

Cohesion policy and regional research and innovation potential

An analysis of the effects of Structural Funds support for Research, Technological Development and Innovation 2000-2010

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I Introduction

Rationale and purpose of the booklet

The European Union's (EU) Cohesion Policy is the single most important EU instrument funding research and innovation at regional level. An estimated €29.5 billion of the EU's Structural Funds (SFs) was spent on research, technological development and innovation (RTDI) during the 2000-2006 programming period and roughly €70 billion is allocated in the current period 2007-2013,

This study, firstly, clarifies the role of Cohesion Policy funding for RTDI in improving regional research and innovation performance. Secondly, the study contributes to the debate on the role of EU instruments in a 'multi-level governance system': to what extent, do they complement and reinforce national and regional research and innovation policies, and, hence, contribute to the Europe 2020 strategy's objectives.

The study considers issues pertinent to discussions on the future contribution of the SFs to the regional dimension of the European Research Area (ERA) and to the European Commission's 2010 Innovation Union communication. The analysis addresses the challenges of improving coordination and seeking synergies and impacts of the various EU interventions on the regional level,

notably between the EU Framework Programme for Research and Technological Development (FP) and SFs.

The booklet provides a comprehensive overview and analysis of previously unpublished regional-level data on the contribution of the EU SFs, in particular the European Regional Development Fund (ERDF) and the European Social Fund (ESF), to RTDI spending in EU regions in the 2000-2006 and 2007-2013 programming periods. The issue of synergies between SF support to regional RTDI policies, from a cohesion perspective, and FP funding for pre-competitive R&D based on "scientific excellence" criteria is explored, albeit tentatively given the difficulty in establishing a casual relationship between SF 'investment' and FP 'performance'.

The booklet addresses three main questions:

- Is there evidence of an improvement over the last decade in the capacity of regions to increase the intensity of investment in RTDI to tackle what Oughton, Landabaso and Morgan (2002) called the regional innovation paradox; namely, the contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to absorb public funds earmarked for the promotion of innovation and to invest in innovation related activities, compared to more advanced regions.

- Aghion et al (2010) have argued that the mix of innovation and other complementary policies is inevitably country specific and should reflect each country's traditions, aspirations and institutional needs, as well as the distance from the technology frontier. As an extension of such thinking, this report seeks to identify regional and thematic patterns of RTDI expenditures and allocations. More specifically, it seeks to collect evidence allowing an assessment of whether the RTDI investments and 'policy-mix' supported by the SF are adapted to the strengths and weaknesses of regional innovation systems.
- The Barca report (2009) considers that innovation is a core priority within a place-based approach to EU cohesion. Place-based interventions are proposed as complementary to developing the ERA, by selecting in each region a limited number of sectors in which innovation can most readily occur and a knowledge base built up (in line with the 'smart specialisation' concept). In this context, is there evidence that Cohesion Policy contributes to the excellence objectives of the ERA through increased participation of research and innovation actors in 'less-favoured' regions, particularly in Convergence regions, in the FP?

The study will be of interest to EU stakeholders (Commission services, European Parliament, etc.) as well as

national and regional policy makers dealing with regional innovation and research policies, and more generally, knowledge-based regional development.

Defining RTDI in the context of the EU Structural Funds

This booklet examines SF investments in favour RTDI based on the thematic categorisation of SF expenditures as laid down in the Structural Funds regulations¹. The categorisation system was subject to a substantial change between the 2000-2006 and 2007-2013 periods. To select the relevant SF thematic categories (or field of intervention, FOI) the definition of R&D and innovation activity contained, respectively, in the Frascati Manual (OECD 2002) and Oslo Manual (2005) are used.

According to the Frascati Manual, research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (OECD 2002, p.30). The focus is notably on "producing new materials, products or

¹ For the programming period 2000-2006 see: http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/regul_en.htm. For the programming period 2007-2013 see: http://ec.europa.eu/regional_policy/sources/docoffic/official/regulation/newregl0713_en.htm

devices, to installing new processes, systems and services or to improving substantially those already produced or installed” (ibid. p.30).

According to Oslo Manual innovation activities include all scientific, technological, organisational, financial and commercial steps, which actually lead, or are intended to lead, to the implementation of innovations (OECD 2005, p.18). Furthermore, in order to differentiate R&D from innovation the manual specifies that innovation comprises a number of activities that are not included in R&D, such as later phases of development for preproduction, production and distribution, development activities with a lesser degree of novelty, support activities such as training and market preparation, and development and implementation activities for innovations such as new marketing methods or new organisational methods which are not product and process innovations. Innovation activities may also include acquisition of external knowledge or capital goods that is not part of R&D.

The SF contribute to activities with a direct link to RTDI as well as to those where the link is weaker or indirect e.g. business advisory services with a focus on organisational or technical improvements to the way enterprises operate, that may or may not involve innovation. In order to differentiate between the two types of support, a two level-approach was adopted by defining interventions

corresponding to “core RTDI” and “business innovation” where the latter focuses on indirect support measures. The following sections explain, in greater detail, the selection of SF categories as well as the approach developed to compare the “core RTDI” and “business innovation” measures across the two periods.

