

Models of Science in Russia and Germany: History of Convergence and Divergence

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The systems of science in Russia and Germany are difficult to compare. Despite being of the same institutional structure with similar sectors, they differ considerably by the functions which are executed by actors in the field. The main difference of the German model is extensive functions of universities, among which research activity is granted the highest priority. In contrast, the “core” of the Russian model is the Russian Academy of Sciences, universities are mostly regarded as a part of the system of higher education, they are obliged to execute the teaching function in the first place.

Nevertheless, during a long period in development of the Russian and German models of science, they were convergent in many aspects (as it will be demonstrated further) – or, in other words, had much in common. Features of the German model can be traced back in Russia: university research was also strong here until the first part of the 20th century, when the Communist Party took the office, and the system of science was significantly restructured.

Another round of the models convergence lasted until the late 1980s. For many decades, until the re-unification of Germany in 1989, this country was divided into two parts, Eastern and Western Germany (the German Democratic Republic and the Federal Republic of Germany respectively). In the eastern part of the country, the GDR, science was organized following the Soviet principles which were the basis for organization of science in the USSR. Thus, research in GDR was concentrated in numerous academies of sciences under control of the state, while university research was distinctly disadvantaged. This model still functions in Russia (though some attempts to change it and make it more flexible are yet to be permanently made), but in former Eastern Germany it was mostly re-structured during the first years after the re-unification. It was one of the starting points

of the new unified state to reinforce transformation of science and research in the former GDR from highly centralized social structure into a decentralized one with multiplicity of sub-systems and actors, funded from different types of resources, which was predominant in the FRG. Science and technology (S&T) in Germany were (and still are) one of the most important priorities, “the main objective of current S&T policy-making is to develop Germany into one of the leading-knowledge based societies”.¹

The present paper seeks to answer the question when and why institutional convergence of the Russian and German models of science turned into divergence. The article briefly examines the main stages of development of the models of science in both countries and also provides an analysis of their current features to demonstrate the models’ differences and similarities.

1. Period of Institutional Convergence

Historically, organization of science in Russia was developing along the European traditions, though having some peculiarities. Originally, universities and the Academy in Russia were intent to have clearly delimited functions. The Russian (originally – Imperial) Academy of Sciences was established in 1724 along with the Saint-Petersburg State University (the first university in Russia). Initially the Russian Academy of Sciences was supposed to be established as a research institute, while the University had solely an educational function. Nevertheless, in fact universities those days were not only the centres for learning, but also the scientific research institutes: many prominent scientists were involved in research activity here (for example, mathematician Leonhard Euler, chemist Friedrich Krafft, philologist and historian Gottlieb Bayer, astronomer Petr Inokhodtsev – all of them worked in Saint-Petersburg State University). The University had strong interrelations with the Russian Academy of Sciences, which had not such a well-developed apparatus or a network of departments and committees as it has nowadays. Even on the contrary, Renate Mayntz declares that Russia in those days “used to have academies in the form of learned societies, but their

universities were the major sites of basic research. To that extent they stood in the West European tradition”.¹

The same “peaceful” co-existence of universities and academies of sciences can be traced in many European countries in the 17th – 19th centuries: Academia dei Lincei in Italy (it was the first academy of sciences in Europe, founded in 1603), the Royal Society of London in England (1660), Académie des sciences in France (since 1666) etc.² In Germany, the Prussian Academy of Sciences was also established in 1700 (now – Berlin-Brandenburgische Akademie der Wissenschaften). Thus, in the 18th century and later, the institutional models of science in Russia and Germany converged, there was no strong distinction between Russian pattern of organization of science and the situation in most European countries, though the Russian Academy of Sciences still had a remarkable distinction. Most European academies of sciences did not have at their disposal numerous institutions and laboratories, they gained from the state only limited funding for libraries and museums, publishing journals, and sometimes for awarding prizes. The members of these academies – as a rule, the professors of the universities and other higher education institutions – often did not get salary for their work in academy. The Petersburg (Russian) Academy of Sciences was originally the only scientific academy, which was entirely financed by the state and made by the scientists for whom their membership in the Academy was a kind of civil service.

While the starting point of the both models was similar, later the trajectory of development of the system of science in Germany was slightly different: instead of gradual concentration of research functions in one body – academy of sciences – and its extensive support by the state, the German model followed a direction of growth of complexity: a number of universities which played (and still do) an extremely important role in research was impressive with a tendency for a permanent increase.

