DOCTORAL (Ph.D.) DISSERTATION

Mikita József Gábor

Debrecen

2012

UNIVERSITY OF DEBRECEN
Centre for Agricultural and Applied Economic Sciences
Faculty of Agricultural and Food Sciences and Environmental Management
Institute for Land Utilisation Technology and Regional Development

KERPELY KÁLMÁN DOCTORAL SCHOOL

Head of Doctoral School:
Prof. Dr. Nagy János DSc

Supervisor:
Dr. Harsányi Endre PhD

Innovation capacities and knowledge transfer capability building in European regions

Prepared by:
Mikita József Gábor
doctoral candidate

Debrecen
2012.

INNOVATION CAPACITIES AND KNOWLEDGE TRANSFER CAPABILITY BUILDING IN EUROPEAN REGIONS

Dissertation in order to attain the doctoral degree (Ph. D.)
in **Regional Sciences**

Prepared by: **Mikita József Gábor** doctoral candidate

Name of Ph.D. school: Kerpely Kálmán Doctoral School
Head of Ph.D. school: Prof. Dr. Nagy János DSc
Supervisor: Dr. Harsányi Endre PhD

Ph.D final exam committee:

	Name	Sc. degree
Chairman:	Dr. Baranyi Béla	DSc
Members:	Dr. Harsányi Gergely	PhD
	Dr. Rőfi Mónika	PhD

Time of PhD. final exam: 2011. 11.18.

Review Committee:

	Name	Sc. degree	Signature
Chairman:			
Members:			
Secretary:			
Opponents:			

Time of Ph.D. defense: 2012.

CONTENTS

1. INTRODUCTION AND OBJECTIVES

Innovation and scientific development are clearly on the top of the agenda of current European policy makers, it is equally extensively discussed in academic circles. The recent developments in the world economy seemed to have strengthened this tendency as a way of finding solutions for fundamental challenges. The idea of the European Research Area (ERA) was elaborated to organize research and innovation actions across the continent in a coordinated, complementary and inclusive way, making sure that all EU member states, as well as sub national territories, would have a certain rationale to follow in this complex system. Moreover, the recently introduced concept of smart specialization adds to this framework that in order to maximize Europe's economic potential in the global competition as well as to effectively respond to societal and economic challenges triggered by the crisis, European territorial entities have to be more strategic and efficient in exploiting the opportunities of the ERA. Regions (understood as sub-national entities) are clearly targeted by European research and innovation policies, because their research and innovation efforts are rather fragmented. Therefore their ability to interpret these policies into concrete actions will considerably shape the competitive landscape of Europe.

When referring to research and innovation capability and capacity in the dissertation, I follow the terminology proposed by Lanny Vincent (Vincent, 2008). He suggests that "capability is a feature, faculty or process that can be developed or improved. Capability is a collaborative process that can be deployed and through which individual competences can be applied and exploited." Whereas "capacity is the power to hold, receive and accommodate". In this work my main focus will be innovation and knowledge transfer capabilities, although innovation capacities are taken into consideration for both the mapping exercise and the knowledge transfer analysis. Moreover I am bound by the expression "capacity" due to the EC terminology in the framework programme.

A theoretical chapter will review the main academic literature contributing to my research questions, and set the conceptual stage to the main research subjects of this work. This reflects some of the main developments of the S&T policy over the last decades, as the focus will be on Europeanization, Multi-level governance, and the Regional Innovation Systems. The hypotheses and work methodology will define the research questions, as well as the methods for assessing these questions. At the end of the work, I will review and assess all the hypotheses, and summarize the main conclusions and the main findings of my thesis.

The objectives of my work are threefold:

Objective 1 is to provide an overview on the development of EU science, technology and innovation policies during the last 60 years, highlighting the main milestones and dynamics of the Europeanization of this complex policy domain. The goal is to describe the main logic behind the evolution of European research, science and innovation policies, with particular focus on the framework programme (FP), the EU's main instrument to support research and innovation. It is very important to understand the evolution of the FP, to put it into a broader policy context, as we use this instrument as a reference tool for the regional mapping exercise, as well as for the knowledge transfer analysis.

Objective 2 is to map NUTS 2 level European regions in terms of their innovative capacities and economic potential. Innovation capacities will be measured by standard parameters collected from Eurostat, as well as from a database on their participation in the European Framework programmes. Different groupings (clusters) of regions will be created based upon these comparisons (7+1) from very innovative and dynamic regions to regions with less innovative capacities. The most efficient regions in terms of innovation and research capacity (Supergroup) will be discussed in details, and I will attempt to draw common characteristics and features upon these.

Objective 3 touches upon less favorable European areas (regions) following the mapping exercise. It offers a case study for demonstrating that targeted intervention is needed to help less developed regions actively participate and to find their rationale in the European Research Area. Research and innovation strategies are difficult to develop and implement therefore some sort of European level assistance (instrument) is welcome for these regions. With the analysis of a selected supranational programme supported by the European Commission’s framework programme for research (Capacities specific Programme – Research Potential’s Evaluation facility for research entities) I will show the importance of knowledge transfer as strategic learning for less developed European regions in order to unlock their innovation potential, to prepare for more complex collaborative actions, as well as to find their clear roles in the setting of a very complex European innovation and research system.

2. SETTING THE SCENE: BASIC APPROACH AND FRAMEWORK

2.1. Multi-level governance and Europeanization

The theory of "multi level governance" (MLG) was introduced in the mid 1990s by Gary Marks, Liesbet Hooghe and Kermit Blank, primarily to describe the rationale of European cohesion policy, and how regions have become important actors and stakeholders in implementing community policy actions.

According to this concept, member states remain the most important players in the European policy arena, however states do not possess any more exclusive rights in European level policy-making. Decision-making competencies are shared among actors at different levels. The European institutions, most importantly the Commission, the Parliament and the European Court have their independent influence in policy-making, but they do not act as the sole agents of national executives.

Furthermore, collective decision-making among the member states constitutes a zero sum game. There are always trade-offs between different decisions, thus at the same time in a particular issue some states have to give up on demands while on other issues these are the countries who gain.

Finally, political spaces are interconnected and closely linked. Even though national actors remain the most influential when defining the state preferences, sub national actors (regions) are active in both national and sub national arenas, hence creating transnational associations in the process. Member States do not have the exclusive right to create links between domestic (regional) and European actors, thus complex interrelations in domestic politics do not stop at the nation-state, but are extended to the European level (Marks-et al., 1996).

In order to better understand the concept of multi-level governance, a simple question must be posed: why are states motivated to give up competences to supra- and to sub-national entities?

State-centrist scholars such as Moravcsik, Milward often try to answer this question that states receive something important which compensates their partial loss of sovereignty. Marks et al. (1996) argue in a different way: they say that due to the fact that decisions are made not by whole states but politicians and public administrators who pursue different goals from the common interests of the whole state, the original question should be reformulated accordingly. Instead of asking, why states are motivated to give up competences, another question should be put forward: why particular individuals (politicians, public administrators) are interested in doing so?

According to the before-mentioned authors, two types of reasons can be differentiated why these actors might wish to delegate competences to supranational levels. First, the costs of losing political control can be compensated by the benefits of decisional reallocation. This might occur for instance in the case if the political costs emerge clearly lagged behind the political benefits; since politicians have a short time horizon, they might sacrifice state sovereignty for short time political benefits. Another example for this type of motivation could be the case when the benefits of supranational policies are more politically salient than the costs of the decisional reallocation. Second, giving up competencies to the supranational level might have peculiar benefits. For instance, in order to avoid responsibility for certain sensitive decisions, political actors often wish to shift decision-making to the supranational level.

The empowerment of sub-national institutions (also referred to as decentralization or regionalization) is motivated by four main elements (Oates, 2006).

First, it enables regional and local governments to adapt local public outputs to local preferences, causing potential welfare gains compared to centralized "one-size-fits-all" solutions. Second, provided that individuals are mobile and they rationally choose administrations that accord to their preferences the most, inter-jurisdictional competition might arise through decentralization. This competition among jurisdictions increases the potential gains from decentralization where public decision-makers are motivated to sustain an efficient performance of local public services. Third, such competition also creates incentives for local decision-makers to make effective budgetary choices, in contrast to the monopolist position of the central government. And fourth, since local jurisdictions are free to shape their policies, decentralization might encourage experimentation and innovation.

Due to the unique structure of the European Union as a "political system" European policy making in all public domains has become very complex in the past decades, it is still in constant change and under evolution. Different theories exist for explaining European policy making, in most cases (for example in the field of trade, agriculture, monetary policy) intergovernmentalism or neofunctionalism is very well equipped to describe the rationale behind these developments. In the field of research and innovation policies, however, where resources and competences are shared between the regional, the national and supranational levels these theories do not provide a clear explanation on how European level integration is taking place. Apart from the member states, more and more subnational governments pursue research, development and technology policies. The EU centrally supports research and development and at the same time coordinates and finances activities at the regional level. Integration in the European research sector takes place basically along two pathways.

First, European institutions develop their own competencies in parallel with the nation state. This is put into evidence by the multi annual framework programmes, which have emerged since the 1980s as an important funding source for conducting research activities.

Second, the EU can take over as a “leader” in coordinating national policies in different policy domains. Together with the Community methods of integration (Community law) or the indirect effects of economic integration, soft law instruments are guiding policy-making in the research field. Soft law governance (such as the Open Method of Coordination) uses tools such as benchmarking, action plans and exchange of information, sharing of best practices, and the definition of common goals to strengthen the EU in the international competition (Morado-Foadi, 2008). Such a regulatory strategy, with the aim of achieving greater integration in a non-coercive manner, is better suited to the realities of national institutions and policies across a range of issue areas in an enlarged and diverse European Union (Edler at al., 2003).

Both of these paths lead up to a complex multi-level governance system, which is likely the most adequate way to present the functioning of the "European Research Area". The ERA constitutes an important historical evolution of European research and innovation policies; therefore the concept of MLG is linked to hypothesis H1. The political agenda set forward by the European Research Area amplifies the role of the EU in the collective production of knowledge. This means that the EU involvement is not limited to the framework programmes, but rather it is a supranational coordinator that entails pooling of resources and creating added value with strong interorganisational effects. The political system of knowledge production in the EU demonstrates elements of lowering national boundaries and becoming more and more interconnected and interdependent in the knowledge creation. Based upon this, it is appropriate to talk about the emerging trend towards a multi-level knowledge and innovation system in Europe, where the supra-national, national, regional and local levels have gradually become more interrelated. (Borras, 2003).

The starting point for our analysis on the knowledge transfer of strategic learning through the selected European programme (Research Potential) is the Europeanization concept, as defined by C. Radaelli, 2004 (Radaelli, 2004), as in this analysis we look into how "formal and informal rules, procedures, policy paradigms, styles, ‘ways of doing things’ and other beliefs and norms" that are either commonplace or generated at the level of the European Union or of the most competitive European regions are diffused and ultimately assess whether they are used or implemented at local level (institute level) by research organizations located in economically less developed European areas. These “ways of doing things” are often referred to as “best practices” that we will closely associate to the knowledge transfer of strategic learning in our analysis. This concept is therefore linked with hypothesis H5-H6. Among the several meanings of Europeanization that different authors associate with the concept, Radaelli’s interpretation can be considered as a relatively wide one: in his definition, he takes into account not only politics, but also national identity and citizenship as subject of Europeanization.

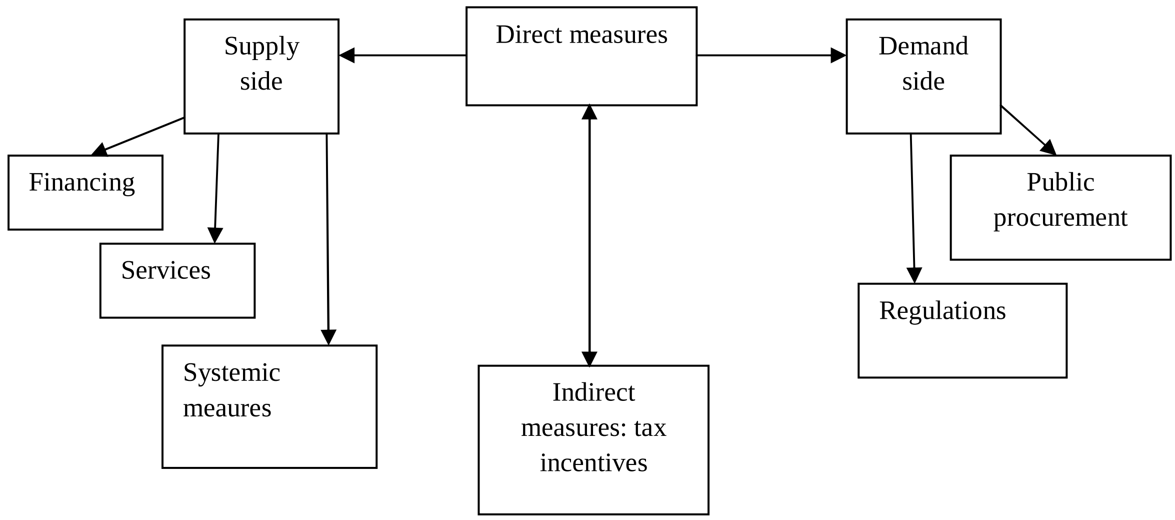
At the same time, he indicates not only what Europeanization means, but also what it does not mean, drawing a line between Europeanization and concepts which are often used in similar contexts: convergence, harmonization and integration (Radaelli, 2000). He finds that Europeanization does not accord with convergence. Instead, the latter is rather a consequence of Europeanization. Europeanization is not harmonization, as Europeanization can end up in regulatory competition and even distortions of competition. And it does not equal political integration, either, because integration theories focus on issues of whether European integration generates multi-level governance and whether it strengthens or weakens the role of the state. By contrast, Europeanization deals rather with the role of domestic institutions in the process of adaptation to "Europe".

2.2. Science policy, technology policy, and innovation policy

As demonstrated by the below table, the main instruments for research, technology and innovation policies are budgetary decisions on allocating funds to public organizations, and providing subsidies, tax incentives for relevant organizations.

Figure 1: Policy measures for RTDI

Source: Report to the European Commission by an independent Expert Group, 2003



The major task in science policy involves allocating sufficient resources to science, to distribute these resources wisely between different activities, and to make sure that resources are used efficiently and contribute to social welfare (Delanghe et al., 2009).

Technology policy refers to policies that focus on technologies and business sectors. The era of technology policy is when science-based technologies (for example nuclear power, space technology, computers etc.) are considered to be at the focus of economic growth. Technology policy has a different interpretation for less developed countries (regions) than it does for high-income countries. In high-income countries the strategic objective is to establish the capacity to produce the most recent science based technologies, and putting into application these innovations. In smaller and economically less advanced countries (regions) it rather means the ability to absorb and use these technologies. Catching up countries may make efforts to enter into specific promising industries using the new technologies in the process. The Cold war triggered the most ambitious technology policy effort in the US, and as a consequence big European countries such as France, the UK and Germany followed suit to develop a policy of promoting national leaders in specific sectors. The main objectives of technology policy are similar to those of science policy; nevertheless it represents a shift from broader philosophical considerations to more instrumental focus on national economic objectives. Therefore one can state that the main difference between science and technology policy is that the latter aims to put into practical application the results of the former taking into account the objectives of economic and social development (Lundvall and Borras, 2006).

The elements of the policy system in technology policy remain the same as for science policy (universities, research institutions, laboratories), however the attention shifts from universities towards engineering and how linkages can be made towards industry. The main instruments promoting technology policy are public procurement, grants, and fiscal measures.

As for innovation policy, we will rely on the theoretical framework of the systemic concept of innovation, more specifically the regional innovation system concept (for more in-depth information on the concept, see for example Cooke et al., 1997; Asheim and Isaksen, 2002; Pellegrin, 2007; Uyarra, 2009).

The systemic approach for innovation implies that the major policy fields need to be considered to the degree that they contribute to innovation. The fundamental objective of innovation policy is to review and redesign the linkages between the components of the system. An innovation system includes universities, research institutions, laboratories, etc. however the focus of policy moves from universities and technological sectors towards a broader scope of actors in the economy (including stakeholders like public authorities, financing agents and companies) that have an impact on innovation processes. Innovation policy pays attention to the institutional and organizational dimension of innovation systems, including organizational performance and competence building (Lundvall and Borras, 2006).

One can also observe a three-step evolution of the science-technology-innovation policies during the last 50 years. After the Second World War the main emphasis was on science policy, it was deemed as an important contributor to the reconstruction process. In particular, nuclear energy was considered as a cheap source of energy that would solve many urgent problems. Science was supposed to provide security, progress and prosperity. This rationale changed during the oil crisis in the 1970s, when an important industrial adjustment was in great demand. National governments shifted their attention from science policy towards technology policy that strengthened the industrial applications of the created knowledge. The

90s again produced a radical change in the perception of knowledge creation and production, as attention was moved to innovation. Particular focus was given to the concept of systems of innovation, as the different performances of countries and regions are due to diverse, historically developed sets of formal and informal norms, and institutional arrangements. The idea is that innovation policy incorporates the objectives and instruments of science and technology policies (Borras, 2003).

2.3. Regional innovation systems

Taking into account the socio-economic changes of the past decades, RTD and innovation capacity has been discussed in a systematic approach, which is closely related to the development of the evolutionary theory of economic change, as demonstrated by Lundvall and Cooke. The systemic approach has surpassed the linear model in several aspects. It has allowed correcting two important shortcomings of the linear model, the failure to appreciate the role of continuous interactions and feedbacks and the important factor of knowledge.

The systematic approach provides a framework for analyzing the complexity of innovation. It is not viewed as a single action by a single entity (business entity), but rather as a complex social process. The existence of networks is of crucial importance in the system, as these represent the means through which the interactions for innovation take place and through which the output of innovation is diffused in the economy. Interaction is clearly a socio-economic process; it involves feedback at different points in the innovation course, as well as in the knowledge development, diffusion and deployment. *Learning* constitutes the basic process for innovation, whereas *knowledge* is the main input for the process. The process (*learning*) involves a large amount of agents operating at different policy levels, coming from different sectors. *Institutions* play an equally important role. Both „soft" and „hard" institutions - sets of norms, rules and organisations - are present and active. As regards the knowledge, it covers not only scientific knowledge but more informal sources of information like know-how and best practices. In our context it is important to distinguish between explicit (codified) knowledge and tacit knowledge. Codified knowledge can be easily exchanged and communicated, while tacit knowledge can only be transferred through interactions and sharing of experience. Tacit knowledge is embedded in the local patterns of interaction. It includes both knowledge and skills certain actors possess, as well as specific information on RTD related issues (Cooke et al., 1997; Asheim and Isaksen, 2002; Pellegrin, 2007; Uyarra, 2009). This concept of “Learning” and “codified knowledge”, referred in our work as "soft variables" is linked to hypothesis H4.

Regional innovation system, as a concept, can be derived from the idea of national innovation system (NIS). As Sharif (2006) explains, the idea of NIS arose simultaneously in academia and policymaking at around the same time, in the mid-1980s, in the context of debates over industrial policy in Europe. NIS itself is still subject to various interpretations; however, he uses Metcalfe’s definition: “NIS is the set of institutions that (jointly and individually) contribute to the development and diffusion of new technologies. These institutions provide the framework within which governments form and implement policies to influence the innovation process. As such, it is a system of interconnected institutions to create, store, and transfer the knowledge, skills, and artifacts which define new technologies” (Sharif, 2006).

According to Sharif, more and more opponents of the concept of NIS have argued that, in a globalized world, the national level is not necessarily the most appropriate unit to identify innovation systems. They pointed out that other classification levels (spatial, technological, industrial and sectoral) should be considered, too – not only as complementary concepts but even as alternatives. Sharif gives a few examples for these relatively new concepts: Sectoral Innovation System can be observed in energy-related industries which rely on an Industry-specific Innovation System, Technological Innovation System is characteristic for electronics with applications in a variety of different industries and Regional Innovation System emerges e.g. in SiliconValley where many innovative companies are concentrated.

Similarly, Freeman and Soete emphasize that “nation states, national economies and national systems of innovation are still essential domains of economic and political analysis (..) but the interaction of national innovation systems with both ‘sub-national systems of innovation’ and with transnational corporations will be increasingly important”. (Freeman and Soete, 1997). The NIS is applied as the origin theory of the regional innovation system (RIS), hence it is linked to hypothesis H5-H6.

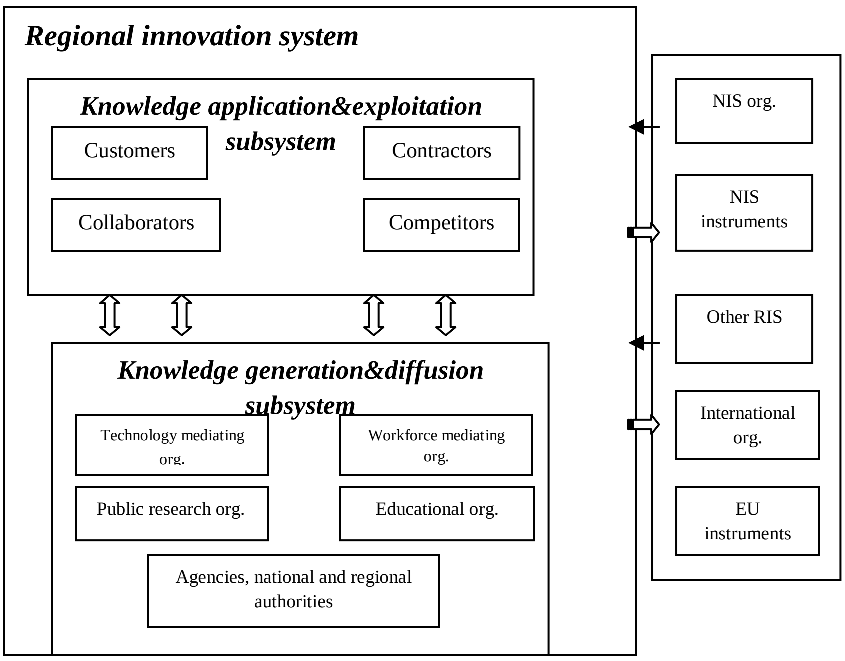
The incorporation of RTD and innovation actions in the regional economic development strategies has provided a new impetus to the territorial perspective of European level research and innovation policies. There exist several common features in the explanation of the links between innovation and regional (place-based) development. Many underline the importance of spatial proximity, which are explained by positive external effects, hence productivity and cost advantages that can be achieved by a flexible and specialised labour among firms operating in the same geographical area (region). Other concepts argue that the mechanism for stimulating cooperation and innovation is the existence of a regional culture and identity which forms the basis for trustful collaboration and from which informal networks develop among the regional actors. This regional culture and identity could generate lock-in effects by a strong regional economic and social embeddedness of firms and other institutions (Koschatzky, 2005).

Associating the systemic perspective of innovation with the EU's endeavor of territorial cohesion (EU regional policy), one can identify the regional scale (meant as a tailor-made sub-national scale) as the primary policy level for innovation as stipulated by the school of Regional Innovation Systems (RIS) (Cooke et al., 1997). The theory of RIS has recently gained an important position within European technology and innovation policy. The concept should contribute to the Europe 2020 strategy by increasing Europe's overall competitiveness in terms of knowledge-driven regional economic performance, as well as to help peripheral and less developed European regions catch up to the (primarily) West-European counterparts (De Bruijn and Lagendijk, 2005).

The idea of RIS underlines the role of the region as a territorial entity in the relationships between technology, market, productive capital, culture and representation. The region is an important environment to create dynamics and generate resources. It is the most appropriate scale to implement development policies for the promotion of knowledge-based economies, hence to stimulate innovation (Pinto, 2009).

The knowledge transfer taking place via the REGPOT evaluation facility in our case study, is specific to the regional innovation systems (Cooke et al., 1997), where the evaluated institutions (public or private entities conducting research) are embedded. Following Tödtling and Trippl (2005), RISs are made up of two subsystems embedded into a common regional socioeconomic and cultural setting. The knowledge application and exploitation subsystem is composed of companies, clients, suppliers, contractors, other collaborators and industrial partners. The knowledge generation and diffusion subsystem is the other main building block of the regional system. It consists of various institutions that all take part in the production and diffusion of knowledge and skills – including those institutions which we analyzed during our case study on the evaluation facility offered by the REGPOT-2 projects. Key components of this subsystem are public research institutions, educational organisations (universities), technology transfer organisations, workforce mediating organisations and other training providing facilities (Tödtling and Trippl, 2005). This list according to us can be enlarged to include the national or regional research and innovation funding programmes managing (i.e. agencies) and/or owning bodies (i.e. national or regional authorities) that are themselves also engaged in the diffusion of knowledge and skills. Moreover as demonstrated on the below table, according to Tödtling and Trippl, the regional innovation systems are also in close interaction with other regional and national innovation systems, their instruments, as well as with international organisations, and EU policy instruments in the field of research, technological development and innovation. These instruments include actions under the Structural Funds, the Competitiveness and Innovation Programme, and the Research Framework Programme. According to Tödtling and Tripple, as for public intervention, it becomes obvious that regional, national, and European actors shape the development and dynamics of regional innovation systems in a multi-level governance structure. The concept of regional innovation system as a setting is applied for hypothesis H5-H6.

