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THE NEED TO ACCOMMODATE THE NATIONAL INNOVATION SYSTEMS OF SMALL TRANSITIONAL COUNTRIES TO THE MAIN PRINCIPLES OF NEW EUROPEAN RESEARCH AREA

INTRODUCTION

The new concept of European Research Area (ERA) brings already now a lot of challenges for the member states of the European Union, as well as for the candidate and other Central and Eastern transitional countries. The latter must increasingly react to various challenges. On the one hand, they are still coping with the obstacles in the scientific system inherited from the past. On the other hand, the proposed new European model of research and development (R&D) requires from them the adaptation of their R&D and innovation systems as soon as possible to the main strategic goals put forward by the EU Commission.

In my contribution, I'm trying to show that the creation of Europe of knowledge is for small scientific communities in transitional countries a source of opportunity, but also of major challenges. The small countries in Eastern and Central Europe are meeting with the challenge of the increased processes of globalization. The recent processes of globalization are leading to unprecedented integration of nations and localities in the new global order. Even nations with very large human resources are forced to join their R&D efforts to supra-national entities. That is true for the situation in Europe as well. There is no doubt that after a more than two decades of action, common intervention had created a new R&D scene in Europe. The new European Research Area, as this idea is experienced among European countries, is in many respects not only new, but also revolutionary. The main thesis of my contribution is that for small transitional countries in Eastern and Central Europe it is very important to follow the strategic goals of ERA, i.e. to create strong university-industry-government relations, to establish the regional innovation networks, to strengthen inter-sectoral research mobility, etc. Namely, these changes are not important only because of the diffusing basic research findings to practice. They are also important because of re-definition of the

whole developmental paradigm in this part of the world as well.

THE NATIONAL AND INTERNATIONAL SYNERGIES IN THE CONTEXT OF ERA

Let us say at the beginning some words about ERA. At first, the creation and development of ERA is presently high on the R&D policy agenda in Europe. The different actors at the European level work jointly towards the creation of a new Europe of knowledge. It has been a prime objective for the European Union (EU) since the Lisbon European Council of March 2000. Subsequent European Councils, particularly Stockholm in March 2001 and Barcelona in March 2002, have the Lisbon objective further forwarded. The main strategic goals of ERA written in different European Commission's documents are the creation of a network of scientific centres of excellence, a more co-ordinated implementation of national and European research programmes, a common system of scientific and technological references for policy implementation, a greater mobility of researchers in Europe, an introduction of the European dimension into scientific careers and the role of regions in the transfer of knowledge (see more: COM 2000 (6); COM 2002 (565); COM 2001 (346)).

For Brussels the coordinated implementation of international scientific and technological cooperation at national and European level is an essential precondition for a consistent overall R&D policy in context of ERA.

To be clear, ERA has established a new political context in which to develop a new strategy of international scientific and technological cooperation on the previous actions undertaken within the EU. Already in the near past, different forms of research networks were becoming an important element in the Europeanizing of R&D. If we use the words of John Ziman, through this form of globalization of science "...the traditional cosmopolitan individualism of science is rapidly being transformed in what might be described as transnational collectivism." (Ziman, 1994:218).

Discussions regarding the common EU research programs began already in the 60s in West-European countries. Notwithstanding, it was only at the beginning of the 80s that The First Framework Research Program (FP) was realized. The First Framework Research Program was reaction to the loss of West European companies in comparison to Japanese and US-American firms. It was also the response to the US Strategic Defence Initiative (SDI), which

was supposed to provide a strong impetus not only to military, but also civilian R&D. Since the beginning of 80s The Framework Programs (FPs) hold the position of the main instruments of inter-European R&D collaboration. Today, after a more than two decades of common R&D policy actions, a new scene for scientists in Europe has been created. The ERA aims at a coherent restructuring of the Europe research system through greater co-ordination and co-operation in order to turn them into one true "Single Market for Research". It could be said that scientists today are no more appearing only as individual members of European scientific community who are competing for international recognition for their contributions to a world-wide knowledge base. They are increasingly becoming a members of strong research networks (see more: Laredo, 2001).

To implement the Lisbon strategy, the European Commission has embarked upon a series of actions to strengthen the research co-operation among different European countries. Sixth Framework Program is introducing a lot of new actions which are important for adaptability of R&D systems to new knowledge society. For Candidate countries as well as for all other transitional countries, the Sixth Framework Program (6FP) is not only important because it leads to the creation of partnerships with the scientific groups of different countries, but also because it focuses the research efforts to interdisciplinary, practically relevant and applicable problems. The scientific groups from Candidate countries and other transitional countries participating in the Sixth Framework Programmes (6FP) will have the additional opportunity to learn how to co-operate with the business sector.