1 Ibid.

2 Kopelevich Y. Vozniknovenie nauchnykh akademiy: seredina XVII – seredina XVIII vekov [Beginnings of Research Academies: mid 17 – mid 18 centuries]. Leningrad: 1974. See also: the official web sites of the Academies of Sciences: www.bbaw.de (Berlin-Brandenburgische Akademie der Wissenschaften), www.royalsociety.org (Royal Society of London), www.lincci.it (Accademia Nazionale dei Lincei), www.academie-sciences.fr (Académie des sciences) (Access: 05.05.2012).

1 Kruhl W., Meyer-Krahmer F. Science and Technology in Germany. London: Cartermill Publishing, 1996.

Preconditions of a high level of complexity of the system of science in Germany can be found in the history of the state. Up to 1871 (when the state was united into a national state of Deutsches Reich) it consisted of many independent states. Each of these small states had its own university which was established and funded by its sovereign, in addition the biggest cities such as Hamburg or Frankfurt often founded their own universities. Even after unification of the Deutsches Reich, in addition to state universities there was a number of universities and research institutes governed by individual states (Länder) or cities still existing. Moreover, there were also complex research institutes operating in the whole Reich, such as Kaiser Wilhelm Gesellschaft and the Notgemeinschaft der deutschen Wissenschaft (Emergency Association of German Science), whose main function was promotion of research and science in German universities and outside their walls.¹ These peculiarities of the historical development of the country, in my opinion, can be considered to be the main precondition for formation of the very complicated system of science, which continues to exist nowadays.

2. Turning to Divergence Trace

According to many authors (Mayntz, Jablecka, Kehm), the turning point in the history of development of both systems of science in Russia and Germany occurred after 1925. This radical change was caused by governance of the Communist Party which initiated a new direction of development of science in Russia and moved the Russian model away from the Western pattern. Also it influenced science in Germany as later it launched restructuring of the whole system of science in its eastern part.

The organization of research in national academies of sciences as the major institutions of state financed research was a Soviet invention. During the Communist Party governance, science was regarded as a necessary basis for economic progress, production and planned innovation (“science push model”). It was the main reason

of that extensive state support which science enjoyed in the Soviet period and caused rapid growth of a number of scientific institutes in Russia and scientific personnel in them. Even nowadays, according to studies made in Russia by the OECD (the last one in 2006) and other international and foreign organizations, a number of scientific personnel in the Russian Academy of Sciences exceeds an average quantity of scientific community in most other countries manifold.¹

Thus, due to the priority role of science for the country’s development, it became necessary to put this vital system under the central control of the state: the easiest way was to pass the main functions of doing research from quite a diffused network of the universities to one centralised body of the Academy of Sciences which was supported and, what was even more important, funded almost solely by the state. “The academy model, i.e. the concentration of research in one large, specialized, and politically controlled organisation is thus closely linked to a particular view of the function of science in a planned society and the proper relationship between knowledge production and application”.²

Under the governance of the Communist Party, the system of Russian science and science in the GDR were significantly restructured: the Russian Academy of Sciences developed an extensive network of its departments throughout the country and in the Soviet republics and also obtained almost the sole right to carry out research. In the GDR, 60 institutes of the Academy of Sciences were also established.³ The universities lost most freedoms and rights they had possessed earlier and became responsible mainly for teaching, in contrast with the universities in the western part of Germany, where not only universities, by also state-financed extra-university research enjoyed a considerable higher level of academic freedom (even in comparison with other Western European countries). During the Communist period, in the eastern part of the country the organization of science was similar to the model which was predominant in the USSR: “state-financed research was organized along the lines

1 For further information on the history of the German model of the organization of science in: Osti-Battaglini A., Karpen U. (eds.) *Scientific Research in the Federal Republic of Germany: Essays on the Constitutional, Administrative and Financial Problems*. Baden-Baden: Nomos Verlagsgesellschaft, 1990.

1 The official web-site of the OECD: www.oecd.org.com (02.02.2010).

2 Mayntz R., Schimank U., Weingart P. (eds.) *Eastern European Academies in Transition*. Dordrecht: Kluwer Academic Publishers, 1998.

