Mobility of knowledge transfer, and the firm's innovation process

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Abstract: The mobility of researchers in the public sector dramatically effects of firm innovation processes. These researchers contribute to the production and transfer of knowledge previously developed and accumulated in the public sector. That scientific knowledge has a positive influence on both inputs and outputs of the firms' innovation process. The fact that firms have access to additional knowledge which is complementary to that they already hold represents a spur for exploiting and applying this new knowledge. The firms continually increased their in-house investments. As a result of these investments firms create new knowledge of a unique and valuable type. The result is that a greater efficiency in human resource management and to improve the design of technology policies. Mobility of the highly-skilled workers plays a crucial role in the creation and diffusion of knowledge. In the knowledge economy research, innovation and lifelong learning have gained special attention at policy level world-wide as knowledge residing in minds of people and embodied in new products and services becomes a critical resource and a vehicle for success, competitiveness and growth of firm.

Keywords: innovation management, scientific knowledge transfer, knowledge management, public researchers' mobility.

1 Introduction

In the knowledge economy research, innovation and lifelong learning have gained special attention at policy level world-wide as knowledge residing in minds of people and embodied in new products and services becomes a critical resource and a vehicle for success, competitiveness and growth. The emergence of new scientific disciplines, the demographic changes in developed countries, the decline of state funding for research and higher education have created new challenges for research organizations and have raised their need to look for research funding from industry. Many countries have supported the access of companies to knowledge generated by researchers from public sector by various initiatives taking into account that innovation is built on collective knowledge sharing and collaboration between different individuals and groups. The European Union (EU), for example, has stressed the importance of research collaboration and the role of researchers in the process of knowledge creation, transfer and usage. Similarly, for OECD the mobility of the highly-skilled workers plays a crucial role in the creation and diffusion of knowledge. It has become an indispensible element of the career trajectory of researchers in all disciplines.

The mobility of researchers, and more broadly, the migration flows of the highly-skilled individuals, is discussed by the research community for years. The push and pull factors have gained special attention, as well as the benefits and losses by the sending and host countries. Considering how to maximise the potential gains of mobility, several researchers pointed out the importance of mobile people as transmitters of technology and tacit knowledge. For companies, in particular, incoming researchers influence strongly their innovation

performance through access to high-value knowledge, and thus provide higher competitive advantages.

While the initial debates stressed the brain-drain and the losses for the sending country, recently the benefits of the brain-circulation dominate. How to convert knowledge into socio-economic benefits, how to facilitate knowledge transfer, and how to enhance European excellence in research and technology development (RTD) – all these issues are discussed at several fora in Europe. In the last few years a number of initiatives have been launched by the EU in order to boost research, innovation and technology uptake in Europe, and to facilitate the career and mobility of researchers. In line with the EU researchers' career policy, the project 'European Career of Researchers' (E*CARE) tries to investigate the situation in 8 countries in South East and Central Europe and to raise the debates at national level for providing better environment for researchers. It focuses in particular on the changing environment for researchers in Europe and the role of EURAXESS Service Centers (ESC). A special emphasis is made on the awareness and usage of the EU tools for researchers, and how ESC may further support the knowledge transfer and innovation in Europe.

2 A firm's innovation process

Innovation and technical change play more and more a fundamental role in the knowledge era for competitiveness of firms and economic growth of countries. The modern literature on economics of innovation and technical change has developed new approaches that include spatial context in patterns of innovation. In fact, geographic space has become key factor in explaining the origin and diffusion of innovation and several scholars are engaged to understand the role of technology and knowledge within this spatial black box. Krugman (1991) argues that the geography of economic activities is based on spatial concentrations and according to Feldman (1994) this is true both for production and innovative activities. The models of knowledge production have been found to hold better for spatial units of observations than for enterprises in isolation of spatial context. In particular, the purpose of new economic literature is to understand the spatial dimension of mechanisms that underlie the propensity of innovative activity to cluster spatially, the mobility of knowledge and technology transfer, the absorptive capacity of adopters on the geoeconomic space, and so on. Technology transfer and knowledge spillover are prominently in addressing these issues. In fact, knowledge created in research laboratories is an important source of technology and knowledge spillover. Technology transfer can be viewed as an active process by which technology is carried across the border of two entities such as countries (international technology transfer), firms, or even individuals, depending on the viewpoint of the observer. New research on technology transfer has grown enormously and synthesizes this voluminous literature using a contingent effectiveness model of technology transfer that considers five dimensions: (1) transfer agent; (2) transfer medium; (3) transfer object; (4) transfer recipient; (5) demand environment. In particular, scholars focus the economic analysis of knowledge and technology production, transfer and diffusion on two research fields. The first is the theoretical basis for technology to transfer and knowledge to spill over with the aim to penetrate the black box of geographic space. The second challenge involves the measurement. Moreover, the literature does not address the path and impact that technology transfer and knowledge spillover take on geo-economic space.

