Is smart specialisation a tool for enhancing the international competitiveness of research in CEE countries within ERA?

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Introduction

Currently the research base of Europe (compared e.g. to the United States) is too fragmented (e.g. duplication of research projects, weak competition between research groups, subcritical mass of research groups) – despite all previous efforts and achievements. Therefore there is needed a process that creates the right conditions of competition and co-operation to support the emergence of world class, specialised clusters – achieving agglomeration effects. The vast majority of the public research funding in EU takes still place in the national level, e.g. in 2004 65 billion Euros were given to the research at the national level and 8 billions spent by the European Commission (van der Horst et al. 2006) This has prevented at the European level specialization, agglomeration and the development of the centres of excellence. Developing national scientific expertise in the same areas would create excessive duplication of research projects, waste of resources, lower competition between research groups, inefficient allocation of resources and subcritical mass (Foray and Ark 2007). One other hand, while there is clear need for more specialization and agglomeration the latter contradicts the idea of cohesion (reducing national and regional disparities). There is a threat threats that a large part EU, e.g. new member states, would be left without the possibility to develop their R&D capacities. As a possible solution, the EU think tank "Knowledge 4 Growth" (K4G) has proposed the idea of "smart specialization" (Varblane 2009). The idea is that instead of directing resources to the more advanced regions all regions should be given a fair chance to compete whereby countries and regions should invest in a particularisation process in order to make their knowledge base distinctive and original. Especially new member states of the EU face in their innovation systems many failures caused e.g. by the part-dependency, like firms inabilities to learn or to adapt to changes, network failures (lack of interactions among the participants of the innovation system), weakness of frontier research etc. The smart specialization assumes that countries know and address these failures (Varblane 2009).

The aim of the paper is to address the question, whether and how by finding appropriate niches in research (i.e. by applying the idea of smart specialization) CEE countries could improve their research competitiveness. The research competitiveness is understood in the paper in addition to excellence also by how it corresponds to the needs of the society and economy.

In the paper we apply the research approach that was originally designed for firms, and is borrowed from the evolutionary economics literature, from evolving approach of dynamic capabilities which is applied to the research institutions. The choice of this approach seems to be appropriate because of the following factors:

- The competition between research institutions has been intensified with the entry of CEE countries into EU.
- There can be observed generally low level of public research funding in CEE countries (Lepori et al. 2009). In particular, research institutions respond to relatively modest national funding by looking for funding also internationally, that helps to create linkages with world economy and other research institutions.
- General tendencies in the society for more entrepreneurial research institutions.

The approach of dynamic capabilities

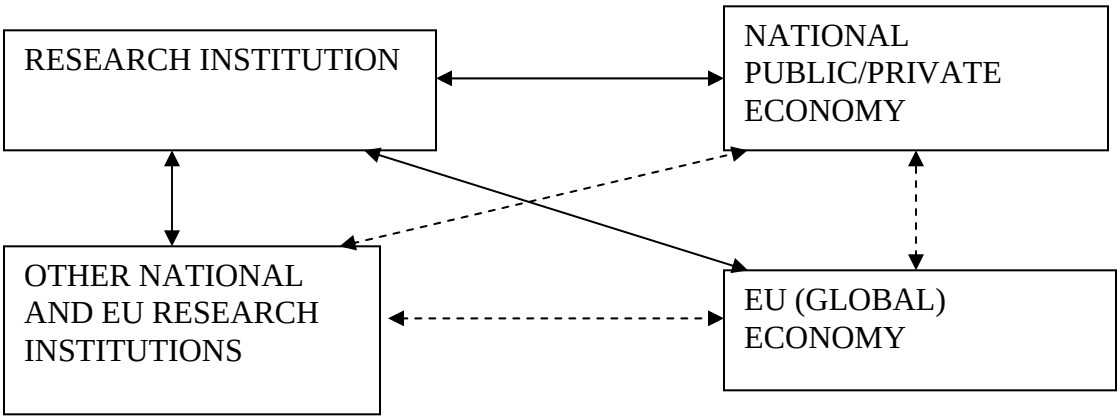
The following discussion here involves institutions undertaking research (universities, research institutes) but also institutions using the outcome of research (other research institutions, firms, also government). In the vain of Penrose (1959), the research institution can be seen as a collection of productive resources (knowledge, apparatus etc) rendering services, which are specific to each institution depending on the accumulated knowledge within it. These services are used for research following the changing opportunities the institutions see on the research market given their resources. Research institutions here are seen as autonomous agents (Van der Meulen 2006), negotiating the best possible arrangements in research contracts in terms of service content, delivery conditions and price (Lepori et al. 2009). The research institutions as firms have product possibilities, production capabilities and profitability (or appropriability) with regard to production in general (Von Tunzelmann, Wang, 2007: 197-199). The profitability can be understood here more broadly as the reputation of research institution which enables to attract better researchers and compete successfully for funding.