RTDI categories in the programming period 2000-2006

In the 2000-2006 programming period, RTDI was classified under Category 1 “*Productive Environment*”, subcategory 18 “*Research, technological development and innovation (RTDI)*”. RTDI priorities of Cohesion Policy centred on improving the innovation capacity of regions, increasing networking through research projects between universities and research institutes, promoting technology transfer from research institutes to/from businesses, and developing human resources through training for researchers.

For the purposes of this study, “Core RTDI” includes the following fields of intervention (FOIs):

- 181: Research projects based in universities and research institutes. Outputs and results from this FOI include support to research students, researchers obtaining a PhD, employment of RTD personnel, registration of patents resulting from innovations, and the

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development of start-ups by researchers and academics.

- 182: Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes. Included in this FOI is the development of joint R&D collaborative projects, including outputs related to technology purchase, collaborative arrangements between research institutions and firms; support to spin-offs from regional enterprises and investment in RTDI by enterprises involved in joint projects.
- 183: RTDI Infrastructure. Included are investments in business parks, innovation centres, incubators, research centres, technological parks and clusters.
- 184: Training for researchers. Examples include support for the development of research skills and generic skills for researchers in order to enhance researchers' employability within or outside academia.

RTDI activities in sub-category 18 are narrowly defined and do not include, for example, areas related to business innovation. Business innovation elements are included in other FOI such as sub-category 15 "*Assisting large business organisations*" or 16 "*Assisting SMEs and the craft sector*". In order to include business innovation in the analysis, the following FOIs were taken into account:

- 153: Business advisory services (including internationalisation, exporting and environmental management, purchase of technology). This field, addressing large business organisations rather than small and medium-sized enterprises (SMEs), focuses on the purchase of technology related to internationalisation and exporting activities.
- 162: Environment-friendly technologies, clean and economical energy technologies. Included is financial support to SMEs to introduce environmental technologies or to develop eco-products. It favours business networking and learning through advice from environmental experts as well as the development of new products and processes, and the acquisition of qualifications connected to environmental norms.
- 163: Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environment management, purchase of technology). This FOI, the counterpart of 153, focuses on SMEs. It includes purchase of technology focused on business services, business planning and internationalisation.
- 164: Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs). Included is a strong component related to business infrastructure

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for SMEs, the construction of business estates, business incubators and generally the availability of industrial sites.

- 24: Workforce flexibility, entrepreneurial activity, innovation, ICTs (person, firms). This constitutes a sub-category in itself and is related to the adaptability and entrepreneurship of persons and firms. It financially supports individuals and companies for training efforts in order to raise productivity levels. Also included is assistance to structures and systems for counselling services to businesses, particularly SMEs.
- 324: Services and applications for SMEs (e-commerce and transactions, education and training, networking). This FOI is part of sub-category 32 “Telecommunications infrastructure and information society” and concerns support to start-up SMEs to develop and commercialise information technology related services.

RTDI categories in the programming period 2007-2013

In the 2007-2013 programming period, RTDI has been classified differently to the 2000-2006 period. For the purposes of this study, core RTDI has been defined using the following FOIs:

- 01: R&TD activities in research centres

- 02: R&TD infrastructure and centres of competence in a specific technology
- 03: Technology transfer and improvement of cooperation networks
- 04: Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)
- 74: Developing human potential in the field of research and innovation, in particular through post-graduate studies

As for the 2000-2006 period, these core RTDI categories do not include areas related to business innovation. For the purposes of this study, “Business innovation” includes using the following FOIs:

- 05: Advanced support services for firms and groups of firms
- 06: Assistance to SMEs for the promotion of environmentally-friendly products and production processes
- 07: Investment in firms directly linked to research and innovation
- 08: Other investment in firms

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- 09. Other measures to stimulate research and innovation and entrepreneurship in SMEs
- 14: Services and applications for SMEs (e-commerce, education and training, networking, etc.)

Table 1 and Table 2 present a synthetic comparison of RTDI-related FOIs between the two programming periods.

Table 1: Core RTDI: fields of interventions 2000-06 and 2007-13

2000-2006	2007-2013
180. Research, technological development and innovation (RTDI)	04. Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)
181. Research projects based in universities and research institutes	01. R&TD activities in research centres
182. Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes	03. Technology transfer and improvement of cooperation networks
183. RTDI infrastructure	02. R&TD infrastructure and centres of competence in a specific technology
184. Training for researchers	74. Developing human potential in the field of research and innovation, in particular through post-graduate studies

Table 2: Business innovation: fields of interventions 2000-06 and 2007-13

2000-2006	2007-2013
153. Business advisory services (including internationalisation, exporting and environmental management, purchase of technology)	07. Investment in firms directly linked to research and innovation
162. Environment-friendly technologies, clean and economical energy technologies	06. Assistance to SMEs for the promotion of environmentally-friendly products and production processes
163. Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environment management, purchase of technology)	05. Advanced support services for firms and groups of firms 08. Other investment in firms
164. Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs)	
240. Workforce flexibility, entrepreneurial activity, innovation, ICTs (persons, firms)	14. Services and applications for SMEs (e-commerce, education and training, networking, etc.)
224. Services and applications for SMEs (e-commerce and transactions, education and training, networking)	09. Other measures to stimulate research and innovation and entrepreneurship in SMEs

Explanation of the differences with the classification used by the Directorate-General Regional Policy of the European Commission

The Directorate General for Regional Policy (DG REGIO) of the European Commission uses a different set of categories to define SF expenditures and allocations to RTDI. The aim is to allow comparability between programming periods. DG REGIO defines RTDI in using the following categories of expenditure:

