the priority areas of development and national security of the Russian Federation. The work on the criteria that underlie the creation of new dissertation councils is still underway at the HAC. In 2014, 665 applications were submitted for the creation of new, or the restart of suspended dissertation councils. Of these, only 64 applications were retained [3].

FORMULATION OF THE PROBLEM

We hypothesize that the optimization of the dissertation-council network will contribute to the harmo-nization of the disciplinary composition of domestic highly qualified scientific personnel in line with the structure of the global scientific and technological fields, which, in turn, will contribute to higher productivity and competitiveness of Russian science.

The reproduction dynamics of scientific personnel over the last 5 years (2009−2013) is decreasing. Specifically, the number of dissertations that were defended at the level of Candidate of Sciences decreased by 26.3% from 26 850 in 2009 to 19 798 in 2013, while the number of dissertations defended at the level of Doctor of Sciences dropped by 38.5% from 3858 in 2009 to 2373 in 2013 (Fig. 1) [4, 5].

The distribution of the total number of Master's and Candidate of Sciences dissertations that were defended in 2013 in the field of science shows that the most dynamic scientific reproduction can be observed in the fields of technical, health, and economic sciences (Fig. 2).

At the same time, the number of dissertation defenses in technical sciences has remained virtually unchanged since 2009 (4531 and 4489 defenses in 2009 and 2013, respectively), while the reproduction of Candidates and Doctors of Medical Sciences decreased by 31% from 5028 in 2009 to 3473 in 2013. The growth rate of highly qualified scientific staff in the field of economic sciences shrank by approximately 37% from 4739 defenses in 2009 to 3000 in 2013.

In this context, it is important to note that one of the key trends of global science in 2009−2014 was so-called "medicinization," where the number of medical publications, grant funding, and scientific staff in the field of Clinical Medicine was significantly higher than in all other subject areas.

Specifically, the number of publications on clinical medicine worldwide that were indexed in the Web of Science (WoS) international bibliographic analytical system increased by 17% in the period from 2009 to 2013. The Russian segment of publications that are reflected in the WoS in the related area of study has been stagnating over the past 20 years (Fig. 3).

Against this background, the 31% reduction of dissertations defended at the level of Candidate and Doctor of Medical Sciences in the past 5 years is a prime example of the gap between the disciplinary structure of the national body of Doctors and Candidates of Sciences in Russia and global scientific and technological trends.

Therefore, the aim of this study is to evaluate to what extent the optimization of the network of dissertation councils in Russia conducted in 2013−2015 has led to the harmonization of the two indicators: the subject structure of global science and highly qualified scientific personnel in Russia.
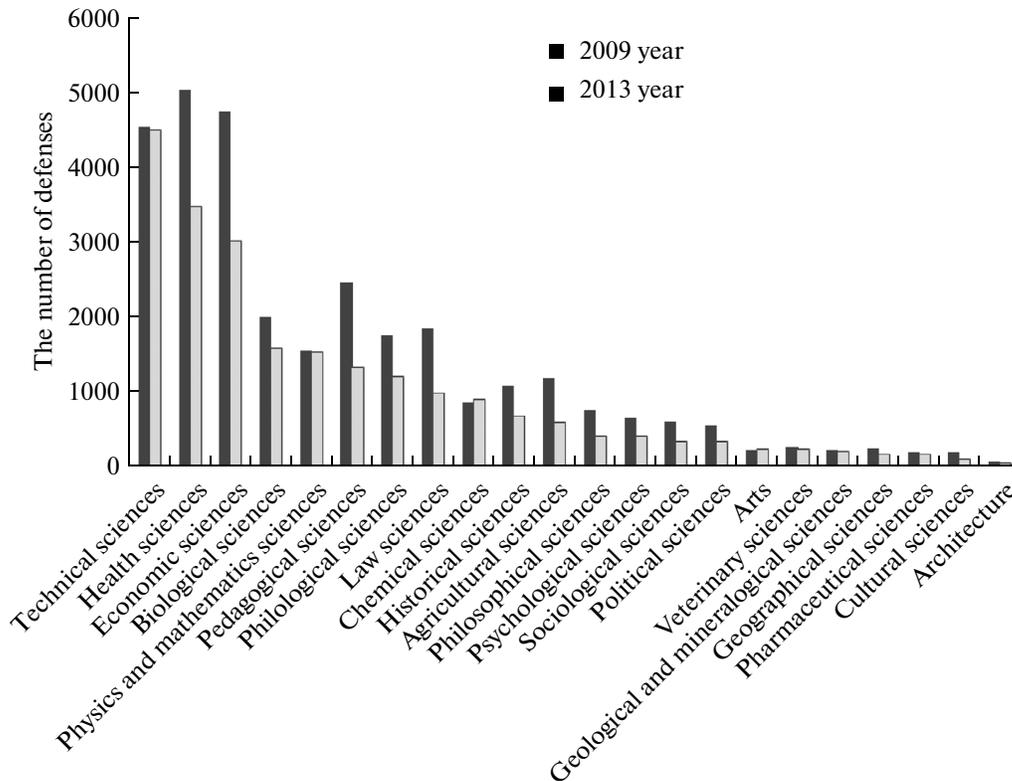
Fig. 2. The distribution of defended Master's and Candidate of Sciences dissertations by fields of science in 2009 and 2013 (Source: www. Science-expert.ru).