As was noticed by different authors, already former Framework Programs have been approved as being highly successful in establishing closer links of co-operation between the academic research sector and industry (see more: Biegelbauer, 1998; Haller, 1999; Luukkonnen, 2000). For example, industries counted among the most influential advisers in the 5 FP (Nowotny et al., 2001). Industries also played at that time a prominent role in most technology foresight exercises. Of course, new dilemmas appear with the shift of the Framework Programs towards a more pronounced market orientation. e.g. a contradiction with the original principle, that EU should not promote the interests of particular companies, but should promote the competitiveness of European industries in general. Terttu Luukkonen extensively dealt with this complex issue (see for example: Luukkonen, 2000; Luukkonen, 2001). She no-

ticed that "pre-competitive" character of FPs presupposes that the participants of a consortium in specific R&D project share the knowledge produced. The research results achieved in the context of FPs would be a limited "public good", to be shared by the all participants. This would lead sometimes to a conflicting situation at the policy level.

The tensions mentioned above were certainly one of the reasons that in the new ERA discourse is given a big attention to the issues of intellectual property rights. As is announced in a lot of strategic EU documents, it will be made a lot of steps towards a more efficient approach to intellectual property rights in filed of academic R&D (see for example: COM 2002 (565); COM 2002 (499); COM 2003 (58)). The priorities are the implementation of legislation to promote the development of a more effective and harmonized framework for intellectual property rights in Europe in generic scientific and technological fields (e.g. biotechnology and software), the launching of a process to identify and disseminate good practice and experience with regard to intellectual property systems applicable to public research institutions, the creation of Common EU Patent. The last strategic goal is hindered by different sort of reasons. The main reasons are disagreements in regard to language use and translation arrangements, the role of the National Patents Offices, and the common jurisdiction.

The ERA's approach should become the central pillar for the whole innovation policy discourse in Europe. It should motivate the interaction between different actors within the same sector, e.g. SMEs and large enterprises, or different sectors, e.g. co-operation between science and industry. What is much more important, ERA's approach should integrate R&D policy with other policies such as: education, competition, regulatory, regional, and foreign policies. This change has been often characterized as the transition to the new innovation paradigm (see more: Lundvall & Borras, 1998; Biegelbauer & Borras, 2003).

Following the rationales of new innovation policy is the key factor for Europe to compete with other big "players" on the world scene. Namely, as was already said, the concept of ERA is based on the assumption that in the times, when the United States and Japan has kept up and even increased their advantages in R&TD and innovations, Europe has felt behind.[1]

For the small European transitional countries, it is of paramount importance to exert their influence on the decision-making processes in Brussels (Thorsteinsdottir,

2000). Namely, it must be clear that the concept of ERA could lead to increasing disparities between small and large, between old and new EU countries, if the balance between the influence of all countries on the R&D decision-making processes at the European level should not be achieved.

There is not rare expressed the fear that the conflicts of interests between different stakeholders will increase with the projected enlargement of the EU.

It seems that the fears concerning the inferior R&D position of small countries in the enlarged Europe are exaggerated (see for example: Haller, 1999:376). Namely, in the near past exactly the small EU Member States have been able to develop in the context of EU R&D policy the most efficient R&D systems. But, I agree with the views that the first condition to avoid the conflict of interests between different type of stakeholders involved in European R&D policy is to create the conditions for consensus building at the different levels of decision-making.[2]

In this respect, the possibility for Candidate countries to approach to EU-funded research programs was very important. They have finally the same rights and obligations as the EU Member States. ERA should not only increase the European dimension of research in transitional countries. It should also help by full integration of Candidate countries into the global market, what is the key condition to strengthen their economies. In all European Commission's documents is expressed the need to help the Candidate Countries to play a more significant part in activities conducted within ERA and to become more fully integrated into more highly structured European research fabric. There is assessment that "...the action needs to be taken first of all by those who are involved in research and innovation and research policies, namely researchers, high-ranking officials and administrators, in particular the younger ones among them, who should be given access to the EU's best scientific research policy knowledge and expertise." (COM 2002 (565)).

The new concept of ERA requires effectiveness of R&D efforts at different administrative and organisational levels. In all of Europe, the increasing social complexity of R&D demands new institutional approaches. ERA is a best tool for intensifying the policy principles of competitive imitation with a recommendation to systematically use the methods of "benchmarking". Development of the methods benchmarking enable public authorities at national and regional levels to evaluate and improve their policies through exchange of good practice. The "benchmarking"

seems to be of crucial importance in the context of EU enlargement. The ideas and activities developed on the European scale could be of great help in fostering changes in the national context (see for example Edler & Boekholt, 2001).

