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Knowledge and Technology Transfer (KTT) from Academia to Industry in Central European Countries: the case of Poland

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The paper describes the relation of science to the economy within the developed countries, factors concerning ideas of a scientific – technological policy in CEC as well as elements of recent Polish policy in this field.

Keywords: technology transfer, knowledge transfer, scientific – technological policy

INTRODUCTION

The concept of scientific-technological policy within a given state refers to the creation of **instruments for an effective unification and co-operation between scientists, engineers, managers, marketing specialists as well as end users towards the end of innovation, thereby stimulating economic growth and overall economic competitiveness.**

Among such instruments may be included – support for the infrastructure of science and technology, technological transfer, the creation of information networks, introduction of tax reductions and credits as well as the creation of conducive conditions for institutions

linking science with the economy proper. It is also significant to formulate a strategic industrial policy, based on innovation and appropriate regional strategies as well as scientific-technological potential particularly where there is a possibility for educating a given region according to these criteria. Scientific policy should be connected with innovative policies in employment, industry and even foreign trade. A state innovative strategic policy thus understood is also based **on the creation of new scientific and technological knowledge, together with its dissemination and practical application.**

THE RELATION OF SCIENCE TO THE ECONOMY WITHIN THE DEVELOPED COUNTRIES

The experience of other countries may serve as an example in accepting the optimal concept for the Central European Countries (including Poland) state's introduction of research and technological results, both as regards the more developed states (USA, FRG, Japan), and such runners-up such as (Korea, Australia, Finland etc.). Nonetheless, the industrial development and the scientific technological policies of these countries has been radically different from that of Poland and other countries of East-Central-Europe in the course of the last decades. In the first phase of industrial development, in the majority of these countries, technology was imported, adapted and improved, leading to an improved economic situation. It was only then that expenditures were increased on developmental works in industry as well as on basic and applied research and financed from the budget. In the socialist countries, a relatively high level of research, particularly in the exact and engineering sciences, was not connected with research-developmental activity in industry.

With the onset of a global economy, foreign economies, research and developmental works are becoming a considerably less expensive source of industrial growth than the development of science itself. Depending on their power and potential, countries make use of more foreign development (i.e., basing themselves on foreign R+D expenditures), or develop their own R+D beyond the possibility of making use of it domestically. The latter then only serves foreign centers, which drain scientific and technological developments from abroad. The results of scientific research, financed from state budgets are generally publicly available and may enrich countries finding ways of utilizing them to greater degrees than the country's originally doing the research. It thus becomes increasingly important to create greater possibilities for making use of these results in ones own country.

FACTORS CONCERNING IDEAS OF A SCIENTIFIC-TECHNOLOGICAL POLICY IN CENTRAL EUROPEAN COUNTRIES (CEC)

- ◆ A relic of the centralized system of socialist economy is its organization of science based on a an inefficient linear model of innovation. Basic, applied research, applied developmental works and industrial production were performed in institutionalized isolation apart from one another. Because of a lack of economic market mechanisms, there was no pressure exerted on the enterprise to finance R+D (there was no such need, since everything that was manufactured ended up being sold anyway). The inability of the economy to cross the technological threshold became one of the sources of the communist system's breakdown.

- ◆ A fundamental characteristic of the R+D sector in CEC (another relic of centralized management) is its control by designated state departments to the exclusion of various industrially-based research centers. The latter have served as a world-wide base for industrial science, ensuring that science be responsible for direct effects in industry. 98% of the extr-budgetary sources in the FRG (which includes over 65% of all expenditures for R+D) is consumed in developmental works, i.e. for introducing industrial technology.
- ◆ The fundamental flaw in financing R+D in CEC, as compared to moderately developed countries of the European Union, is not only the low level of global financing from public sources (e.g. in Poland 0.42% GNP) but the exceedingly low extra-budgetary financing (from enterprises) estimated at $\sim 0.25\%$ GNP in Poland. In the highly developed countries (Germany, Great Britain), the share of extra-budgetary sources is usually twice the amount of the budgetary shares proper.
- ◆ The low overall competitiveness of CEC industry, particularly the low level of modern technology in the total production, as well as a lack of a formulated industrial policy in the course of the last decade, has not allowed the majority of enterprises to increase the financing of developmental works from their own resources.
- ◆ There is no system for connecting and coordinating science with economic activity. Only recently has a process of adjusting legislative and economic-financial measures been initiated to aid in the commercialization and transfer of technology in CEC.