THE DISCIPLINARY STRUCTURE OF DISSERTATION COUNCILS IN RUSSIA IN 2011

The objective of our previous study was to compare the subject structure of global science with the disciplinary structure of Russian dissertation councils [6, p. 29]. For this purpose, we estimated the number of Russian dissertation councils that operated in 2011 and corresponded to the seven subject areas of study in the Standard Fields classifier that is used in the WoS database: Economics and Business, Chemistry, Physics, Agricultural Sciences, Earth Sciences, Mathematics, and Clinical Medicine. At the same time, we calculated the contribution of each of these subject areas to the global publication flow that is indexed in the WoS and the development of international scientific fronts based on the Essential Science Indicators (ESI) data.

The comparison of three indicators, viz., the share of global scientific fronts in the subject area, the share of publications indexed in the WoS, and the proportion of dissertation councils in the related subject area in Russia in 2011, exposed disparities, which were particularly strong in areas such as Clinical Medicine, Chemistry, Economics, and Business (Fig. 4).

Special attention was paid to the fact that in the fastest growing area of global science, which is Clinical Medicine, the share of dissertation councils in Russia in 2011 amounted to only 7.3% of the total number of councils, while the corresponding figure for the Economics and Business domain was extremely high (11.5%). Given the incomparably greater speed of data updating in the field of medicine, which is many times higher than the generation of new economic knowledge [7], the discrepancy between the share of dissertation councils for medical and economic sciences was considered ungrounded and made it relevant to revisit the analysis of the relationship between the subject structure of global science and the newly balanced network of dissertation councils in Russian following the optimization.