The Candidate and other transitional countries can receive necessary information to adapt their policies and systems and get them closer to those of the European Union. Some of the Candidate countries are already involved in great part of these activities (see more: Devan & Papanek & Borsi, 2002). Additionally, in Lisbona was also launched the institutional innovation which is called the "new open method of co-ordination". It is coupled with a stronger guiding and coordinating role for the European Council to ensure more strategic direction and effective monitoring of progress in the field of R&D. Its main goal is translate European guidelines into national and regional policies by setting specific targets and adopting measures, taking into account national and regional differences (see more: COM 2002 (565)).

Namely, the modern occurrences in R&D are all the time characterized by the global-local dialectics. The paradox of globalization is that we cannot even think about globalization without referring to specific locations and places. Globalization is dialectic process in which the global and local do not exist as polarities, but as combined and mutually impliciting principles. The concepts such as "national scientific community" (Stichwech, 1996:332) or "national system of innovation" (Nelson, 1993:3) are challenging with the processes of globalization, but not abolished. Also in the context of ERA, where supra-national and sub-national (e.g., regional) levels of steering are increasingly emphasized in the last times, there was not coming entirely to the abolishment of national context. In that sense, the general EU R&D course cannot be considered a whole supplement to the national R&D policies.

To change R&D policies in transitional countries, it would be necessary to take into consideration the successful cases of small EU-countries in 90s. Since the beginning of 90s Brussels strongly influenced the way in which individual EU Member States have structured and re-designed their R&D policies. As is indicated by different analysis supranational organizations such as OECD and EU have played an important role especially in the development and diffusion of the new R&D policies in small EU Member States (see more: Alestalo, 1999; Miettinen, 2002). The countries like Finland, the Netherlands and Denmark

have re-designed their policy instruments and administrative structure under the influence of OECD and EU documents. These countries belong to the so-called "first movers" in the introduction of new "innovation paradigm" (see more: Biegelbauer & Borras, 2003). Although the interplay between stakeholders and policy-makers in this group of countries has worked very differently, their common characteristic was that they succeeded to establish strong communication channels between them. The Dutch government initiatives like "centers of excellency", "technology top institutes" or "research schools" did not have major problems in coming into being, as stakeholders were positively interested on those, not just for the new organizations, but also because they were economical viable through public funding (van Steen, 2003). Denmark reinforced and expanded the number of "contact-points" between stakeholders and the administration in the 1990s. Beside the traditionally active "technology councils", there were activated 29 different working groups (Christensen, 2003). In Finland key social actors also took part in the formulation of the new policy. Here was followed more tripartite model (Lemola, 2003).

In fact, in the last few years the new innovation concepts gradually find their way into the key strategic policy documents of Candidate countries as well. Let us take only one example. As is well known, the conclusions of the Barcelona European Council in March 2002 gave the EU the objective of increasing its research effort so that it approaches 3% of GDP by 2010. On the basis of these Conclusions, the Commission has presented a Communication entitled "More research for Europe: Towards 3% of GDP" (see: COM 2002 (499)). R&D decision-makers in all transitional countries expressed a strong ambition to follow this strategic goal.[3]

ERA AS A SOURCE OF OPPORTUNITY AND CHALLENGES FOR SMALL TRANSITIONAL COUNTRIES

The creation of Europe of knowledge is for small scientific communities in transitional countries a source of opportunity, but also of major challenges. In spite of numerous differences among the transitional countries concerning the organisation and mode of operation of their national innovation systems there exist a lot of common structural problems which are shared by all these countries. According to my view, the key structural and institutional issues of the national innovation systems which are, at the moment, present in all transitional countries are the following:

1. the big divide between the academic research business-economic sector and the absence of intermediary structures in relations between state, science and industry;
2. weak co-operation between science and industry at regional level;
3. the lack of inter-sector mobility of scientists.

That is the reason why the need to accommodate the R&D policies and R&D systems to the main principles of new ERA is so urgent for small post-communist countries in transition. Let us deal with the above mentioned topic more detailed.

THE NEW ROLE OF ACADEMIC SCIENCE IN KNOWLEDGE-BASED SOCIETY

The main strategic goal of ERA is to create knowledge society. The knowledge society depends for its growth on the production of knowledge, its transmission trough education and training, its dissemination trough information and communication technologies, and on its use through new industrial processes and services. In the last time the European Commission's Communications are oriented to re-think the new role of academic science (first of all university system) in a future knowledge-based Europe (see more: COM 2003 (58)). The changes in the position of the universities in a knowledge-based Europe have called the traditional "ivory tower" model of the university into the question. According to my view, for the transitional countries it would be useful to follow The Triple Helix model.