Figure 2: The structure of a regional innovation system, Source: Tödtling and Trippl (Tödtling and Trippl, 2005), and adapted by the author.



2.4. The added value of European level S&T policy

The most important guiding principle of the European level research and innovation policy – as for European level policy making in other domains- is the "European added value". The basic idea is that funding research and technological development activities at the European level composed of research actors coming from different Member States are expected to generate EU-wide benefits of scale and scope, and provide additional funding to RDI investments. It shall also create a pool of resources, enhance research capacity, encourage multi-level policy coordination, and make knowledge available to a much wider target group.

The Expert Group responsible for the Interim Evaluation of the Seventh Framework Programme (Interim Evaluation of the Seventh Framework Programme, 2010), based on the Commission's Ex-ante Evaluation of FP7 (Muldur et al., 2006) and on the Expert analysis of the Ex Post Evaluation of FP6 (Stampfer, 2008), has pointed out the following justifications for delegating competences to the European level in the field of research and technological development:

- EU level support for RTD actions has a considerable effect on the scale and scope of multidisciplinary research activities. It makes it possible to bring together what otherwise might be fragmented RTD resources to reach a "critical mass" not attainable at the national level, and is capable of creating new resources which would not have been mobilized without EU intervention.

- A major factor justifying intervention at the European level is linked to the fact that it can improve the quality of research and researchers. The capability to attract and engage high level researchers from around the world, as well as to attract companies for investing into RTD. This illustrates EU action to develop and better exploit the human capital through Europe-wide training and mobility schemes to facilitate the accumulation of knowledge.

- A research capacity building role in exploiting and strengthening research potential, including infrastructures, in less developed regions of the Union or in research areas that would otherwise be unable to attract sufficient resources if they rely exclusively on national or sub-national government funds.

- EU intervention makes it possible to better deal with encompassing European challenges. Certain aspects of public policy (environment, health, food safety, climate change) have taken an international dimension, and solutions are easier to obtain on the basis of common scientific actions.

- Given the encompassing nature of RTDI policies, EU level intervention should provide coherence with other policy areas, both at national and EU levels, especially in the frame of the broad economic and social objectives in the Europe 2020 and other EU level strategies.

3. HYPOTHESES AND METHODOLOGY

3.1. Hypotheses

The evolution of European research and innovation policies reflect the main historical trends of European integration during the last 60 years. The Member States agreed to deepen their collaboration over the course of this period (both in terms in geographical and technical scope) and allocate more and more competences to supranational level, providing the European Commission with a considerable budget to implement on community policies. Of the community internal policies, research and innovation have become of major focus these last decades, given its derivative effects on economic and social development. Therefore studying the objective and impact of European level research and innovation policies are of great importance these days.

***H1**: The progress of European level S&T policies is related to economic and historical challenges: it has been a reactive policy development rather than a proactive evolution.*
Method of assessment: desk research, overview of literature.

The main instrument at the European level to support research and innovation activities is the Framework programme managed by the European Commission and its executive agencies. This current program (FP7) supports transnational actions organised around two axes (thematical, activity oriented) in research and innovation around Europe. The main idea is to provide European added value for these initiatives, bringing together actors from around the EU, working on issues that otherwise would be difficult to tackle.. The beneficiaries of this programme are private or public research entities, public authorities, small and medium sized enterprises and other business.

***H2**: In the European Union researchers, research expenditure and funding from the EU Framework programmes are regionally concentrated and different regional groupings can be constituted using the mentioned parameters.*

Method of assessment: statistical analysis

An important question arises when allocating funds attributed mainly from the Member States GNI (around 75% of the Community budget comes from this component). These funds are coming from European tax payers' money, therefore it is highly political what the main objectives of such a programme is, and how these objectives are reflected in the allocation of available funds.

***H3**: The allocation of funding from the Framework programmes also reflect the divide between “old” and “new “ European member states, but the state of economic development does not necessarily mean strong absorption rate of EU research funds.*

Method of assessment: statistical analysis

Dealing with European research funds requires beneficiaries’ special skills, knowledge and experience. These skills are obtained over time, therefore there is a clear advantage for "old" member states when preparing, implementing (absorbing) European funds. Equally, institutional settings, informal networks, well developed infrastructure (both physical and human) are widening the gap between the "old" and "new" member states.

***H4**: There are other ("soft") variables such as organizational methods, existing infrastructure, policies, norms and know-how (sticky knowledge) which play an important role in absorbing European funds.*

Method of assessment: desk research, questionnaire, personal interviews

In the thesis Europe's less developed territories are understood as used by the methodology applied in regional policy: convergence regions, defined in 2006, are regions having a per capita gross domestic product (GDP) of less than 75 % of the average GDP of the EU-25. These European regions are mainly constituted by regions from the "new" member states. Hence, these regions are lacking both in economic terms as well as in terms of "institutional" variables.

***H5**: For research organizations established in less developed European regions, targeted instruments, such as the “Evaluation facility of research entities” can assist the catching up process by enabling strategic learning from supranational level (EU) to institute level..*

Method of assessment: desk research, questionnaire, personal interviews

Acquiring the "soft" variables is sine qua non for successful engagement into European level research and innovation activities, financed by the framework programme. Besides creating the necessary research infrastructure (physical and human) research actors from less developed regions should be able to absorb these funds and turn them into new opportunities (research and innovation actions).

H6*: Knowledge transfer is an important way of building research and innovation capabilities in the less developed European regions as a first step for engaging in more complex collaborative research and innovation activities.*

Method of assessment: desk research, questionnaire, personal interviews

3.2. Research methods used

Analysis of relevant literature

During the analysis of relevant literature I had the opportunity to use the facilities of the library of the Directorate General for Research and Innovation (European Commission), the European Parliament, as well as the central library of the Brussels Free University (University Libre de Bruxelles – ULB).

Statistical data analysis

As regards the statistical analysis, the main sources of information were

(a) publicly accessible data from Eurostat on economic indicators of NUTS 2 statistical regions in the EU27;

(b) a database compiled from the CORDA (Common Research Data Warehouse) internal information system, administered by DG Research and Innovation, European Commission. I have requested and received the authorization from DG RTD to assemble a database for scientific purposes. The database contains aggregated data on all EU27 NUTS 2 regions as for their participation in the research framework programmes: FP5, FP6, and FP7 (until the middle of 2010). During the preparation of this database we had to do some simplifications to preserve the consistency of our data:

- Given the modification in Denmark's NUTS 2 distribution during the 1990s, we decided to take Denmark as 1 region (country).

- For Slovenia, the Commission information database (CORDA) only recorded data for the entire country, therefore we considered Slovenia as one region during our analyses
- Similarly to Denmark, there were several modifications in the distribution of NUTS regions, which prompted us to take Finland as 1 region (country) as well
- For Romania, there also been some changes in terms of NUTS regions, however these only regarded the denominations with no changes in the described territory. In our database we used the latest version of NUTS 2 level regions.
- There were some special cases regarding FP5: 10 current UK NUTS 2 regions were merged into four larger regions for the relevant period; two current NUTS 2 regions in Ireland and two current NUTS 2 regions in Germany were also listed as one separate region respectively.

Following these simplifications, we have worked with 241 regions.

After completing the database with the FP data, we combined and merged it with the Eurostat tables containing NUTS 2 level information on relevant economic, and innovation capacity indicators. As a concrete statistical tool we used the K-mean clustering. The K-mean clustering algorithm was developed in the 1970s. It classifies or groups objects based on attributes and features into K number of group. K is a positive integer number. The grouping is done by minimizing the sum of squares of distances between data and the corresponding cluster centroid. Hence the main objective of K-mean clustering is to classify data. We have executed the calculations with the computer software SPSS (Statistical Package for Social Sciences). These calculations were completed under the supervision of Dr. Balázs Borsi.

An additional tool for processing our data was the Lorenz curve. It is a graph for showing the concentration of ownership of economic quantities such as wealth and income (in our case participation in FP and relevant economic and innovation capacity indicators); it is formed by plotting the cumulative distribution of the amount of the variable concerned against the cumulative frequency distribution of the individuals possessing the amount.

<u>Analysis of the selected proposals and questionnaire and or the project proponents</u>

In developing the methodology two conceptual frameworks were used to analyze the available data: policy transfer proposed by D. Dolowitz & D. Marsh (2000), and organizational learning categorization by Schon & Argyris (Argyris, 2000). D. Dolowitz & D. Marsh define policy transfer as "a process by which knowledge about policies, administrative arrangements, institutions and ideas in one political system is used in the development of policies, administrative arrangements, institutions and ideas in another political system" (Dolowitz and Marsh, 2000).

As this research deals with a sub-part of the elements included in Dolowitz & Marsh's definition only, i.e. the knowledge transfer of ideas and attitudes, we had to adapt the seven questions that are at the heart of this conceptual framework to their purpose.

Table 1: Measuring knowledge transfer of ideas and attitudes, as strategic learning in REGPOT-2

The original questions defined by Dolowitz &Marsh, 2000.	**The research questions formulated for studying the REGPOT-2 evaluation facility.**
1.Why do key actors engage in policy transfer?	1.Why do actors engage in knowledge transfer?
2.Who is involved in the policy transfer process?	2.Who are the actors involved in the knowledge transfer process?
3.What is transferred?	3.What is transferred?
4.From where are lessons drawn?	4.From where are lessons drawn?
5.What are the different degrees of transfer?	5.What is the participation level of knowledge transfer?
6.What restricts or facilitates the policy transfer process?	6.What restricts the knowledge transfer process?
7.How is the process of policy transfer related to "success" or "failure"?	Not applicable – see explanation below

The following scales were established to quantify the answers (where it was appropriate):

For question 1 two different proposal types were distinguished. There were projects with the "traditional stick to the call" – meaning the responder's approach closely followed the stipulations in the text of the Call- , whilst certain proposals provided more "original and elaborated", meaning answers with additional ideas compared to what was fixed in the call text answers.

Regarding the participating actors in the knowledge transfer process (question 2), we established a qualitative scale with the following components. There were actors whose participation was the minimum requirement to execute such an activity: *EC nominated experts and the research organization's key staff* (senior faculty and management). In other cases, projects could foresee the involvement of one or more of the following actors (*other research staff* – Post-doc researchers, junior faculty members, PhD-students; regional *and/or national funding bodies; local industry;* and *other experts or stakeholders)*.

Question number 3 (What is transferred?) The initial version by Dolowitz &Marsh offered eight different possible replies (policy goals, policy content, policy instruments, policy programs, institutions, ideologies, ideas and attitudes and negative lessons) addressing policy transfer. It was clear from the objectives of the calls that what would be transferred here would fall in only one of these possible categories, i.e. ideas and attitudes (SWOT analysis, SOR, Action Plan, etc.). This question was therefore adjusted to the purpose of this study and a 5-step ranking was established. The basic transfer (score 1 out of 5) involved a *„SWOT analysis and an action plan"* (evaluation of research capacity in comparison with European standards). In other projects the knowledge transfer covered *future research orientation (SOR); research management; research policy (institutional settings) - research agenda at national/regional level;* and *quantified performance indicators.* Any one of these components would add a score to the project with the full list representing a maximum result (5 out of 5).

Regarding the origin of the policy transfer (question 4), Dolowitz and March differentiated among three possible categories: the international, the national and the local level. For the purpose of this study addressing knowledge transfer we have extended this list to a 5 scale spectrum: basis (transfer coming exclusively from the EC appointed experts – score 1 out of 5); or transfer coming from regional; trans-regional; national; and supranational levels (incorporation of European standards). The scoring reflected the previous logic, giving 1 additional mark for each additional level (maximum score 5 out of 5).

Question number 5 by Dolowitz and Marsh addressed the different degrees of policy transfer: copying; emulation; combinations; and inspiration. Though still relevant to knowledge transfer, it was necessary to adjust this question based on the available empirical data. A quantitative version of question number 2 (Who are the key actors involved in the knowledge transfer?) was set up, establishing a measuring scale of 1 to 5. The participation degree's quantification was thus based on the following: the actors whose participation was the minimum requirement would score 1, with any additional involvement of 1 or more of the previously identified actors under question 2 elevating the final score with a possible full list entailing a maximum score (5 out of 5).

As for the factors restricting or facilitating the policy transfer (question number 6), Dolowitz and Marsh tried to assess the very factors (positive and negative) which are related to successful or unsuccessful transfer process. Based on the available information, this question had to be altered by focusing on the negative factors and linking it to the issue of participation, hence creating a qualitative scale of missing participation.

Finally, the original question number 7 (How is the process of policy transfer related to „success" or „failure"?) was supposed to assess the extent to which policy transfer accomplishes the aims set by a sponsor when they engaged in transfer, or is perceived as a success by the key actors involved in the policy area. Based upon the available data, we did not find a way to answer properly this question as applicants were overwhelmingly positive about the outcomes of their projects.

The second framework for analysis is the categorisation suggested by Schon & Argyris (Argyris, 2000) that distinguishes three types of organisational learning: *Single-loop learning*, *Double-loop learning* , *Deutero-learning*. Each of the 16 REGPOT-2 projects were studied accordingly and a score on a scale of 1-5 given. We have extended the initial scale by two intermediary categories. Equally, we have adapted the original interpretation of the three types of organisational learning to the study of knowledge transfer of ideas and attitudes related to the definition of strategic research agendas (knowledge transfer as strategic learning) from supranational/trans-national level to institute level.

Learning types' taxonomy as put forward by Schon & Argyris (Argyris, 2000), adjusted to this study*:*

1. **Type 1: Single-loop learning**

   This takes place when errors are discovered and corrected, and the research entity continues with its current policies and objectives. Single-loop learning can be used for activities that add to the basic knowledge and skills, as well as routine, without modifying the essential character of the institution's activities.

   Single-loop learning is considered the lowest level of learning, adaptive learning, and the so-called non-strategic learning.

2. **Type 2: Single-loop learning towards double-loop learning – as suggested by the author**

3. **Type 3: Double-loop learning**

   This happens when in addition to discovery and revision of errors, the research institution is involved in the questioning and adaptation of existing norms, procedures, policies and objectives. Double-loop learning entails changing the institution's knowledge-base, specific competences or routines. Double-loop learning is also referred to as higher level learning, generative learning and strategic learning.

4. **Type 4: Double-loop learning towards deutero learning – as suggested by the author**

5. **Type 5:Deutero-learning**

   This presents itself when a research institution learns how to execute single-loop and double-loop learning. The first two forms of learning (single loop learning and double loop learning) will not take place, unless the institution is aware that learning must occur. This means identifying the learning orientations and styles and the processes and structures necessary to promote learning. Double-loop and deutero-learning are concerned with the why and how to change the institution while single-loop learning is concerned with accepting change without investigating underlying assumptions and core beliefs.

Before putting together the questionnaires, we have also analysed the following sources of information:

- the call for proposals related to the evaluation facility program (REGPOT-2),
- the project proposals,
- the ex-ante evaluation reports (Evaluation Summary Reports)

The purpose first was to understand, categorize and assess the declared intentions of project proponents. Subsequently, we studied the mid-term and ex-post evaluation reports, as well as the questionnaire sent to all project coordinators.

The list of questions included in the questionnaires was the following:

- Have you experienced any change in the project's objectives during its implementation?

- In the actual implementation of the project who were the key actors involved making input to the project?

- Where appropriate, please rate (scale 1 to 5) the extent of participation in the project of the actors.

- In which of the activities do you consider knowledge transfer strong?

- Where do you think the new knowledge originated?

- After the implementation of the project how would you describe the learning: single-loop learning; double-loop learning; deutero learning? Basically, after completing the project have you carried on with the policies and goals; have you modified the existing norms, policies and goals; or have you identified new knowledge needs in the project?

Findings from the available data and replies to the above mentioned questionnaire have been aggregated to preserve the confidentiality of project results and the anonymity of respondents.

Study trips, personal interviews

Over the course of the preparation of my thesis I was fortunate enough to speak and discuss with key European stakeholders in research and innovation policy. During my time in the Commission and the Stuttgart Region Economic Development Corporation I had the privilege to deal directly with the regional dimension of European innovation policy. Conferences like Research Connection 2009, WIRE I, WIRE II, gave me the opportunity to conduct informal interviews with key actors from academia, industry and the public (governance) authorities.

4. THE DEVELOPMENT OF EUROPEAN S&T&I POLICY TOOLS: FROM SUPRANATIONAL TO REGIONAL LEVELS

European level research (science), technology (development) and innovation policies have seen an important evolution over the last 60 years. The main developments of these policy areas have been closely linked to the dynamics of European integration, and the willingness of member states to delegate powers to the European level. In the following section we will attempt to sum up the main developments of this very complex and crucial policy field at the European level, also touching upon some recent dynamics of governance issues.

4.1. The first developments in RTD policy at the European level

Research and technological development has been present in the EC since its very beginning, however in a restrained role. Nonetheless the lack of an explicit legal and political framework to devise a community level research policy made it difficult to carry out concrete actions in the field. Research was already present in the early days of the EEC via Article 55 European Coal and Steel Community (ECSC), which gave the High Authority the task of encouraging research into technological and economical aspects of production and growth in the consumption of coal and steel, as well as to foster research affecting safety at work in these industries. Furthermore, there was a minor reference in the EC Treaty Article 35, which called for the dissemination of agricultural knowledge (Moussis, 2007).

Another important milestone was the establishment of the European Atomic Energy Community (EAEC), better known as the EURATOM, created by six European countries (Belgium, France, Italy, Luxemburg, the Netherlands, and West Germany) in 1957. This was basically an attempt to re-launch the European idea along technical lines, to use economic integration as a means of furthering and imposing political unity. The basic objective was to develop a European nuclear energy industry independent of the USA (H1). This was closely connected with the development of military nuclear capability, and therefore in postwar Europe the idea of developing this technology in a framework of international collaboration was obvious. A further motivation for this project was that nuclear energy was considered as the key technology for the future development of industry and the economy. The high costs associated with the new technology made the combination of efforts a rational choice. On the other hand a model for organizing and implementing nuclear research programmes was available and to a similar extent followed in most countries, by building up large scale nuclear research institutions (Dresner and Gilbert, 2001).

From the instrument of industrial policy, the EUROATOM was gradually transformed via its projects into an instrument of energy policy, and eventually into a scientific and technological research organization in the nuclear sector. The development of nuclear research had a central place in the EURATOM Treaty, and it became clear that this was the only assignment which the Community was in a position to carry out. Article 4 of the EURATOM Treaty gave the Commission the task of endorsing and facilitating the nuclear research of member States, and integrating them through the implementation of the Community's research and training programmes. EURATOM was set up with the characteristics of a state-controlled enterprise, with a centralized decision-making process. Article 215 of its Treaty set out an initial programme of research and training for five years, containing two major strands. The first concerned the Joint Research Centre, in-house research by direct means, and the „Europeanization" of existing sites around the six countries. The second involved the use of external contracts, research by indirect means. This meant that EURATOM financed and participated in research through various types of contracts, also known as „research by indirect means" (Hix, 2005).

The mid-1960s witnessed the emergence of a debate in Europe, widely known as the „technological gap „ which separated Europe from the United States (H1). It was realized that the technological developments in the US were not only quantitatively greater but also of a different kind. While Europe spent time over reconstruction, in the US technology was revolutionizing industry and society, the organisation of work was being transformed, new sectors were taken up and the pace of innovation was unprecedented. American industry seemed to enjoy comparative advantages to Europe, a larger scale, a greater ability to raise finance, higher productivity, massive investment in research and development, and considerable financial support for innovation from the federal government. Another characteristic of the US was the process called „cross-fertilization" between government initiatives, research and development in large companies, and research projects in universities, so that inventions rapidly became technological innovations and subsequently products on the market. The often recalled „technological gap" was also a „management gap" caused by the inability to stimulate and safeguard talent. This was due to training programmes which were insufficient and restricted to a minority, and to the preservation of rigid hierarchical structures particularly in European universities (Welfens and Addison, 2009).

As noted before the three initial Treaties establishing the European Communities gave the green light for the financing of research and development projects only in the fields of nuclear research, coal and steel, and to a minor extent in agriculture. During the 1960s it became necessary to respond to the American challenge, and in 1963 the Commission made its first of a long list of recommendations to Member States on the subject of strengthening co-operation in the field of science and technology (H1). These recommendations culminated in 1970 in the setting up of the COST Committee (Scientific and Technological Cooperation), an intergovernmental initiative composed of senior officials from fifteen countries. The initiative supported joint research projects with contributions coming from each participating state. The structure of the initiative was that each country could take part in, and contribute financially to, those projects, in which it was interested. In order to make the arrangements even more flexible, each agreement allowed for countries to participate at a later stage. The role of the Commission in the COST was ambiguous. As the initiative was of strictly intergovernmental character, the Community bodies were relegated to secretarial functions. The COST continued to maintain its main character, but attempted to complement rather than compete with the Community programmes. In particular the Secretariat General of the Commission took over the provision of secretariat services to COST later on, and the Community itself took part in several COST actions, thus financing not the research but the administration (de Elera, 2006).

The first mention of a „European Scientific Area" was included in the work programme presented by the then Commissioner responsible for research Ralph Dahrendorf in 1973. The ideas introduced in this document anticipated much of the content of the official European Research Area (ERA) project from almost thirty years later. The work programme called for the European Community to overcome the limits of national boundaries in the development of science and to create an effective single area for European research in which competition and cooperation complement each other in a sensible way. The document called for the facilitation of the mobility of researchers, the setting up of international targeted meetings between European research organizations, and the stimulation of European cooperation by concerted actions and projects (Andre, 2006).

January 1974 marked a historic month for European research and technology policy. The Council adopted four resolutions which would shape science policy in the coming years. The first resolution was general in character, and concerned the co-ordination of national policies and the definition of projects of Community interest. A Scientific and Technical Research Committee (CREST), formed by representatives of the Member States, was set up to help both the Council and the Commission to fulfill these tasks. The second resolution was dealing with the collaboration of the Communities in the establishment of a European Science Foundation (ESF) modeled after the American National Science Foundation to oversee the development of fundamental scientific research. The idea of a foundation came from the Commission to set up a sort of research council, which could provide both the Commission and the Council with advice and consultancy service in matters of basic research. The foundation project, on which many research councils and European academies were working, provided for a diffuse structure and the participation of 16 countries. For this reason the Foundation did not become a Community institution, nevertheless the Communities stressed a strong collaboration with the ESF (H1). The third resolution established the necessity for the Community to have its own science and technology policy which would integrate the research programmes already set up by the Communities with specific projects advanced by the Commission working closely together with the CREST. These projects would be chosen above all on the basis of their usefulness to Community objectives, both generally and in particular areas. The fourth and last resolution introduced a specific venture, which was preparatory to the formulation of Community science and technology policy. This was only a preliminary programme for future research activities, on the basis of which the Commission had to present new proposals to the Council (Papon, 2001).

When in 1974, the Community took the first steps towards establishing its own research and development policy, the political and economic circumstances were not favorable. The oil crisis, followed by Arab-Israeli conflict put the economies of Western Europe into a critical situation, where governments were suggested to make huge budget cuts. The situation persuaded European leaders to rethink and diversify the activities of Community level science policy (H1). In this context the Commission proposed in 1977 a broadening and diversification of Community research, principally in the field of safety of reactors, radiation protection, new energy sources, and the conservation of environment and resources. It was also considered the right moment to set up criteria on what research projects the Community should support, and where it could contribute a real value added. The Commission established a list of general criteria for this purpose: there needed to be Community intervention wherever this would promote the rationalization of effort and allow greater efficiency (example: controlled fusion research); Community research was necessary in all areas which by nature do not concern a single country (transport, information, environment, telecommunications); Community involvement was needed in areas where the R&D costs were very high and the products required larger than national markets (aerospace, computing); and finally European projects were to be set up which may satisfy needs common throughout the Community (environment, urban and land use, standardization). In the same year (1977), the Commission presented six great areas of research where Community intervention was to be elaborated: energy, resources, environment, living conditions, services, infrastructure and industry (Guzzetti, 1995).