3 Technology-knowledge transfer and diffusion process to firm

Technology as knowledge allows firms to accumulate know-how which is the precondition for generating innovations, raise the productivity and competitiveness. Technologies as well as knowledge are localized since depend on learning process and by interacting path dependence. It is not sufficient to create technology into research labs for increasing economic growth, but it is also necessary to transfer it into geoeconomic space. Figure 1 shows the main subjects of technology-knowledge transfer and diffusion process (Coccia, 2005). Knowledge and technology transfer between organizations, groups or areas that differ in terms of customs, age, social status, financial position, receptivity and production activities are less probable.

Technology and knowledge are important inputs within economic space such that firms prefer a nearby location to research institutes (sources of knowldge), even if the cost of other factors is higher. The empirical literature suggests that geographical proximity leads to a faster technology and knowledge transfer. The spatial analysis of knowledge transfer received a first important contribution, who stated that when the physical distance from the source of knowledge increases, the users' adoption of information decreases: the so-called neighborhood effect is due to lower probability of contact among subjects when the distance increases.

Feldman (1994), Audretsch and Feldman (1996) have highlighted the importance of physical distance in innovation and technology transfer process too. Saxenian (1995) whereas shows that physical proximity and greater interdependence among individuals lead to higher technology transfer than subjects more isolated and less interdependent.

In fact, the economic space creates economic and technological interactions among subjects, such as productive units (firms), public administrative bodies and sources of knowledge (universities, research institutes) that generate flows of information and goods. Geographical and technological proximity of economic agents are seen as main factors to knowledge transfer, since both kinds of proximity have an impact on learning capabilities of firms . The proximity of subjects can be measured by interactions of technological, spatial and organizational nature.

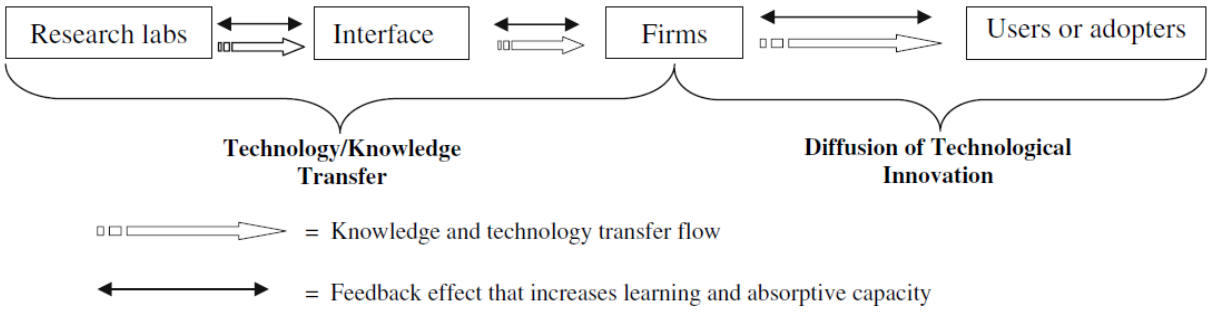

Fig. 1 Technology-knowledge transfer and diffusion process
Source: Coccia, 2005

Spatial mobility of knowledge transfer and absorptive capacity transfer be most appropriately directed to impacts on networks of interconnected scientific and commercial subjects. Coccia (2005) investigates the spatial interaction of technology transfer by a series of indicators, called sensors, which consider the relationship between sources and users of technology. These indicators have provided useful information to the governance of research institutes such as the potential market which indicates the labs that are better located in

proximity of the total demand and than offer greater capacity for selling the technological activities.