3 Kehm B., Lanzendorf U., *Reforming University Governance. Changing Conditions in Four European Countries*. Bonn: Lemmens, 2006.

of the Soviet model, i.e it was concentrated in national academies”.¹ This form of research organization was in a sharp contrast with the main tendencies of development of science in the western part of the country (the Federal Republic of Germany), where an organized division of labor between different types of academic institutes existed and was promoted by the state.

The universities in Russia, supplemented with the newly established higher education institutions (based on the concept of a higher professional school, a very different concept from that of a university),² also lost their research function and for many decades were regarded as a part of the system of higher education only.

3. Current Situation: between Convergence and Divergence

In Germany, the re-unification in 1989 led to the significant changes of the model of science in the former GDR: The three largest academies – Academy of Sciences, Academy of Building and Architecture and Academy of Agriculture – were formally dissolved, though their sub-divisions (research groups and infrastructure) were restructured according to the principles of the Western European model. Some of the former academy institutes were incorporated into Max Planck Society or Fraunhofer Association; some of them, due to a good deal of applied research they included, were expected to find a new employment in the economic sector or to establish themselves as commercial institutes doing contract research. Two-thousand persons from various academy institutes (especially those who were involved in research in humanities and social sciences) were recommended to be transferred into universities. Finally, just 6 of 60 academy institutes were closed down completely.³ Nevertheless, the implementation of these measures appeared to be very problematic: after the re-unification the industrial sector experienced financial difficulties and was not capable to absorb newly established institutes; the capacity

1 Kruhl W., Meyer-Krahmer F., *Science and Technology in Germany*. London: Cartermill Publishing, 1996.

2 *Reviews of National Policies for Education: Tertiary Education and Research in the Russian Federation*. OECD, Centre for Co-operation with Non-Members, 2003.

3 Kruhl W., Meyer-Krahmer F., *Science and Technology in Germany*. London: Cartermill Publishing, 1996.

of universities to absorb additional personnel from the academies was also limited. Additionally, many academy researchers did not have enough qualification to fulfill the requirement of university jobs.

In Russia, in contrast to Germany, the model of science was not re-structured significantly after the fall of the USSR. Despite of the ongoing changes and current attempts of the Russian government to incorporate education and science, the Russian model still preserves the features it gained in the Soviet period and thus differs significantly from the Western model. The governmental sector still prevails: the number of scientific institutes here increased during the 1990s, contrary to the worldwide tendency to decrease. It occurred not only because of establishment of the new academic organizations, but also because of the division of some already existing academy institutes. The Russian Academy of Sciences has a large share in this sector of science, it comprises 11 per cent of Russia’s total of research and development (R&D) institutions, in comparison with six per cent in 1990.¹ The Russian Academy of Sciences is composed by nine departments (according to the branches of sciences), three regional departments and 15 regional research centres, which are mostly involved in and responsible for basic research.²

The business sector of Russian science is represented by the market-oriented R&D institutions, including R&D units of industrial enterprises, which specialise primarily in performing applied research.

The system of science in Germany is notable for a much higher level of institutional diversity than in Russia. It consists of a great number of different institutions and academic organizations, each of them contains a network of numerous sub-divisions and departments, which also can contain a number of sub-structures. All these institutions are funded from different resources, they have different degrees of freedom and different objectives, and are subordinate to different actors.

State research institutes constitute one of the sectors of the system of science. All of them can be divided according to their affiliation and source of funding:

1 Mindeli L., *Russian R&D in Transition*, in: www.rieyt.org (Access: 05.05.2012).

2 For further information: the official web site of the Russian Academy of Sciences: www.ras.ru (Access: 05.05.2012)

1. Research institutes which are controlled and financed by their controlling state ministries or by one of the sixteen states. These organizations conduct research in different spheres of science: agriculture, astronomy, international relations, biology, medicine etc. The brightest examples of this group of research institutes are the famous Zentralinstitut für Kunstgeschichte in Munich, the Sigmund Freud Institut in Frankfurt, the Pädagogisches Zentrum in Berlin, some of them are situated in foreign countries;

2. The so-called Big-Science Institutes (Großforschungseinrichtungen) which are funded by the state, but privately organized. Mostly, these institutes are involved in research in natural sciences and engineering. Usually their projects are carried out beyond the scope of university or industrial research, consequently, they can be regarded as a link between these two actors in the system of science. All the Big-Science Institutes are united in a network in order to promote exchange of ideas and interdisciplinary research;