4.2. The 1980s: the Framework Programmes

Research and technological policy in the European Community really gained momentum in the early 1980s. At the same time, the progress in European integration was reignited after a period of stagnation. Looking at different policy development of these years, one can note obvious linkages between the facilitating of European integration and promoting industrial competitiveness, economic growth and thus living conditions through research and innovation. The term „Eurosclerosis", meaning the stagnation in the political development of the EC, as well as the stagnating competitiveness and economic performance of Europe as compared to the USA, Japan and the newly industrialized countries shows this linkage. The elaboration of R&D&I budget and the continuation of European integration was brought about by the widely accepted interpretation that the economic downturn was primarily caused by a lack of innovation in all sectors of Western European societies, in the structures of firms as well as in politics and administration, research, technology as well as individual attitudes and behavior. Despite the Council's resolutions of 1974, there was still no Community policy on science and technology, because governments were on the whole opposed to any extension of Community activities in the area, and every single initiative had to be unanimously approved by the Council either by reference to Article 235 of the EEC Treaty or on the basis of EURATOM and ECSC treaties. In this situation the Commissioner and the Director General went on to adopt a pragmatic approach, taking advantage of the crisis in certain sectors in order to persuade the Council to accept new Community initiatives. Between 1982 and 1983 they began to reorganize the individual research and development activities and included them in a more comprehensive plan which was supposed to serve as the basis for a real policy for science and technology. Putting together all the separate research and development programmes in the field of technology in a Framework Programme designed to last over several years, the Commissioner had the idea to provide the Community with a means of selecting and orchestrating scientific and technological aims, a means of planning which could co-ordinate Community and national activities through financial provisions. The Commission wanted to create an organization which reflected in its administration the complexity of the development process. From this point of view the Framework programme resembled a matrix in which all single programmes found different points of intersection with each other and with other Community policies. In relation to national research and development activities (public and private), the Commission established criteria for deciding which intervention seemed to require the Community to take overall responsibility. There were four specific criteria: research on a vast scale that requires important financial means that no single country can bear; research that would benefit financially from being carried out jointly; research that because of the complementary nature of the work carried out, would achieve significant results in the whole of the Community for problems to which solutions call for research conducted on a vast scale in a geographic sense; and research that contributes to the cohesion of the common market, and which promotes the unification of European science and technology, as well as research which leads where necessary to the establishment of uniform laws and standards. To these four criteria, two were added, a fifth in 1987 regarding social and economic cohesion, and in 1994 another followed dealing with the mobility of researchers and the coordination of national policies (Dresner and Gilbert, 2001).

Among the factors contributing to the success of the Framework Programme initiative were the discussions about the European technological gap, especially in microelectronics and information technologies. These were related to global economic developments, namely Japan and the newly industrialized countries, which were putting pressure on the US and European economies (H1). The US reaction was a resurgence of protectionism, which also affected Europe and contributed to the triadization of the world economy – the perception that Japan, the US and Europe were competing as three blocks. At the same time new shifts became apparent in global R&D trends. Increasingly, there was more focus on innovation, which served as a term encompassing technology development, industrial policy and state regulation and standardization. Changes in the relations between academia and industry began to appear, with more and more close links developing (Clegerei, 2007).

The Single European Act, which was approved in February 1986, and entered into force in July 1987 added a Title VI to the EEC Treaty with a view to legally cover research and technological development activities. The objective set out by the Single Act for Community research was primarily economic. It called for the bolstering of scientific and technological foundations of European industry so that it boosts its competitiveness internationally and promotes geographically homogenous development (H1). In particular, the Single Act established a close link between research and the completion of the single market. The Community encouraged cooperation between companies (including small and medium-sized companies), research centers and universities, aiming at enabling undertakings to exploit the internal market potential to the full. Many Commission directives concerning the completion of the Single Market had a direct impact on science and technology. Genuine economic integration required common standards and norms, a step which could be achieved through the reciprocal recognition of national standards, or through harmonization. Both the development of new technologies and their rapid commercialization made it necessary that the national organizations in charge of creating standards and industries worked in a coordinated manner and set homogenous standards at European level (Guzzetti, 1995).

Amid the Community level developments of European science and technology policy, the mid 80s saw the establishment of an important intergovernmental initiative, the EUREKA. The President of France, Francois Mitterand, proposed a programme for technological co-operation among the European nations in order to compete with similar American and Japanese initiatives (H1). The programme was introduced under the name EUREKA, where EU stood for Europe, RE for research, K for coordination and A for action. From a Community point of view the creation of this new organization was on the one hand the reconfirmation of the intergovernmental method in research and technology for France, as well as a specific European response to the American Strategic Defense Initiative (SDI), better known as the „Star Wars" project. The main idea of EUREKA was to set up a complementary programme to Community initiatives, especially in the precompetitive phase. Its existence can be justified by the need to fund at European level, development projects close to the market. EUREKA took a bottom-up approach, with companies proposing research topics that would be first assessed by the existing national bodies, whereas Community programmes were top-down in terms of areas of research, and bottom-up as for individual projects, without the involvement of the national level (Guzzetti, 1995). In light of the developments that followed, EUREKA was later considered as the First Framework Programme for research.

The Second Framework Programme brought about an additional thematic on the Community R&D scene: economic and social cohesion, introduced to the EEC Treaty by the Single European Act. This provision was already anticipating the massive enlargement of the following decade (2004) involving economically less developed member states coming from Eastern and Central Europe. The previously mentioned criteria and rationale for organizing RTD actions at the Community level (1983) were extended by a fifth. There was obvious tension between the main logic behind Community RTD policy (Scientific excellence) and the pursuit of cohesion (development of less developed European regions) (Guzzetti, 1995).

In fact the criterion of scientific excellence is created to go against the principle that each Member States would be allocated RTD contracts in proportion to its financial contribution. The Community's solution to this problem was considered the use of Structural Funds to strengthen the less-developed regions by building up capacity, modernizing research, training and infrastructure. Following this logic, on the long run all European regions were supposed to find themselves on an equal footing in the competition to obtain funding for RTD projects. The creation of research infrastructure in less developed regions (peripheral regions) has the positive effect of slowing down brain drain from these poor regions to more advanced European and third countries. Moreover the very fact of organizing RTD actions at Community level makes its own contribution to cohesion by putting research organizations from less developed regions into contact and collaboration with well established excellent research organizations in Europe (Musyck and Reid, 2007).

The events surrounding the adoption of budget for successive framework programmes revealed the tension between the Commission and the Parliament, and the Member States as for the relative importance of the Community level engagement into research and technological development. The Member States have been trying to keep national control of technologies which they consider strategic and where they could have competitive advantage over other countries. The result is that the ministers most of the time would reach a compromise at the lowest possible level. Two fundamental issues have been linked to the funding of RTD at the European level. The first concerns the division of competences between the Community and the Member States, where the Member States try to apply the notion of subsidiary. The second is the term additionally or attribution. The question in the later here is whether Community funding should be considered an addition to national funding or part of them (Guzzetti, 1995).

Before preparations started for the fifth Framework programme, the EU's RTD policy was in a difficult position. The Davignon report, the evaluation report on the Fourth framework programme, was rather critical. It stressed that the Commission's programme management was not effective, and it lacked a clear overall strategy. The report recommended reorienting the framework programme towards more social and economic relevance.

The Fifth programme also differed from the previous versions, as it introduced so-called thematic programmes. These did not address scientific disciplinary areas or industrial fields, as the former programmes did. Instead social and economic problem areas were selected and objectives were set up accordingly (thereby taking the recommendations of the Davignon report on board). Innovation was considered in the fifth programme as an iterative process that could be improved by creating networks between knowledge producers and knowledge users. The most crucial novelty compared to previous programmes was that not only narrow economic and industrial applications were targeted, but also broader social problems were taken into account. Another important feature of the FP5 was the integration of Central-European Countries. Research organizations, universities, companies and industrial organization were eligible to participate in the published calls for proposals (Dresner and Gilbert, 2001).

The sixth framework programme followed the footsteps established by FP5, as it further increased the managerial flexibility and autonomy of research activities as well as concentrated research efforts into larger networks and projects. New funding instruments were introduced: „integrated projects", „networks of excellence" and the „article 169 instrument". The main goal was to establish self-organized, longer term cooperation across Europe that would replace the small-scale, short-term research projects. The networks of excellence were deemed to connect national centers of excellence, providing for the possibility to exchange researchers and sharing of data. Article 169 of the Maastricht Treaty made it possible to do coordination of RTD policies (Banchoff, 2002a). An important attribute for the sixth programme has been the launching the Regions of Knowledge (ROK) as a pilot action after the insistence of the European Parliament. The ROK was created to provide transnational collaboration for regional research clusters, whereby important knowledge transfer and sharing of best practices could take place.

The currently ongoing 7th Framework Programme's aims and objectives were laid down in the Decision 1982/2006/EC of the European Parliament and the Council of 18 December 2006. It claimed that the main objective was to contribute to the EU becoming the world's leading research area. As concrete objectives, transnational cooperation, frontier research based on excellence, and the strengthening of the human potential in research and technology were particularly underlined. Further objectives were the promotion of a dialogue between science and society, facilitating the career development of researchers, strengthening of research capacities in less developed European regions and assuring the dissemination of the knowledge generated by research actions funded through the Framework Programme. As for the regional aspects of the framework programme, the FP7 developed the Regions of Knowledge into a full-fledge community action, also slightly modifying its content. Notably, the new and less prosperous member states (regions) were incorporated through a specific provision on mentoring, which allowed first the development of science based clusters in these areas, as well as their integration into thematic networks around Europe. The other programme targeting the scientific capacity building of lagging behind European regions was the Research Potential activity. The analysis of its targeted sub-action (evaluation facility of research entities in the EU's convergence and outermost regions) is the subject of chapter 6 (pages 89-100), where the main rationale and objective of this community intervention is outlined in detail.

One has to note that the context for FP7 has dramatically changed since its original launch in 2006. As the EU has been facing a severe economic crisis since 2008, several new challenges have emerged. The 'smart, sustainable and inclusive growth' buzzword is the focus of the Europe 2020 agenda. It tries to set up the broad directions for socioeconomic development over the next decade; however Europe also has to find ways of dealing with longer-term transformations, such as the ageing of the population, the emergence of new economic competitors, as well as the shifting to a low-carbon paradigm.

In all these challenging areas, research can play an important role in achieving the new knowledge needed to promote change, to support innovation and to enable society to accommodate diverse scenarios (Interim Evaluation of the Seventh Framework Programme, 2010).

The recently adopted Europe 2020 agenda considers knowledge and innovation as drivers of future growth, with research and technological development represented as a crucial means. These challenges will be met by coherent policy approaches and by avoiding fragmentation and duplication of efforts, an aspect underlined in the Innovation Union flagship initiative for Europe 2020. This flagship initiative stresses the need for EU level intervention to complete the European Research Area and to develop a strategic approach to research and innovation (European Commission, 2010a; European Commission, 2010b).

As a summary, the main milestones of the European level research and innovation policy are summarized in Table 2:

Table 2: The major milestones in the evolution of EU's S&T&I policies. Source: Prepared by the author.

Year	**Milestone**
1957	EURATOM
1970	COST
1974	CREST, resolutions for a European science policy
1986	Single European Act
1983-2013	Framework Programmes
2010	Europe 2020, Innovation Union Flagship

4.3. Recent developments in European research and innovation efforts

As we have seen, with the creation of new initiatives and instruments over the past decades, and the addition of new member countries, the institutional and organizational setup of EU RDI policy field have become very complex (with more differentiated needs and capacities) and it has become very difficult to coordinate. To better structure existing instruments, and to align new initiatives, the EU Commission set out the courageous goal of creating a genuine European Research (and innovation) Area. The origin of the European Research Area (ERA) goes back to the end of the 1990s. With the emergence of the information and communication technologies the term „knowledge based economy" became the new reference word. Furthermore Europe as a whole was suffering from a widening gap compared to the US and Japan, as regards the putting into practice of this new economy. The EU was forced to reorient its scientific, technological policies in order to keep up with the growing challenge (H1). The ERA proposal submitted by the Commission was one of the first steps in the establishment of the so-called Lisbon Strategy (Boyer, 2009).

In January 2000 the European Commission published the Communication "Towards a European research Area" (European Commission, 2000), which was an important attempt to reform European RTD policymaking. One of its main goals was the building up of European research identity and the preparation for more effective and strategically planned pan-European cooperation. Its major means would be a better and more flexible co-ordination of national RTD policies; the implementation of multi-partner projects aimed at strengthening excellence on a research topic by networking the critical mass of resources and expertise around a joint program of activities; the preparation of multi-partner projects to support objective –driven research by bringing together a critical mass of resources to reach ambitious goals, where the primarily deliverable is knowledge for new products, processes and services. The aim of these instruments has been to create self-organized, long-term co-operation across the EU that would take the place of short-term, small-scale, centrally managed projects. The European Commission this way was to receive more autonomy to initiate projects and programs that directly affect national research actors.

The March 2000 Lisbon European Council endorsed the objective of creating a European Research Area (ERA), consequently many initiatives have been launched to pursue these goals. Globalization of research had an ever more significant role; moreover new scientific powers were hosting considerable amounts of R&D investments. These trends exposed Europe's ability to sustain a leading edge in knowledge and innovation, which was confirmed as the core element of the renewed Lisbon Strategy for Growth and Jobs in 2005.

The EU and Member States have likewise expressed that the ERA, along with high quality education and a supportive environment for innovation, is essential for Europe to become a leading knowledge society and thus providing the necessary conditions for future generations.

The ERA concept integrates three inter-linked aspects of European level research. A European 'internal market' for research should be formed, where researchers, technology and knowledge can freely circulate; an effective European-level coordination of national and regional research activities, and finally effective and well targeted programmes, policies; and initiatives need to be implemented and funded at European level (Borras, 2003; Banchoff, 2002b).

Furthermore, the recent decades also witnessed important steps in the development of a number of key fields of technology including information and communication technologies (ICT), nanotechnology and life sciences This fast pace progress boosted the expectations of policy-makers and society. However most of this progress was coming from outside Europe. The EU never managed to reach the US levels of economic growth and employment. In addition to this, over the course of the last 15 years, major developing economies (Brazil, Russia, India, and China) have made important progress in economic growth. Foreign direct investment has flown into these countries, more and more setting up the production of middle- and high tech products. Due to trade liberalization these countries have been able to export these products to advanced markets such as the EU, thus posing new competitive threats to the developed economies. This trend even more pushed the EU (and other developed economies) to specialize in more high-tech industries, and put research and development to the top of the political agenda (H1) (Muldur et al., 2006).

The Presidency Conclusions of the Lisbon European Council in 2000 began with an analysis of the EU's strengths and weaknesses. The Council coincided with the peak of the Internet boom, thus the document proclaimed that "the Union is experiencing its best macro-economic outlook for a generation" and that "growth and jobs creation is on". The most important weakness it mentioned was the underdevelopment of key economic sectors and human capital formation (Borras, 2003).

Almost immediately after this summit meeting the new economy boom collapsed, the economic situation worsened rapidly, and the need for a faster economic growth in the EU was very much in demand. All the European summits from 2000 onwards have underlined the contribution of research and education in adapting to the new global competition. In March 2002, in order to achieve this target, the Barcelona Declaration urged for a rise in the share of European GDP invested in research (from 1,9% to 3%) and second, promoted the idea to increase the number of researchers. These objectives were defined to create a dynamic area for research that would elevate Europe to the forefront of international scientific excellence (European Council, 2002).

In 2004, the European Commission and the European Council decided to prepare a mid-term review of the Lisbon process, which was presented at the Spring Summit in March 2005. The former Prime Minister of the Netherlands, Wim Kok was given the mandate by the European Council to lead a group of experts in examining the Lisbon Strategy. This report suggested that research was one of the major elements of the Lisbon process, however little progress had been achieved in innovating Europe's economy, and the reform process was not moving fast enough. The expert group advised to refocus the whole process on jobs and growth (High Level group chaired by Wim Kok, 2004).

To achieve the 3% target, the Commission prepared a "Community Lisbon Programme" to complement the national action plans for growth and jobs, which were completed by the

Member States in October 2005. The programme consisted of 50 initiatives including regulatory actions, financing actions and policy development. The renewed Lisbon agenda adopted in 2005 introduced a streamlined reporting process, due to the fact that there were serious delays and shortcomings in the implementation. As a consequence, Member States prepared their National reform Programmes (NRPs) including reforms elaborating on micro-economic, macro-economic and employment policies for the period 2005-2008. They submitted progress reports in the autumn of 2006, 2007 and have been following the same practice since then. These plans aim at enforcing the EU Commission and Member States' partnership to transfer effective and innovative practices from one country to another (Begg, 2007).

Based on the first years, the Commission has made an assessment pointing out the strengths and weaknesses of the renewed process. Four priority areas were identified, where more commitment and action was needed: education and research; SMEs; common employment policy; and a common energy policy. As regards research and innovation, a group of four high level experts were mandated by the Commission to draft a report, which made suggestions to boost Europe's research and innovation performance. The report's main recommendation was a "Pact for Research and Innovation to drive the agenda for an innovative Europe". The expert group underlined the fact that current efforts were not sufficient towards the revised Lisbon agenda, and more collective commitments were needed. The Seventh Framework Programme was confirmed as a key contributor to the re-launched Lisbon programme (Expert Group chaired by Esko Aho, 2006).

4.4. Attempts towards more efficiency in the governance of research and innovation policies: from the European Research Area to Smart Specialization

Important progress has been made in the implementation of the renewed Lisbon agenda, but still in March 2007 the European Council called both the Member States and the Commission to pursue actions that strengthen the internal market and competitiveness and provide better framework conditions for research and innovation (Begg, 2007).

The open method of coordination (OMC) was officially adopted during the Lisbon Council in 2000, as an important new governance model. Policy coordination corresponding to such a new mode of European governance was included in the field of fiscal policy, as well as later on in the fields of economic and employment policies. During the late nineties the method was extended to other policy fields, where the Member States remained the main responsible, nevertheless some countries accepted the fact that certain goals could be obtained through a concerted action with much more efficiency that on an individual basis (Prange and Kaiser, 2005).

The OMC provides a new approach and way of cooperation for the EU member states in order to pursuit common goals. Its main components are:

- Common Guidelines for the Union established by the Council with specific timetables for achieving these goals, set in the short, medium, and long run
- A reciprocal learning process and the setting up performance indicators and benchmarks against the most advanced global actors and tailored to the needs of different Member States and sectors as a means of best practices
- The transforming of these guidelines into national and regional policies by setting up targets and establishing measures in the form of national plans for each government
- Periodic monitoring and follow-up from the EU Council, which result in recommendations (Telo, 2002)

The rationale of the OMC is that public policy actors at the European, national, regional and local level should become more involved to ensure that measures taken at different levels will be consistent. According to this logic, innovation policies conducted and implemented at different levels in Europe are expected to become more integrated in a multi-level governance structure. Depending on the constitutional set-up of European member states, and the “maturity” of their science and innovation systems this multi-level governance structure can vary from country to country, thus making the whole European scene very complex and difficult to map. In a decentralized country like Germany, the number of competency levels in research and innovation policy may even reach 4 and 5, very often risking the duplication and fragmentation of efforts. In other countries the landscape might seem more simple and transparent; however with ever more powerful (mainly informal) information and policy networks encompassing the entire community of 27, the reality is different. Therefore the OMC can be considered an important attempt to come up with viable solutions for structuring and streamlining European efforts (Edler, 2005).

In terms of EU policy formulation, the OMC can be located between the intergovernmental cooperation and the Community method. As noted, the goal is to set up common guidelines, to introduce benchmarks and share best practices in policy fields where the EU has limited competence. The main added value of this governance method is that with the centrally defined norms and indicators, Member States have the opportunity to share experiences and best practices and to participate in a collective learning process (Kaiser and Prange, 2004).

Even though this governance method has not been as successful as expected for the field of research and innovation, it needs to be underlined that it was thanks to the Lisbon Strategy that the very important role of research and innovation has been recognized for the economic and social progress in Europe. The new competences formally attributed to the European Council regarding research and development had two main results at the EU level.

In the European Union traditionally the funding of basic science is mainly a national responsibility while the EC Framework Programmes have become significant instruments on industrial and socially targeted research. The idea was that in the institutional context of European integration, answers to challenges of competitiveness and social development are traditionally understood as in terms of short- to medium-term industrially relevant R&D programmes. Community support of science has been legitimate only as much as it supported policies provided in the treaties. However, a genuine European Research Area would be rather incomplete without increased funding for long-term, fundamental science and the establishment of a body to implement it. Therefore the setting up of the European Research Council (ERC) adds value to the existing national systems by creating a wider, continental science for both competition and collaboration in science, urgently required to enable Europe to face up to the dynamism and attractiveness of the US science system. The main argument to introduce the ERC in the context of the ERA is to compensate for the applied orientation of the framework programme, and the existing research councils in the member states, as well as a strategic response to the US challenge. It is expected that such a funding instrument will boost European funding for basic research, strengthen the quality standards and lower the barriers to cooperation and the achievement of critical mass. It should equally help the EU foster innovative and multidisciplinary science, and make the EU more attractive in the global competition for talented researchers, as well as to stimulate industrial R&D investment (Gronbaek, 2003). The ERC hence is another prime example of the “responsive” nature of EU RDI policy, attempting to meet challenges posed by Europe’s main competitors in the domain. Moreover, the ERC serves a very interesting “governance” attempt as it tries to gather all EU level efforts for basic and frontier research. One can also state that ERC is where pure research and scientific excellence is rewarded in contrast to other parts of the framework programme.

The other major achievement of the strengthened position of R&D in the EU policy is the strong increase in the funding of the 7th Framework Programme. Since 1983, the budget allocated to the framework programmes has increased steadily from around 3,7 billion (1983-86) to 4,5 billion (1987-1990), to 6,5 billion (1991-1994), to 13,2 billion (1995-1998) to 15 billion (1999-2002) and with the 6th Framework Programme, to 17,5 billion (2003-2006). The approval of the 7th Framework Programme (2007-2013) with a budget of over 50 billion for its seven years duration marked an important milestone in this evolution, with an annual increase of 40%. This makes today the EU Framework Programme one of the most important financial contributors to the development of science and technology policy in Europe (Guzzetti, 2009).

Despite great improvements during the last decade through the European Research Area, research and innovation efforts in Europe are still fragmented, there is often duplication of thematics, the competition between research and innovation actors is suboptimal. Therefore a new rationale has been adopted by European policy makers to create the right conditions of competition and co-operation to support the emergence of world class, specialised clusters – achieving agglomeration effects for the whole territory of the EU.

On the one hand the great majority of public research funding in Europe comes from the national level (about 90°%), the remaining amount is provided by the European Commission. This certainly doesn’t contribute to European level specialization and the development of European Centers of Excellence. Moreover supporting national scientific expertise in the same fields of competence would lead to excessive duplication of research and inefficient spending of public resources. On the other hand one must take into account the fact that there are huge differences in terms of economic development and innovation capacities among EU member states, and these countries/regions must be equally integrated into the common European setting (Varblane et al., 2009).

The EU Commission (DG RTD) supported expert group “Knowledge 4 Growth” (K4G) has proposed the idea of “smart specialization” as a possible way forward (European Commission, 2008). The smart specialization argument emerged initially from the literature examining the transatlantic productivity gap. The concept was first elaborated by Dominique

Foray and Bart van Ark, and subsequently developed along with their co-authors Paul David, Bronwyn Hall and by other members of the "Knowledge for Growth" expert group (Foray and Van Ark, 2007). The smart specialization has been equally adopted by the Barca report, and subsequently endorsed as the cornerstone of future European cohesion policy (Barca, 2009).

The idea is that instead of directing resources to several frontier technology research fields and not making an important impact in any of those areas, one should encourage investment in programmes that will complement the given territory's other productive assets to create future comparative advantage. In this framework all regions should be given a fair chance to compete whereby they invest in a particularization process in order to make their knowledge base distinctive and original. Especially less developed EU 15 regions and new member states face in their innovation systems many failures that the smart specialisation is expected to address (Cooke, 2009).

Smart specialisation is supposed to generate more diversity among regions than a system in which each region tries to create approximately the same value in a duplicative manner, with overlapping research and educational programmes and hence a diminished potential for complementarities within the European Research Area. It is very important to note that the smart specialisation does not mean a top-down policy with pre-identified plans. Instead the K4G suggested an entrepreneurial process of discovery that will show in what research and innovation domain a certain country and region should focus. The smart specialisation should be a learning process in which the given region identifies the research and innovation field in which it has potential to excel, which is „market niches". As mentioned before this should be the responsibility of entrepreneurs who are best disposed to discover these domains. Cross-sectoral approaches and consideration of future potential changes or spin-offs from existing sectors can contribute to an efficient portfolio of competences. Furthermore policy makers are invited to participate in more moderate role in selecting the right areas of specialisation. They should provide infrastructural assistance, providing and facilitating information about emerging technological and commercial opportunities, as well as provide the necessary encouragement for businesses. The aim of regions adopting smart specialisation strategies is to achieve coherent matching between their science base, technology production and economic structure (Foray et al., 2009).

