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Polish Science in a Regional Approach

Introduction

The present work outlines the project of an expert's report whose aim is to describe the regional structure of Polish science and to define the nature and role of the regional dimension of scientific policy.

We rely on two assumptions as a basis for the analysis of the regional structure of science: of a system interpretation of science and of the geographical dimension of scientific activity.

The system interpretation of science treats it as a socio-cognitive system. Science is not only a cognitive activity, but also a mode of social activity and its artefact produced by a community of researchers in a specific social environment. A socio-cognitive system is defined by its three aspects: its composition, its surroundings, and its relational structure. The composition of a socio-cognitive system embraces the totality of individuals engaged in scientific activity, i.e. the scientific community. It is diversified functionally and institutionalised legally and customarily, as expressed by scientific institutions of various forms. The surroundings of a socio-cognitive system embrace, apart from the technical environment, i.e. means and facilities necessary to pursue science, also the social environment in which researchers operate. It greatly controls external determinants of scientific activity. This influence mainly manifests itself in activities of the state and its scientific policy as well as in the demand for scientific products necessary to improve practical operation. The structure of the system includes internal and external relations. Among internal relations are first of all research activity and also communication and criticism as well as other social relations, e.g. co-operation, competition, etc. External relations include the interaction between science and society.

Science as a socio-cognitive system is found to occur at different scales or levels of complexity: at a global scale it constitutes "world science"; at a sub-global (broadly understood regional) scale it is the science of a country, e.g. Polish science, or the science of a region.

The geographical dimension of science results from differences in the level and effectiveness of scientific activity, and from differences in the conditions of its development in each country and region. In the geographical approach to science a special role is played by differences in scientific activity among particular countries, because they provide the basic social, economic, political and cultural conditions for the development of science. They are expressed in the scientific policy of society towards science, and especially in the scientific policy of the state, which influences scientific activity, more or less actively, through its institutions and financial programmes.

What is of primary importance for the geographical formulation of science on its system interpretation is the spatial diversity of its subsystems at two levels: national and regional.

At the national level science should be considered as a whole, i.e. as a component of science in the global sense, or world science. At the regional level, in turn, science should be regarded in terms of its spatial diversification as manifested by the spatial organization of scientific centres. The distribution of scientific centres presents the regional approach to science.

Thus, the regional approach turns on the concept of a scientific centre as a subsystem, as well as a component, of the regional structure of science in the national system. This approach is an elaboration of the concept and research results published earlier (Chojnicki, Czyż 1992).

Starting with these assumptions, we propose to present two issues in this report: 1) the regional structure of Polish science, and 2) the character and role of the regional dimension of scientific policy. They can be outlined as follows.

1. The regional structure of Polish science

Starting from the assumption that the distribution of scientific centres presents the regional approach to science in Poland, there are two tasks to perform: 1) the characterization of scientific centres, and 2) the description of the differences and links among those centres.

To carry out the first task, it is necessary to define the character of the scientific communities of the centres, their organizational-institutional structures, and their educational and research activities, and to describe and evaluate the quality of their technical and spatial development. The study of the scientific community of a centre includes an analysis of its numbers and qualifications, the growth of young research staff, the percentage of academic teachers, and the research profile. The evaluation of the educational activity of the centres embraces an analysis of the types of higher-education institutions, courses of study they offer, new courses and how they answer the country's needs, and the training of young research staff. An attempt is made to evaluate the role of the educational function in creating scientific centres. The level of scientific activity

is defined in terms of scientific specialization, the intensity of research, scientific achievements in the basic sciences — applied sciences — technology pattern, and the ability to create scientific schools and authorities.

The starting point for accomplishing the second task is the analysis of the spatial distribution of scientific centres and its relation to the distribution of towns. The main issues are the differences in scientific and educational potentials and scientific and educational functions of the centres, as well as links holding among them. The links can be divided into organizational-institutional, research and educational ones; an attempt is also made to identify factors generating those links (complementarity, co-operation, competition, monopolization). Another issue is the hierarchization of the centres and the determination of the degree of polarization of their system in terms of functions. On the basis of the established hierarchy of the centres their impact is defined: within a region and at the national and international scales. The impact consists of the relations:

- 1) between science and the economy and innovation market,
- 2) between education and the labour market, and
- 3) between science and culture.