**ELEMENTS OF A SCIENTIFIC-TECHNOLOGICAL POLICY
UNDER ACTUAL CONDITIONS OF ECONOMIC GROWTH IN
CEC – THE CASE OF POLAND**

- ◆ **The essence of the state's scientific and scientific-technological policy lies in connecting it with the concept of the social and economic development of the country.** Creation of a unified concept, which may be referred to as a **strategic innovative policy** – is the leading task of decision makers, i.e., the government, parliament, with the concerted cooperation with representatives of science and industry (as experts). The most important element of an active policy of innovation is the creation of mechanisms, resulting in increased extra-budgetary sources (earmarked for research and development activity). This may be realized through the creation of an appropriate system of institutional solutions supporting innovation and economic competitiveness, i.e. increasing its actual demand and making use of the practical effects of scientific research. The present “KBN” statute on innovative activity (December 1999) creates only the basis and describes the task of this new activity in our socio-economic reality, which mustn't become the domain (duty) of only the scientific sector.
- ◆ In view of a lack of strong Polish holding concerns, capable of creating and supporting their own research-development centers, which in the OECD countries are often decisive of the scientific-technological policy of the state, under Polish conditions, a **system of legal and economic-financial solutions should be established, supporting the transfer of technology and commercialization of research particularly in small and average-sized enterprises.** The Economics Ministry program, “Increasing economic

innovations in Poland to the year 2006” (insofar as it will be realized) is a significant step in the creation of mechanisms and structures actually aimed at introducing modern solutions in the economy.

- ◆ **Deep restructurization of the research-development sector towards adjusting it to the the market economy is necessary and has been delayed by almost a decade.** This sector, according to the foreign model, should be an attractive place of work for young people. In Japan, the universities employ as many as 39% of the scientific workers, research institutes employ 8%, and industry employs 53%. In Poland, 76% percent of scientific workers are employed by the universities, 8% by PAN and only 16% of the total in various government departments and in industry. This does not mean that there are too many workers at the university, but does mean that factors were not employed to shift the need for research workers to the broadly understood science of industry.
- ◆ Creation of state research institutes from their respective parts (approximately 10%), as in the current year, as well as taking over and restructuring part of the existing OBR by the state and private industry is not the only way towards their restructuring. Based upon models from other countries (e.g., The Fraunhofer Society for Supporting Applied Research or the Otto von Gueride Community for Industrial Works & Research Associations), a system of legislative and economic preferences should be instituted in order to restructure the majority of state-run institutes.
- ◆ Protecting the interests of Polish R+D, while privatizing and selling state enterprises, particularly to foreign investors – is one of the key conditions for the continued presence of Polish science in industry.

- ♦ A good example could be the establish in a **National Program for the Development of Highly Advanced Industrial Technologies**, preceded by reviewing the potential and achievements in research and development by Polish scientists and engineers. This should provide a description of the technological gap in given sectors of the economy, which would map out the potential areas and technological niches where Poland could compete with multinational conglomerates.

ELEMENTS OF KNOWLEDGE AND TECHNOLOGY TRANSFER (KTT) IN POLAND

The basis for this is an active state innovation policy whose primary purpose is to rapidly implement new technological concepts and organizational initiatives, gearing them to actual production, operations and services. This aim should be achieved by stimulating and promoting innovation-oriented attitudes in the community and among businesses, concerns, banks, etc.

In view of insufficient instruments to encourage firms to financially support R&D we should extend those presently existing and find new forms of a pro-innovative policy in Poland particularly through:

- ♦ Creation and promotion of a broad range of mainly private innovative centres, technology incubators, technology transfer centres, venture capital corporations, research and technology parks etc., as well as other institutions dealing with marketing and R&D promotion, which would, in the future result in a marked increase in the non-budgetary financial funding of R&D.

- ◆ Offering tax exemptions and concessions for R&D expenditures. Tax incentives could be an especially efficient way to encourage domestic and particularly, foreign based Hi-Tech scientific firms investing in Poland and opening R&D facilities and plants here. If only a few leading science-based (e.g. pharmaceutical and other renowned chemical) firms were persuaded to establish R&D laboratories in Poland (which has a highly-qualified scientific personnel). This would set an important example for Polish industry and the overall research community. With such developments, some of the present branch R&D units could be transferred to these corporations.
- ◆ Introducing of tax incentives to promote KBN projects and other collaborative research with universities and research institutes.
- ◆ Stimulating the development of non-profit research institutions by granting them tax-exempt status. This would have the final effect of supporting universities and research institutes rather than performing on-site R&D activities at public expense.
- ◆ Establishment or extension of special strategic programs stimulating, e.g. the application and implementation of Polish technology in industry and the promotion of transfer technology purchases to new technologies, introduction on foreign markets etc. This can be focused on foreign projects such as applications in manufacturing technologies (see Canada) and the development of businesses using new technologies (see Norway).

Creation of a formula of standard programs for increasing the competitiveness of the Polish economy according to the guidelines of the "Standard Programs of the European Union" as a one of the proposals worthy of consideration. Expanding these programs to

international concerns active in Poland “in the name of the Polish economy” is another variation on this theme.

- ◆ Provision of special funding for extension of strategic R&D programs directed at given sectors (e.g. mining, construction or the pharmaceutical industry) through invoice write-offs and targeted funds.
- ◆ A multi-faceted promotion of competitiveness (e.g., joint research-development programs) between universities, institutes of the Polish Academy of Sciences, on the one hand, and broadly understood industrial science (research and development works) on the other. This is a great chance for removing barriers that had come into existence under the old system in introducing scientific achievements in Poland.

Other forms of increasing innovation that have been successful in the developed countries, such as professional training centers, technological centers (Centers of Excellence) etc., which should begin to be an example worthy of emulation under Polish conditions.

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