As we have seen in this section, the most important motivation for European actors to pool resources and collaborate on science, technology and innovation issues in the last half a century has always been coming from the outside, and mostly it has been a reaction mechanism and not a proactive behavior (H1). The global political and economic changes since the Second World War have enforced the continent to take stock of its resources and to try to keep pace with other parts of the world. From the initial rationale of EU-level S&T&I actions to the current developments of an enhanced focus on innovation policy through the recently published EU2020 strategy, European decision-makers have been playing a catch-up game, rather that dictating the global trends, be it policy or technology related orientations. The main EU level instrument to fund research and innovation (FP) has seen an important growth in scope and in financial terms as well since its launch in the early 80s. Currently the FP is considered as one of the main instruments at the European level to implement the policy goals set out in the next mid-term EU strategy, the EU 2020.

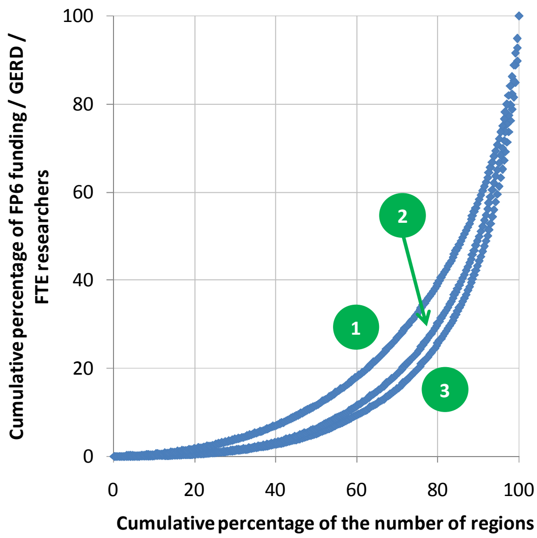
5. CLUSTER ANALYSIS OF EUROPEAN NUTS 2 REGIONS IN TERMS OF THEIR RESEARCH AND INNOVATION CAPACITY

5.1. Regional R&D and the Framework Programmes

Concentration

As the Lorenz-curves demonstrate on Figure 3, the regional concentration of GERD (Gross domestic expenditure on R&D), the number of researchers and FP6 funding is high.

Figure 3: Lorenz-curves of average GERD (2003-2007), the average number of researchers and FP6 funding in EU regions. Source: Prepared by the author based on Eurostat and CORDA data.



Legend: 1 = researchers, 2 = GERD, 3 = FP6 funding

Not more than 20 regions used half of the funding from FP6 and not more than 24 regions spend half of Europe's R&D, and not more than 34 regions account for half of Europe's researchers. The table below lists these regions and it is interesting to see which regions receive large FP6 funding without performing equally substantial R&D or accounting for a large number of researchers and vice versa (H2).

Table 3: The results from the Lorenz-curve. Source: Prepared by the author based on Eurostat and CORDA data.

The 20 regions using 50% of FP6 funding	**The 24 regions spending 50% of Europe’s R&D***	**The 34 regions accounting for half of Europe’s researchers****
FR10 Ile de France	FR10 Ile de France	FR10 Ile de France
DE21 Oberbayern	DE21 Oberbayern	FI Finland
UKI1 Inner London	DE11 Stuttgart	DE21 Oberbayern
DK0 Denmark	FI Finland	DE11 Stuttgart
ITE4 Lazio	DK0 Denmark	UKI1 Inner London
ES30 Comunidad de Madrid	DE71 Darmstadt	DK0 Denmark
FI Finland	FR71 Rhone-Alpes	ES30 Comunidad de Madrid
DEA2 Köln	UKH1 East Anglia	ES51 Cataluna
ITC4 Lombardia	SE11 Stockholm	UKJ1 Berkshire, Buckinghamshire and oxfordshire
NL33 Zuid-Holland	DEA2 Köln	UKH1 East Anglia
DE12 Karlsruhe	DE12 Karlsruhe	SE11 Stockholm
UKJ1 Berkshire, Buckinghamshire and oxfordshire	ITC4 Lombardia	PL12 Mazowieckie - FP5
SE11 Stockholm	DE91 Braunschweig	FR71 Rhone-Alpes
BE10 Région de Bruxelles	SE23 Västsverige	DE71 Darmstadt
GR30 Attiki	UKI1 Inner London	DE12 Karlsruhe
NL32 Noord-Holland	DE30 Berlin	DEA2 Köln
ES51 Cataluna	UKJ1 Berkshire, Buckinghamshire and oxfordshire	DE30 Berlin
AT13 Wien	ES30 Comunidad de Madrid	ITC4 Lombardia
UKH1 East Anglia	ITE4 Lazio	UKJ3 Hampshire and Isle of Wight
DE30 Berlin	DEA1 Düsseldorf	UKK1 Gloucestershire, Wiltshire and Bristol
	FR62 Midi-Pyrénées	ITE4 Lazio
	AT13 Wien	ES61 Andalucía
	ES51 Cataluna	AT13 Wien
	UKK1 Gloucestershire, Wiltshire and Bristol	SE23 Västsverige
		RO32 Bucuresti-Ifov

		FR62 Midi-Pyrénées FR82 Provence-Alpes-Cote d'Azur PT17 Lisboa UKG3 West Midlands UKM3 South Western Scotland HU10 Közép-Magyarország CZ01 Praha UKF1 Derbyshire and Nottinghamshire DE91 Braunschweig

* Based on average regional GERD in the years 2003-2007

** Based on the average number of researchers in the years 2003-2007 (FTE basis)

There are 16 regions, which are present on all three lists above (Wien, Karlsruhe , Oberbayern, Berlin, Köln, Denmark , Comunidad de Madrid , Cataluna, Finland , Ile de France , Lombardia , Lazio , Stockholm , East Anglia , Inner London, Berkshire, Buckinghamshire and Oxfordshire). This „supergroup" of European regions accounts for (H2):

- 15% of Europe's population,
- 24% of Europe's GDP,
- 30% of Europe's researchers,
- 35% of Europe's GERD, and
- 43% of the FP6 funding.

<u>FP6 funding in relative terms</u>

After completing the Lorenz curves, and generating the "supergroup", we have collected the following three variables for all regions in reference: % of FP6 funding in regional GERD, FP6 funding per FTE researcher, GERD in per cent of GDP. A cluster analysis of these three variables using the K-mean clustering with the SPSS programme shows that beyond the above-mentioned "supergroup", the remaining European regions can be classified into seven groups(K=7), depending on the relative weight and importance of R&D and FP funding in the region. We agreed with this number of clusters, since it outcome provided a reasonable composition and distribution of regions.

The indicators used to classify eight groups of European regions (averages)

Table 4: FP6 funding in relative terms. Source: Prepared by the author based on Eurostat and CORDA data.

Group	No. Of regions in the group	GERD in % of GDP in the region	FP6 funding per FTE researcher (euro)	% of FP6 funding in regional GERD
1	86	0,7	3 775	5,0
2	44	1,1	11 676	8,9
3	12	4,4	8 148	3,8
4	35	2,3	7 304	4,2
5	16	1,3	32 898	16,7
6	26	0,5	4 438	22,0
7	6	0,6	25 207	40,4
The "supergroup"	16	3,0	16 207	9,3

1st group:

AT34	Vorarlberg
BG31	Severozapaden
CZ03	Jihozápad
CZ04	Severozápad
CZ05	Severovýchod
CZ07	Střední Morava
CZ08	Moravskoslezsko
DE24	Oberfranken
DE41	Brandenburg — Nordost
DE93	Lüneburg
DEA4	Detmold
DEA5	Arnsberg
DEB1	Koblenz
DEB2	Trier
DED1	Chemnitz
DEE0	Sachsen-Anhalt
ES11	Galicia
ES12	Principado de Asturias
ES13	Cantabria
ES23	La Rioja
ES24	Aragon
ES41	Castilla y Leon

ES42	Castilla-La Mancha
ES43	Extremadura
ES53	Illes Balears
ES61	Andalucía
ES62	Región de Murcia
ES70	Canarias
FR21	Champagne-Ardenne
FR22	Picardie
FR23	Huate-Normandie
FR24	Centre
FR25	Basse-Normandie
FR26	Bourgogne
FR30	Nord-Pas-de-Calais
FR41	Lorraine
FR51	Pays de la loire
FR53	Poitou-Charentes
FR63	Limousin
GR11	Anatoliki Makedonia, Thraki
GR14	Thessalia
GR22	Ionia Nisia
GR24	Sterea Ellada
GR25	Peloponnisos
GR42	Notio Aigaio
HU21	Közép-Dunántúl
HU22	Nyugat-Dunántúl
HU31	Észak-Magyarország
HU32	Észak-Alföld
ITF1	Abruzzo
ITF2	Molise
ITF4	Puglia
ITF6	Calabria
ITG1	Sicilia
ITG2	Sardegna
LV00	Latvija
NL12	Friesland
NL34	Zeeland
PL22	Slaskie
PL31	Lubelskie - FP5
PL32	Podkarpackie - FP5
PL33	Swietokrzyskie
PL52	Opolskie - FP5
PL61	Kujawsko-Pomorskie - FP5
PL62	Warminsko-Mazurskie
PT18	Alentejo
PT20	Região Autónoma dos Açore
PT30	Região Autónoma de Madeira
RO11	Nord-Vest
RO31	Sud-Muntenia
RO32	Bucuresti-Ifov
RO41	Sud-Vest Oltenia

RO42	Vest
SE31	Norra Mellansverige
SE32	Mellersta Norrland
SK02	Západné Slovensko
SK03	Stredné Slovensko
UKC1	Tees Valley and Durham
UKD1	Cumbria
UKE1	East Yorkshire and Northern Lincolnshire
UKF3	Lincolnshire
UKG2	Shropshire and Staffordshire
UKK2	Dorset and Somerset
UKK3	Cornwall and Isles of Scilly
UKL1	West Wales and The Valleys
UKN0	Northern Ireland

2nd group:

GR13	Dytiki Makedonia
SI0	Slovenija
UKC2	Northumberland and Tyne and Wear
UKE3	South Yorkshire
UKK4	Devon
ITD1	Provincia Autonoma Bolzano
DE60	Hamburg
NL42	Limburg
AT11	Burgenland
AT12	Niederösterreich
AT32	Salzburg
CZ06	Jihovýchod
DE27	Schwaben
DE42	Brandenburg — Südwest
DE73	Kassel
DE80	Mecklenburg-Vorpommern
DE94	Weser-Ems
DEA3	Münster
DED3	Leipzig
DEF0	Schleswig-Holstein
ES21	Pais Vasco
ES52	Comunidada Valenciana
FR83	Corse
IE01	Border, Midland and Western
IE02	Southern and Eastern
ITC1	Piemonte
ITD3	Veneto
ITD5	Emilia-Romagna
ITE2	Umbria
ITE3	Marche
ITF3	Campania
ITF5	Basilicata

LU00	Luxembourg
PT11	Norte
PT16	Centro (PT)
PT17	Lisboa
SE21	Smaland med öarna
UKD3	Greater Manchester
UKE2	North Yorkshire
UKE4	West Yorkshire
UKF2	Leicestershire, Rutland and Northhamptonshire
UKG3	West Midlands
UKI2	Outer London
UKJ2	Surrey, East and West Sussex

3rd group:

AT22	Steiermark
DE11	Stuttgart
DE14	Tübingen
DE91	Braunschweig
DED2	Dresden
FR62	Midi-Pyrénées
SE12	Östra Mellansverige
SE22	Sydsverige
SE23	Västsverige
UKD2	Cheshire
UKH3	Essex
UKJ3	Hampshire and Isle of Wight

4th group:

AT21	Kärnten
AT31	Oberösterreich
AT33	Tirol
CZ01	Praha
CZ02	Střední Čechy
DE13	Freiburg
DE25	Mittelfranken
DE50	Bremen
DE71	Darmstadt
DE92	Hannover
DEB3	Rheinhessen-Pfalz
FR71	Rhone-Alpes
FR72	Auvergne
NL41	Noord-Brabant
SE33	Övre Norrland
UKD4	Lancashire
UKF1	Derbyshire and Nottinghamshire
UKH2	Bedfordshire and Hertfordshire
UKJ4	Kent

UKK1	Gloucestershire, Wiltshire and Bristol
UKM5	North Eastern Scotland
DE26	Unterfranken
DE72	Gießen
DEA1	Düsseldorf
DEG0	Thüringen
ES22	Comunidad Foral de Navarra
FR43	Franche-Comté
FR52	Bretagne
FR61	Aquitaine
FR81	Languedoc-Roussillon
FR82	Provence-Alpes-Cote d'Azur
UKD5	Merseyside
UKG1	Herefordshire, Worcestershire and Warwickshire
UKL2	East Wales
UKM3	South Western Scotland

5th group

FR42	Alsace
ITC2	Valle d'Aosta
ITC3	Liguria
ITD2	Provincia Autonoma Trento
ITD4	Friuli-Venezia Giulia
ITE1	Toscana
NL11	Groningen
NL13	Drenthe
NL21	Overijssel
NL22	Gelderland
NL23	Flevoland
NL31	Utrecht
NL32	Noord-Holland
NL33	Zuid-Holland
UKM2	Eastern Scotland
UKM6	Highlands and Islands

6th group

BG32	Severen tsentralen
BG33	Severoiztochen
BG34	Yugoiztochen
BG41	Yugozapaden
BG42	Yuzhen tsentralen
EE00	Eesti
GR21	Ipeiros
HU10	Közép-Magyarország
HU23	Dél-Dunántúl
HU33	Dél-Alföld
LT00	Lietuva

PL11 Lodzkie - FP5
PL12 Mazowieckie - FP5
PL21 Malopolskie - FP5
PL34 Podlaskie - FP5
PL41 Wilkopolskie
PL42 Zachodnopomorskie
PL43 Lubuskie - FP5
PL51 Dolnoslaskie - FP5
PL63 Pomorskie - FP5
PT15 Algarve
RO12 Centru
RO21 Nord-Est
RO22 Sud-Est
SK01 Bratislavsky krai
SK04 Východné Slovensko

7th group

CY00 Kypros
GR12 Kentriki Makedonia
GR23 Dytiki Ellada
GR30 Attiki
GR41 Voreio Aigaio
MT00 Malta

Table 5: Comparative table of the regional cluster groups I. Source: Prepared by the author based on Eurostat and CORDA data.

	GERD	Researchers	Population	GDP	FP6 Funding
	2003-2007	2003-2007	2002-2006	2002-2006	2002-2008
	millions of euro	FTE	headcount	millions of euro	millions of euro
Group 1	18 061	174 325	137 838 564	2 065 756	671
Group 2	25 036	187 755	87 812 888	2 120 239	2 104
Group 3	28 858	128 570	22 068 056	611 809	1 018
Group 4	42 021	224 132	67 871 064	1 808 318	1 626
Group 5	9 029	45 460	22 775 151	658 628	1 543
Group 6	2 355	92 377	52 179 024	296 558	472
Group 7	936	15 387	7 919 628	142 651	374
The “supergroup”	69 741	391 499	74 155 653	2 557 395	6 415
Total	196 037	1 259 506	472 620 028	10 261 354	14 223

Table 6: Comparative table of the regional cluster groups II. Source: Prepared by the author based on Eurostat and CORDA data.

	GERD	Researchers	Population	GDP	FP6 Funding
	2003-2007	2003-2007	2002-2006	2002-2006	2002-2008
	%	%	%	%	%
Group 1	9,2	13,8	29,2	20,1	4,7
Group 2	12,8	14,9	18,6	20,7	14,8
Group 3	14,7	10,2	4,7	6,0	7,2
Group 4	21,4	17,8	14,4	17,6	11,4
Group 5	4,6	3,6	4,8	6,4	10,8
Group 6	1,2	7,3	11,0	2,9	3,3
Group 7	0,5	1,2	1,7	1,4	2,6
The “supergroup”	35,6	31,1	15,7	24,9	45,1
Total	100	100	100	100	100

Looking at the results of our calculations the following conclusions can be made. In terms of FP funding, aside from the “supergroup” which took 45,1% of all funds there are three other groups of regions with relatively strong absorption capacity of EU R&D funds. Group 2 is dominated by regions from the UK (10), from Germany (9) and from Italy (7). These regions accounted for 14,8 % of the FP budget allocated between 2002 and 2008.

Equally, Group 4 and Group 5 have attracted considerable amount of funds from the FP, accounting for 11,4% and 10,8% respectively of all committed and executed research budget for the studied period. Group 4 is led by German (10) and UK (10) regions. Group 5 is a relatively smaller group in number, with 8 regions from the Netherlands and 5 regions from Italy leading the way.

As for the least productive European regions regarding the absorption capacity of FP funds there are three groups that stand out. Group 1, 6 and 7 have all received under 5% of available funding. Group 7 has the lowest proportion of success with only 2,6% of the resources. Group 1, with 4,7% of received funding, is mainly constituted of regions from less developed parts of the EU 15 (Greece, Spain, Italy), as well as by numerous regions coming from the EU 12 member states (Poland, Hungary, Romania). The predominance of regions from member states having acceded the EU after 2004 is even more obvious in the composition of Groups 6 and 7, where the EU financing amounts to 3,3% and 2,6% respectively. Out of the 26 regions in Group 6 24 are from the new EU member states, Poland being the most representative with

9 regions. Finally Group 7 is composed of two new member states (Malta and Cyprus) and several regions from Greece (H3).

Summing up the previous observations, one can see a clear indication about where European level framework programme RTD resources have been heading over the past few years. These not so surprising results obviously table some important questions about the rationale and whereabouts of EU RTDI policy and whether this tendency in the allocation of funds really corresponds to the policy objectives and rhetoric of the European Union (H3).

There has been an ongoing discussion about the main purpose and rationale of European level funding on research and innovation since 1994, and especially since the latest wave of enlargement in 2004 and 2007. As we have seen in the historical chapter (page 32), with the provisions of the Single European Act (1987), and the consequent implementation of the Maastricht treaty in 1994 bringing about the strengthening in general of European regional development policy, “cohesion” was added as a justification for European level research policy-making. This provision culminated in the massive enlargement of 10(12) countries in 2004(07) from Eastern and Central Europe, representing mainly economically less-developed territories. In the Commission’s regional policy the majority of the new member countries’ regions qualify for the so-called “convergence regions”, that is to areas that lag behind in terms of economic development compared to the average figures in the EU, and especially compared to most Western European member states. Hence, the question of assisting less developed areas of the EU 27 catch-up to the scientific elite of Europe was more and more tabled during the policy discussions. There have been two main groups leading divergent arguments in this issue.

Most “old” member states are of the opinion that European level science and innovation policy should be exclusively about excellence, and transnational research should be financed for a certain critical mass, with partners of very high scientific quality, and money should not be fragmented but rather concentrated on certain important domains. For them all instruments that are supposed to raise the RTDI capacity/potential of less developed countries should be dealt with under the realm of regional policy.

On the other hand “new” member states, as well as certain peripheral “old” member countries insist that the framework programme should contain certain targeted sections for providing a springboard for less developed countries in order to create an equal competition for the more established member states. It’s a different approach, and different ideas about a European

Research area, but also a real competition for the allocation of the European level research and innovation funds. These funds, albeit only about 10% of all available European funding for RTDI, constitute nevertheless a very important funding source for science and innovation.

The relationship between the structural characteristics of R&D and the Framework Programmes

Table 7 presents the structural composition of R&D funding (GERD) in the studied groups. BERD represents business R&D, HERD stands for Higher Education R&D and GOVERD for the Government R&D. The figures in the below table are averages.

Table 7: Structural aspects of R&D and the Framework Programme. Source: Prepared by the author based on Eurostat and CORDA data.

	GERD/GDP	BERD/GDP	HERD/GDP	GOVERD/GDP
	2003-2007	2003-2007	2002-2006	2002-2006
	%	%	%	%
Group 1	0,67	0,39	0,21	0,09
Group 2	1,08	0,62	0,33	0,14
Group 3	4,38	3,29	0,61	0,37
Group 4	2,26	1,53	0,47	0,24
Group 5	1,29	0,55	0,52	0,26
Group 6	0,50	0,15	0,19	0,18
Group 7	0,58	0,16	0,33	0,08
The "supergroup"	2,98	1,84	0,63	0,48
Total	1,33	0,82	0,34	0,18

The main concerns of European policy makers has been the lagging behind of EU compared to other global players in terms of science, research and innovation policy. The main indicator for measuring this "R&D gap" has been the relative spending on R&D compared to the GDP, with special attention devoted to R&D spending coming from the private sector (business R&D). When looking at table 7, one can see that the tendency for relative spending on R&D does not correspond to our observations made in our studied groups regarding the FP absorption. For example, the "supergroup", which takes 45,1% of all available funding, has lower averages in terms of GERD/GDP, as well as in terms of BERD/GDP than Group 3, while the R&D funding from higher education and government sources are approximately the same. This difference can be nevertheless explained by the composition of Group 3, where strong industrial centres contribute substantially to the business side R&D (Baden-Württemberg – Germany, Steiermark – Austria, Sweden and the UK).

Figure 4: Business funded R&D in the computed clusters. Source: Prepared by the author based on Eurostat and CORDA data.

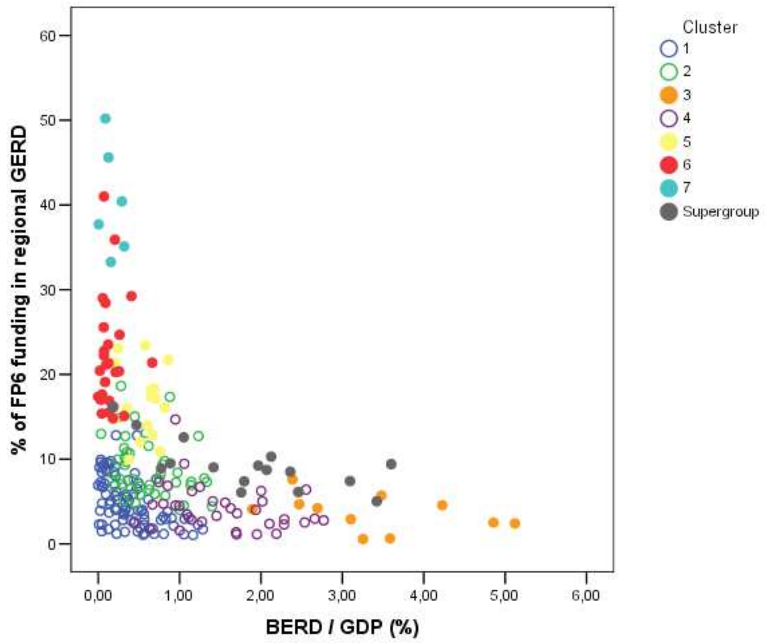


Figure 4 depicts how the computed clusters of the European regions differ in terms of business funded R&D and FP funding. It is worth noting again that in relative terms, both the Supergroup and the highly industrialised regions (Group 3) exhibit low share of the FP funding in their research spending structure, which is dominated by business research spending, whereas the FP funds seem to be the major source for R&D in Groups 5, 6 and 7, where business expenditures on research are not so strong (H3).

5.2. Growth and jobs in the regions: GDP, employment and the Framework Programmes

<u>The relationship between the per capita FP data and the following equation</u>

Per capita GDP is a commonly criticized yet widely used indicator of economic wellbeing. It can be expressed as a product of two indicators: productivity (calculated as value added per employment) and the activity rate:

GDP per capita = GDP per employment (productivity) * Employment / Population

The regional FP6 spending are correlated both with the regional GDP per capita and the regional productivity indicators, showing – again – that FP spending tends to favor better off regions (H3).

Table 8: Linear correlations among regional parameters I. Source: Prepared by the author based on Eurostat and CORDA data.