The external factor determining the development of scientific centres is taken to embrace financial outlays for science, i.e. their magnitude, structure and origin.

These data can also provide a basis for a cartographic presentation of the distribution of scientific activity in the form of an atlas of European science.

2. The character and role of the regional dimension of scientific policy

The distinction of the regional aspect of scientific development entails the definition of the character and role of the regional dimension of scientific policy as a totality of means regulating and promoting the development of science in a regional approach. Hence, two dimensions should be distinguished in scientific policy: national and regional.

In **the national dimension** scientific policy embraces the regulation and shaping of scientific activity by central state institutions from the point of view of global interests of society and the state, while maintaining the cognitive goals of the development of science and scientific progress. Naturally, the aims and instruments of such policy can assume a variety of forms.

Kukliński (1994: 244) suggests adopting the following as the fundamental goals of Polish scientific policy: “a) improving the competitiveness of Polish science at the global scale, and b) strengthening Polish science as a factor involved in the process of the transformation of the country, society and economy”, and incorporating the discussion about scientific policy into a broadly understood strategy of Poland’s development.

To achieve those goals, several conditions have to be satisfied, the most important of which include: 1) ensuring a suitable level of financing, 2) selective promotion of research directions, 3) utilizing research results, and 4) introducing institutional and organizational changes. Here is a short comment on this matter.

Re 1) The drastically low financial outlays for science in Poland, which over the last three years varied between 1.3% and 1.1% of national income distributed, reduce science to a mere survival level and bring about a sort of depreciation of scientific staff and their outflow abroad. This makes progress impossible in those basic studies of an experimental nature which depend on expensive apparatuses, as well as in technological research. Such a situation leads to Poland's increased technological dependence and purchase of still more licences, while weakening the position and role of its science in making practical activities more efficient.

Re 2) A selective promotion of research directions is a must in the face of the existing financial limitations. However, it imposes serious restrictions on the development of science, which is a system system of connected vessels of a kind, and as such requires a reasonably balanced development. This holds especially for relations between basic sciences on the one hand and applied and technological sciences on the other.

The selection of specific research directions cannot be made by central state institutions because, as the experience of the previous period demonstrates, it is conducive to monopolization, a paucity of discoveries, and a low level of innovativeness. The choice must be made under conditions allowing scientific bodies to put forward research projects and to evaluate them.

At the same time, however, the selection of research directions, especially those of a technological nature, should be in agreement with the directions of economic development, and particularly with the restructuring of production. As Hofman (1992: 237) observes, the authors of works dealing with the strategy of economic development cannot define it strictly enough, which hinders the choice of directions of applied research as well as research and development projects.

Re 3) The advantages brought by scientific progress must be viewed in two aspects: a broader one, concerning education, culture and the rationalization of social consciousness, and a narrower one, expressing itself in practical applications, especially in technological innovations and new industrial applications. However, for the results of scientific research, especially state-of-the-art technologies, to be used effectively, it is necessary to create appropriate socio-economic and organizational conditions. What we mean are not merely some organizational changes such as the setting up of information centres, but first and foremost fitting technological progress in with the restructuring and practices of industrial enterprises, e.g. in the form of credits, so as to make them take suitable steps themselves.

Re 4) Institutional and organizational changes in the system of science should aim at improving the effectiveness of scientific activity. Its financing from state funds has already been reorganized, with the State Committee for Scientific Research set up to handle the matter. Proposals are also put forward for transforming the basic research units, i.e. the institutions of the Polish Academy of Sciences, as well as higher schools into self-governing and self-supporting bodies. This would require them to adjust to the rules of the market game, and would depend on the emergence of a market for scientific products and for higher-school graduates. Although the transition to a market-regulated mode of

functioning is not possible, market-oriented reforms have to be a component of the operation of science in Poland.

With the above as a background, let us consider problems and dilemmas of the regional dimension of scientific policy.