THE DISCIPLINARY STRUCTURE OF DISSERTATION COUNCILS IN RUSSIA IN 2015

Using the materials that were prepared for the meeting of the HAC of the Ministry of Education and Science of the Russian Federation on October 23, 2014, we analyzed the dynamic reduction in the number of dissertation councils in various specialties as of December 31, 2013 and October 1, 2014, and the future targets for the reduction in the number of dissertation councils in separate branches of science by
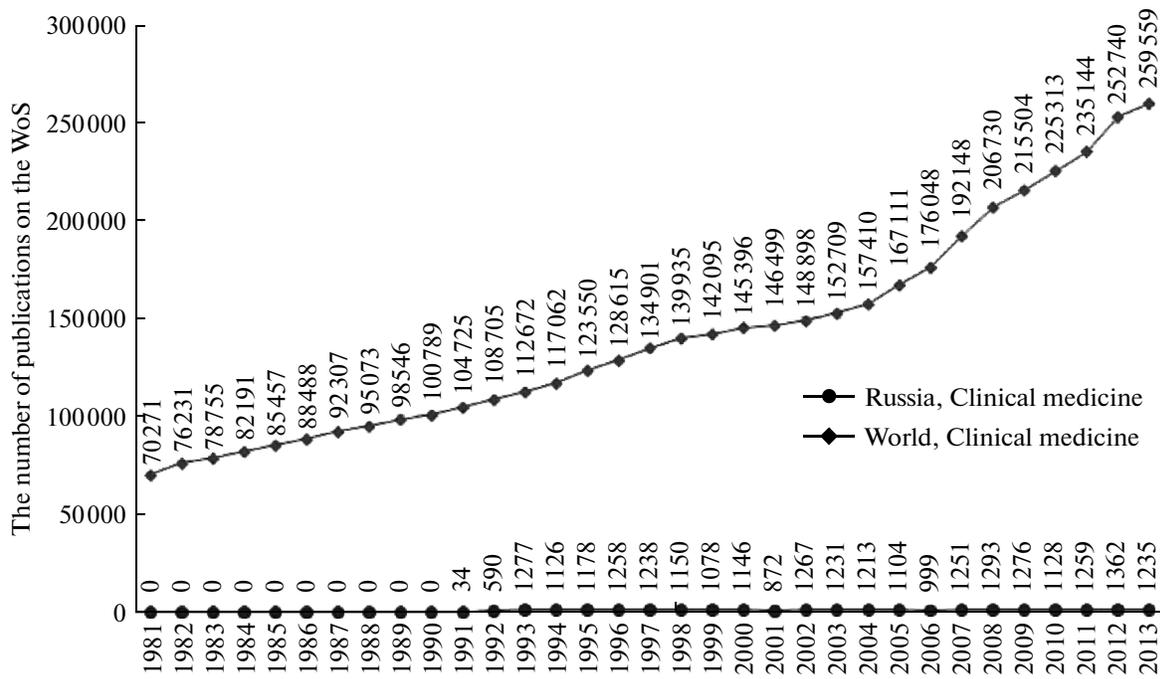
Fig. 3. The dynamics of the publication flow that is indexed in the WoS for clinical medicine in Russia and worldwide (InCites data as of February 19, 2015).
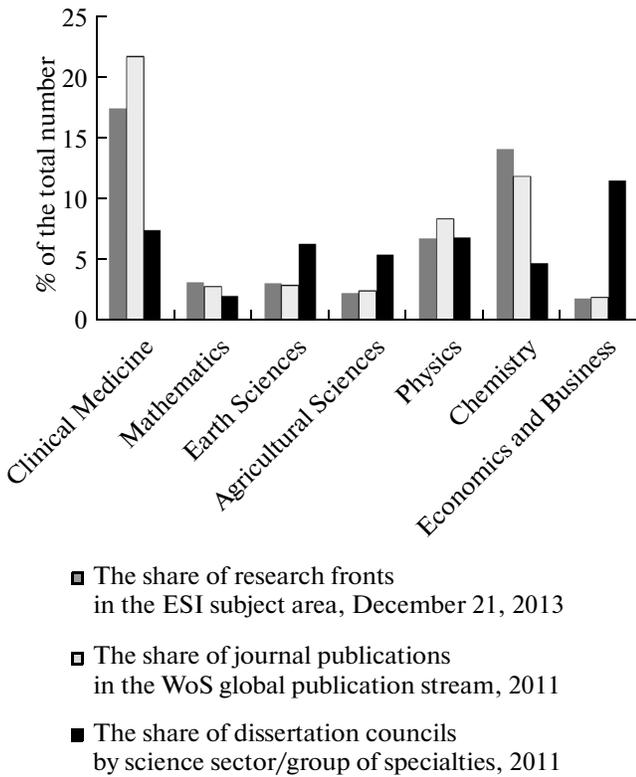

- ▫ The share of research fronts in the ESI subject area, December 21, 2013
- ▯ The share of journal publications in the WoS global publication stream, 2011
- ■ The share of dissertation councils by science sector/group of specialties, 2011

Fig. 4. The ratio of the proportion of the individual areas of knowledge in the structure of global science and the proportion of specialized dissertation councils in Russia in 2011 (WoS data on Dec 1, 2011).

the end of 2015, as recommended by the expert council of the HAC.

Figures 5 and 6 present the data that show the actual dynamic changes in the number of dissertation councils in select specialties in 2013–2014 and planned targets for 2015, as well as the reduction in the share of dissertation councils in certain specialties that took place in 2014 and is expected to take place in 2015.

This data shows that the maximum reduction in the number of dissertation councils could be observed in the fields of pedagogical and psychological sciences. By October 1, their number decreased by 30%. By late 2015, it will decrease by 39.72% (in relation to the number of boards on December 31, 2013), i.e., the total reduction will amount to 69.72%. A similar reduction by 34.52% compared to October 2014 and by another 31.47% by the end of 2015, i.e., in total by 65.99% !!! could be observed with regard to the number of dissertation councils that form the body of highly qualified surgeons.