The Triple Helix and the ideas which define the ERA are strongly connected. As has been explained by different social scientists, the nature and process of recent scientific knowledge production is changing tremendously. This process of transition is variously described as post-academic science (Ziman, 2000), the Mode 2 (Gibbons et al., 1994) the post-normal science (Funtowicz & Ravetz, 1993), etc. It seems that especially the concept of The Triple Helix became in the mid 90s the symbolic banner of new theoretical and practical viewpoints on the changing role of academic science in the knowledge society (Eztkowitz & Leydesdorff, 1997; Etzkowitz & Leydesdorff, 2001). The concept could be used as a theoretical framework for the analysis of changes European R&D policy in 90s. Namely, the European R&D policy actors today expect academic science to be increasingly aware of its contribution to socio-economic development.

Let me only quote the paragraph from the already mentioned Brussel's document "Towards a European research area" to support this thesis. This document includes among others the following expectation: "Essentially, the non-existence of a European research area is due to the compartmentalisation of public research systems and the lack of coordination in the manner in which national and European research policies are implemented. Much needs to be done in this area, without however, putting unwieldy mechanisms in place. At the same time the barriers must be lifted between different disciplines, along with barriers that curb the movement of knowledge and persons between academic and business world." (Communication from the EU Commission, 2000:9)

The Triple Helix concept is centrally concerned with the question of how relation between academic science – industry – government is conceptualised in different institutional contexts. According to Henry Etzkowitz, it was one of the ironies of history that as post-communist countries moved from corporativistic to individualistic models numerous countries with a laissez faire capitalist tradition moved in the opposite direction. In the 90s in high developed industries in North America, Europe and Asia the style and extent of government intervention in economy have varied, but government –business – university interaction has always played a critical role (see more: Etzkowitz, 1994; Etzkowitz, 1996). Marja Alestalo noticed that especially in Nordic countries the functional changes in the state with a fluctuation from a liberal orientation to intensive state intervention and regulation are capable of explaining the characteristics of the political pressures to make the academic science system more utilitarian and marketable (see more: Alestalo-Hayrinen, 1999).

To come in transitional countries to the full realization of the Triple Helix it will be necessary to change the traditional academic values of scientists. Namely, without a change of values of academic scientists concerning the commercialisation and application of their research results it is not possible to expect the demanded changes.

Let us take the example from Slovenia as a small country in transition. Because of its smallness it could be said that there exist some additional problems. The small size of country does not necessary lead to a high degree of co-operation between different R&D actors or to the more flexible behavior of social actors in the field of R&D. On the contrary, with the limited formal mechanisms for co-ordination there is a risk that the system is poorly equipped to manage diversity and foster new opportuni-

ties and challenges. I tried to find in my research work, if there existed at all any reorientation of scientists in Slovenia regarding the so-called commercialisation of science. In the context of this empirical investigation the interviews among the representative sample of active researchers have been made in different time periods: in 1990, in 1995, and finally, in 2001. The surveys have concerned a very extensive range of issues and the respondents have been asked to answer questions about different aspects of R&D activity in Slovenia (see more: Mali, 1998; Mali, 2000; Mali, 2003). For the purpose of my discussion here, I will take into consideration only parts of my longitudinal empirical investigation, first of all those that concern the value orientation of Slovene scientists to application and commercialisation of research. The scientists in Slovenia interviewed in the context of my empirical investigation mostly insisted on the distinction between "pure" and "applied" science, in spite of the fact that this type of distinction has been suggested as artificial, in theory as well as in practical science policy actions (see Levitt, 1999; Ziman, 1994; Nowotny et al., 2001).

What is interesting for our discussion, is that the scientists in Slovenia interviewed also in the last time period of our empirical investigation (in the year 2001) expressed the opinion that the division between basic and applied science is very strict and for that reason justifiable. Additionally, most of them said that the industry should be in charge of the financing of applied research, and the state for financing basic research. In the year 2001, only about 30% of the scientists interviewed responded that the industry in Slovenia should play a more active role in the financing and strategic direction of basic science. This percentage was not much higher than in former time periods of our empirical investigations.

In all time periods of our empirical investigations scientists responded that they alone have the decisive influence on the discourse in and content of their research work. In the year 2001, 61% of all interviewed scientists responded that they alone have the decisive role in defining the content of their research work. Only 18% of all interviewed scientists answered that they defined the content of their research work considering also the demands of industrial firms in their regional environment. Next to industry influencing research, followed government (11%), international institutions (6%) and others (4%).

According to the new concept of ERA, regions may play the "motor" role in the overall context of economic growth based on research, technology and innovation. At a regional level, the public and private actors could establish synergies due to their partnership. Some successful cases in Europe could offer models of the innovative regions. Let us mention only Baden-Wuerttemberg in Germany, Rohne-Alpes in France, Lombardy in Italy and Catalonia in Spain, which are often taken as examples of "motor regions" in the EU (see for example: Third European Report on Science & Technology Indicators, 2003).