The regional dimension of scientific policy rests on the recognition of scientific centres as independent agents of scientific policy, and on the acknowledgement of their role and character in the development of science. Both scientists and scientific institutions tend to be located in places which are centres of scientific activity and which offer several benefits, like scientific co-operation, the use of technical and information bases, as well as interactions and links with a region's economy.

In the regional dimension, scientific policy influences regional differences in scientific activity by promoting particular scientific centres on the basis of their research potential in specific disciplines and their creative scientific programmes. It also deals with various sources (central and regional) of financing. It should consider regional interests as well, and encourage regional patterns of innovation and co-operation with the economy.

The major aspects of the regional dimension of scientific policy can be tentatively taken to embrace:

1) the impact of the character of scientific centres on the effectiveness of scientific activity, and

2) the role of scientific centres as places generating technological and organizational innovation.

Re 1) The promotion of scientific activity has to take into consideration the impact of the character of scientific centres on the effectiveness of scientific activity. This requires the introduction of the special regional coefficient in the evaluation of scientific programmes, i.e. carrying out research in a specified scientific centre. What we have in mind here are primarily complex, finalization-type programmes. In this way the broader environment of scientific research could be taken into account, namely equipment, scientific information, and co-operation. This, in turn, should be conducive to the specialization of the centres and the formation of scientific schools, which, however, cannot lead to monopolization. Within the centres themselves it may reinforce internal links and indicate particularly creative institutions around which scientific activity tends to crystallize.

Re 2) Apart from their science-creating role, scientific centres are places generating technological and organizational innovation of a regional and supra-regional nature.

At the regional scale, those scientific actions should be promoted which condition or support social, economic and civilization development of a region. Regional aspects of socio-economic development are increasingly more important, and science itself becomes a significant factor of economic development. Despite the open character of scientific activity, the regional links between science and the economy tend to influence production profiles and the economic effectiveness of regions ever more strongly. The activity includes: the training of highly-qualified scientific staff, consulting, the creation of technological and scientific information

centres, firms implementing research achievements, technological parks, industrial incubators, etc. Simultaneously this activity opens up new possibilities of financing science from sources outside the state.

At the supra-regional scale, specific scientific centres could collaborate with major centres of innovation and technological progress which are European or world "islands of innovation." This concept of Hilpert's (1992) and his studies show the role of such collaboration for innovation processes.

Taking into consideration the regional dimension of scientific policy in Poland makes it necessary to devise a new strategy of the development of science accommodating the regional aspect of scientific activity, and to create such legal and fiscal mechanism which would stimulate the diversified development of scientific centres and the use of their research potentials in the economic and civilization development of regions. The legal and fiscal regulations to be introduced should encourage the financing of research and development projects from sources other than central ones.

A preliminary list of issues in regional policy might include the following: defining the character of benefits of decentralization; defining the character of means and instruments used to promote the development of scientific centres; establishing principles of the ranking of scientific centres; recognizing and defining effective forms of central and decentralized financing of the development of science in a regional approach; formulating principles of making the organizational structures of units engaged in scientific activity more flexible; defining the ways and forms of collaboration among scientific centres and co-ordination of their activities; and defining the role of the centres as islands of innovations and forms of collaboration with industry.

Empirical studies of the regional system of scientific centres in Poland will be based on secondary sources and primary factographic data. Use will be made of the official published statistics of science and higher education (statistical yearbooks of the Central Statistical Office, reference books of Polish science, bulletins of the State Committee for Scientific Research) as well as unpublished materials (current data of the Central Statistical Office, information of the Centre for the Promotion of Science of the Polish Academy of Sciences). It is also necessary to carry out a survey research on the character and role of regional scientific policy. It will cover a representative sample of scientists, also of the young generation, selected deliberately from different scientific centres.

In this approach, this study will allow us to gain insight into the regional structure of Polish science and will provide a basis for defining the character and role of the regional dimension of scientific policy.

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**SCIENCE
TECHNOLOGY
ECONOMY**

Editor:
ANTONI KUKLIŃSKI

WARSAW 1994