4 Mobility of researchers in EU

Today the growth of the new economy depends on the production of new knowledge, its transmission through education and training, its dissemination, and finally its exploitation in industry and society. While RTD organizations are mainly dedicated to the development of science and technology for the benefits of the economy and the society, universities have a more broad and multidimensional role. Beyond the creation and processing of knowledge, their tasks include transmitting of knowledge during the teaching process, but also are linked to a permanent communication of scientific achievements to the industry and the society.

The role of research organisations and universities in the knowledge society poses several challenges to them, including to change and to respond much better to the needs of the industry for knowledge and competencies, and the society in general. Public universities have faced a difficult process to adapt to the requirements for degrees and transferability of skills, as well as to keep their position on the competitive market for educational services in Europe. Besides, all public research institutions are struggling of not sufficient funding.

Researchers have a central role to play in the on-going processes of change, and in knowledge creation, transfer and application. It is not surprising that EU pays special attention to human resources in RTD, and in particular to young researchers, and considers the need for increasing their number in order to face the challenges of the knowledge economy. EU acknowledges as well the positive impact of the mobility of the highly-skilled workers for both, receiving and sending country. Researchers mobility, in particular, supports the transfer of knowledge, higher innovation, enterpreneurship and creativity in the host country. For sending countries, a benefit is the opportunity for gaining external knowledge and expertise, and access to global networks through the Diaspora networks.

Since launching the ERA in 2000, a number of EU measures were targeted at building a European labour market for researchers and taking the maximum benefits of their mobility, knowledge and networking, as well as attracting researchers to Europe and providing excellent opportunities for their work and career development.

Some important actions deserve particular attention:

- The Mobility strategy of 2001 focused on turning the ‘brain drain’ into ‘brain gain’ and using the ‘brain circulation’ of researchers for the benefits of the new economy and the society in Europe as a whole.
- The emphasis on career development of researchers found its expression in the European Charter for researchers and Code of Conduct for the recruitment of researchers (C&C). C&C is part of EURAXESS Rights and sets out the roles and responsibilities of researchers and their employers and sponsors, as well as focuses on greater transparency of the recruitment process and providing better career perspectives and stability of researchers’ jobs.
- The funding for researchers’ mobility and career development is supported by an increase of the Marie Curie (MC) Actions budget under the FP7 Specific Programme People.
- The Scientific visa is another tool in order Europe to attract 3rd countries researchers.

The skills development process of scientists does not prepare them for the knowledge economy, for moving between sectors and countries, as well as for working in competitive environment. Ageing of researchers and the not sufficient attractiveness of the job for young people did not find a proper solution in the last few years despite the efforts at EU level.

The salaries vary from country to country, and a common practice is to hire young researchers on part-time bases without clear career advancement prospects.

Therefore, a new Commission's initiative in 2008 pointed the existing barriers and problems for the research labour force in Europe. The aim of the European partnership for researchers is to accelerate progress in key areas including social security, competition based transnational recruitment and portability of funding, employment and working conditions, and training and skills. It represents a commitment of European and national institutions for taking measures in four important areas:

- to ensure open and transparent recruitment of researchers, including job advertisement at the EURAXESS portal, and to establish procedures for recognition of diplomas and qualifications from other countries and sectors;
- to provide social security and supplementary pension opportunities to mobile researchers, and increase their awareness on the respective rights and practice;
- to ensure attractive employment and working conditions for both young and experienced researchers by applying the 'flexicurity' principle;
- to equip researchers with skills and competences necessary for working in open and competitive environment, for clear communication of ideas and undertaking innovation and entrepreneurial activities.

5 The barriers to knowledge transfer in the Czech Republic

In the Czech Republic there are still significant barriers to more intensive networking of research and application sphere and knowledge transfer. In addition to the barriers at the level of research organizations, there are other barriers, especially at the level of the whole innovation system and in part on the level of individual researchers.