ERA encourages the development of regions that transcend national boundaries for the dual purpose of enhancing European unity and creating foci for knowledge-based economic development. Large scale policy interventions in R&D are no longer desirable. Policies have to be fine-tuned to regional innovation processes in order to develop the desirable network externalities. ERA takes into account the importance of embedding of research projects into regional economic and scientific structures, so as promote technological progress and economic growth (see fro example: COM 2001 (549)). Spatial proximity can help co-operation and networking aimed at transforming scientific knowledge into industrial applications within regions. In the recent times science-based technologies, such as nanotechnology and biotechnology are an areas that can especially benefit from regional approach. It is thus not surprising that at the European level a number of initiatives were triggered to encourages regionally based biotechnology networks which crossed the national borders. Several small and medium EU countries put as a key priority in their science and technology policy the fostering of biotechnology.

The regional dimension of research and innovation activities should be taken into consideration by the Candidate and other transitional countries as well. In the document titled "The Regional Dimension of the European Research Area" (COM, 201, 549 final) it is explicitly stated that in the ERA particular attention will be paid to the building of research and innovation capacities in the regions of candidate countries. In this part of the world, there is really coming to the awareness that with the growing globalization R&D itself has become more "spatially fluid". Benefits of research being undertaken in one locality are no longer necessarily remaining in that area. Therefore the efforts have to be made to integrate R&D capabilities with the local economy.

Notwithstanding, here is still the scarcity of R&D base at the regional level. The R&D systems in transitional countries mainly centers on capital cities, with weak and slow regional innovation performance (see more: Technology, Knowledge and Learning, 2001). Although institutional decentralization has been attempted in some countries (Hungary is considered the most advanced in this respect), these processes are still in the starting phase.

Let us take again the example of Slovenia. We have been faced, throughout the last ten years, with different normative acts and documents which put in the forefront the role of R&D as the main promoter of socio-economic development at the regional level. Unfortunately, reality showed us just the opposite. The main reasons for this situation were the following:

1. The R&D groups in Slovenia remained in the last ten years still mostly disciplinary and not problem-orientated (see for example: Mali, 2003).
2. The centre-dominated approach in the R&D policy have not been entirely abolished, in spite of the fact that the smallness of the country could have offered greater opportunities for achieving a more balanced regional development. (see for example: Bučar & Stare, 2003; Mali, 1997).
3. German experts who have analysed the innovation policy in Slovenia have stated that the minimum precondition for an innovation-oriented regional development is to establish an agency which can co-ordinate activities at the regional level and work out a strategic approach in collaboration with chambers of industry. There is still a lack of such "interface" institutions in Slovenia (see more: Phare Report, 1995; Walter, 1997).
4. An additional factor for deficiency is that representatives of the regional industrial sectors are not involved enough in the development of national R&D programmes (see more: Bučar & Stare, 2003).

The realisation of the strategic goal to create the regional innovation networks will be difficult in Candidate and other transitional countries also because of the high orientation of technical and natural scientists in this part of the world to the publicizing and not to the patenting. Unfortunately, in CEE – countries, the relative high publication productivity often does not correlate with technological performance.

Let us take the following example: if we compare the data about the publication productivity and citation impact of computer sciences which was one of the most rapidly growing scientific field in the second half of 90s and,

undoubtedly, one of the most important field for the future knowledge based society, the position of some East-European transitional countries is still very good. Three of them belong to the group of thirty countries that score at least world average citation impact of 0,80. Concerning citation impact by country in computer sciences, Slovenia is ranked at the third place (Source: The Third European Report on S&T Indicators 2003).