	GDP per capita (2006)	GDP per employment (2006)	Employment per population (2006)	FP6 funding per population	FP6 funding per employment
GDP per capita (2006)	1	0,96	0,44	0,65	0,62
GDP per employment (2006)		1,00	0,20	0,61	0,61
Employment per population (2006)			1,00	0,32	0,24
FP6 funding per population				1,00	0,99
FP6 funding per employment					1,00

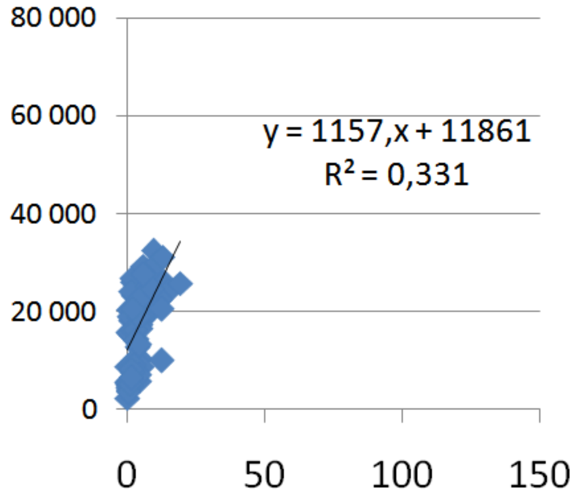
FP6 funding per capita and 2006 GDP per capita (euros)

In the below tables one can see the presentation of the tendency between the FP6 funding per capita and the GDP per capita in 2006 for the different groups. It is interesting to compare the slopes of the different groups' curves. For group 1 the slope is rather steep, whereas for groups 2, 4 and 6 the curves are moderate. This means that higher per capita FP funding in Group 1 implies that the per capita GDP will grow at a higher pace than in the case of other regional groups. This might be attributable to the very heterogeneous composition of Group 1 in terms of per capita GDP, where the dispersion of per capita GDP as well as the standard deviation is higher than in other groups.

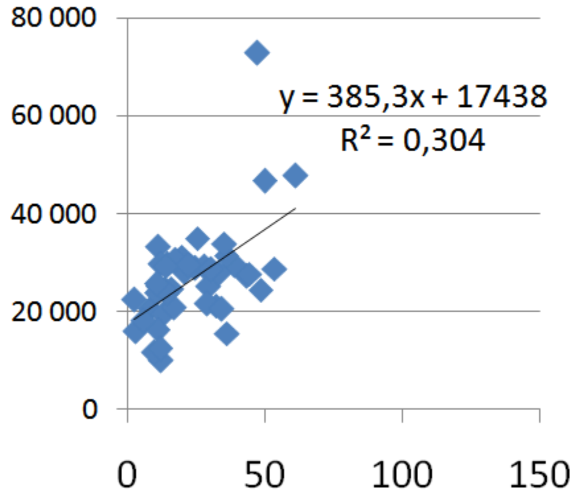
Figures 5-8: Correlation between the FP6 funding per capita and the GDP per capita for different groups. Source: Prepared by the author based on Eurostat and CORDA data.

The vertical axis represent the GDP per capita, the horizontal axis describe the FP6 funding per capita.

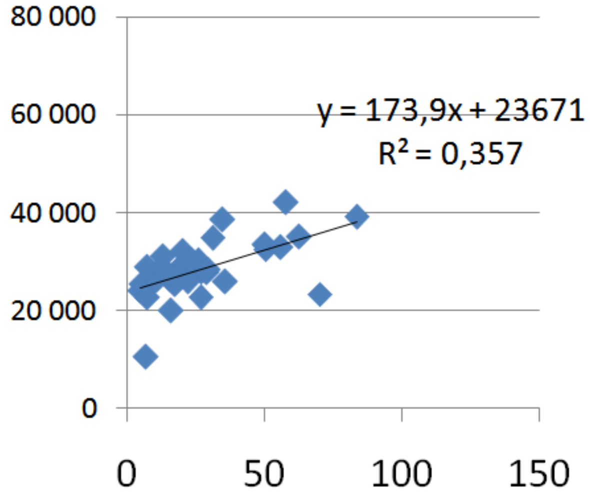
Group 1



Group 2



Group 4



Group 6

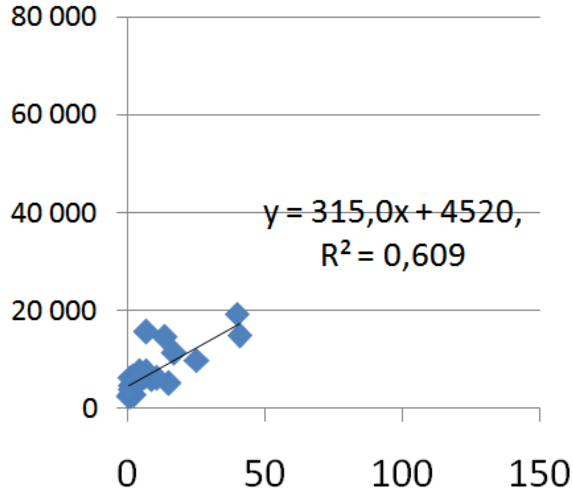
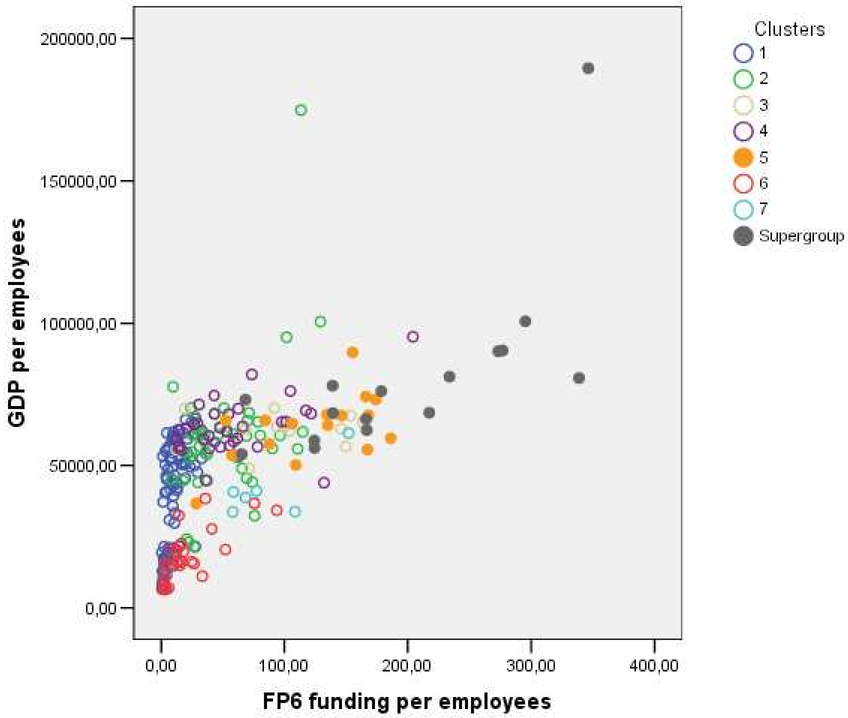


Figure 9: Relationship between the growth of GDP, employment and the FP data. Source: Prepared by the author based on Eurostat and CORDA data.



<u>The relationship between the growth of GDP, employment and the FP data</u>

Although the computation is not an econometric analysis of R&D spillover impacts at all (not talking about regional agglomeration effects of R&D, which are probably very different from the regional borders within Europe), it is interesting to note that the FP funding data (as well as the growth of FP funding over FP5 to FP6) has correlation neither with the growth of GDP, nor with the growth of employment. Thus we cannot say that higher FP funding implies higher growth. Taking into account the fact that FP funding is concentrated in richer regions, this is no surprise: in general, well-off regions tend to have lower rates of growth than catching up regions (H3).

Table 9: Linear correlations among regional parameters II. Source: Prepared by the author based on Eurostat and CORDA data.

	FP5_funding	FP6_funding	FP7_funding	FP6perFP5	GDP 2007/2003	Employment 2007/2003
FP5_funding	1	0,98	0,98	-0,09	-0,05	0,01
FP6_funding		1,00	0,99	-0,03	-0,05	0,00
FP7_funding			1,00	-0,03	-0,04	0,01
FP6 per FP5 funding				1,00	-0,01	-0,03
GDP 2007/2003					1,00	0,43
Employment 2007/2003						1,00

Note: only those regions are included, where the FP6/FP5 growth of funding was below tenfold growth

5.3. The "Supergroup": regional characteristics of research and innovation capacities

As we have seen in our calculations in the previous section, there are 20 regions using 50% of FP6 funding, 24 regions spending 50% of Europe's R&D, and 34 regions accounting for half of Europe's researchers.

From these three different groups of European regions, 16 are present in each of these groups. This „supergroup" is composed of: Wien, Karlsruhe, Oberbayern, Berlin, Köln, Denmark (as a whole country), Comunidad de Madrid, Cataluna, Finland (as a whole country), Ile de France, Lombardia, Lazio, Stockholm, East Anglia, Inner London, Berkshire Buckhinghamshire and Oxfordshire).

This „supergroup" constitutes:

- 15% of Europe's population
- 24% of Europe's GDP
- 30% of Europe's researchers
- 35% of Europe's GERD, and
- 43% of FP6 funding.

In the following section, a short review will be given on these 16 regions, which represent the main regional actors in terms of European science, technology and innovation. The main features of their research and innovation policies will be presented, as well as the main strengths and innovative capacities.

Vienna (Wien) – Eligible area under the Regional Competitiveness and Employment Objective

Research funding and subsidies are important generators for economic growth. The region of Vienna has defined knowledge as a crucial resource for economic development and funding is available through a wide range of programmes to promote innovation and to create complementarities between existing national activities. Effective measures include the active encouragement of cutting edge research and intensifying knowledge dissemination between institutions and businesses, thus improving links between theoretical research and practical applications (http://www.eu.wien.at/).

The House of Research (Haus der Forschung) in Vienna's 9th district is the centre for all major organisations that provide research and innovation support and services. Organisations such as the Austrian Research Promotion Agency (FFG) and the Austrian Science Fund (FWF) are also integrated in the same premises, in order to make greatest use of synergies (http://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-09.pdf).

The research and innovation sector in the Vienna region is driven by both business and public measures. The overall expenditure on R&D per GDP (2.0%) remains above the average of Austria as a country (1.7%). The region's overall expenditure on R&D contributes 40.9% to the Austrian total; therefore, the Vienna region plays a very important role in the innovation system of Austria. One third of all Austrian research institutions are located in Vienna. Research activity is not reserved to universities and large research institutes. Over recent years, the number of businesses conducting research has risen by over 50%. Additionally, Vienna is Austria's main centre of education, home to many universities, professional colleges, art schools and research institutions. Historically, Vienna has always been a city of science and research and is one of the oldest university cities in Europe. The research landscape is shaped by nine universities, five technical colleges, as well as about 1,000 research institutions (http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=AT13#rnd-innovation).

Whilst R&D policy is originally under the responsibility of the central government and has been almost an exclusive right of federal policy making, beginning in the mid 90s the States started to implement their own research and science policies with a strong focus on innovation. This process was motivated very importantly by Austria’s EU membership and the subsequent availability of Structural Funds. This triggered a more regional focus originating from central government initiatives (e.g. competence centres) and by the availability of additional funds mainly from privatisation of energy utilities and banks. At this moment, 7 out of the 9 existing federal states show an explicit and autonomous research policy. Each federal state has either a science-, research- or innovation-concept or at least a strategic RTDI orientation embedded in other strategy documents at federal level. In most cases, regional R&D policy is innovation oriented, whereas in the Vienna region, a strong research policy focus is also available. Since the late nineties, federal policy making has gradually adopted a policy regime, which involved the Federal States through co-funding of specific programmes. Presently, a new way of coordination is to be elaborated, as the number of provinces strongly involved in R&D increased on the one hand, and the federal level of research funding has been reorganized.
(http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=613&parentID=27&countryCode=AT).

<u>Karlsruhe (Karlsruhe, Baden Württemberg) - Eligible area under the Regional Competitiveness and Employment Objective</u>

Baden Württemberg is one of Germany’s leading regions for scientific research and innovation. 12 of all the 80 Max-Planck-Institutes and 14 of all the 57 Fraunhofer-Institutes, as well as 25 % of the research capacity of establishments run by Helmholtz, including the German Cancer Research Centre in Heidelberg, are located in this region. Approximately 100 non-university research entities in Baden Württemberg are closely connected to its universities (www.625.uni-heidelberg.de).

Baden Württemberg is also one of the leading research regions in the entire European Union. Expenditure and gross domestic product in Baden Württemberg are 4.4%. This is the highest figure in the European Union (for a federal state), even ahead of Sweden with 3.6% and Finland with 3,5%. The average research intensity rate in recent years of the 27 EU countries has been around 1.9% - whereas the average figure for the German federal states accounted for about 2.5%.

The research, development and innovation profile of Baden Württemberg is considerably influenced by enterprises in the vehicle and mechanical engineering and electrical engineering sectors. Over four fifth of the R&D capacity in the Baden Württemberg enterprises is devoted on these three branches of industry. A little less than half of all people employed in R&D activities work in research entities specialized in vehicle engineering.

Thanks to the high level of research and development activities, a vast number of patentable inventions have been recorded. In 2008, 30,6 percent of all patents submitted to the German Patent and Trademark Office came from Baden Württemberg (http://cordis.europa.eu/baden-wuerttemberg/rd_en.html).

The globalisation of the markets and the shortening of product cycles have made businesses secure themselves an edge over their competitors primarily with innovative products. This always happens more frequently in co-operation with other stakeholders and networks. The innovation policy, therefore, pays considerable importance to the development and furthers strengthening as well as the funding of cluster initiatives – particularly in line with the European Commission support for cluster policy approaches within the context of the EU2020 strategy, and its innovation flagship initiative (European Commission, 2010a).

Clusters, as adopted and understood by the European Commission, are established in a geographically defined area among co-operating businesses, suppliers, service providers, education, research and development organizations, as well as further supporting organisations such as business development facilities, associations and chambers which contribute to achieving common goals (Sölvell et al., 2003). The conditions for enabling innovations in intensive co-operations between universities, research facilities and industry – along the logic of “triple-helix” configurations are, in Baden Württemberg very supportive.

Baden Württemberg supports active networks and innovation platforms throughout the state as well as through regional cluster initiatives. These measures include:

- Publication of regional cluster data.
- Organisation of an ideas contest to strengthen regional clusters. The winners, chosen by an independent jury, can apply for funding for their project idea from the European

structural funds for the strengthening of “regional competitiveness 2007 to 2013”. With the funding of professional cluster management, regional cluster development should be pushed forward on this basis.

- Support of the Clusters of Excellence in Baden-Württemberg which have been boosted by the Federal Ministry of Education and Research within the cluster competition, part of the German high-tech strategy.

In recent years numerous organisations have developed in Baden Württemberg to support the co-operation between industry, universities, research facilities and further supporting organisations.

A Cluster dialogue with representatives from Lombardy, the Rhône-Alpes and Catalonia, as well as from Wales, Flanders and the Greater Zurich area, takes place within the “Four Motors for Europe” (http://www.4motors.eu/?lang=en). These areas want to learn from each other in cluster politics and also initiate joint projects and assume an innovator role for Europe (http://cordis.europa.eu/baden-wuerttemberg/rd_en.html); (http://www.ksri.kit.edu/Upload/Modules/634/Jahresbericht_2008_2009_web.pdf).

Bavaria (Oberbayern, Bayern) - Eligible area under the Regional Competitiveness and Employment Objective

Bavaria is the recognized as the first high-tech region in Europe. More than 12 per cent of all the people working in Bavaria are involved in the high technology sector, more than anywhere in Europe. International companies, for example from the electronics or the pharmaceutical sectors, are moving to Bavaria and setting up production facilities there. In addition a large number of new high technology and state-of-the-art technology firms are being set up as well. These measures all contribute to Bavaria being at a leading position of innovation and technology. These high-tech companies are offered the most adequate conditions: highly qualified staff, technology-friendly basic conditions, an extremely well-equipped infrastructure, modern research facilities as well as universities and other research organisations. Research and technology policies in Bavaria have long concentrated on so-called key technologies, which are particularly innovative and possess great growth potential: aerospace technology, information and communications technology, life science, medical technology, material research, environmental technology, mechatronics, and nano-technology.

Such technologies will become even more important in the future, because other economic sectors also profit from the growth dynamics in the high-tech sector and its innovations (http://www.bayern.de/A-State-of-Innovation-.617/index.htm).

In the early 1980s, the Bavarian Government began to pursue a specific research and innovation policy which has been implemented on the basis of an own budget. While some regional RTDI policy objectives are fairly generic in nature, many of them focus on specific technology fields and aim to further exploit the existing strengths.

The major objectives of current regional research and innovation policy are:

- to assure and extend Bavaria's leading position in well-established industries;
- to develop and support basic and cross-section technologies;
- to promote innovative future technologies in the region.

The main measures for the implementation of these objectives are: the identification of technology trends; the provision of an effective research infrastructure; the improvement of framework conditions for industrial R&D; the improvement of the commercial usability of (public) research activities; support for concrete R&D projects. In higher education, Bavaria is the only German state with a regional strategic concept (Elite Network of Bavaria) including elite graduate and postgraduate programmes, international doctorate programmes and a support programmes (https://www.elitenetzwerk.bayern.de/).

Moreover, in the late 1990s (supported by a federal programme) clustering activities have become a very popular instrument. Nowadays, the Bavarian "Cluster Campaign" is designed to enhance Bavaria's role as a top location for business and science. The campaign is defined by a second pillar in the form of the "Allianz Bayern Innovativ" aimed at boosting cross-sectoral regional networks. The Bavarian Government's allocation for the cluster campaign is around €50m

(http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=618&parentID=27&countryCode=DE).

Berlin (Berlin) - Eligible area under the Regional Competitiveness and Employment Objective

Berlin has four universities, 17 colleges and universities of applied sciences, more than 70 public and private research organisations as well as more than 20 technology centers, which forms one of the most concentrated research and higher education networks in Europe. A total of 29 Nobel Prize winners carried out research at the Humboldt University.

University graduates are offered favorable opportunities of finding a job in the region. Outside colleges and universities, more than 50,000 researchers work in private and public research institutions – this figure represents roughly 15% of all the people in Germany who work in the research sector. In Berlin one can find research institutes of the Fraunhofer Society, the Max Planck Society, the Gottfried Wilhelm Leibniz Scientific Community and the Helmholtz Association of National Research Centers. A total of 1.8 billion euros a year of public investment flow into Berlin's science and research sector. This investment can also be expressed in patent registration, as 13% of all scientific patent registrations in Germany come from Berlin.

One of the most significant sectors in the region is the solar industry. A cluster of producers, suppliers and service providers with the strongest growth in Europe has developed in and around the German capital. Some 4,000 people conduct research in this field and produce this clean form of energy. The German Conergy company has invested 250 million euros in the world's most modern fully integrated solar wafer production plant. First Solar Manufacturing is building the world's largest thin-film solar module factory. What solar technology from Berlin can achieve is demonstrated by the façade of the Ferdinand Braun Institute for High Frequency Technology in Adlershof: a solar wall covering an area of eight by eighty meters collects solar energy to generate electricity (http://www.young-germany.de/life-in-germany/life-in-germany/article/berlin-the-research-and-innovation-capital.html) (Forschung und Entwicklung in Berlin Motor für Innovation und technologische Leistungsfähigkeit, www.tsb-berlin.de)

Cologne (Köln, Nordrhein-Westfalen) - Eligible area under the Regional Competitiveness and Employment Objective

Biotechnology is a rapidly growing industry in the region of North Rhine-Westphalia. Its products and processes in the health care, chemistry, food and environment sectors are of great importance. About 280 life sciences companies including 70 or so biotechnology firms are currently operating in this sector, which accounts for 40 per cent of the aggregate turnover achieved in this industry in Germany. Moreover, as a leading centre of chemical and pharmaceutical industry, North Rhine-Westphalia possesses one of Europe‘s most diversified research system. Around 40 universities and research facilities are operating in the red, green and white biotechnology sectors, while, at the same time, some 60 technology centres aim at strengthening links between science and industry.

With over 1 million employees, the medical and health care industry is another powerful engine of growth and innovation in North Rhine-Westphalia. Due to over 20 R&D facilities including seven faculties of medicine and six university clinics plus the Bochum-based network of clinics, North Rhine-Westphalia has a massive concentration of competence in this field. In addition to providing in-patient treatment to some 270.000 people annually, the region’s medical faculties/university clinics focus on research on ageing, inflammation, cardio-vascular diseases and cancer as well as on molecular biology, neurosciences and transplants.

In North Rhine-Westphalia, several hundred scientists at 24 universities and top-class research institutions are performing research on a range of subjects that extends from nanoanalytics to microfluidics, and from optoelectronics to systems engineering. The rapid rate of innovation and the increasing interconnection between science and industry are one of the main reasons for North Rhine-Westphalia’s leading role globally in nano-, micro- and materials engineering.

North Rhine-Westphalia is equally Europe’s leading energy region. The energy sector employs about 250.000 people and accounts for approximately one-third of the electrical power generated in Germany. A secure, efficient and climate-sensitive supply of energy necessitates cutting-edge energy research of the highest international standard. More than 20 universities and research institutions are covering the complete range of energy issues of both the present and the future. Research priorities include power station technology, energy grids, storage of energy, solar-thermal energy, fuel cells and hydrogen as well as knowledge based bio-economics (http://cordis.europa.eu/north-rhine-westphalia/rd_en.html).

Denmark (Danmark)- as a country eligible area under the Regional Competitiveness and Employment Objective

Denmark is one of the most advanced European countries on a number of science and innovation indicators. It includes a high technology agricultural sector and a well-developed manufacturing industry, with world leaders in pharmaceuticals, maritime shipping and renewable energy. Denmark has a considerable government R&D budget and high expenditure on biotechnology and pharmaceutical R&D. In 2008, Denmark's gross domestic expenditure on R&D (GERD) was 2.7% of GDP, considerably above the OECD average of 2.3%. Industry-financed GERD increased to 61%, while government-funded GERD declined to 25%. Business expenditure on R&D (BERD) was a comparatively high 1.9% of GDP in 2008; as a percentage of industry value added, this was almost double the OECD average. In the same year, Denmark also had a high venture capital intensity of 0.16%, well above the European average. Denmark's R&D inputs can be transposed into solid outcomes. During 2004-06 an above-average 16% of firms introduced new-to-market product innovations, while a close-to-average 47% of firms undertook non-technological innovation. Innovation linkages are strong: in 2005-07, a relatively high 16% of firms collaborated on innovation activities, and a noteworthy 19% of patents were developed with foreign co-inventors (http://www.oecd.org/dataoecd/42/13/46664002.pdf).

Denmark gives great importance to provide favorable conditions for collaboration between the research and business sectors and to improve the commercial exploitation of the research and development activities. Denmark sustains a high level of public and private investments in an effective public research and innovation system as well as an improved governance of research institutions and institutions for technological development.

According to estimations R&D-active enterprises, which cooperate with universities and other research institutions reach on average 15 per cent higher productivity per employee compared to R&D-active enterprises with no cooperation with research institutions. An additional analysis shows that 400.000 EUR invested by a company in public-private research partnerships bring 2-3 millions EUR in gross profits. An analyses of the return from private R&D investments in Denmark show that R&D-active enterprises have a 15 per cent higher average productivity per employee compared to non R&D-active enterprises. The return of increasing private investments in innovation and R&D is in average between 30 per cent and 66 per cent for Danish companies. OECD analyses show that an effective diffusion of knowledge doubles the economic impact of private investments in research, development and innovation. In consequence, it is beneficial to invest in R&D and innovation and in collaboration between research and business. R&D leads to the creation of new products, processes and services in businesses, increasing earnings and at the same raising their level of knowledge (http://www.icdmuenchen.um.dk/en/servicemenu/News/RDAndInnovationInDenmark.htm).

Community of Madrid (Communidad de Madrid) - eligible area under the Regional Competitiveness and Employment Objective

In recent years, the Communidad de Madrid region accounted for the highest regional expenditure on R&D as part of the GDP among Spanish regions: 1,98%. In 2005, 30.5% of all Spanish company expenditure on research, development and innovation originated from the Madrid Region. The three main research sectors, in which 100 consortia and 4000 researchers are working with companies in Madrid are experimental and technological sciences, biology, biomedicine, and social sciences. Research papers from the Madrid Region published in international journals make up 28.38% of all Spanish papers, making the Madrid Region as the national leader. In 2005, 18.4% of all Spanish patent awards were registered in the region (http://www.madrimasd.org/mapa-conocimiento).

2.30% of all Spanish professionals dedicated to research and innovation activities are located in Madrid. 60% of all Spanish professionals committed to new technologies are also based in Madrid. The innovation activity in the firms of the region is more active than the Spanish average, paying special attention in that sense to the construction and service sectors. The expenditure of the innovation activities implemented in the Madrid region by industry was about 17% of the total national, while its contribution of the Gross Domestic Product (GDP) has been 13%. Community of Madrid ranked number 91 in the 2006 Regional Innovation Scoreboard (RIS), with a score of 0.61 in Regional Innovation Performance (RRSII) (http://cordis.europa.eu/madrid/rd_en.html).