The number of dissertation councils was also reduced by more than 55% in the following groups of specialties and fields of science: oil and gas, construction and architecture, historical sciences, philology and art history, organic and inorganic chemistry, law, livestock and veterinary science.

Of special note is the fact that despite the decrease in the number of dissertation councils for each of the groups of specialties and fields of science in 2015 compared with December 12, 2013, the number of disser-
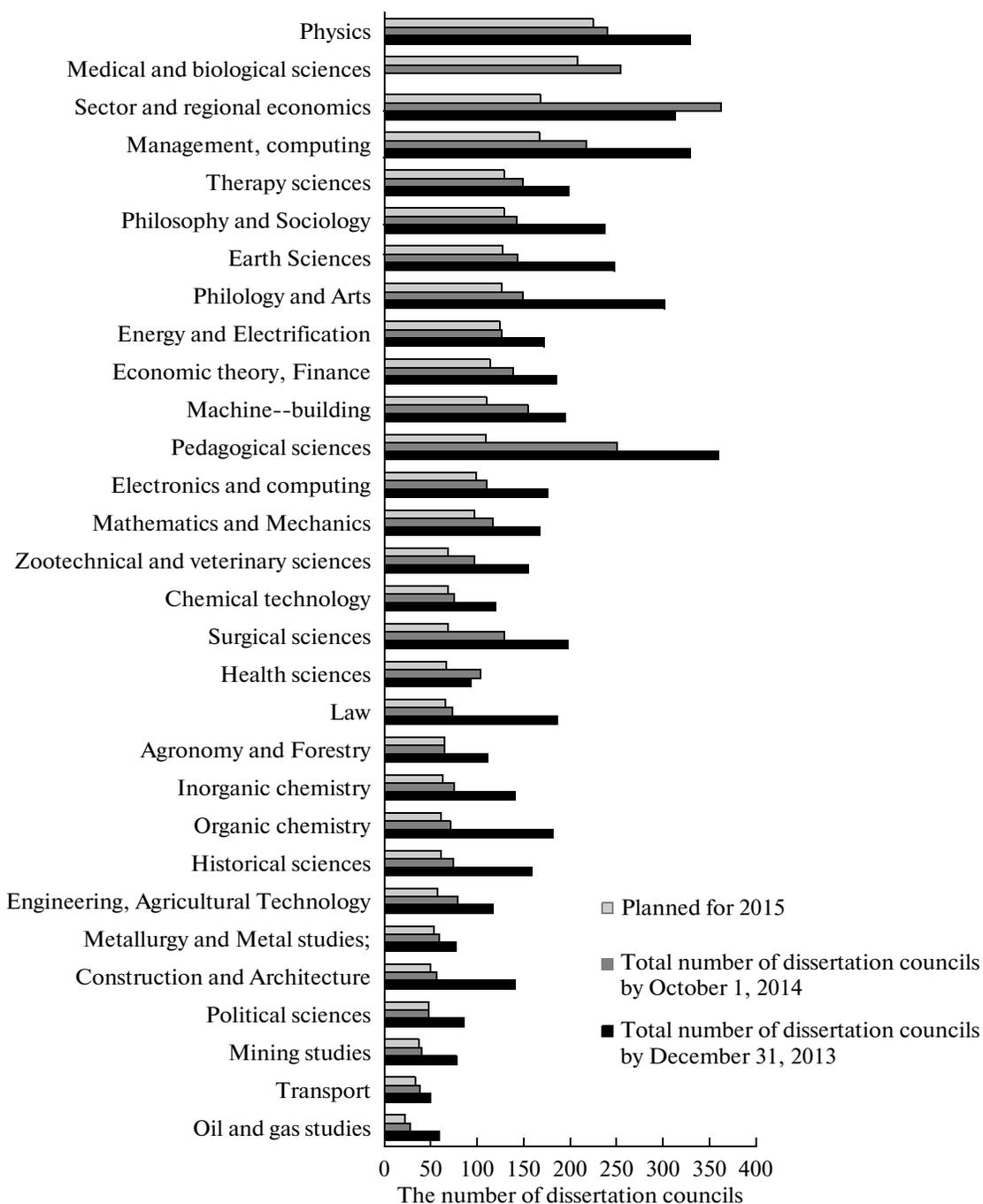
Fig. 5. The dynamic actual changes in the number of dissertation councils for selected specialties in 2013 and 2014, and 2015 (planned) (Source: materials prepared for the meeting of the HAC of the Russian Ministry of Education and Science, October 10, 2014).

tation councils increased by 15.29% and 11.96%, respectively, in two groups of specialties: sector and regional economy (from 314 to 362) and preventive medical science (from 92 to 103) at the first stage of optimization (from December 31, 2013 to October 1, 2014).