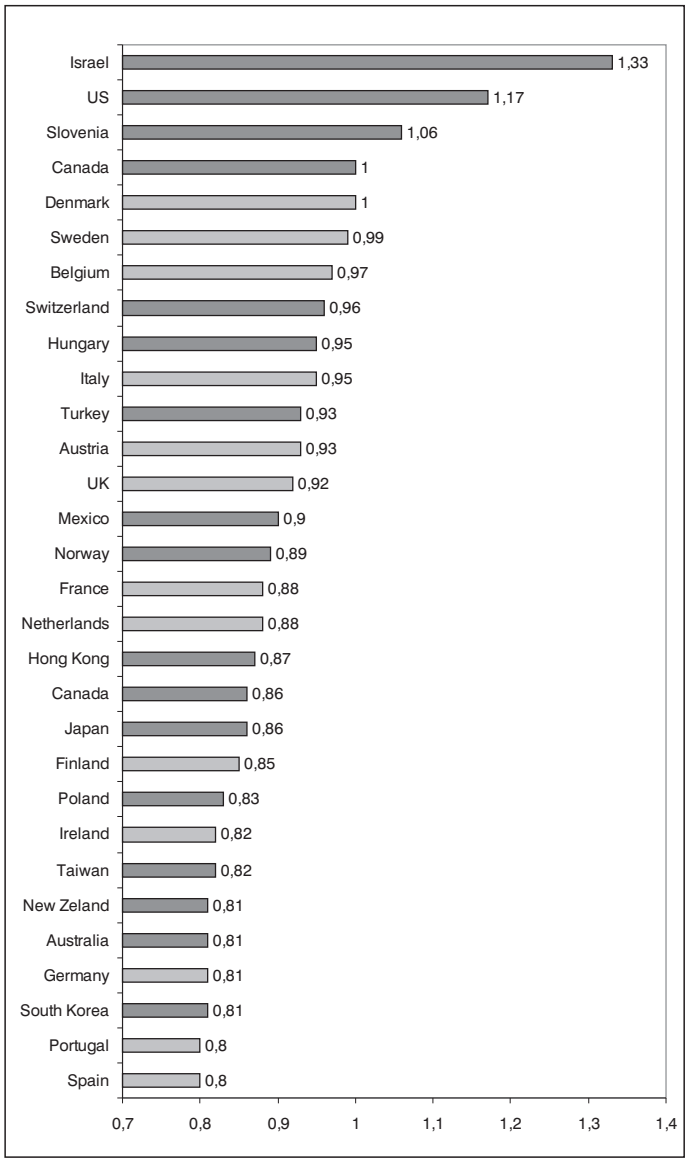

Figure 1
Citation impact by country in computer sciences (1993-1999)

Source: DG Research
Data: ISI, CVTS (treatments)
Third European Report on S&T Indicators, 2003

Unfortunately, the indicators about the internal scientific influence do not reveal much about the external utility of the research outcomes in filed of computer sciences. In Candidate and other transitional countries, there still exists low level of patenting in high-tech industry. That is opposite to the situation in EU Member States. Moreover, the figures from the above cited source (The Third Report on Science & Technology Indicators 2003) illustrate that the greatest dynamism in terms of both patenting and high-tech trade is presented in small EU Member States. Small EU Member States in particular have developed niche areas in which they perform well: Ireland in Computers, Finland in Telecommunications, Denmark in Pharmaceutics. The same is true for the dynamism in terms of patents. On the one hand, it is clear that large economies of Europe, the US and Japan have the dominant share of European and US patents. But the countries that have displayed the largest growth in patenting activity over the last ten years were smaller EU Member States, notably Finland and Denmark.

THE INTER-SECTOR MOBILITY OF SCIENTISTS

The concept of ERA triggers a greater mobility of researchers and the introduction of an European dimension to scientific careers. The mobility of European scientists is seen as an important instrument for the transfer of scientific knowledge throughout the world. As was pointed out in different EU documents, the mobility of human resources are now regarded as an essential factor for a high performance of the scientific system and the dissemination of scientific results to the broader social environment.

The mobility of scientists and research ideas is a more pronounced problem in the Candidate and other transitional countries. In an EU document titled "A Mobility Strategy for The European Research Area" (COM 2001,331 final), different sorts of reasons are identified which prevent a more efficient professional mobility of scientists in the Eastern part of Europe. These factors extend from the distorted career tracks of scientists to the blocked ways of intersectoral mobility, notably between academic institutions and industry.

In transitional countries, the "internal" brain drain is much more critical than the "external" brain drain. This is especially critical when there is a lack of highly educated and trained staff in industry and, at the same time, there is coming to the internal "brain drain" of young scientists. The most significant indicator that this form of domestic

"brain drain" out of universities and institutes has not halted the economies of transitional countries is provided by data which show that during the 90s in which this mobility has strongly occurred, the amount of in-house industrial research in almost all transitional countries has dropped. An "internal" brain drain (that is, one which happens within the country) is worse than one in which talented scientists leave the country to find a job abroad. The loss of scientists in this way is painful to a country but it is understandable. Today the need for an openness of the scientific community towards the most developed parts of the world is high. The fact is that especially in small transitional countries, for purely objective reasons, the spirit of provincalism can threaten the development of R&D. The only way to overcome self-sufficiency and scientific inbreeding of a small scientific community is its openness towards world. Small transitional countries enter in an increasingly globalized environment which is constantly changing and which have a big winners, but also many losers.

It is interesting that in the context of mobility actions proposed by the promotors of the idea of ERA, there is not only a strong emphasis on the training of researchers from European countries abroad, but also on the mechanisms which could stimulate the return of the emigrated groups of scientists to their home countries and regions. To approach to the last mentioned goal, the Candidate and other transitional countries are still at the beginning. The R&D policy actors in these countries have to do much more to arrive at the so-called reverse brain drain.