Catalonia (Cataluna) - eligible area under the Regional Competitiveness and Employment Objective

Catalonia with its capital, Barcelona has traditionally been one of the most industrial, research intensive and innovative areas in Spain. It has a large metropolitan concentration and a network of medium-sized cities and smaller towns, linked together by an effective transport network. There is a dense and innovative industrial community of small and medium-sized companies and an active presence of large multinationals, particularly in the biomedical, agrofood, automobile and telecommunication sectors. The Catalan science and technology system is essentially made up of universities, public research centres, a network of centres linked to the Health Service, and Spanish state public research bodies and private sector R&D&I departments. The university network has eleven universities: 7 public universities, 4 private universities and one semi-distance learning university (Open University of Catalonia). As for the public bodies of the Catalan government, one should underline the network of centres of the Institute for Food and Agricultural Research and Technology (IRTA), which is attached to the Ministry of Agriculture, Food and Rural Action, and the activities to enhance research and industrial development managed by the Centre for Business Innovation and Development (CIDEM), which is attached to the Ministry of Innovation, Universities and Enterprise. The network of centres linked to the Catalan Health Service comprises public and private hospitals, research foundations linked to health centres and other organisations.

As regards private and public research institutions, Catalonia has a long tradition in several fields of scientific knowledge and research - especially biomedical and electronics. In addition, the region also controls 9 large infrastructures of research, constructed to improve the scientific and technological capacity of Catalonia, to increase competitiveness and to provide the scientific community with access to facilities to perform top-level research projects. There are two large infrastructures which are of particular importance: Marenostrum is one of the most powerful supercomputers in Europe and the number 40 in the world, according to the last Top500 list. Built in 2004, it has 10.240 processors with a final calculation capacity of 94.21 Teraflops. The other facility is the Synchrotron light facility ALBA, currently under construction (http://cordis.europa.eu/catalonia/intro_en.html).

In the public and private sectors there is a whole list of entities and interface organisations that work in a variety of fields (science, technology, manufacturing and finance). Their objective is to enhance the transfer of research results and facilitate the implementation of technological innovations in the manufacturing sector

(http://www.gencat.cat/diue/ambits/ur/recerca/sistema_cat/index_en.html).

Finland (Suomi) – eligible area under the Regional Competitiveness and Employment Objective

Finland's innovation performance is one of the strongest at the international level. Collaboration with other countries is well advanced, and a large part of the labour force has a tertiary qualification. Venture capital intensity is above average and the government's R&D budget is large. Since 2000, gross expenditure on R&D (GERD) has continuously increased to 3.7% of GDP in 2008. In 2008, industry financed 70.3% of GERD, while government's contribution fell to 21.8%. Business expenditure on R&D (BERD) has remained above average over the last ten years and reached its highest point at 2.8% of GDP in 2008. Also in 2008, its venture capital intensity of 0.24% of GDP was the highest in the OECD area. Finland's strong R&D investment can be demonstrated by solid innovation-related outcomes. It had 64 triadic patents per million population in 2008, almost double of the OECD average. With 1 573 scientific articles per million population in 2008, Finland is third among OECD countries and contributed 0.5% of the world share of scientific literature. Nearly 25% of companies introduced new-to-market product innovations during 2004-06. Given the economy's focus on manufacturing, business R&D in the services sector was comparatively low. A below-average 42% of firms undertook non-technological innovation during 2004-06. In 2004-06, Finland led the OECD with almost 30% of all firms collaborating on innovation activities.

The Finnish government's Innovation Strategy, launched in 2008, constitutes the basic document for innovation policy in Finland. It comprises measures to promote innovation in non-technological business areas, especially in the services sector, and measures to increase demand and user orientation of R&D and innovation activities. The most recent significant reform was the Universities Act in 2009, which modified the legal status of universities and renewed structures through mergers (http://www.oecd.org/dataoecd/42/11/46664029.pdf).

Technology and innovation policy measures aim to enhance the competitiveness of Finnish industry and the well-being of society, with the aim of making Finland capable of providing companies with a top-flight innovation environment internationally, which also attracts foreign R&D investments. In addition to technology, emphasis is given to contributing to stronger business management skills, the development of service innovations and growth entrepreneurship. It is of great importance that innovations based on customer and consumer needs are particularly promoted.

In terms of the competitiveness of companies and the entire innovation system, networking with leading countries and regions in technology can play a very important role. Consequently, the network of international innovation centres shall be more expanded. In addition, standardisation activities at European and international level are forming a part of the development of the innovation environment (http://www.research.fi/en/technologypolicy).

Paris region (Ile de France) – Eligible area under the Regional Competetiveness and Employment Objective

The Paris region (Ile de France) is the leading region in Europe and the second in the world in terms of hosting Fortune 500 companies (ahead of London and New York, and just behind Tokyo). In the region one can find basically all the major French industrial partners, all international market leaders in their respective sectors. Moreover Paris is also the world's second city for international organizations. The region is one of the top three destinations in the world for industrial and service sector locations. Cutting-edge sectors such as biotechnology, nanotechnology, wireless services and 3D graphic animations are present alongside more traditional sectors like the aerospace and automotive industries. Paris region's multi-specialist economy is unique in Europe, with several world class high-tech clusters. In addition the government has enhanced its support for the sectors of excellence, with increased research funding, greater international visibility and a global-reaching partnership between all the research players in the region (http://www.paris-region.com/ard/paris-region-economic-developpement-agency/paris-region-s-economy/sectors-of-excellence/). Furthermore, the region is notable for its strong links between public laboratories, public authorities and private enterprises, leading to the structuring of the research domain around industries of excellence. The most important industrial sectors of the region: eco-industries; ICT; Photonics; Biotechnology; Imaging; Space; aviation; defense; automotive (http://cordis.europa.eu/ile-de-france/regional4.htm).

Lombardy (Lombardia) - Eligible area under the Regional Competitiveness and Employment Objective

The regional innovation system of Lombardy is a great example of excellence in Italy. Compared to other Italian regions, Lombardy's position is more in line with the trends and objectives defined at European level and, in particular, with the directions of the Lisbon European Council on the composition of industrial expenditure.

Around 30% of all Italian expenditure on R&D originates from companies in Lombardy, and private expenditure accounts for approximately 85% of the total regional expenditure on R&D. Moreover, with 17.9% of the national position, Lombardy ranks second behind Lazio as regards the number of R&D employees. This figure also means an important number concerning the proportion of the population. Lombardy has 3.2 employees per 1,000 inhabitants and is second only to another Italian region. The large number of employees working in industry, high and medium technology and in services requiring a high degree of knowledge and technology represents 13.92% of the total workforce. In addition, the broad and well-developed university research system is one of the region's main driving forces. It provides training courses and conducts future-oriented research, with special emphasis on life sciences (http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=ITC4#rnd-innovation).

The Regional Innovation System is equally characterised by a widespread network of institutions and connections for technology transfer. Presently, around 500 centres provide a varied range of innovation services for companies, of which approximately 200 are geared towards research and technology transfer. Although the scope and advancement of the centres constitute an enormous wealth, they call for the development of processes aimed at creating higher-quality structures and progressive specialisation.

The information society is very highly introduced, with a system of dorsal and telematic networks as well as relatively easy access to information and communication technology. In this regard, the dissemination of new technology is clearly more widespread at regional level compared with the national average, and is in line with the more developed European regions (http://cordis.europa.eu/lombardy/rd_en.html).

<u>Lazio (Lazio) - Eligible area under the Regional Competitiveness and Employment Objective</u>

Lazio region's main economic strengths are tertiary, value-added services and production sector, which amount to 80% of all economic activity. Traditional manufacturing and agriculture makes up for the remaining 20% of the regional economy. The emerging sectors, which have been substantially growing in recent years, include business services and telecommunications. Companies providing financial, administrative and consultancy services dominate the services sector, while the communications sector includes internet access providers, data processing and IT service providers. The industrial sector, which comprises chemical, pharmaceutical and electronics production, is distributed evenly around the region.

The region's high tech capacities are supported by the presence of some 18,000 ICT companies. Lazio has Italy's highest concentration of public research institutes covering areas such as energy, physics and health issues. There is also a multitude of R&D bodies, institutions of higher education and 11 universities. Additionally, there are government-led initiatives to contribute to the technology sector's growth

(http://locateinitaly.com/regions/articles/0404/lazio_apr04.htm).

In recent years, the Lazio Region has become one of the leading Italian regions for the planning, creation and implementation of innovation activities, as well as the capacity to adapt to changes in the economy. It is also the first region in Italy that has produced a Regional Innovation Evaluation Table (Lazio Region Innovation Scoreboard). It is a tool based on the European Innovation Scoreboard managed by the European Commission which measures the level of innovation of a territorial area through a summary of more than 20 specific indicators covering both economic and industrial aspects and the creation and transfer of knowledge. Its function is to act as a monitoring tool for businesses and for those responsible for innovation policies (http://cordis.europa.eu/lazio/rd_en.html).

Stockholm (Stockholm) – Eligible area under the Regional Competitiveness and Employment Objective

Sweden is in the leading position according to the innovation monitoring system from the EU Commission for 2010, Innovation Union Scoreboard (IUS).The comparison is based on 25 different indicators addressing among other things, the research systems, the R & D investments of enterprises and the economic effects of the innovations. Sweden, Denmark, and Finland are at the top of that list

(http://www.stockholmregion.org/website1/1.0.1.0/75/3/index.php);
(http://www.stockholmsciencecity.com/en/).

The conditions for innovation in Stockholm are very favorable. There are several strong research universities, e.g. the Royal Institute of Technology, Karolinska Institute, Stockholm University, the Södertörn University, Stockholm School of Economics and a number of specialised university colleges. 19 of these are cooperating on student information, marketing, analysis and networking (Stockholm Academic Forum). There is also the internationally awarded university hospital of Karolinska, several research institutes, incubators (STING, KIAB and SUIAB) and science parks (Kista Science City and Karolinska Science Park)

(http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=SE11#rnd-innovation).

The Stockholm region is a diverse, innovative region, with a highly developed international network. It is the largest city of the country, and growth engine of Scandinavia with an open, supportive and stable business environment.

As one of the most innovative and knowledge-intensive regions worldwide, Stockholm has demonstrated to be as a leading supplier of innovative solutions and products in a wide range of global industries. Investment opportunities can be found in key sectors such as Life Science, ICT, Cleantech, Financial Services and Automation.

Stockholm is often quoted as a leader in adopting new technologies and setting new consumer trends. There are many examples of companies using Stockholm as a test market.

Stockholm is an ideal location for business operations in Scandinavia and Northern Europe. Stockholm accounts for a major share of both consumers and economic activities in the region. Almost half of all multinationals with operations in Scandinavia, and a majority of Swedish companies, have their headquarters in Stockholm.

(http://www.investstockholm.com/en/Investment-Opportunities/Why-Stockholm/).

As one of the most knowledge-intensive and innovative regions in the world, Stockholm has an impressive evidence of creating new companies from exciting ideas, cutting-edge technology and modern innovations. The incubators and science parks located in the Stockholm region provide major support for the highly talented entrepreneurs in the region. They create unique meeting places and facilitate opportunities for new companies to start up and develop. They also serve as great links between the Swedish entrepreneur and industrial and financial investors.

Stockholm region is also Scandinavia's economic center with the largest gross regional product and most multinational companies. The region hosts one of the world's largest ICT clusters, one of Europe's largest biotechnology clusters, and northern Europe's financial center is also located here (http://international.stockholm.se/Business-and-statistics/).

East Anglia – Eligible area under the Regional Competitiveness and Employment Objective

East of England hosts more than 30 research institutes with world-class reputation for research and innovation. There are seven universities in the region, including Cambridge University, Cranfield University and the University of East Anglia. The region's long tradition of research excellence is deeply embedded as demonstrated by the fact that the region has produced 40 Nobel Prize winners in medicine and chemistry. East of England is the UK's leading region in terms of research and development, accounting for almost a quarter of the UK's expenditure in this field. It has knowledge capabilities that are vital to the continued success of the UK economy. This includes five of the world's top ranked universities, the third highest level of business expenditure on research and development in Europe, a global financial hub, a vibrant technology sector, creative and cultural centres of excellence. The East of England has access to world-leading environmental expertise through its research institutions, universities and centres of excellence. It has the highest investment in research and development of any region in the UK (http://www.eeda.org.uk/the-region.asp).

The innovation strategy of the East of England region is elaborated to help businesses and institutions that would like to pursuit innovation to build on the region's science and technology strengths and increase the commercial application of ideas. The region aims to encourage open innovation through the development of physical environments that enable small and large businesses to co-locate alongside universities and research centres to encourage a greater exchange of people, knowledge and ideas.

The East of England has clusters of international reputation and importance in ICT and life sciences. The region has significant groups of technology consultancy companies, some major corporate players, a number of research institutes and, of course, leading academic institutions in the digital industries and ICT sector.

Furthermore the region is the UK's leading region for biosciences. With 256 biotech companies, 100 med-tech companies and 370 service companies supporting the life sciences sector, the East of England is home to the most mature and successful cluster of biotechnology and life sciences companies in Europe. As such it is a major player in the global biotech economy (http://www.innovationuk.org/news/innovation-uk-vol6-1/0354-east-of-england---the-ideas-region.html).

Inner London, London – eligible under the Regional Competetiveness and Employment Objective

Innovation is widely acknowledged as a fundamental tool for to economic growth and improvements in welfare. London has been a leading region for innovation for most of its history. The processes by which innovation takes place and shits from an idea to a commercialised product or service are complex and interlinked. Businesses, both large and small play a central role, together with universities, research institutions, governmental organizations. These conditions are very well developed in London, it can profit from a dense cluster of institutions that can innovate together for mutual benefit. As a highly productive world city with a diverse economy and population and range of institutions, London is exceptionally well placed to make the most of agglomeration economies (http://www.lda.gov.uk/Documents/Economic_Development_Strategy_%282010%29_6543.pdf).

London has a world-class science and research base, which collaborates to form globally significant partnerships in fields with economic potential. London is the host for at least 15 universities including the University of London and its 20 constituent's colleges. Many of University of London colleges are essentially universities in their own right and of recognised international reputation. University College and Imperial College are ranked 4 th and 6 th internationally, and 2 nd and 3 rd in the UK in the international university rankings. These universities also have particular strengths in the science, technology, engineering and medical fields. London is also home to a small number of high quality public-sector research establishments such as the National Physical Laboratory, MRC Clinical Sciences Centre, MRC Centre for Outbreak Analysis and Modelling. The latter form part of London's health and bioscience cluster based around the capital's significant conglomeration of healthcare services, the MRC institutes, university life science research and the presence of the Wellcome Trust (the UK's largest charity and world's second largest medical research charity) (http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=UKI#rnd-innovation).

South East of England – Eligible area under the Regional Competitiveness and Employment Objective

The South East region is one of the two regions in the UK with the highest level of investment in R&D, with an average Business Expenditure on Research and Development (BERD) between 2000 and 2008 of 1.9% and a Gross Expenditure on Research and Development (GERD) of 2.5% - both higher than the national average. It is also a very successful region in terms of innovation outputs. In 2008, across all English regions, it had the highest proportion of businesses introducing new products, it was in the top two in terms of proportion of businesses introducing novel processes, and had obtained the highest number of patents.

The region hosts 16 universities, many of which are research intensive with reputations in science, technology and engineering disciplines - such as the world-class University of Oxford and the Universities of Surrey, Reading and Sussex. The University of Oxford was ranked fifth in the world (and fourth in the UK) in the 2009 Times Higher Education/QS University rankings, and the University of Southampton was ranked 95 in the worldwide rankings.

A large number of public-sector research establishments and research facilities are also located in the region such as the Rutherford Appleton Laboratory (including particle, physics, space, and astronomy research), Diamond Light Source, UK Atomic Energy Authority and the ESA Centre at the Harwell campus in Oxfordshire, and the nearby Culham campus which houses the European JET fusion facility. Other public sector research institutes include the Veterinary Laboratories Agency, Centre for Ecology and Hydrology, Environmental Systems Science Centre, Institute for Animal Health, NERC Centre for Population Biology and NERC Centres for Atmospheric Science. There are also significant science parks on the Harwell campus, in Oxford (linked to the university) and in Milton Keynes.

Significant degree of private R&D is performed in the region, by businesses in the pharmaceutical, agribusiness, consumer products, space technologies, ICT. Furthermore, employment in R&D carried out by businesses in the South East accounts for more than 23% of all UK employment in R&D and it is the highest in the country (http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=UKJ#rnd-innovation).

Local transport infrastructure includes: Heathrow and Gatwick Airports, major ports include Dover, Southampton and Portsmouth and access to the Channel Tunnel.

The South East region is firmly embedded in the global economy and compares favourably to other countries economic capacity. In generic terms the South East economy can be considered as advanced, high-income, highly skilled, broadly-based and service-oriented. Strong financial sectors exist in Surrey, Berkshire and Kent. Further centres of expertise exist in Brighton – with a digital industries cluster and around Oxford with a hi-tech manufacturing cluster.

The South East economy brings more than 4 million jobs and the labour market is relatively stable well during the recession. The employment rate of the South East has remained the highest, and the employment rate the highest, of any region throughout the recession so far.. Counties in the South East report some of the highest percentages of 25-64 year olds with tertiary education. Parts of the south East have some of the highest proportions of working age people educated to degree level in the UK (http://www.seeda.co.uk/about-the-south-east).

The proportion of micro and small employee businesses in the South East is higher than the UK average, while the proportion of medium and large businesses in the South East is smaller than the UK average. In 2007, total R&D expenditure as a percentage of GVA in the South East was 2.9%, the second highest in the country after the East of England. There were a total of 40,745 business start-ups in the South East in 2008, the second highest number after London. The number of start-ups within the South East was highest in the county of Surrey at 6,770; the lowest was in the county of East Sussex at 2,080 (http://www.seeda.co.uk/_publications/PSE_February_2011.pdf).

As we have seen from the research and innovation profiles of the “supergroup”, these regions constitute highly developed territories with great innovation and research potential.

- The „supergroup” regions are notable for their strong links between public laboratories and private enterprise, leading to the structuring of the research domain around industries of excellence. Leading edge industries form an important strand of regional economic development in many of these regions, with several hundred specialised companies operational in the field. With the challenges of innovation and technology transfer on a worldwide scale, industries are at the heart of research activities (H4).

- In all of these regions research and innovation policies are well organized, they interact and complement each other and are embedded into European and national initiatives. Research and innovation funding comes from both public and private sources, as backed-up by the strong presence of industries. Equally, universities and other higher education establishments are well developed, and respond to the needs of local economic and social requirements (H4).

- an important aspect of the „supergroup region" is the well-established and deeply rooted links between the academia (universities), industries and the (local and/or regional) government sphere. The coexistence and collaboration of these actors constitute an important framework for creating innovations, and bringing the concrete benefits of research to the market place. The European Commission pays an equally important role to these groupings when allocating funds for research and innovation. The Triple Helix model takes the traditional forms of institutional differentiation among universities, industries, and government as its starting point. The model thus takes account of the expanding role of the knowledge sector in relation to the political and economic infrastructure of the larger society. The increase of interactions among the institutions has had the effect of generating new structures within each of them, such as centers in universities or strategic alliances among companies. These interactions have also led to the creation of integrating mechanisms among the spheres in the form of networks, e.g., of academic, industrial and governmental researchers, and hybrid organisations such as incubator facilities (Etzkowitz and Leydesdorff, 2000). The Triple Helix model leads to view the institutional actors on an equal level in the network. However, each is positioned differently with reference to the infrastructure that they collectively reproduce. Therefore, the focus on observable interests and agency should be complemented with attention to expectations and orientations in communication systems (Leydesdorff, 2000). Closely linked to the triple-helix structures, further notable characteristics of the "supergroup" regions are their highly advanced and well organized clusters, and the management of these organizations. Cluster initiatives are planned aspiration of clusters coming from a region, involving companies, government and research organizations. The cluster initiatives have become an important policy tool linking industrial policies to economic and innovation policies. Cluster initiatives play an important role in revitalizing older clusters, as well as promoting the emergence of science-based partnerships. Clusters are equally important in underlining the regional dimension of European research and innovation policies, given their embeddedness into local environments and their impact (H4).

- As for the considerable success of the „supergroup" in the research framework programme, one can assume a very well-trained professional network of collaborators at the home region, as well as Brussels based „satellites" with strong formal and informal linkages to the most influential stakeholders and close connections to the European institutions. The importance of these regions' representation in Brussels can play an important role in gathering and diffusing information towards the home region's research and governmental organisations. The previously mentioned „efficient triple helix" configurations can really strengthen and facilitate the flow and processing of this information. The significance of these multilevel and multi-actor groupings is that research institutions and companies exploit both region-specific resources and European „informal knowledge" in order to strengthen their competitiveness. The membership or special links to Europe wide sectoral and industrial associations and interest organisations can equally increase a given region's successful participation in the European research programme. Formal and informal networks, especially for discussing concrete bids and proposals from the very early stage provide fora for sharing knowledge and information as well as for forming successful consortia. Obviously the regions' home organisations need to have clear and long term ideas (strategies) about how and to what extent they would like to use European research funding sources. The success of the „supergroup" in the EU's Framework programme also suggests the importance of „informal" knowledge, when it comes to regional economic development. The „informal knowledge" – tacit knowledge - includes both „know-how" – knowledge and skills in the specific technologies the companies possess – as well as „know-who" – information about persons in R&D institutions and other stakeholders with special knowledge. The knowledge is considered to be „sticky" as it is embedded in local patterns of interactions and sharing of experience (Hypotheses H4). The best way to acquire this „sticky" knowledge is to be present in areas where learning processes that develop new and economically useful knowledge takes place. The place specific knowledge

(„sticky knowledge") and the interactive and dynamic way in which this knowledge is acquired is an additional explanation of the tendencies of successful path dependency in several regions (Asheim and Isaksen, 2002). These "soft" variables play an increasingly important role in obtaining European level funding.

6. KNOWLEDGE TRANSFER FOR RESEARCH AND INNOVATION CAPACITY BUILDING IN LESS DEVELOPED EUROPEAN REGIONS

6.1. Knowledge transfer through a supranational instrument: evaluation facility

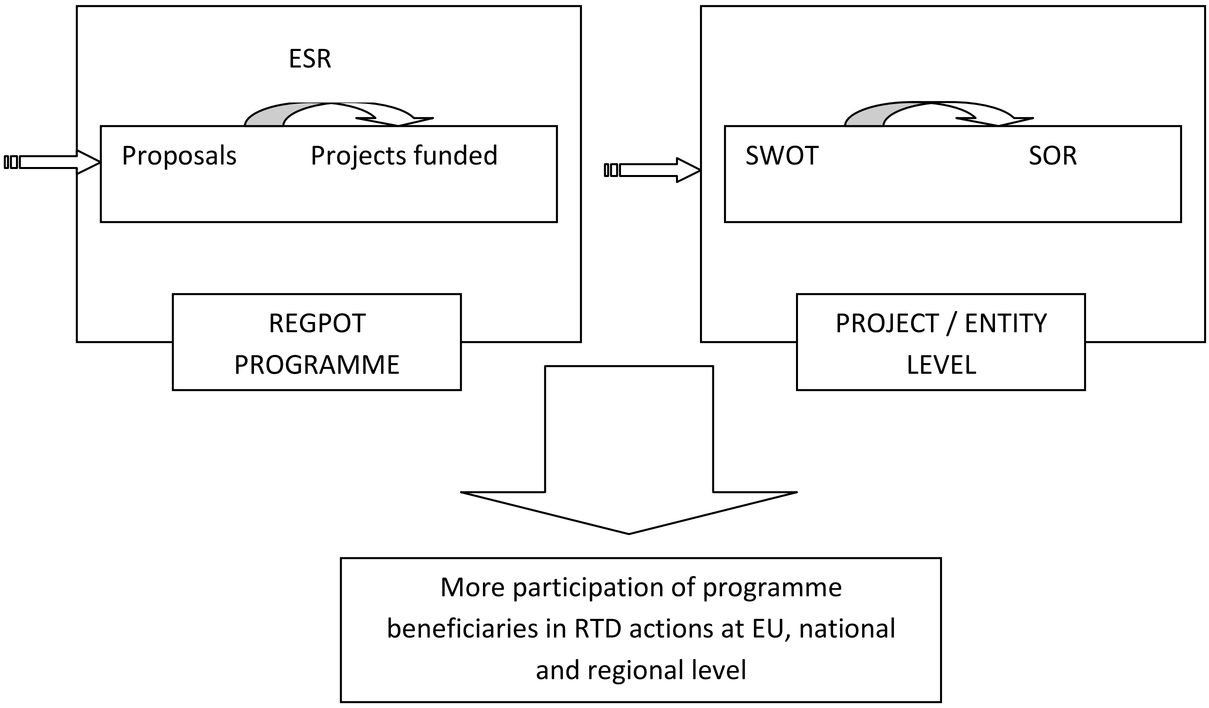
The definition of strategic research agendas as a foundation for regional innovation systems requires knowledge transfer of ideas and attitudes. As outlined in the methodological section, we consider the analysis of transfer of strategic learning (SWOT, SOR, Action Plan etc) as a subcategory of the taxonomy used by Dolowitz &Marsh (Dolowitz and Marsh, 2000) concerning ideas and attitudes. This strategic leaning according to us can be considered to be examples of soft policy tools at the European level, such as the open method of coordination. As discussed, the rationale behind this instrument is that the EU centrally supports research and development through the framework programme, and at the same time co-ordinates and supports activities at regional level. The Community intervention is based on normative inputs, which are the framing mechanisms of European integration. European institutions need to choose the appropriate tools to achieve the consensus on the common goals. Along with the Community methods of integration or the indirect effect of economic integration, new soft law instruments have emerged in the European research fields especially with the implementation of the Lisbon strategy. This soft governance method uses tools such as benchmarking, action plans, exchange of best practices with the aim of achieving common goals in a non-coercive manner (Morado-Foadi, 2008). This case study investigates the transfer of very similar measures (strategic learning) from the supranational to the institute level.