2000-2006	2007-2013
180. Research, technological development and innovation (RTDI)	01. R&TD activities in research centres
181. Research projects based in universities and research institutes	02. R&TD infrastructure and centres of competence in a specific technology
182. Innovation and technology	

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2000-2006	2007-2013
<p>transfers, establishment of networks and partnerships between businesses and/or research institutes</p> <p>183. RTDI Infrastructure</p> <p>184. Training for researchers</p> <p>322. Information and Communication Technology (including security and safe transmission measures)</p> <p>323. Services and applications for the citizen (health, administration, education)</p> <p>324. Services and applications for SMEs (electronic commerce and transactions, education and training, networking)</p>	<p>03. Technology transfer and improvement of cooperation networks</p> <p>04. Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)</p> <p>07. Investment in firms directly linked to research and innovation</p> <p>09. Other measures to stimulate research and innovation and entrepreneurship in SMEs</p> <p>11. Information and communication technologies</p> <p>12. Information and communication technologies (TEN-ICT)</p> <p>13. Services and applications for citizens (e-health, e-government)</p> <p>14. Services and applications for SMEs (e-commerce, education and training, networking, etc.)</p> <p>15. Other measures for improving access to and efficient use of ICTs by SMEs</p> <p>74. Developing human potential in the field of research and innovation, in particular through post-graduate studies and training of researchers, and networking activities between universities, research centres and businesses</p>

Additionally DG REGIO defines “Support to firms and other investments not directly relating to RTDI”, with another set of categories which includes the following codes:

2000-2006	2007-2013
<p>150. Assisting large business organisations</p> <p>151. Investment in physical capital (plant and equipment, co financing of state aids)</p> <p>153. Business advisory services (including internationalisation, exporting and environmental management, purchase of technology)</p> <p>154. Services to stakeholders (health and safety, providing care for dependants)</p> <p>155. Financial engineering</p> <p>160. Assisting SMEs and the craft sector</p> <p>161. Investment in physical capital (plant and equipment, co financing of state aids)</p> <p>163. Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology)</p> <p>164. Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs)</p> <p>165. Financial engineering</p> <p>166. Services in support of the social economy (providing care for dependents, health and safety, cultural activities)</p> <p>167. Vocational training</p>	<p>05. Advanced support services for firms and groups of firms</p> <p>08. Other investment in firms</p>

Figure 1 presents SF expenditures and allocations in the 2000-2006 and 2007-2013 periods following DG REGIO's definitions. Expenditures on RTDI represented 8% of all SF expenditures in 2000-06 (€13.7 billion); and 22% of all allocations in 2007-13 (€59.3 billion). Figure 2 presents a comparison of the DG REGIO definitions for both programming periods. The difference between the definition of 'core RTDI' used in this study and DG REGIO's definition of RTDI is evident from Figure 2. In the 2000-2006 period the main differences are the categories *Services and applications for the citizen* (14% of all expenditures using DG REGIO's definition); *ICT* (11%), and *Services and applications for SMEs* (8%).

In the 2007-2013 period, DG REGIO's definition of RTDI differs from the one used in this booklet mainly due to DG REGIO including categories related to the general diffusion of ICTs (*ICTs/TEN-ICTs*); and other generic ICT support such as *Services and applications for the citizen*. While these are clearly broad drivers of societal technology take-up, this study considers that there is a less direct link to innovation performance than categories aimed at direct funding of ICTs in enterprises (including in our analysis).

Moreover, DG REGIO's definition "Support to firms and other investments not directly relating to RTDI" is

more generic in nature and does not focus only on innovation related measures since the category 08 'other investment in firms' is a catch-all for direct funding of SMEs that only indirectly, at best, supports innovation.

On the contrary, the definition used in this booklet for 'business innovation' includes codes that are core innovation drivers such as those related to the support of *environmental friendly technologies in SMEs*, which are not included in the DG REGIO definition.

Evidence: uniqueness and limits to interpretation

The combination of different sources of evidence used makes this booklet 'ground-breaking' and will require follow up by more in-depth studies. Some explanations are necessary due to the nature of the data. As the datasets used were organised according to different categorisations and developed for different purposes, the results should be read with caution, in particular:

- For SF data:
 - In the case of the national, cross-border or transnational operational SF Operational Programmes (OPs) the expenditures and allocations were regionalised on per capita basis. The regionalised datasets were developed by DG Regional Policy;
 - Comparisons between 2000-2006 and 2007-2013 needs to be read keeping in mind that 2000-2006

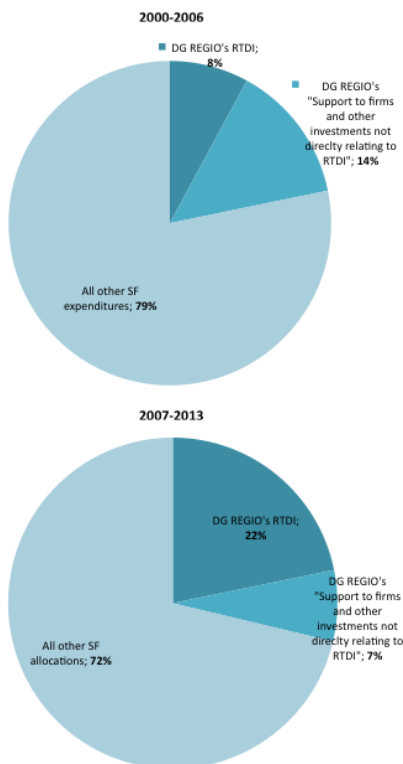
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data is certified expenditures where as 2007-2013 are planned allocations.