CONCLUSION

At the European level the processes of globalization and commercialization of R&D are currently most tangibly influenced by the growing importance of European Research Area (ERA). In order to better understand what is the influence of ERA on the national innovation systems of small transitional countries, my interest was first of all to confront with the basic rationales of new Europe of knowledge. Of course, my intention was not to present all different theoretical and practical concepts including in ERA. I tried to stay at the presentation of the key structural issues which demand from Candidate and other transitional countries to accommodate their R&D policies and R&D systems to the main principles of new ERA as much as possible. The creation of Europe of knowledge is for national innovation systems in this part of world a source of

opportunity, but also of major challenges. To be clear, it is not possible to insist on full imitation of procedures used in the near past in Western European countries. Every transfer of R&D policy concepts has to take in regard the different economic, social and political traditions of each country. The countries can not follow the model of full coping. Notwithstanding, they have to learn the experiences of each other through the transfer and diffusion of coded and un-coded experiences in the form of policy formulations, organizational arrangements, procedures, and similar measures.

FOOTNOTES

[1] Of course, Europe has also a lot of advantages. For that reason in all EU official documents is stressed that the advantages of Europe must be maintained, increased and fully exploited.

[2] About the driving political mechanisms leading to the consensus among stakeholders in the context of ERA see more in Jakob Edler's contribution to ESA conference in Murcia (Edler, 2003).

[3] In June 2003, there was organized in Slovenia a big strategic conferences dedicated to the realization of Action Plan 3%. The participants at the conference were coming from different social sectors: science, economy, politics, etc. After the presentation of Prime Minister's report, sever focus groups were formed to discuss in depth of particular aspect of ERA and national innovation strategy.

LITERATURE

Alestalo-Hayrinen, Marja (1999), The University under the pressure of innovation policy. Reflecting on European and Finish experiences. *Science Studies*, 12(1):44-69.

Bučar, Maja and Stare, Metka (2003), *Inovacijska politika male tranzicijske drzave*, Ljubljana. FDV.

Biegelbauer, S. Peter (1998), Mission Impossible. The Governance of European Science and Technology, *Science Studies*, 11(2):20-39.

Biegelbauer, S. Peter and Borras, Susana (eds.) (2003), *Innovation Policies in Europe and the US. The new agenda*, Hampshire, Burlington: Ashgate.

Christensen Jesper Lindgaard (2003), Changes in Danish Innovation Policy – Responses to the Challenges of a Dynamic Business Environment, pp. 93-113, in: P. Biegelbauer and S. Borras (eds.), *Innovation Policies in Europe and the US. The new agenda*, Hampshire, Burlington: Ashgate.

COM 2000 (6): Towards a European research area (2000) Communication from The Commission to The Council, The European Parliament, The Economic and Social Committee and The Committee of The Regions. Brussels, 18 January, 2000.

COM 2001 (346) final: The International Dimension of The European Research Area. Communication from the Commission. Brussels, 25 June, 2001.

COM 2001 (331) final: A Mobility Strategy for European Research Area. Communication from Commission. Brussels, 20 June, 2001.

COM 2001 (549) final: The Regional Dimension of the European Research Area. Communication from Commission, Brussels, 3 October, 2001.

COM 2002 (499): More Research for Europe. Towards 3% of GDP. Communication from Commission. Brussels, 11 September, 2002.

COM 2002 (565) final: The European Research Area: Providing New Momentum. Strengthening – Reorienting – Opening up new perspectives. Communication from the Commission. Brussels, 16 October, 2002.

COM 2003 (58): The role of universities in the Europe of knowledge (2003) Communication from the Commission, Brussels, 2 February, 2003.

Devan, Katalin; Papnek, Gabor; Borsi, Balazs (eds.) (2002), *A Methodology for Benchmarking RTD Organisations in Central and Eastern Europe*, Budapest: University of Technology and Economics.

Edler, Jakob (2003), The Emergence of European Research Area: An inter-temporal comparison to make sense of governance change in Europe, paper for ESA conference, Murcia 2003.

Edler, Jakob and Boekholt (2001), Benchmarking national public policies to exploit international science and industrial research: a synopsis of current developments, *Science and Public Policy*, 28(2001)4: 285-94.

Etzkowitz, H. and Leydesdorff, L. (eds.) (1997), *Universities and the Global Knowledge Economy. A Triple Helix of University-Industry-Government Relations.* London, Washington: Pinter.

Etzkowitz, Henry and Leydesdorff, Loet (2001), Universities in the Global Knowledge Economy, pp. 1-11, in: H. Etzkowitz and L. Leydesdorff (eds.), *Universities and the Global Knowledge Economy. A Triple Helix of University-Industry-Government Relations*, London, New York: Continuum.