For this analysis we have chosen to focus on the Research Potential-2 (REGPOT-2) call for proposals under the Capacities specific programme of the 7th Framework Programme of the European Commission.

The „Research Potential” (REGPOT) programme is one of the seven components of the „Capacities specific programme” under the FP7. The declared objective of „Research Potential” is “to stimulate the realisation of the full research potential of the enlarged EU by unlocking and developing existing or emerging research potential in the European Union’s convergence regions and outermost regions, and helping to strengthen the capacities of their researchers to successfully participate in research activities at EU level” (Council of the European Union, 2006). The reason for launching the REGPOT scheme was that certain regions in the European Union and in counties associated to FP7, do not fully take advantage of their available scientific potential and capabilities. This is particularly true for less developed regions remote from the European core of research and industrial development. The European Commission wants to help researchers and institutions of these regions catch up to their counterparts in more developed regions, to be able to substantially participate in the collaborative research arena, as well as to contribute to the overall European research effort. Research Potential supports the following set of five measures: recruitment of experienced researchers; organisation of secondments; purchase of scientific equipment; and setting of workshops and dissemination events. These measures are carried out in close collaboration with other experienced and knowledgeable research institutions, taking advantage of their knowledge and experience. „Research Potential” aims at establishing the conditions that will allow the applicant institutions to exploit their potential and thus will be able to contribute to the completion of the European Research Area in the enlarged Europe.

The specific subject of the analysis undertaken is the „evaluation facility”, a targeted instrument offered under „Research Potential” in 2007 and 2008. This activity has provided "evaluation facilities" through which any research entity in the EU’s convergence and outermost regions could obtain an international independent expert evaluation of the level of its overall research quality and infrastructures and define an Action Plan to improve its research capacities. As a result of this evaluation facility the selected projects have received a transfer of strategic learning, a set of soft policy tools to enhance the research capacity of their institution (SWOT analysis, Strategic Orientations, Action Plan etc.). Any public or private research entity in the qualifying regions defined as a working unit operating in any of the research topics covered by the EC FP7 was eligible to submit a proposal for funding this activity. High level independent experts, nominated by the Commission, have evaluated the level of research quality and infrastructures of the selected applicants, and finally a SWOT analysis summarised the evaluation results. On the basis of this evaluation, the evaluators elaborated Action Plans to upgrade and reinforce the institutes' research potential.

Figure 10: Schematic presentation of the REGPOT-2 process. Prepared by the author based on practical experience.



ESR : Evaluation Summary Report

SWOT : Analysis of Strengths, Weaknesses, Opportunities and Threats related to the research capacity and research strategy of the beneficiary (a public or private research entity)

SOR : Strategic Orientation – based on the SWOT analysis, it is a prospective exercise that will be implemented through a detailed Action Plan

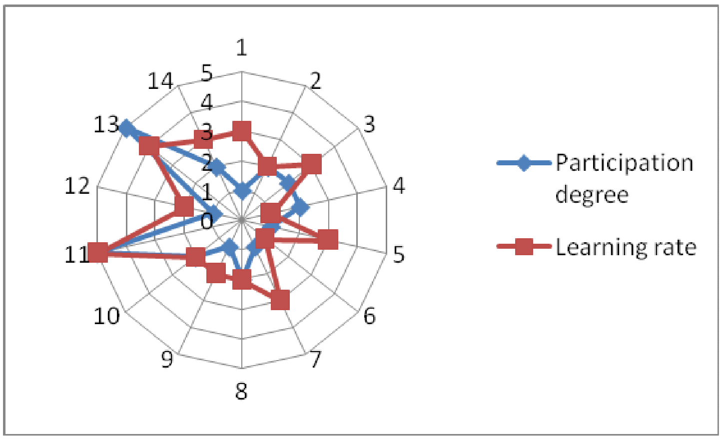
Through this analysis, the intention is to contribute empirically to the field of knowledge transfer of ideas and attitudes at European, transnational or regional levels. In addition policy recommendations might be drawn that could be of use beyond the scope of REGPOT-2 and serve as a source of information for policy/programme design of future schemes aiming at transferring knowledge of ideas and attitudes through an active learning process, especially aimed at less developed European regions.

6.2. Findings based on the analysis of the call for proposals, the project proposals and the ex-ante evaluation reports (Evaluation Summary Reports)

Based on the assessment and scoring methodology explained previously in the methodology section, we have decided to make the following analysis about the outcomes. We considered that the main determinants of the knowledge transfer of strategic learning were the "participation degree (who are participating in the knowledge transfer)", and "the subject of the knowledge transfer (what is transferred)", adapted by ourselves from the methodological building block of policy transfer proposed by D. Dolowitz & D. Marsh (2000). The reference component was the "learning rate", following the adaptation of the organisational learning categorisation by Schon & Argyris (Argyris, 2000).

First we decided to assess the dynamic between the "participation degree" and the "learning rate". The "participation degree", we felt, was a very relevant and sensible question from our adjusted list of research questions, in particular when dealing with research institutions located in less-developed regions of the EU. This we linked to the other methodological tool (the "learning rate" covering the main subject of this study) in order to assess the dynamic between these two factors.

Figure 11: Graphical presentation of the participation degree and learning rates in the initial proposals. Source: Prepared by the author based on assessment of initial proposals.

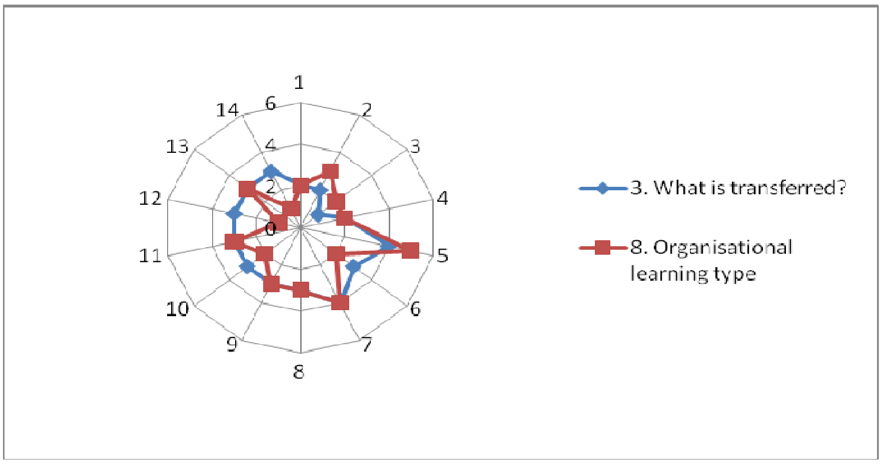


As it can be seen from Figure 11 there is a strong relation between the participation degree of the knowledge transfer and the learning rate within the selected research organisations (correlation coefficient: 0,67). Out of the 14 studied cases, the participation degree was minimal (1 out of 15) in 6 projects, meaning that the applicants did not plan to involve any other actors in the knowledge transfer other than what was a mandatory condition set by the call: the EC-nominated experts and the key staff of the research organisation (senior faculty staff and/or management). For 6 other projects the knowledge transfer would involved at least one other important actor (*other research staff* – Post-doc researchers, junior faculty members, PhD-students; regional *and/or national funding bodies; local industry;* and *other experts or stakeholders).* There were only 2 projects where the participation level was considered "perfect". As already outlined in the methodology section, by "perfect" we mean the project implementation with the planned participation of EC-nominated experts + research organisation's key staff (senior faculty staff and/or management)=Basic requirement; other research staff (junior faculty members, PhD students, Post-Doc researchers); regional or national funding bodies; local industry; and other experts or stakeholders. In our scoring methodology this corresponded to the perfect score of 5.

As for the learning rate examined on a 5 level scale (Types 1-5 from Single-loop learning to Deutero-learning), most of the research institutes belong to either Single-loop learning (5 projects) or to Type 1-3 (From single-loop to double-loop learning) (5 projects). This means that around 70% of all selected research organisations are actively involved or have insisted on their active involvement in the knowledge transfer process. There are two projects that have reached the categories from double-loop to Deutero learning and Deutero learning, and these coincidentally are not the same two organisations where the participation level was of the highest possible score (5 out of 5). Two projects were allocated under Single-loop learning (that is these institutions only passively participated in the knowledge transfer), and these same institutions were also considered rather low on the scale of the Participation degree (1 and 2 respectively).

Second we looked into the relation between the "subject of the knowledge transfer" taking place (which was another of our adjusted research questions) and our reference, the "learning rate". Under the "subject of knowledge transfer" we were trying to assess the actual content of what was anticipated to be transferred to the successful applicants. We found this particularly interesting, as this was one area where the successful applicants were able to steer and formulate the project by adding subjects to the obligatorily defined "SWOT evaluation" and "Action plan"

Figure 12: Graphical presentation of the „subject" of the knowledge transfer and learning rates in the initial proposals. Source: Prepared by the author based on assessment of initial proposals.

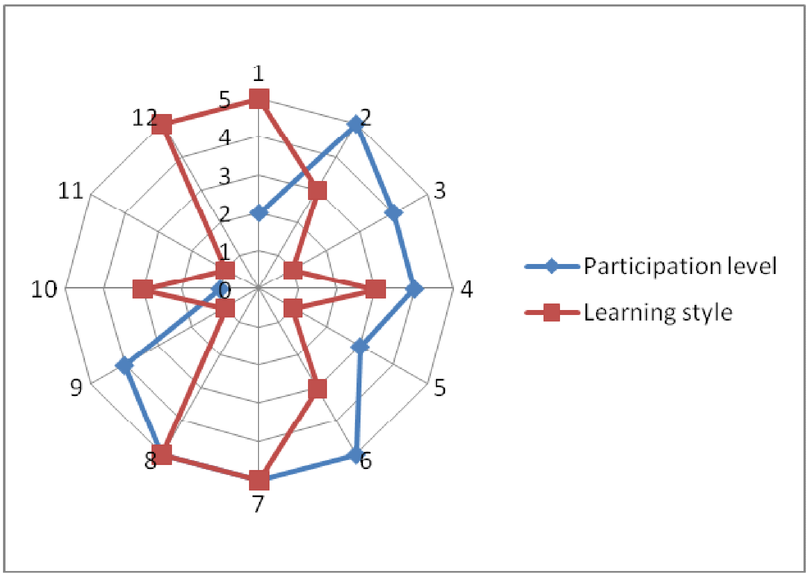


As demonstrated by the above graph there exists a moderate correlation between the precise subject of the knowledge transfer and the organisational learning types (correlation coefficient: 0,50). As for the content of the knowledge transfer, 8 out of the 14 projects include at least two components (from the list of: future orientations; research management; research policy; and quantified indicators) to the basic call topic which is the transfer of SWOT and the preparation of an action plan. There are two projects where the knowledge transfer covers almost the entire recorded list (with scores of 4), trying to maximise the potential of the knowledge transfer process. Three of the remaining four projects add just one additional component to this exercise, while there is only 1 selected project, where the proponent only plans with the basic scope of the knowledge transfer. Regarding the learning types, five organisations are considered to be at the stage of double-loop learning, and five have resulted to be closing on to this stage (from single-loop learning to double-loop learning). There are two organisations with high marks under the organisation type category (4 and 5), and two with the lowest possible score (single-loop learning). In the two cases where the knowledge transfer was the most complex in terms of content (with scores of 4 in both projects), the organisational learning type also turned out to be of high mark (scores of 4 and 5). Where the knowledge transfer was limited to the basic call topic, or to just one additional component (4 projects, with scores of 1 and 2), the learning type was scoring rather low as well. However there were two projects where the knowledge transfer scored 3, whilst the organisational learning type resulted in the lowest mark (single-loop learning).

6.3. Findings based on the analysis of the questionnaires

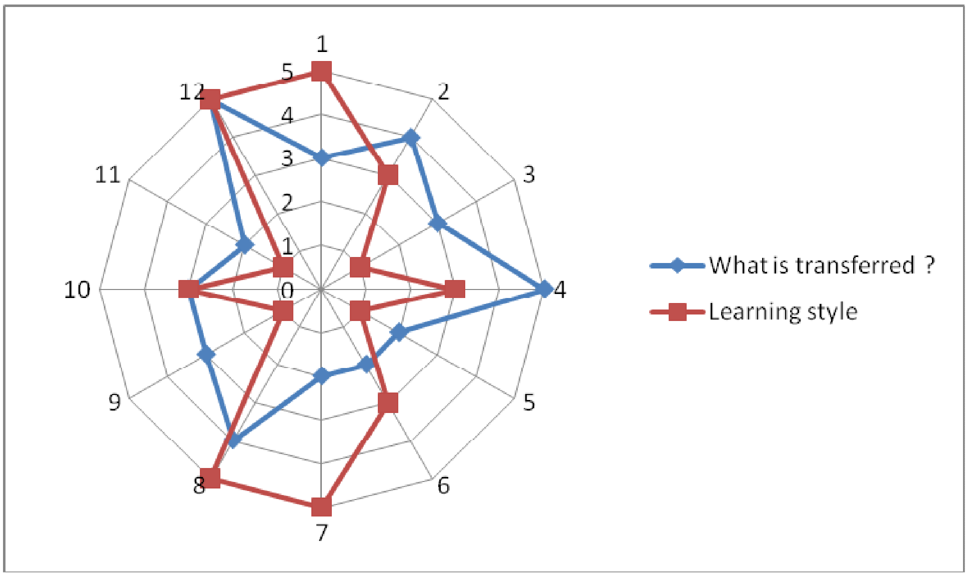
From the 14 coordinators contacted by us, 12 have completed and sent to us back the questionnaires. The analysis is based on these respondents. The list of questions has been assembled following the same logic as used in the proposal level analysis. The list is indicated in the methodological section. As already outlined previously, we are limited to a rather small number of 14 and 12 samples in our analysis, however this number corresponds to the number of projects supported by the European Commission under our chosen funding instrument.

Figure 13: Graphical presentation of the participation degree and learning rates in the implemented projects from the questionnaire. Source: Prepared by the author based on assessment of questionnaires.



Having analyzed the incoming answers through our questionnaires, one can make the following observations. In all but two cases the coordinators found that the participation level in the actual implementation of their projects was rather high (3+), meaning that almost all project coordinators have involved a great number of partners in the projects, considerable more that the initially fixed basic requirement (EC nominated experts and the RTD organisation's key staff). As additional partners, regional and national funding bodies were invoked on most occasions. This suggests that in most cases the project coordinators were aiming to embed their program into a wider context of their respective regions in an attempt for future sustainability and possible follow-up. On the other hand, only in two cases did the project coordinators involve other European organisations in the implementation of the exercise. Regarding the learning style, one can find a rather balanced outcome from the respondents. Exactly one third of coordinators thought that the learning that took place was following the our adaptation of Schon&Argiris was "single-loop", one third deemed it "double-loop", and one third considered that "deutero-learning" occurred during the implementation of their projects. Interestingly, as regards the actual implementation there is a rather small correlation between the participation level in the projects and the learning style (correlation coefficient:0,16).

Figure 14: Graphical presentation of the „subject" of the knowledge transfer and learning rates in the implemeted projects from the questionnaire. Source: Prepared by the author based on assessment of questionnaires.

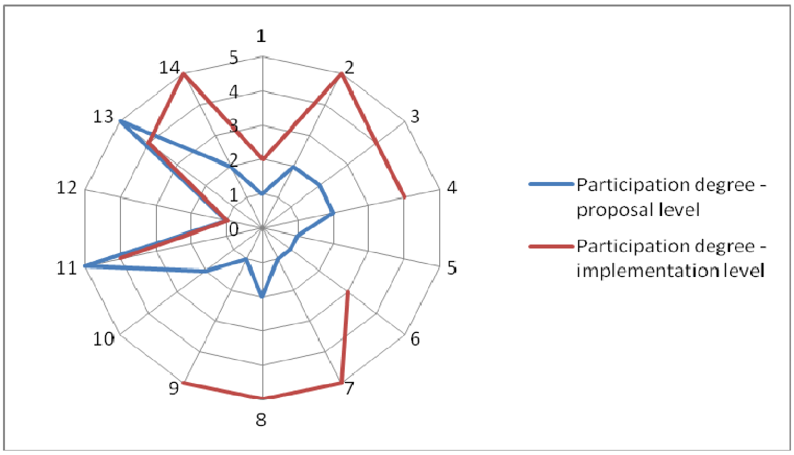


As regards the implementation of projects, in terms of the "subject" of the knowledge transfer (What is transferred?), and the "learning style", the following outcomes have been recorded. As for the actually occurred knowledge transfer, the coordinators felt in all cases that the most important subject was the SWOT analysis and the action plan for the respective institutions. 75%of the respondents deemed that the evaluation of their research capacity according to European standards (benchmarks defined by concrete output indicators) was a great added value of the exercise, and otherwise difficult to obtain. Only 42% of the coordinators felt that they received important input as regards research management and research policy, while even fewer (2 out of 12) were able to link the activity to the regional and national level research and innovation agenda. As already noted, regarding the learning style, a rather balanced outcome can be seen from the respondents. Exactly one third of coordinators thought that the learning that took place was following our adaptation of Schon&Argiris was "single-loop", one third deemed it "double-loop", and one third considered that "deutero-learning" occurred during the implementation of their projects. As for the relation between these two factors, the correlation was very moderate (correlation coefficient:0,38).

6.4. Comparison of the outcomes from the proposal level and the questionnaire responses

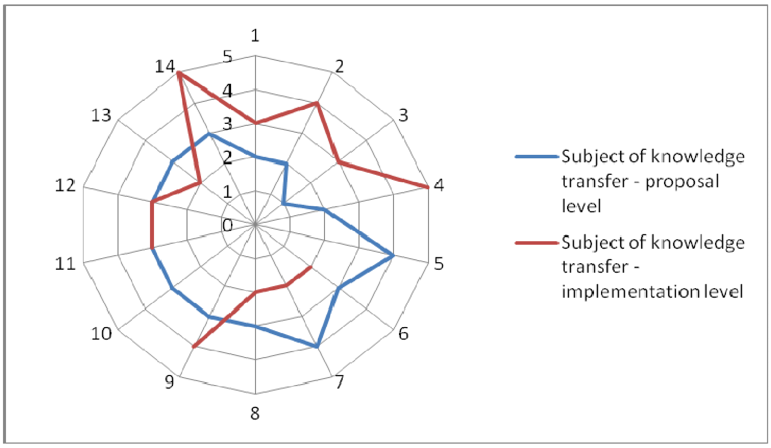
When comparing the anticipations of project coordinators regarding the knowledge transfer and the outcomes of the actual project implementations, the following conclusions can be summed up.

Figure 15: Comparison of proposal level and project level – participation degree. Source: Prepared by the author based on assessment of proposals and questionnaires.



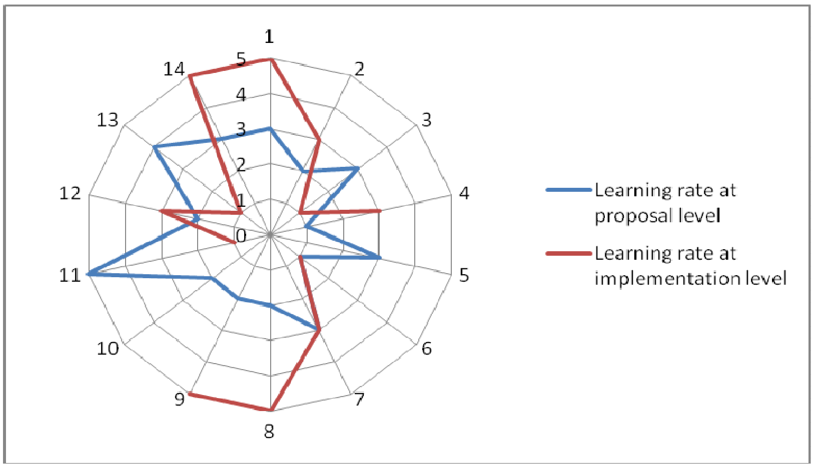
As regards the participation degree in the projects, in 10 of the 12 recorded cases the coordinators actually managed to engage considerably more stakeholders in the project implementation as initially anticipated in the submitted proposals. In one case the participation degree resulted exactly the same as anticipated, whilst in one project the foreseen participation degree did not match the actual outcome, even if only by a small margin (a score of 4 instead of the anticipated 5). This we interpret as a definite success of this instrument supposed to entail knowledge transfer of strategic learning from supranational to institute level.

Figure 16: Comparison of proposal level and project level – subject of knowledge transfer. Source: Prepared by the author based on assessment of proposals and questionnaires.



As for the „subject of knowledge transfer" the outcome is less positive, nevetheless in 6 out of the 12 recorded cases the knowledge transfer actually occured covering a wider spectrum of subjects than initially anticipated, whilst in two projects the anticipation and the actual implementation was the same. The remaining four cases resulted in a less ambitious knowledge transfer that initially forseen. Again one can see the potetntial of the activity and the intention and willingness of research organisation located in less developed European regions as knowledge recepients.

Figure 17: Comparison of proposal level and project level – learning rate. Source: Prepared by the author based on assessment of proposals and questionnaires.



Considering the „learning rate”, one can underline that 7 out of the 12 recorded cases the coordinators have achieved a more quality based knowledge transfer, than initially predicted. This should be encouraging, and again suggests the great potential in such an instrument. In two projects the „learning rate” was equal, whereas there were 3 projects where the „learning rate” scored less during the actual implementation than at the proposal stage.

We have made an experiment of testing the effects of knowledge transfer of strategic learning from supranational to institute level. The startegic learning was defined as a subcategory of Dolowitz and Marsh’s „ideas and attitudes”. In other words we were assessing how and to what extent did this knowledge transfer take place in research institutions located in less developed European regions, in order to make their integration into the European (rather dominated by western European) research area. Following our analysis, we can state that an important learning process/knowledge transfer indeed took place through the implementation of the evaluation facilities, and it does constitute a possible tool for assisting less developed regions research actors catch up to their western European counterparts. Nevetheless this kind of instrument cannot be considered as the ultimate solution, but rather an indicative first step. It is also very important to underline that with the implementation of these projects the coordinators have aquired a knowledgebase which needs to be reinvested obviously into follow-up actions (H5-H6).

7. CONCLUSIONS: ASSESSMENT OF THE HYPOTHESES

H1*: The progress of European level S&T policies is related to economic and historical challenges: it has been a reactive policy development rather than a proactive evolution.*

As underlined in the chapter on the historical trends, European level research and innovation policies have been triggered by outside events and actions, European decision-makers delegated competences to the supranational level in these policy fields following impulses coming from third countries. These impulses were initially originating from industrialized regions like the US, Japan, but recent times have seen the emergence of challengers from less developed countries (India, South America), and obviously from China. In fact during the last years research and innovation have grown to become one of the key issues for the EU when defining medium term strategies, as well as one of the key means for achieving the objectives of these strategies, which is also reflected in the allocation of budget for implementing these policies (Lisbon strategy; EU2020 strategy).