- FP data:
 - There is a bias toward capital and metropolitan regions due to the “headquarters effect”, namely that large organisations and particularly national public research organisations are officially located, registered and submit their accounts at their registered headquarters, and not where the project teams are actually working. This is notably the case of countries with highly centralised research systems, such as France, Spain and Italy.
- Comparing SF and FP data to national RTDI statistics
 - When comparing SF and FP data and the mainstream RDTI indicators, it should be remembered that the datasets were developed for different purposes and therefore they do not reflect exactly the same scope or type of operations.

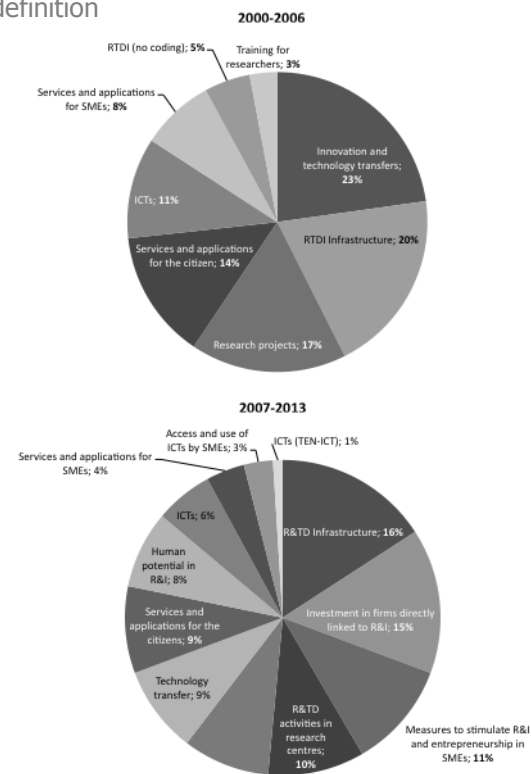
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Figure 1: SF expenditure and allocations in the 2000-2006 and 2007-2013 programming periods - DG REGIO definition



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Figure 2: Categorisation of RTDI expenditure and allocations 2000-2006 and 2007-2013 in the programming periods - DG REGIO definition



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

II Structural Funds Allocations and Expenditures on RTDI between 2000-2006

Allocations and expenditures of Structural Funds on core RTDI

This sub-section presents a comparison of stated policy objectives versus outcomes by looking at core RTDI allocations and actual expenditure. During 2000-2006, on average the EU's regions spent about 89.5% of allocations to core RTDI, which represents an average under-spend of €3.8m per region. On average, regions in the EU10 spent 94% of allocations to core RTDI, compared to 89% in the EU15 regions. Objective 1 regions also spent on average more than Objective 2 regions compared to allocations: 93% and 87% respectively. These differences can be explained by funds not yet spent in unfinished programmes, or regions that had not declared their expenditures to the EC at the time the data used by this study was provided by DG REGIO.

Latvia was the biggest under spender with a ratio of expenditure to planned allocations of only 55% for core RTDI; followed by Ireland (78%) and Germany (81%). In contrast, Luxembourg over spent by 1%, as did Greek regions (2%), Lithuania (5%) and most notably Hungary (15%).

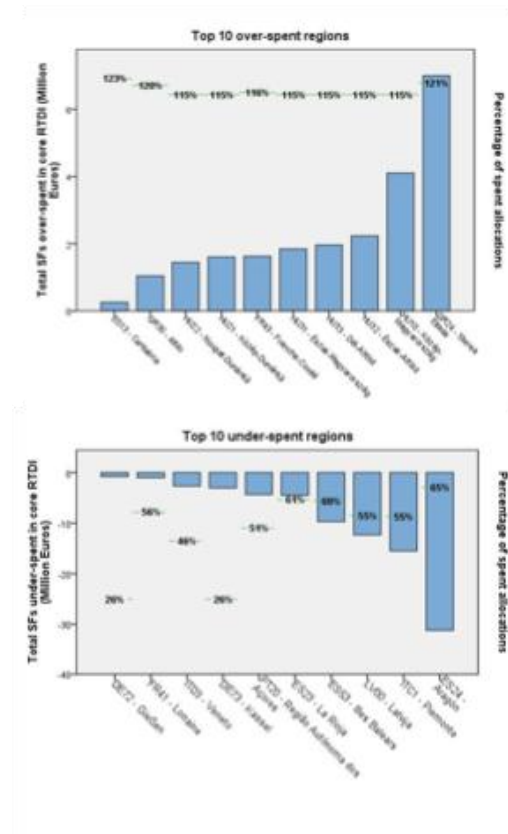
Figure 3 shows the top 10 over-spending and under-spending regions for core RTDI. *Cantabria* (ES23) over spent the most relative to allocations to core RTDI (about 23% more). The rest of the top 10 over-spending regions are mostly Objective 1 regions from Hungary and Greece. The only exception is the Objective 2 region of *Franche-Comté* (FR43), which over-spent by 16% the initial allocation to core RTDI. In contrast, most of the top 10 under-spending regions are Objective 2 regions, with the exception of *Região Autónoma dos Açores* (PT20) and *Latvija* (LV00) that had only spent 51% and 55% respectively of allocated funds for core RTDI. The top under-spending regions are the German regions of *Gießen* (DE72) and *Kassel* (DE73) that spent only about 26% of their allocations. Spanish regions, and the French region of *Lorraine* (FR41), that spent only about 56% of allocated funds, were other notable under-spenders.