Etzkowitz, Henry (1994), Technology centers and industrial policy: the emergence of interventionist state in the USA, *Science and Public Policy*, 21(2):79-89.

Etzkowitz, Henry (1996), Losing our bearings: the science policy crisis in post-Cold War Eastern Europe, former Soviet Union and USA, *Science and Public Policy*, 23(1):13-26.

Funtowicz, S. O. and Ravetz, J. R. (1993), Science for the Post-Normal Age, *Futures*, 25(7):739-755.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Throw, M. (1994), *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*, London: Sage Publications.

Haller, Max (1999), The model of science and research policy of the European Union in perspective in the making of the European Union, in: M. Haller (ed.), *Contributions of the social sciences*, pp. 369-393, Berlin, Heidelkberg, New York: Springer Verlag.

Laredo, Philippe (2001), Technological Programs in the European Union, pp. 33-43, in: H. Etzkowitz and L. Leydesdorff (eds.), *Universities and the Global Knowledge Economy. A Triple Helix of University-Industry-Government Relations*, London, New York: Continuum.

Lemola, Tarmo (2002), Convergence of national science and technology policies: the case of Finland, *Research Policy*, 31(5):1481-1490.

Lemola, Tarmo (2003), Innovation Policy in Finland, pp: 77-93, in: P. Biegelbauer and S. Borras (eds.), *Innovation Policies in Europe and the US. The new agenda*, Hampshire, Burlington: Ashgate.

Levit, N. (1997), *Prometheus Bedeviled. Science and the Contradictions of Contemporary Culture*, New Brunswick, New Jeresy, London: Rutgers University Press.

Lundvall, Bengt-Ake and Borras, Susan (1998), *The Globalizing Learning Economy: Implications for Innovation Policy*, Brussels: European Commission.

Luukkonen, Terttu (2000), Additionality of EU framework programs, *Research Policy*, 29(6):711-724.

Luukkonen, Terttu (2001), Old and new strategic roles for the European Union Framework Program, *Science and Public Policy*, 28(3): 205-211.

Mali, Franc (2003), Socio-Economic Transition and new Challenges for the Science and technology Policy in Slovenia, pp. 211-233, in: P. Biegelbauer and S. Borras (eds.), *Innovation Policies in Europe and the US. The new agenda*, Hampshire, Burlington: Ashgate.

Mali, F. (2000), Obstacles in developing university, government and industry links. The Case of Slovenia, *Science Studies*, 13(1):31-50.

Mali, F. (1998), Eastern European transition, *Industry and Higher Education*, 12(6):347-357.

Mali, F. (1997), The increasing role of university research for socio-economic development in the nineties: the case of Slovenia, in: M. Szymonski and I. Guzik (eds.), *Research at Central and East European Universities*, pp. 205-220, Krakow: Jagiellonian University Press.

Miettinen, Reijo (2002), *National Innovation System. Scientific Concept or Political Rhetoric*, Helsinki: Edita Prima Ltd.

Nelson, R. Richard (1993), *National Innovation System: A Comparative Analysis*, New York: Oxford University Press.

Nowotny, H., Scott, P., Gibbons, M. (2001), *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*, London: Polity Press with Blackwell Publishers.

Stichweh, Rudolf (1996), Science in the system of the world society, *Social Science Information*, 35(2):327-340.

Phare Report (1995), *A Science and Technology Strategy for Slovenia*, Ljubljana: Ministry for Science and Technology of Republic of Slovenia.

Technology, Knowledge and Learning (2001), Enlargement Future Report Series 3. Final Report, November 2001. Joint Research Center: Institute for Prospective Technological Studies.

Third European Report on Science and Technology Indicators (2003), Luxembourg: Office for Official Publications of the European Communities.

Thorsteinsdottir, H. (2000), Public-sector research in small countries: does size matter?, *Science and Public Policy*, 27(6):433-442.

Van der Steen, Marianne (2003), Technology Policy Learning in The Netherlands, pp. 113-137, in: P. Biegelbauer and S. Borras (eds.), *Innovation Policies in Europe and the US. The new agenda*, Hampshire, Burlington: Ashgate.

Walter, H. G. (1997), Slovenian – German Co-operation in the Field of Technology Policy. Lectures on Technology Transfer, Innovation, Financing, Evaluation 1993-97. Research Report. Karlsruhe: Frauenhofer Institute for Systems and Innovation Research.

Ziman, John (1994), *Prometheus Bound. Science in a dynamic steady state*, Cambridge: Cambridge University Press.

Ziman, J. (2000), *Real Science. What it is, and what it is mean*, Cambridge: Cambridge University Press.