To assess the degree of harmonization of the disciplinary structure of Russian dissertation councils fol-lowing the network optimizing and the disciplinary structure of global science, 31 specialty groups were combined in clusters that correspond to seven subject areas of the WoS Standard Fields:

• *Clinical Medicine*: the number of councils for sur-gical sciences, medical sciences, and preventive and therapeutic sciences combined;
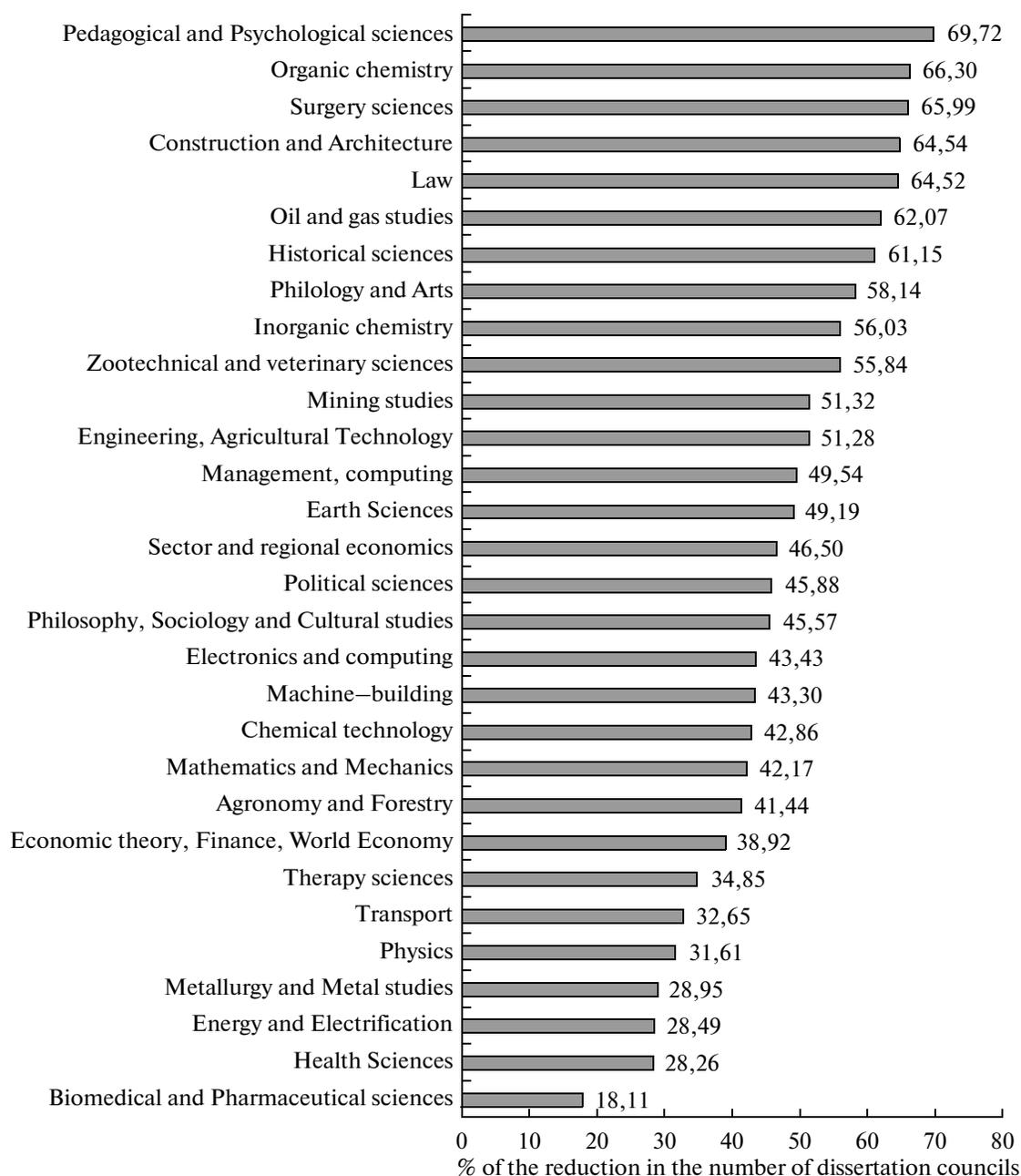
Fig. 6. The fractional reduction in the number of dissertation councils in selected specialties for the period between December 31, 2013 and 2015 (Source: The materials prepared for the meeting of the HAC of the Russian Ministry of Education and Science, October 23, 2014).* For Biomedical and Pharmaceutical Sciences, the reduction is calculated for the period from October 1, 2014.