Figure 4 details the top 10 regions in terms of higher core RTDI allocations of total SF allocations. *Comunidad Foral de Navarra* (ES22) is the region in the EU25 with the highest percentage of total SF allocations to core RTDI (about 20%). The top 10 regions, from six different EU15 countries (Austria, Belgium, Finland, Germany, Spain and Sweden), allocated between 10% to 14% more than the EU15 average, and 12% to 16% more than the EU10 average. The top three regions (ES22, ES24, AT22) are Objective 2 regions. The regions with

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the highest absolute expenditure, *Cataluña* (ES51) and *País Vasco* (ES21), are also Objective 2 regions. Three of the Objective 1 regions in the top 10 are Nordic regions in Finland and Sweden (SE32, FI13, FI1A).

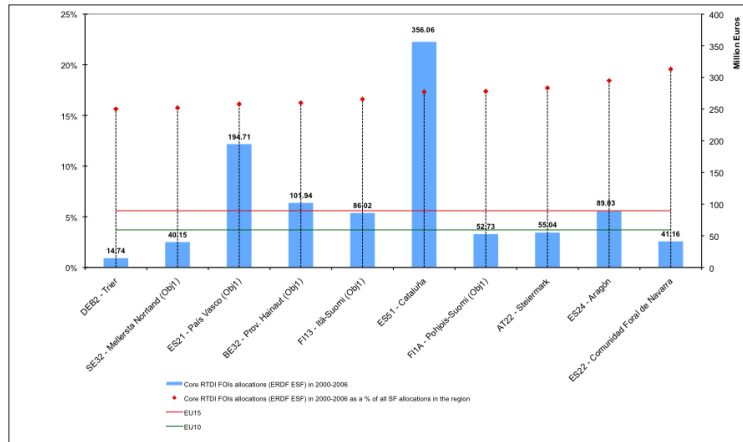
Figure 3: Top 10 over-spending and under-spending regions on core RTDI relative to initially allocated funds



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

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Figure 4: Core RTDI allocations (ERDF ESF), 2000-2006: top 10 regions



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

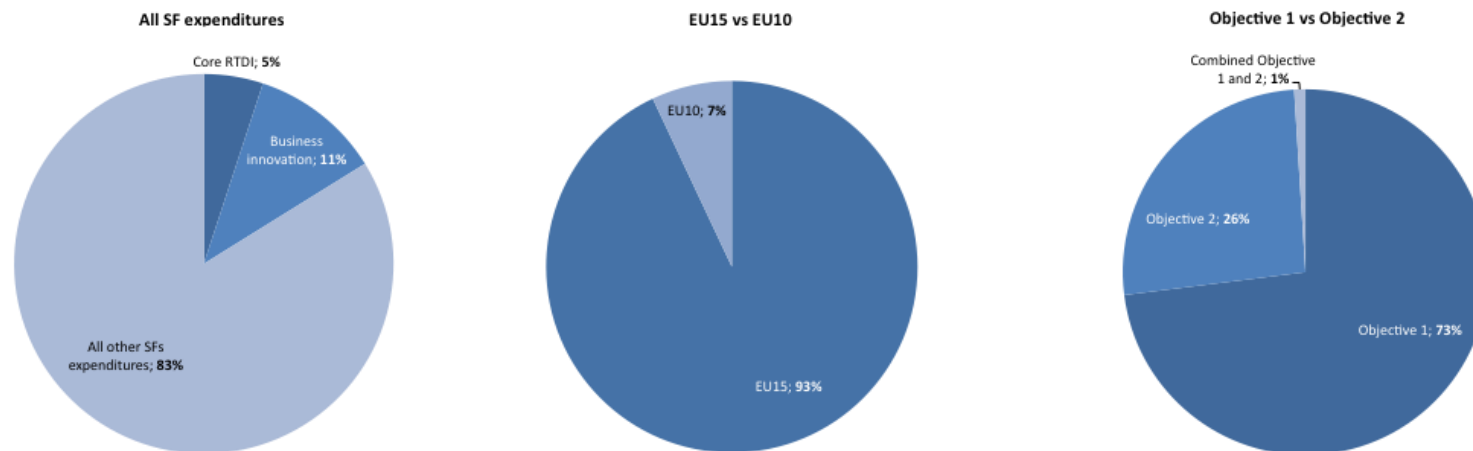
The Structural Funds contribution to RTDI expenditure in the 2000-2006 period

This section looks in more detail at the SF contribution to RTDI spending and discusses trends and characteristics of core RTDI, business innovation and ‘extended RTDI’ definitions for Objective 1 and Objective 2 regions. Figure 5 and Table 3 present a general overview

of SF expenditure during the 2000-2006 programming period. Total expenditure on RTDI amounted to 16% (about €29.5 billion) of the total SFs expenditure; of which 5% of total SF expenditure was spent on core RTDI and 11% on business innovation.