In the dynamic capabilities approach, the theory from Penrose is combined with a similar model for consumption by Sen (1985) which incorporated the characteristics of goods (in this case, the quality of research etc), the capabilities of the consumer to use the research and respective utility obtained, and how the characteristics of a good (research) respond to the needs of the consumer, labelled as functionings. The capabilities can be improved by education, by obtaining skills to use and understand the research results. The capabilities of both research producers and consumers can be seen as cumulative as Chandler (1990) speaks about accumulated dynamic capabilities.

In the approach of dynamic capabilities, the capabilities of firms (research institutions) are aligned with the circumstances where specific firm is operating in real time (dynamic competition following Schumpeter) and with the respective learning mechanisms termed dynamic interactive capabilities (Von Tunzelmann, Wang, 2007: 202). This concept of dynamic capabilities explains the extent to which the capabilities of firms are appropriate to the environment, and to the capabilities of consumers. We apply this approach to the specialization of research institutions (and national research systems) in the international level.

By applying this model to the research performing organizations, the following scheme can be drawn for analysis. The research institution by smart specialization has to find a research “niche” on the international research market that corresponds to the specific needs of the national public or private economy and meets the demands of international economy as well, i.e. is aligned to the levels brought out on the Figure 1. This is contrary to some of the current views and practices in CEE countries that research funding between different fields should be distributed only according to the scientific excellence and not by the needs of the national economy; one argument is that the existing excellence should be supported as it might take too long to establish new excellence. In such conditions the funding proportions between different scientific fields could reflect rather the past performance of institutions and the initial starting positions than the needs and the structure of the national economy (Masso and Ukrainski 2008). Concerning the economy, the new EU member states should pay attention to the development of less capital intensive areas (due to more limited funding cabapibilities), where integrated knowledge is needed and maybe also technology-based services such as health care, energy, and environment. Particularly important is to find niches inside the broad areas of implementing new technologies in mature industries and services. Here is extremely relevant to link new technologies with the already existing strengths of research expertise.

Figure 1. The framework for smart specialization for a research institution



Note: dotted linkages are not analyzed in this article.
Source: compiled by the authors

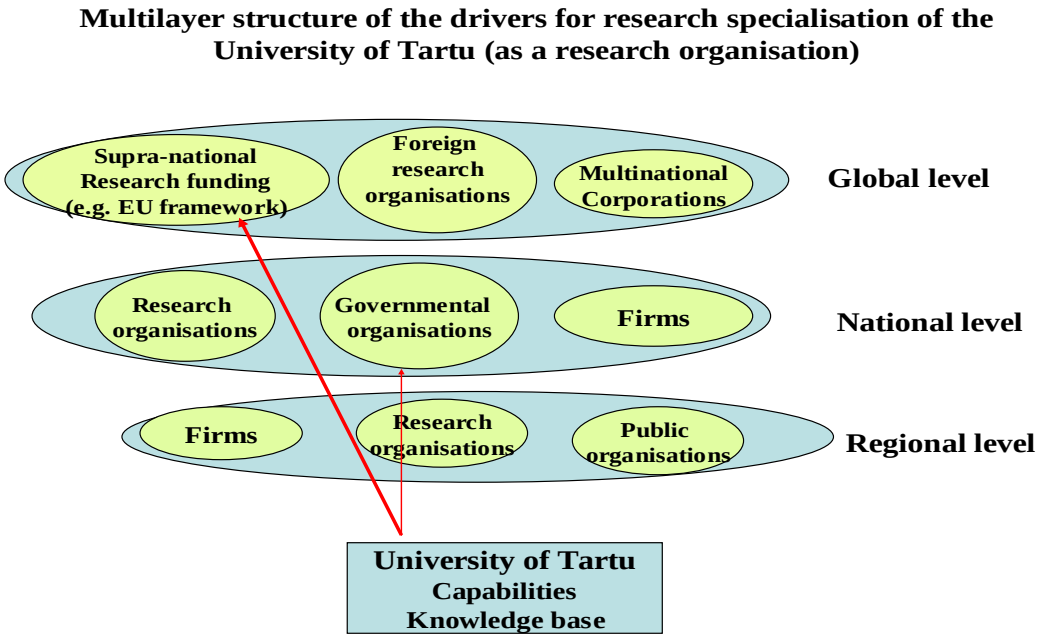
There can be outlined several factors that influence this specialization:

- The discrepancies between the existing knowledge base and the needs of the economy;
- Different countries are in practice often trying to specialize in the same fields, like biotechnology, material science etc.
- Problems of cooperation between universities and businesses. In new member states, cooperation between universities and business is often at quite modest levels, the possible reasons being the lower innovation capability of enterprises on the one side and problems with the orientation of public sector research to the needs of the business (e.g. Ukrainski 2008 has provided some evidence on that), misalignment of the public research infrastructure in catching-up countries; on the other hand, public research funding decisions could influence the innovation collaboration of universities and firms.