• *Mathematics*: the number of councils for Mathematics and Mechanics;

• *Earth Science*: the number of councils for Earth Sciences;

• *Agricultural Sciences*: the number of councils for agronomy and forestry combined;

• *Physics*: the number of councils for physics;

• *Chemistry* the number of councils for inorganic chemistry, organic chemistry, and chemical engineering combined;

• *Economics and Business*: the number of councils for sector and regional economy, economics, finance, and global economy combined.

The results are presented in Fig. 7. It should primarily be noted that by 2015 the share of Russian disser-
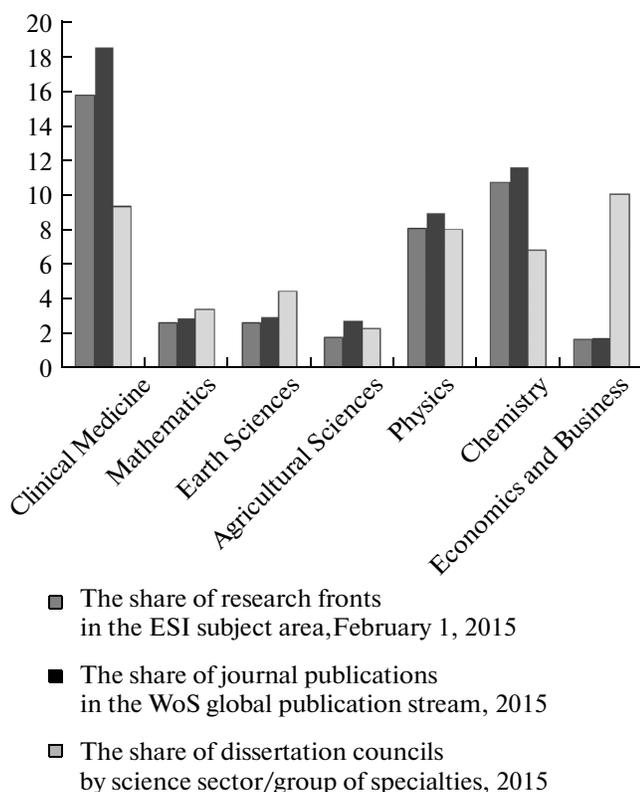
- ▣ The share of research fronts
  in the ESI subject area,February 1, 2015

- ■ The share of journal publications
  in the WoS global publication stream, 2015

- ▢ The share of dissertation councils
  by science sector/group of specialties, 2015

Fig. 7. The relationship between the proportion of individual areas of knowledge in the structure of global science and the share of specialized dissertation councils in Russia (the WoS data as of February 1, 2015).

tation councils that can be attributed to the subject area of Clinical Medicine in the WoS is supposed to reach 9.3% of the total number of dissertation councils, compared with 7.3% 2011. However, a 2% increase in the share of dissertation councils for medical science, which is the largest field in terms of both the number of scientific fronts worldwide and the number of publications indexed in the WoS, is inadequate.

The 66% reduction in the number of surgery dissertation councils is especially unclear. Surgery, neuroscience, and oncology are the top three fastest growing disciplines in the WoS subject area of Clinical Medicine [8].

The dynamic changes in the share of dissertation councils in chemistry are positive. The share of dissertation councils in chemistry increased from 4.6% in 2011 (Fig. 4) to 6.8% in 2015 (Fig. 7), which reduces an explicit imbalance in the ratio of international scientific fronts in chemistry and the number dissertation councils in Russia. However, the more than 60% decline in the number of dissertation councils for organic and inorganic chemistry is unjustified.