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Figure 5: SF expenditure (ERDF ESF) in the programming period 2000-06



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

The vast majority (93%) of core RTDI funding was spent in the EU15. In terms of the regional classification, Objective 1 and 2 regions spent 73% and 26%, respectively, on core RTDI.

SF expenditure on core RTDI amounted to €9.4 billion. The vast majority (94%) of this support was from the ERDF, while 5% was from the ESF and 1% from the EAGGF. While the ERDF and the ESF intervened in favour of all four FOIs comprising core RTDI, the EAGGF

supported only *research projects* and *innovation and technology transfers*. ERDF and EAGGF supported mainly *Innovation and technology transfer* (36% and 67% of total RTDI expenditure, respectively).

Spending on *Training for researchers* accounting accounted for 77% of total RTDI ESF expenditure. Overall, 8% of total ERDF resources were spent on core RTDI compared to only 1% of total ESF and EAGGF resources.

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In terms of the share by FOI, Research projects in universities and research institutes received 25% of total RTDI investment (€2.4 billion), Innovation and technology transfers received 34% (€3.2 billion), RTDI infrastructure amounted to 29% (€2.8 billion) and training for researchers represented 4% of total spending (€365 million). Around 7% of total SF RTDI spending was not attributed to a specific FOI or project category.

Table 3: RTDI expenditure in the Programming Period 2000-2006 (Million Euros)

	ERDF	ESF	EAGGF
Core RTDI	8,849.83	466.67	94.21
RTDI (non attributed) (18)	678.69	5.95	0.00
Research Projects in universities and research centres (181)	2,244.71	85.13	31.44
Innovation and technology transfers (182)	3,146.56	15.96	62.77
RTDI infrastructure (183)	2,772.70	1.42	0.00
Training for researchers (184)	7.17	358.21	0.00
Business innovation	8,740.94	11,274.16	110.35

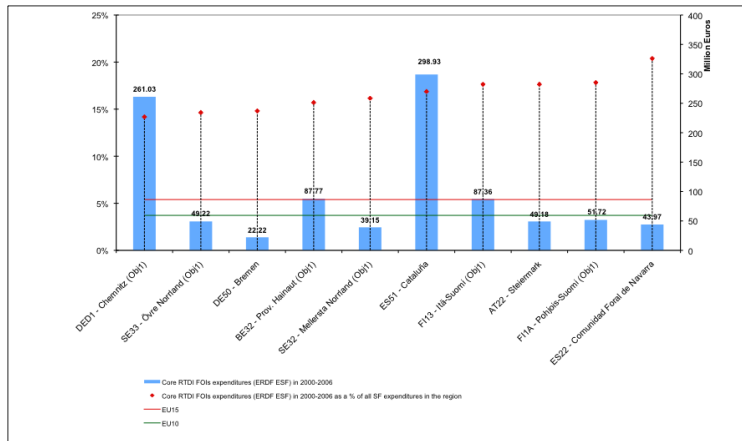
Business advisory services for large business organisations (153)	507.93	3.92	0.00
Environment-friendly technologies for SMEs (162)	1,070.30	0.00	0.00
Business advisory services for SMEs (163)	2,827.31	8.31	7.46
Shared business services for SMEs (164)	3,164.18	5.02	101.54
Workforce flexibility, entrepreneurial activity, innovation, ICTs (240)	172.37	11,224.50	1.36
Services and applications for SMEs (324)	998.86	32.40	0.00
Extended RTDI in SF	17,590.77	11,740.83	204.56

Source: Data warehouse Directorate General Regional Policy European Commission (December 2009). Regional estimates by Unit C3 DG REGIO

The share of expenditure on core RTDI by the EU10 was 4% of total expenditure compared to 5% for the EU15. Figure 6 presents the top 10 regions in terms of percentage of total SF expenditure on core RTDI. *Comunidad Foral de Navarra* (ES22) spent the highest share on core RTDI, slightly more than 20% and in absolute terms spent slightly more than initially allocated (€44 million vs. €41 million).

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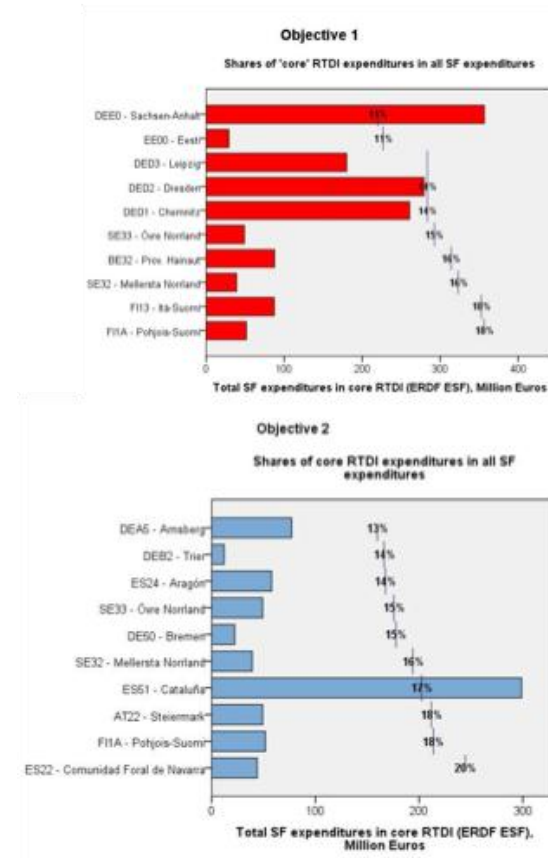
Figure 6: Core RTDI expenditure (ERDF, ESF) in 2000-2006: top 10 regions



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Figure 7 and Figure 8 show the relative frequency of Objective 1 and Objective 2 regions, first in terms of percentage of core RTDI relative to all SF expenditure and then in terms of absolute expenditure to core RTDI.