This sector of science includes also four large institutional networks (the sector is typically called extra-university research sector, what stresses the benchmarking role of the system of universities, though the networks of academic organizations, which are listed below, still cannot be considered to be of less significance):

1. The Max-Planck Society (Max-Planck-Gesellschaft, MPG) focuses on the basic research in science and the humanities. The 80 Max-Planck-Institutes (MPIs) are the oldest extra-university research institutions in Germany. The Max-Planck Society is compared often with the Russian Academy of Science. Indeed, it has similar structure, it concentrates mostly on fundamental research; nevertheless, the Society has a much higher level of autonomy from the state: it is granted with a use of a mixed system of funding and mixed system of management.

2. The Fraunhofer Association (Fraunhofer-Gemeinschaft, FhG) focuses on applied research in science and engineering in cooperation with industry. The first institute was founded in Mannheim in 1954, and there are now 57 Fraunhofer-Institutes.

3. The Leibniz Association (Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz, WGL) is specialized in applied research in all fields of science and the humanities. The 80 Leibniz-Institutes were

founded individually and became members of the Leibniz Association at different points of time.

4. The Helmholtz Association (Helmholtz-Gemeinschaft Deutscher Forschungszentren, HGF) is constituted by former providers of large research facilities. The 15 Helmholtz Institutes were originally providers of large research facilities serving universities and other research groups, some of them have developed into broad-range science and engineering centers, working more especially on long-term research topics that are relevant to the State and society.¹

The member institutes of the last two associations enjoy a certain degree of freedom from their holding organizations, while the members of the first two are strongly connected with their heading organizations. Extra-university research centers are free from political influence owing to a comprehensive system of governance and decision-making process. When being internationally compared, German extra-university institutions are well-known for their high level of autonomy.

Business and industry constitute the third sector of science: as a rule, large companies in Germany have their own research centers and laboratories. Moreover, the business sector provides financial support for state academic organizations and university research centers, some of the larger enterprises found grant programs. Quite often, even smaller companies stay in cooperation with research institutes of universities or extra-university research sector. It helps smaller enterprises to solve problems they face and to conduct research necessary for their development, but which they do not have facilities to carry out themselves.

Nowadays in Germany the share of industry in funding and conducting research is about 50-60%, it is a federal priority to maintain the existing degree of industry participation and involvement into research activity. Nevertheless, because of decreasing state support and influence of globalization, the in-house R&D capacities of enterprises have decreased.

All the three sectors discussed above play an important role for development of science and technology in Germany, but nevertheless, universities are granted traditionally (and these traditions are still

¹ Kehm B.M., Lanzendorf U., *Reforming University Governance. Changing Conditions in Four European Countries*. Bonn: Lemmens, 2006.

alive today) a status of the central actors in research. In Russia, on the contrary, universities account for only 10.4% of the total R&D activities (2003).¹ Only 38% of accredited higher education institutions have funds for R&D activities, and only 20% of the academic personnel are engaged in research. Universities' role is one of the main differences between two models of science: research is organized differently within universities of these countries, the systems of funding differ considerably, even obligations of faculty members concerning research activity are defined in different ways.

Conclusions

Nowadays, the Russian and German models of science have divergent structures, with only one convergence feature left – their composition. They both are composed of four main sectors, nevertheless, functions of these sectors and their interrelations differ significantly in Russia and Germany. The systems of science in the two countries are organized according to diverse principles. The Russian model is based on the central role of the Russian Academy of Sciences, in Germany the central actors in the field of science are universities which execute two main functions simultaneously – teaching and research. In contrast to Germany, universities are considered in Russia most of all as educational institutions and their share in total fundamental research of the country is rather low.

As it was demonstrated in the article, the current institutional divergence started its development in the first part of the 20th century as a result of influence of the political system and changed state priorities. Before this turning point, the Russian model of science had been staying alone with the European tradition.

The results of the analysis described above and conclusions made throw light on historical development of Russian science and discover the original convergence of the Russian and European models, which are often regarded nowadays as two radically different traditions. The study also provokes further reflections on the impact of political system on science in Russia – not only in historical perspective, but in current period as well.

¹ Reviews of National Policies for Education: Tertiary Education and Research in the Russian Federation. OECD, Centre for Co-operation with Non-Members, 2003.