Interconnection of the individual barriers and factors that affect the poor level of collaboration research and application spheres in the Czech Republic is indicated in Figure 2. From there, and from previous reviews it is clear that in any case cannot identify a specific cause for the low level of collaboration research and application spheres. There are barriers to innovation system level and at the level of individual researchers.

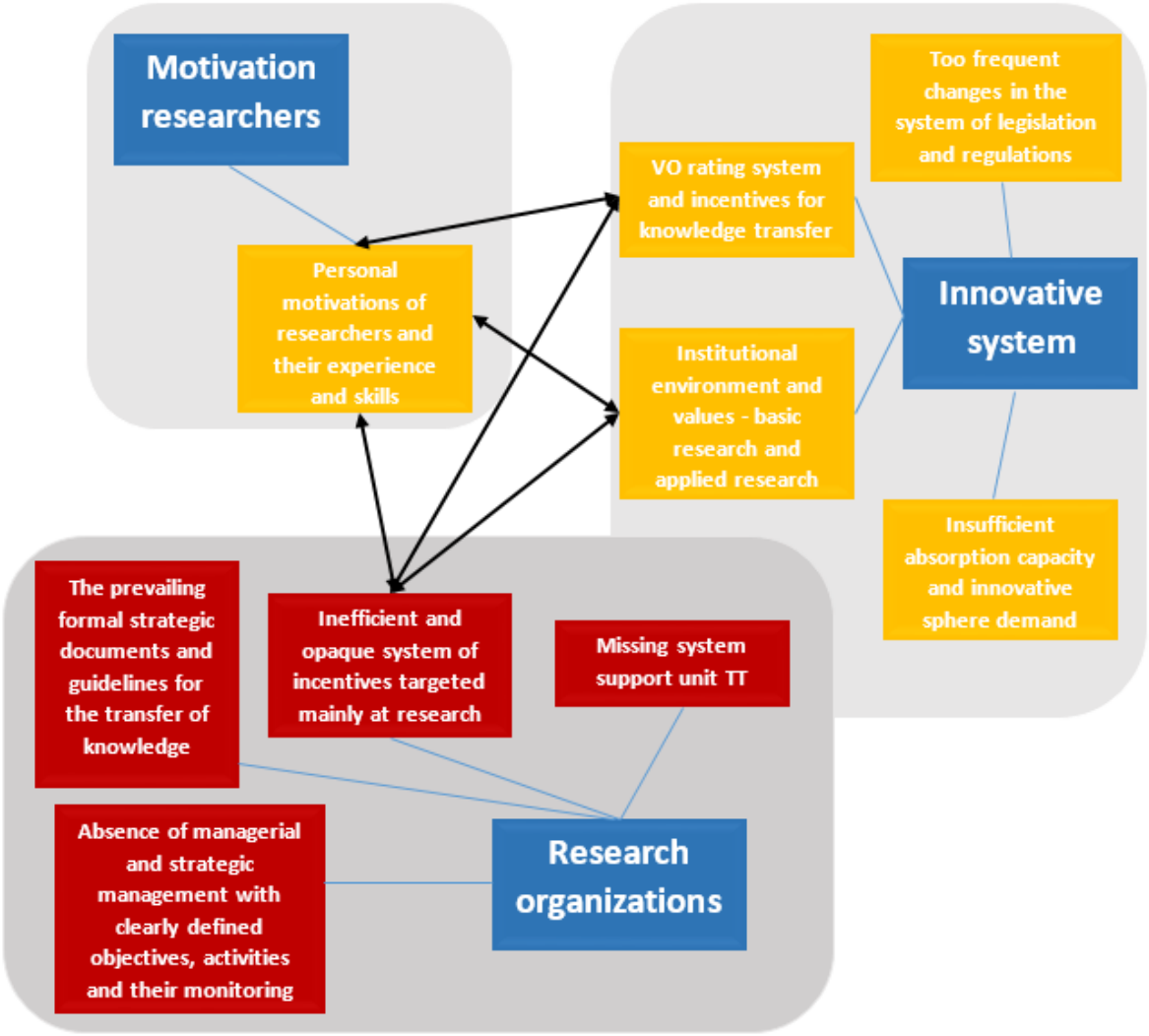

Fig. 2 Diagram of barriers to collaboration research and application spheres in the Czech Republic
Source: TC AS proposal

According to a survey carried qualitative evaluation by foreign experience can be at the level of research organizations to identify the four main areas of barriers.