Unfortunately, in our view, in the process of optimizing the network the HAC experts have ignored the relatively unjustified high share of dissertation coun-

cils for the legal and economics subject fields in comparison to the disciplinary structure of global science. This problem was systematically discussed at both the governmental level, in particular, at the meeting of President Medvedev with the Cabinet of Ministers July 15, 2014 [9], and in the works of Russian researchers [10].

In 2011, the number of dissertation councils for subject areas in economics was 379, i.e., 11.5% of the total dissertation councils in Russia (Fig. 4). At the same time, according to the recommendations of the expert council for sectoral and regional economy, as well as the Council for economic theory, finance, and the world economy, following the reform, the number of dissertation councils should reach 168 and 113, respectively, or 10% of the total number of councils (Fig. 7). Similarly, the increase in the number of dissertation councils for industrial and regional economy at the first stage of optimization (from December 31, 2013 to January 10, 2014) is ungrounded.

CONCLUSIONS

Optimization of the network of dissertation councils in Russia is aimed at harmonizing the structure of domestic science in accordance with global scientific trends, supporting training of competitive specialists in accordance with the current state of development of innovative areas in the economy, and adjusting imbalances with regard to the training of highly qualified specialists in the research and educational sectors.

The results of the distribution of dissertation councils across individual branches of science that are expected by late 2015, analyzed based on the outcomes of the optimization of the dissertation-council network in Russia, show that the reform contributes to the harmonization of the reproduction structure of highly qualified scientific personnel in Russia in line with the disciplinary structure of global science. However, it should be noted that the unreasonably low share of dissertation councils for medicine and the high share high of dissertation councils for economic sciences, which contradicts global science trends, will still dominate the Russian academic landscape by late 2015.

REFERENCES

1. The concept of modernization of the system for certification of highly qualified scientific personnel in the Russian Federation (Project). http://минобрнауки.рф/%D0%B4%D0%BE%D0%BA%D1%83%D0%BC%D0%B5%D0%BD%D1%82%D1%8B/3307.

2. Proceedings of the Round Table of the Committee on Science and High Technologies from February 21, 2014. http://минобрнауки.рф/%D0%BD%D0%BE%D0%B2%D0%BE%D1%81%D1%82%D0%B8/3972.

3. Exponentiation. Higher Attestation Commission Head Vladimir Filippov calls to expand the autonomy of uni-

versities and research institutes in training. http://www.rg.ru/2015/01/23/filippov.html.

4. Network of dissertation councils of the Russian Federation. Quantitative distribution of defenses of candidate's dissertations per year, regardless of the outcome of defending by fields of science of the Russian Federation. http://science-expert.ru/dsrf/federal_level/Results/ON/Result_on_1.shtml.

5. Network of dissertation councils of the Russian Federation. Quantitative distribution of defenses of doctoral dissertations per year, regardless of the outcome of defending by fields of science of the Russian Federation. http://science-expert.ru/dsrf/federal_level/Results/ON/Result_on_2.shtml

6. Kurakova, N.G., Tsvetkova, L.A., and Eremchenko, O.A., *Analiz primenimosti naukometricheskikh pokazatelei v kachestve kriteriev dlya optimizatsii seti dissertatsion-nykh sovetov v Rossiiskoi Federatsii* (Analysis of the Applicability of Scientometric Indicators as Criteria for Optimization of the Network of Dissertation Councils in the Russian Federation), Moscow: Izd. Dom "Delo" RANKhiGS, 2013.

7. Kurakova, N.G., Tsvetkova, L.A., and Eremchenko, O.A., Scientometric parameters of Russian economic science: General state and assessment of dissertation councils, *Vopr. Ekon.*, 2013, vol. 11, pp. 21–38.

8. Kurakova, N.G., Zinov, V.G., Tsvetkova, L.A., Eremchenko, O.A., and Golomysov, V.S., *Aktualizatsiya priorititetov nauchno-tekhnologicheskogo razvitiya Rossii: Problemy i resheniya* (Actualization of Priorities for Scientific and Technological Development of Russia: Problems and Solutions), Moscow: Izd. Dom "Delo" RANKhiGS, 2013.

9. Medvedev, D.A., On the development of the higher education system. Transcript of the meeting on the development of the higher education system. http://government.ru/news/13753/#sel=12:28:Wcj,12:96:kVf.

10. Natkhov, T.V. and Polishchuk, L.I., Engineers or lawyers? Institutions and demand for higher education, *Vopr. Ekon.*, 2012, no. 10, pp. 30–51.