Figure 7: Core RTDI expenditure (ERDF, ESF) in 2000-2006: Objective 1 and Objective 2 top regions as a percentage of all SFs



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

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Although the absolute values for Objective 1 regions are considerably higher than those for Objective 2 regions, in relative terms the difference is less marked: Objective 1 regions spent on average 4.5% of all SF expenditure on core RTDI compared to 3.7% in Objective 2 regions².

The Objective 1 region with the highest percentage (18%) of expenditure on core RTDI in the EU25 was *Pohjois-Suomi* (FI1A). However, in absolute term, *Pohjois-Suomi*'s spent €52 million which was amongst the smallest amounts in the top 10 Objective 1 regions (just behind *Eesti* and *Mellesta Norrland*). *Comunidad Foral de Navarra* (ES22) was the Objective 2 region with the highest share of expenditure on core RTDI. An interesting observation from Figure 7 is that seven of the 20 regions shown are German, with four having Objective 1 status.

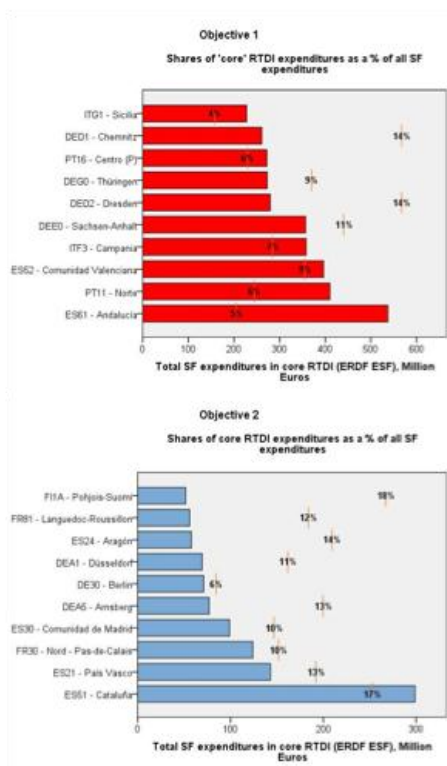
In terms of absolute expenditure, see Figure 8, there were considerable differences between the top 10 Objective 1 and Objective 2 regions; the former spending on average €68 million on core RTDI compared to €14 million in Objective 2 regions. German regions are the most prevalent in the top regions when looking at the highest absolute expenditure.

Nevertheless, compared with Figure 7, the top regions in terms of total SF expenditure on core RTDI. *Andalucia* (ES61) is the Objective 1 region with the highest expenditure on core RTDI, totalling €537 million (5% of all SF expenditure). *Cataluña* (ES51) is the Objective 2 region with the highest of all SF expenditure on RTDI, amounting to €299 million or 17% of all SF expenditure in the region.

² Figure 3 in annex presents core RTDI expenditure as a percentage of all SF expenditure per country showing the top regions and comparing the EU15 and EU10.

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Figure 8: Core RTDI expenditure (ERDF, ESF) in Objective 1 and Objective 2 regions: top 10 regions by absolute expenditures, Million Euros



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Three German Objective 1 regions, *Sachsen-Anhalt* (DEE0), *Dresden* (DED2) and *Chemnitz* (DED1), are in the top 10 regions both in terms of percentage and absolute expenditure, The same was the case for the Objective 2 regions of *Cataluña* (ES51), *Arnsberg* (DEA5) and *Aragón* (ES24). This suggests core RTDI was a clear priority of SF expenditure in these regions.