5.1 Management Research Organization

Limited use of strategies to promote the transfer of knowledge and their contents are often formalized the result of a lack of strategic and management control research organizations. Research organizations in the Czech Republic are not overwhelmingly set clear long-term vision and objectives of its development, but also in its management to favor "academic freedom". Their activities are often decided individually or in restricted research team. A large part of the decision is to be ad hoc or out of inertia, which inevitably reduces the synergies and benefits.

5.2 Strategy and directive research organizations

The lack of managerial managing research organizations related to the nature of most strategic documents and directives relating to the transfer of knowledge. Even at this level can be found next barrier.

a) The first is tied to the fact that the vast majority of existing documents is unilaterally focused inward research organizations. Documents are focused mainly on determining the (general) rules for researchers at various stages of cooperation, commercialization and knowledge transfer.

b) Another drawback is very general and formal nature of the documents, without setting a clear vision of what you want the organization of cooperation to achieve goals that will lead to the realization and implementation elements and clear responsibilities for its implementation.

5.3 The benefits of knowledge transfer and collaboration with industry

A significant barrier is also low awareness of the management and figuratively research organizations and researchers about the benefits of these activities for further development of institutions, which is reflected in both the general nature of the documents and in their active promotion and publicity. Cooperation with industry is seen as "extra work" or unwanted interference in academic freedom.

5.4 Unit (center), knowledge transfer

Experience in the Czech Republic with regard to the unit (center), transfer of technology and knowledge are two main barriers.

a) The principal systemic lack of centers for transfer of knowledge lies in the prevailing way of their previous funding, which was founded on the basis of projects co-financed from EU structural funds, without their own system of funding research organizations.

b) Another barrier is the lack of capable managers and professionals able to implement the whole process of cooperation, since its establishment after the final sale of the final product and a personal understaffing of many of these institutions. This is related to lack of funding.

5.5 Motivation researchers

The success of knowledge transfer and collaboration with industry, of course, depends on the actual researcher and his motivation to transfer their research findings into practice. What is important is direct personal motivation, which is still mostly the main engine of collaboration with industry. The main drawbacks (barrier):

a) Organizations have a complex form of motivation researchers. For researchers with such a system it is difficult to navigate.

b) Trying research organizations maximize the number RIV points to get a higher volume of institutional funding.

c) Research organizations greatly underestimate the role of intangibles (non-financial) incentives.

6 Conclusion

Presently, the mobility of the highly-skilled scientists is part of the globalization processes world-wide. It provides opportunities for international knowledge transfer, as well as finding talents and skills not available on the national labour market. In Europe, the mobility of researchers is considered of high value, and of fundamental importance for the efficient

operation of ERA. The European Commission has created institutional and funding tools in order to enhance researchers' mobility and tackle the ever-challenging phenomenon of "brain drain". However, it is not only a European issue, but a global one, having to do with the absence of attractive reintegration possibilities and career prospects for researchers. Thus, since international mobility is considered beneficial for researchers and indispensable for acquiring new knowledge and skills, the main issue is not to prevent researchers from moving, but take profit and provide them with adequate return opportunities and career prospects.

The main question is to create conditions for brain-gain and brain-circulation in Europe. Thus, changing universities and research organisations, increasing their performance quality and strengthening their links to industry, and thus, fostering knowledge application in practice could essentially raise the attractiveness of ERA. Besides, a number of EU initiatives as pointed out above have focused on removing the barriers for mobility of researchers, raising the attractiveness of the researchers' career in Europe and creating a genuine European labour market for researchers. These initiatives are more or less visible among researchers.

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