H2*: In the European Union researchers, research expenditure and funding from the EU Framework programmes are regionally concentrated and different regional groupings can be constituted using the mentioned parameters.*

Following the clustering exercise conducted on the available data, there indeed is a geographical concentration in the territory of the European Union of researchers, R&D expenditure and EU framework programme support. Not more than 20 of the examined regions used half of the funding from FP6 and not more than 24 regions spend half of Europe's R&D, and not more than 34 regions account for half of Europe's researchers. 16 regions are present on all three groups of regions. These are: Wien, Karlsruhe , Oberbayern, Berlin, Köln, Denmark, Comunidad de Madrid , Cataluna, Finland , Ile de France , Lombardia , Lazio , Stockholm , East Anglia , Inner London, Berkshire, Buckinghamshire and Oxfordshire). This „supergroup" of European regions accounts for:

- 15% of Europe's population,
- 24% of Europe's GDP,
- 30% of Europe's researchers,
- 35% of Europe's GERD, and
- 43% of the FP6 funding.

H3*: The allocation of funding from the Framework programmes also reflect the divide between "old" and "new " European member states, but the state of economic development does not necessarily mean strong absorption rate of EU research funds.*

Looking at the results of our calculations the following conclusions can be made, one can see a clear indication about the geographical allocation of European level framework programme RTD resources over the course of the past few years. These not so surprising results obviously table some important questions about the rationale and whereabouts of EU RTDI policy and whether this tendency in the allocation of funds really corresponds to the policy objectives and rhetoric of the European Union. At the same time, there are rather economically strong regions where the role of EU level research funding is not considerable, mainly due to the fact that these regions have other sources of funding and hence they were not required to engage and participate in the learning process of "informal knowledge" that involves the participation to EU level research and innovation programmes.

H4*: There are other variables such as organizational methods, existing infrastructure (physical and human), policies, norms and know-how (sticky knowledge) which play an important role in absorbing European funds.*

When completing the clustering exercise, we have seen the emergence of one exclusive cluster of regions (supergoup) that based on the calculations conducted for H2 proved to be very important actors in European research and innovation. Besides these objective and clearly measurable variables, we have observed some common characteristics within these regions that also contribute to their successful participation in the framework programmes. These are well developed formal and informal networks, norms, know-how, and ways of doing things.

H5*: For research organizations established in less developed European regions, targeted instruments, such as the "Evaluation facility of research entities" can assist the catching up process by enabling strategic learning from supranational level (EU) to institute level.*

Based on the analysis on the two-year programme under FP7 (2007-2008), after studying the proposal level documentation (submitted proposals, Evaluation summary reports), as well as the responses to our questionnaire conducted with the coordinators of completed projects, there is a clear indication that research entities based in economically less developed European regions have very much appreciated a targeted instrument for their catching-up in terms of research and innovation capacities to Western European counterparts. Besides the actual physical infrastructure, such programmes could help research organizations acquire the “informal/ sticky” knowledge required for a successful participation in FP, as well as to make the necessary personal contacts and join the relevant networks.

H6*: Knowledge transfer is an important way of building research and innovation capabilities in the less developed European regions as a first step for engaging in more complex collaborative research and innovation activities.*

According to our two analyses, it is clearly demonstrated that less developed European regions (concentrated mainly in the new member states) receive considerably less support from the EU framework programme for research that economically leading regions. They not only miss out on financial support, but also on equally important derivative advantages. For them to become equal partners of western regions in the collaborative strands of the FP (those with the most substantial budget), targeted tools/instruments are needed.

8. NEW SCIENTIFIC RESULTS

1. Through the clustering of European (NUTS 2) regions, I have created groups of European regions in terms of research and innovation capacity, extending the traditionally used indicators/parameters with a new variable, data managed by the European Commission's Directorate General for Research and Innovation on participation to the European Framework Programmes for RTD. To my best knowledge no such study has been conducted before.

2. The emergence of the "supergroup", as well as the other resulting clusters confirms that economic development and research/innovation capabilities go hand in hand. As regards the participation to the Framework Programme, soft variables have been also identified as important conditions for successful participation to EU level funding programmes. Well developed European regions (EU15) are more successful and active than less developed European areas (EU12) in EU level funding for RTDI, however advanced economic development does not always entail strong participation to the FP programme.

3. I have conducted a study on the transfer of knowledge, understood as strategic learning, on research organizations established in less developed European regions. The subject of my analysis was a targeted action sponsored by FP7 (Evaluation facility of the Research Potential programme). The objective was to understand how these less developed European regions could enhance their participation to EU level funding programmes, thus strengthening their involvement in the European research and innovation area. The outcome of the analysis was an important learning process/knowledge transfer that took place during the implementation of the Evaluation facility. The programme itself can be considered as a blueprint for enhancing and upgrading research and innovation capabilities in economically less developed regions.

4. From the questionnaire conducted, it can be concluded that less developed European regions need intermediary instruments for catching up to their more developed counterparts in terms of research and innovation capacities, and the ability to fully exploit the opportunities of EU level funding. I suggest that these intermediary instruments come from the EU level, whereas the national and local levels could provide complementary facilities.

9. SUMMARY

In order for the EU to meet the growing number of economic and social challenges, community level research and innovation policies need to be better articulated and coordinated with national and sub-national level instruments. The dissertation, by applying quantitative and qualitative methods, addresses the research and innovation (RTDI) potential of NUTS 2 level European regions, as well as catching up possibilities for economically less developed areas in terms of their RTDI potential.

European regions are arranged into clusters (7+1) and mapped according to standard parameters collected from Eurostat, and from a specifically assembled database on their participation in the European Framework programme. By introducing this indicator it is clearly demonstrated that certain European regions – mainly the economically well developed "old" member states – have a stronger participation record in the European framework programme than the "new" member states. Moreover, "soft" variables such as organizational methods, existing infrastructure (physical and human), policies, norms and know-how (sticky knowledge) equally play an important role in absorbing European funds.

Economically less advanced European areas are studied in terms of possibilities for upgrading their research and innovation potential, and for strengthening their participation in the framework programmes. The analysis is based on a two year programme (2007-2008), financed by FP7 (Evaluation Facility – REGPOT-2). According to the results of the questionnaire conducted with the coordinators of selected projects, there is a clear indication that research entities based in economically less developed European regions can acquire certain "soft" variables through the knowledge transfer, hence enhancing their research and innovation capabilities.

The dissertation tables policy questions as what measures would assist less developed European regions gain more access to EU level funding in RTDI, along with finding their clear rationale in the European Research Area.

10. ÖSSZEFOGLALÁS

Az Európai Unió előtt álló fontos társadalmi és gazdasági kihívások sikeres teljesítése érdekében egyre markánsabban kell megjeleníteni a közösségi, nemzeti és regionális szintű kutatási és innovációs politikai elképzeléseket. Az értekezés Európa NUTS2 régióinak kutatás-fejlesztési és innovációs potenciálját (K+F+I), s a kontinens elmaradottabb térségeinek ilyen jellegű felzárkózási lehetőségeit vizsgálja, elemzi kvantitatív és kvalitatív módszerekkel.

Az Európai Unió régióit klaszterekbe (7+1) rendezzük gazdasági és innovációs paraméterek alapján. A hagyományosan alkalmazott, hivatalosan hozzáférhető (Eurostat) indikátorokhoz egy speciálisan, ehhez a munkához összeállított adatbázist társítunk, mely az egyes európai régiók kutatási keretprogramban regisztrált részvételét tartalmazza. Az új változó bevezetésével az elemzésből világos következtetések vonhatók le, hogy Európa egyes térségei - főleg a gazdaságilag fejlett régi tagállamok - lényegesen nagyobb arányban részesülnek az európai kutatási keretprogramok nyújtotta lehetőségekből, mint az újonnan csatlakozottak. Megfigyelhető továbbá, hogy az eredményes szerepléshez elengedhetetlenül fontos az ugynevezett „soft" változók (szerveződési módszerek, infrastruktúra, normák és “know-how", ”ragadós ismeretek – sticky knowledge") elsajátítása, ezek állandó fejlesztése.

A gazdaságilag és innovációs/kutatási képességekben elmaradottabb régiók felzárkózási lehetőségeit tanulmányozzuk egy a Hetedik Kutatási Keretprogram (FP7) által támogatott két éves (2007-2008) alprogramon (Evaluation Facility – REGPOT-2) keresztül. A kérdőíves vizsgálatok erdeményei bizonyítják, hogy ezen kevésbé fejlett térségekben a REGPOT-2 jellegű kezdeményezések tudástranszfer/statégiai tanulás formájában fontos segítséget nyújthatnak egyes “soft" ismeretek elsajátításában, hozzájárulhatnak egyetemek és kutató intézetek közép – és hosszú távú stratégiáinak kimunkálásához.

A disszertáció szakpolitikai kérdéseket tanulmányoz, következtetéseket fogalmaz meg, ajánlásokkal igyekszik megvilágítani a probléma időszerűségét. Javaslatként felveti, hogy milyen célravezető módszerekkel lehetne hozzáférhetőbbé tenni az elmaradottabb régiók számára az európai kutatási eszközöket/programokat. Az aktuálisan is meglévő jelentős egyenetlenségek viszonylagos kiegyenlítődése teremtheti meg ezen térségek felzárkózását az Európai Kutatási Térségben.

BIBLIOGRAPHY

André M. (2006): L'espace européen de la recherche: histoire d'une idée. Journal of European Integration History. 12. 2. 131-151.

Argyris C. (2000): On organisational learning. Blackwell Business, Massachusetts, USA.

Asheim B. T.- Isaksen A. (2002): Regional Innovation Systems: The Integration of Local `Sticky' and Global 'Ubiquitous' Knowledge. Journal of Technology Transfer. 27. 77-86.

Banchoff T. (2002a): Institutions, Inertia and European Union Research Policy. Journal of Common Market Studies. 40.1. 1-21.

Banchoff T. (2002b): The Politics of the European Research Area. ACES Working paper 2002.3.

Barca F. (2009): An agenda for a reformed cohesion policy, A placed-based approach to meeting European Union challenges and expectations. Independent report prepared at the request of Danuta Hübner, Commissioner for Regional Policy.

Begg I. (2007): Lisbon II, Two Years on: An Assessment of the Partnership for Growth and Jobs, Special CEPS Report.

Borras S. (2003): The Innovation Policy of the European Union. From Government to Governance. Edward Elgar. 10-12.

Boyer R. (2009): From the Lisbon Agenda to the Lisbon Treaty: national research systems in the context of European integration and globalization. In Delanghe H.-Muldur U.-Soete S. (2009): European Science and Technology Policy. Edward Elgar.

Clergerei J-L. (2007): L'Europe de la connaissance. Les Petits affiches. 396. 183. 6-14.

Cooke P. (2009): The Knowledge Economy, Spillovers, Proximity and Specialisation. Perspectives and policy implications. In: Pontikakis D.-Kyriakou D.- van Bavel R.(Editors). Joint Research Centre Scientific and Technical Report, by Joint Research Centre and Directorate General for Research. Luxembourg: 2009. European Commission. EUR 23834 EN

Cooke P.-Uranga M.-Etxebarria G. (1997): Regional innovation systems: Institutional and organisational dimensions. Research Policy. 26. 475-491.

Council of the European Union (2006): Council decision on the Specific Programme: „Capacities" implementing the Seventh Framework Programme of the European

Communiy for research, technological development and demonstration activities (2007 to 2013). 2006/974/EC.

De Bruijn P. – Lagendijk A. (2005): Regional Innovation Systems in the Lisbon Strategy. European Planning Studies. 13. 8. 1153-1172.

de Elera A. (2006): The European Research Area: On the way Towards a European Scientific Community? European Law Journal. 12. 5. 559-574.

Delanghe H.-Muldur U. –Soete L. (2009): European Science and Technology Policy. Edward Elgar Publishing Limited.

Dolowitz D. - Marsh D. (2000): Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making" in Governance : An International Journal of Policy and Administration, 13. 1. 5-24.

Dresner S.-Gilbert N. (2001): The Dynamics of European Science and Technology Policies. Ashgate. 14-16.

Edler J.- Kuhlmann S. – Behrens M. (2003): Changing Governance of Research and Technology Policy, The European Research Area. Edward Elgar.

Edler J. (2005): Towards One system?. Technikfolgenabschätzung – Theorie und Praxis. 1. 14. 59-68.

Etzkowitz H.- Leydesdorff L.(2000): The dynamics of innovation: from National Systems and „Mode 2” to Triple Helix of university-industry-government relations. Research Ploicy. 29. 109-123.

European Commission (2000): Towards a European research Area. COM(2000) 6 final, Brussels.

European Commission (2008): Knowledge for Growth, European Issues and Policy Challenges. Luxembourg: Office for Official Publications of the European Communities.

European Commission (2010a): Europe 2020 Flagship Initiative Innovation Union, SEC (2010) 1161. Brussels, 06.10.2010.

European Commission (2010b):Europe 2020: A strategy for smart, sustainable and inclusive growth. Brussels 3.3.2010. COM(2010)2020 final.

European Council (2002): Presidency Conclusions. Barcelona European Council, 15 and 16 March 2002.

Expert Group on R&D and Innovation appointed following the Hampton Court Summit and chaired by Mr Esko Aho (2006): Creating an Innovative Europe.Luxenbourg, Office for Official Publications of the European Communities.

Foray D.- David P.A.- Hall B. H. (2009): Smart specialisation – the concept. Selected papers from Research Commissioner Janez Potocnik's Expert Group.

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. http://ec.europa.eu/invest-in-research/pdf/download_en/policy_brief1.pdf

Freeman C. – Soete L. (1997): The Economics of Industrial Innovation. Third Edition, Pinter, London, 1997, chapter 12: 'National systems of innovation', 295 - 315.

Gronbaek D.J.V. (2003): A European Research Council: an idea whose time has come?. Science and Public Policy. 30. 391-404.

Guzzetti L. (1995): A Brief History European Union Research Policy. European Commission – DG XII.

Guzzetti L. (2009): The ‚European Research Area' in the history of Community policy-making. in Delanghe H.-Muldur U.- Soete L. (2009): European Science and Technology Policy. Edward Elgar.

High Level Group chaired by Wim Kok (2004): Facing the challenge The Lisbon Strategy for Growth and Employment.

Hix S. (2005): The Political System of the EU. Palgrave MacMillan. 296-297.

Interim Evaluation of the Seventh Framework Programme (2010): Report of the Expert Group.

Kaiser R.-Prange H. (2004): Managing diversity in a system of multi-level governance: the open-method of coordination in innovation policy. Journal of European Public Policy. 11.2. 249-266.

Koschatzky K. (2005): The regionalization of innovation policy: new options for regional change?. Economics of Science, Technology and Innovation. 30. 291-312.

Leydesdorff L. (2000): The triple helix: an evolutionary modelof innovations. Research Policy. 29. 243-255.

Lundvall B.-Borrás S. (2006): Science, Technology, and Innovation Policy. In: Fagerberg J.-Mowery D.C.-Nelson R.R. (2006): The Oxford Handbook of Innovation. Oxford University Press. 599-615.

Marks G.- Hooghe L.- Blank K.(1996): European Integration since the 1980s. State-Centric versus Multi-Level Governance. Journal of Common Market Studies. 34. 341-378.

Morado-Foadi, S. (2008): The missing Piece of the Libon Jigsaw: Is the Open Method of Coordination Effective in Relation to the European Research Area? European Law Journal. 14.5. 635-654.

Moussis N. (2007): Guide to European policies. European Study Service. 316-317.

Muldur U.- Corvers F.- Delanghe H.- Dratwa J.- Heimberger D.- Sloan B.- Vanslembrouck S. (2006): A new deal for an effective European research policy. The design and impacts of the 7th Framework Programme. Springer.

Musyck B.-Reid A. (2007): Innovation and Regional Development, Do European Structural Funds make a difference? European Planning Studies. 15. 961-980.

Oates W. E. (2006): On the Theory and Practice of Fiscal Decentralization. Institute for Federalism and Intergovernmental Relations. IFIR Working Paper No. 05

Papon P. (2001): L'Europe de la science et de la technologie. Presses Universitaires de Grenoble. 5-21.

Pellegrin J. (2007): Regional Innovation Startegies in the EU or a regionalised EU Innovation Starategy?. Innovation. 20. 3. 203-221.

Pinto H. (2009): The Diversity of Innovation in the European Union: Mapping Latent Dimensions and Regional Profiles. European Planning Studies. 17. 2. 303-324.

Prange H.-Kaiser R. (2005): The Open Method of Coordination in the European Research Area: A New Concept of Deepening Integration?. Comparative European Politics. 3. 289-306.

Radaelli C. (2000): Whither Europeanization? Concept stretching and substantive change. European Integration online Papers, vol. 4 ,n°8.

Radaelli C. (2004): Europeanisation: solution or problem?. European Integration online Papers, vol. 8, n°16.

Report to the European Commission by an independent Expert Group (2003): Raising EU R&D intensity. European Commission, Directorate General for Research.

Sharif N. (2006): Emergence and development of the National Innovation Systems concept. Research Policy. 35. 745–766.

Sölvell Ö.- Lindqvist G.- Ketels C (2003): The Cluster initiative Greenbook. www.cluster-research.org

Stamfer M. (2008): European Added Value of Community Research Activities. Expert Analysis in support of the Ex Post Evaluation of FP6. WWTF – Vienna Science and Technology Fund.

Telo M. (2002): „Governance and government in the European Union. The open method of coordination", in: Rodrigues M.J. et al. (2002): The New Knowledge Economy in Europe, Northamton, MA US and Cheltentam, UK: Edward Elgar. 242-271.

Tödtling F. - Trippl M. (2005): One size fits all? Towards a differentiated regional innovation policy approach. Research Policy. 34. 1203-1219.

Uyarra E. (2009): What is evolutionary about "regional systems of innovation"? Implications for regional policy. Journal of Evolutionary Economics. 20. 1. 115-137.

Varblane U.- Ukrainksi K.- Masso J (2009): Is smart specialisation a tool for enhancing the international competitiveness of research in CEE countries within ERA? University of Tartu, Estonia. http://www.eurosfaire.prd.fr/7pc/doc/1292235415_smart_specialization_varblane_urainski_masso.pdf

Vincent L. (2008): Differentiating Competence, Capability and Capacity. Innovating Perspectives. 16. 3. http://www.innovationsthatwork.com/pdf/June08newsltr.pdf

Welfens P. J. J.- Addison J. T. (2009): Innovation, Employment and Gowth Policy Issues in the EU and the US. Springer. 154-155.

Internet sources:

http://www.eu.wien.at/

http://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-09.pdf

http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=AT13#rnd-innovation

http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=613&parentID=27&countryCode=AT

www.625.uni-heidelberg.de

http://cordis.europa.eu/baden-wuerttemberg/rd_en.html

http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf

http://www.4motors.eu/?lang=en

http://cordis.europa.eu/baden-wuerttemberg/rd_en.html

http://www.ksri.kit.edu/Upload/Modules/634/Jahresbericht_2008_2009_web.pdf

http://www.bayern.de/A-State-of-Innovation-.617/index.htm

https://www.elitenetzwerk.bayern.de/

http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=618&parentID=27&countryCode=DE

http://www.young-germany.de/life-in-germany/life-in-germany/article/berlin-the-research-and-innovation-capital.html

www.tsb-berlin.de

http://cordis.europa.eu/north-rhine-westphalia/rd_en.html

http://www.oecd.org/dataoecd/42/13/46664002.pdf

http://www.icdmuenchen.um.dk/en/servicemenu/News/RDAndInnovationInDenmark.htm

http://www.madrimasd.org/mapa-conocimiento

http://cordis.europa.eu/madrid/rd_en.html

http://cordis.europa.eu/catalonia/intro_en.html

http://www.gencat.cat/diue/ambits/ur/recerca/sistema_cat/index_en.html

http://www.oecd.org/dataoecd/42/11/46664029.pdf http://www.research.fi/en/technologypolicy

http://www.paris-region.com/ard/paris-region-economic-developpement-agency/paris-region-s-economy/sectors-of-excellence

http://cordis.europa.eu/ile-de-france/regional4.htm

http://locateinitaly.com/regions/articles/0404/lazio_apr04.htm

http://cordis.europa.eu/lazio/rd_en.html

http://www.stockholmregion.org/website1/1.0.1.0/75/3/index.php

http://www.stockholmsciencecity.com/en/

http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=SE11#rnd-innovation

http://www.investstockholm.com/en/Investment-Opportunities/Why-Stockholm/

http://international.stockholm.se/Business-and-statistics/

http://www.eeda.org.uk/the-region.asp

http://www.innovationuk.org/news/innovation-uk-vol6-1/0354-east-of-england---the-ideas-region.html

The Mayor's Economic development Strategy for London – May 2010 - http://www.lda.gov.uk/Documents/Economic_Development_Strategy_%282010%29_6543.pdf

http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=UKI#rnd-innovation

http://www.rim-europa.eu/index.cfm?q=p.regionalProfile&r=UKJ#rnd-innovation

http://www.seeda.co.uk/about-the-south-east

The South East of England Profile – February 2010
http://www.seeda.co.uk/_publications/PSE_February_2011.pdf

Investing in Innovation for Long-Term Growth, OECD, June 2009
http://www.oecd.org/dataoecd/59/45/42983414.pdf

Relevant publications by the author

Mikita J.–Nagy J. (2007): Nyílt koordináció az európai közös kutatási politikában. Agrártudományi közlemények. Debreceni Egyetem AMTC, Debrecen, 27: 182–187. ISSN: 1587–1282

Mikita J. (2009): Versenyképesség és kohézió: az európai kutatási és regionális politika összefüggései. Európai Tükör. 15.11:13–23. ISSN: 1416-6151

Mikita J. (2009): The European Research Area: In quest of the Lisbon goals. Acta Agraria Debreceniensis. Debreceni Egyetem AMTC, Debrecen, 35: 73–79. ISSN: 1587–1282

Mikita J. (2009): A „Nyílt koordináció" és az Európai Kutatási Térség. [In: Rechnitzer J., Hardi T. (szerk.) Közép-, Kelet- és Délkelet-Európa térfolyamatai – Integráció és Dezintegráció]. Évkönyv. Széchenyi István Egyetem, Győr, 293–302. ISNN: 2060–9620

Mikita J. (2009): A regionalitás és az európai kutatási politika összefüggései az Észak-Alföldi régióban. [In: Baranyi B., Nagy J. (szerk.) Tanulmányok az agrár- és a regionális tudományok köréből az Észak-Alföldi régióban]. Debreceni Egyetem AMTC, MTA RKK, Debrecen, 4: 245–258. ISBN: 978-963-9899-10-0

Mikita J. (2009): Az európai közös kutatási politika regionális dimenziója. Tér és Társadalom. 23.1: 157–166. ISNN:0237-7683

Mikita J. (2009): A Debreceni Egyetem szerepe az Észak-Alföldi régió versenyképességében az EU közös kutatás-fejlesztés-innovációs politika szemszögéből. [In: Belanka Cs., Duray B. (szerk.) Helyünk a világban – alföldi válaszok a globalizáció folyamataira]. MTA RKK Békéscsabai Osztály, Békéscsaba, 194–198. ISBN:978-963-87155-2-4

Mikita J (2012): Knowledge transfer for research and innovation capacity building in less developed European regions – a megjelenés folyamatban.

DECLARATION

I prepared this dissertation in order to attain the doctoral degree (PhD) at the Kerpely Kálmán Doctoral School of Crop Production, Horticulture and Regional Sciences of the University of Debrecen, Centre for Agricultural and Applied Economic Sciences, Faculty of Agricultural and Food Sciences and Environmental Management.

Debrecen, 2012.

…………………………
Mikita József Gábor
doctoral candidate

DECLARATION

I certify that Mikita József Gábor doctoral candidate performed his work under my supervision between 1st September 2007 and 31st August 2010 at the doctoral school mentioned above. The findings of the dissertation represent the candidate's own creative activity and the dissertation is the candidate's own work. I recommend to accept the dissertation.

Debrecen, 2012.

…………………………….
Dr. Harsányi Endre PhD
advisor

ACKNOWLEDGEMENT

I would like to show my acknowledgement to **Prof. János Nagy** for raising my attention to the importance of this topic, as well for providing me the opportunity to join his doctoral school.

I am very grateful to **Dr. Endre Harsányi** for his continuous support and advice.

I am really indebted to **Dr. Balazs Borsi** who provided me with important methodological help and guidelines in the topic.

I am highly thankful for **Prof. Béla Baranyi** for his very constructive suggestions.

During my time at the Commission I received great support and advice from Mr **Jean-David Malo** (Head of Unit for Financial Engineering DG RTD) and other **Colleagues**.

I had the honour to consult with **Prof. Phil Cooke** and **Prof Keith Harrap**, for which I am very grateful.

Finally, I would like to express my greatest gratitude to my **Parents** and to my **Sister** and her **Family** for supporting me all the way.

List of Figures (1-17)

List of tables (1-9)