In the paper we try to use the innovation and R&D indicators on both ways: on the one hand, how the countries should specialize in their R&D activities (especially the university research), and secondly, how to measure the successfulness of specialization, or how the notion of smart specialization could be related to quantitative STI indicators.

Figure 2 describes the various factors affecting the specialization differently: at each level (regional, national, global or EU level) research specialization is (potentially) affected by both business sector (needs of economy), other research organizations and the public sector or government (e.g. through research funding agencies). We aim to describe though different quantitative indicators, which drivers of the specialization are in case of particular institution more important.

Figure 2 Different agencies impact research specializations at different levels



Source: compiled by the authors

The empirical analysis

We try to capture the capabilities that are realized via linkages with different partners sketched on the Figure 1, however, not all of these can be measured by available data. The following capabilities and linkages are selected for empirical assessment:

The indicators measuring the links between research institutions and the specialization within research

- Number of papers in ISI database: total number of papers, highly cited papers, hot papers. Source: ISI Essential Science Indicators
- Average number of citations per paper across various fields. Source: ISI Essential Science Indicators
- In order to analyze the specialization of universities, the indicators are standardized relative to the means of the variables in respective scientific fields – i.e. in certain scientific disciplines papers gather on the average much more citations per paper et cetera.
- The proportion of public research funding in various scientific fields. Both national and international funding (EU framework programmes) will be considered. Source: universities, Ministry of Education and Research

Indicators on the linkages between research institution and national economy

- Number of formal cooperation agreements between universities and enterprises. Source: data should be collected directly from universities. While the Community Innovation Survey includes questions on cooperation with universities and public research institutes, at home country and abroad, no information is about that, with which particular university or in which field the cooperation takes place.

- Joint publications between universities and domestic enterprises. Source: ISI publications databases. Identifying enterprises in the data could be quite complicated and needs to be done manually.
- Joint patents with authors from both universities and domestic businesses. Source: international patent databases.
- Industrial professorships – i.e. professorships funded by the domestic private sector. Source: universities.
- The number of PhD dissertations complemented in cooperation with domestic private sector (e.g. topic, part of the funding comes from the latter, part of the thesis is written in the private enterprise)
- Scientists and engineers in private sector, especially those with PhD degree - that indicates the potential of the private sector to cooperate with the universities. Source: R&D expenditures survey
- The structure of the national economy – that shows the potential, to which smart specialization of universities should approach. Comparison of this indicator with the structure of university research (e.g. by publications, research funding) should give thus some information, however, the connection between the two is rather complicated – 1) in the same sector, different kinds of research could be useful (e.g. in forestry both chemistry, biology, engineering et cetera); 2) all economic sectors may need to some extent similar input from universities, e.g. regarding marketing.
- Spin-off companies. That is a common measure of knowledge transfer to private sector. Source: universities.

Indicators on the linkages between research institution and EU (global) economy
The indicators could be similar to those above.

- Formal cooperation agreements with global (multinational) enterprises. Source: universities.
- Joint publications with global enterprises
- Joint patents.

The idea would be to show, how that system of indicators is able to measure the success of smart specialization. Ideally, we plan to gather data on these indicators at least on two universities, 1) University of Tartu (that has expectedly increased its scientific output strongly over time, but has not so strong links with local economy), 2) some university in Finland (e.g. University of Helsinki), that has supposedly in addition to strong contribution to research as such also stronger linkages to economy.

References

Chandler, A.D. (1990), The Enduring Logic of Industrial Success, Harward Business Review, March-April: 132-140.

Foray, D. Van Ark, B. (2007): Smart specialisation in a truly integrated research area is the key to attracting more R&D to Europe. Knowledge Economists Policy Brief n° 1 October 2007, 4 p.

Lepori, B., Masso, J., Jablecka, J., Sima, K. Ukrainski, K. (2009), Comparing the organization of public research funding in Central and Eastern European Countries, Science and Public Policy, forthcoming.

Penrose, E.T. (1959), The Theory of the growth of the Firm. Basil Blackwell: Oxford.

Sen, A. (1985), Commodities and Capabilities, Amsterdam: North-Holland.

Ukrainski, K. (2008). Sources of Knowledge Used in Innovation: An Example of Estonian Wood Industries. PhD thesis. Tartu: Tartu University Press

Van Der Horst, Lejour, A., Straathof, B. Innovation Policy: Europe or the Member States? CPB Netherlands Bureau for Economic Policy Analysis, No 132, November, 2006

Van der Meulen, B. (2006), Funding systems as implicit contracts between science and government, paper presented at the PRIME indicators conference in Lugano, 16th -17th of November.

Varblane, U. (2009), “European Research Area and the new members of the European Union”, University of Tartu, mimeo.

Von Tunzelmann, N.,Wang, Q. (2007), Capabilities and production theory, Structural Change and Economic Dynamics, 18, 192-211.