Per capita core RTDI expenditure

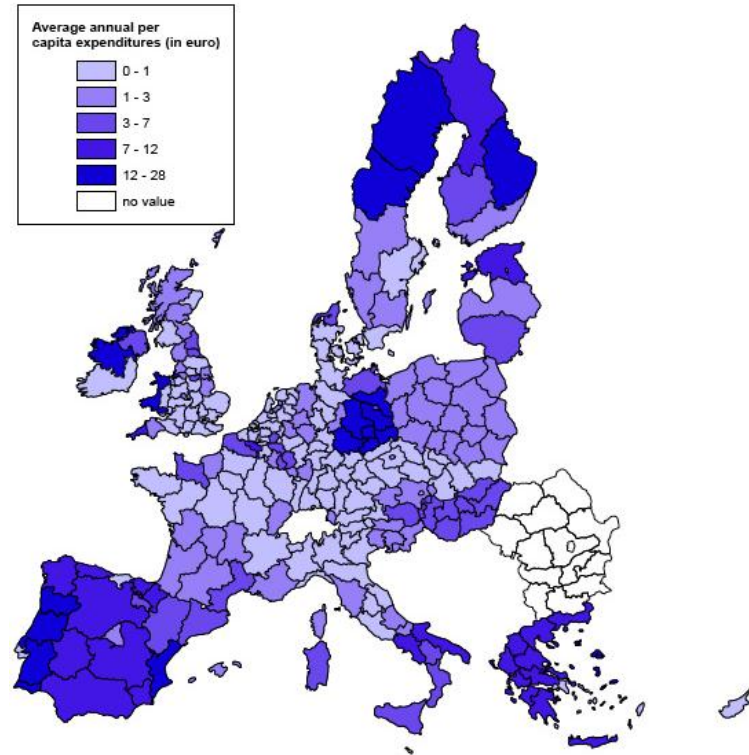
This subsection analyses core RTDI expenditure based on average annual per capita expenditures. This indicator is a more representative basis for comparison across the EU25 since EU10 regions only received funds between 2004-2006, Figure 9 categories in a map format the E25 regions based on the intensity of SF expenditure on core RTDI. The regions with the highest average annual per capita expenditures are *Border, Midland and Western* (IE01) with €27 per inhabitant and the German regions of *Leipzig* (DED3), *Dresden* (DED2), *Chemnitz* (DED1) and *Sachsen-Anhalt* (DEE0). It is noteworthy that the top 60 regions with the highest average annual per capita expenditures are EU15 regions.

Ireland has the highest average annual per capita expenditure on core RTDI, equalling €14 spent per inhabitant. The country is followed by Portugal (€12), Spain (€8) and Greece (€8). The EU15 regions have much higher average annual per capita expenditures on core

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RTDI than the EU10 average (€4 vs. €2 respectively); whereas Objective 1 regions spent on average €7 compared to €1 spent in Objective 2 regions.

Figure 9: Average annual per capita (NUTS2) SF expenditures (ERDF ESF) on core RTDI in 2000-2006, euro per inhabitant



So

Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Thematic focus of RTDI expenditure in the 2000-2006 SF Programming Period

Core RTDI expenditure is divided into four main categories (plus one category for non-codified expenditure): (i) *research projects*, (ii) *innovation and technology transfers*, (iii) *RTDI infrastructure* and (iv) *training for researchers*. Innovation and technology transfer and RTDI infrastructure each represented about 2% of total SF expenditure (€3.2 billion and €2.8 billion, respectively), compared to only 1% for research projects (€2.3 billion) and less than 1% for “training for researchers” (€365 million).

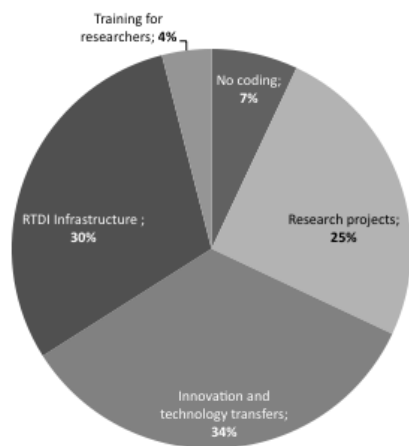
Within the ‘Core RTDI’ group, the most important categories (see Figure 10) were *Innovation and Technology transfer* (accounting for 34% of total expenditure on core RTDI), followed by *RTDI Infrastructure* (30%) and *Research projects in universities and research institutes* (25%). However, as Figure 11 shows, the distribution of ‘Core RTDI’ expenditure by category varied significantly between countries³. Spanish regions focused mainly on *Research Projects* (41% on average of all core RTDI expenditure), while in Italy, the Netherlands, the Czech

Republic and Slovakia the focus was on *Innovation and technology transfer* (76%, 70%, 66% and 60%, respectively). *In contrast*, in Latvia, Luxembourg, Lithuania and Poland the main focus was on *RTDI infrastructure*, whereas an average region in Portugal focused mostly in *Training for researchers*.

³ No money was allocated by Cyprus through the SF to core RTDI, whereas in Slovenia, Sweden and Denmark expenditure was not codified within the core RTDI priorities and, thus, there is no available thematic data for analysis.

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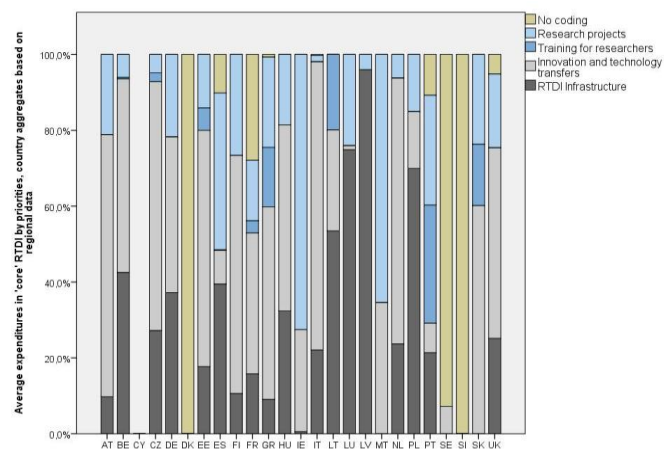
Figure 10: Thematic focus of core RTDI expenditure, percentage of total



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

The Annex of this booklet presents a deeper analysis of the thematic priorities of core RTDI expenditures.

Figure 11: Average core RTDI expenditure in the Programming Period 2000-2006 by thematic priorities, percentages of total



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

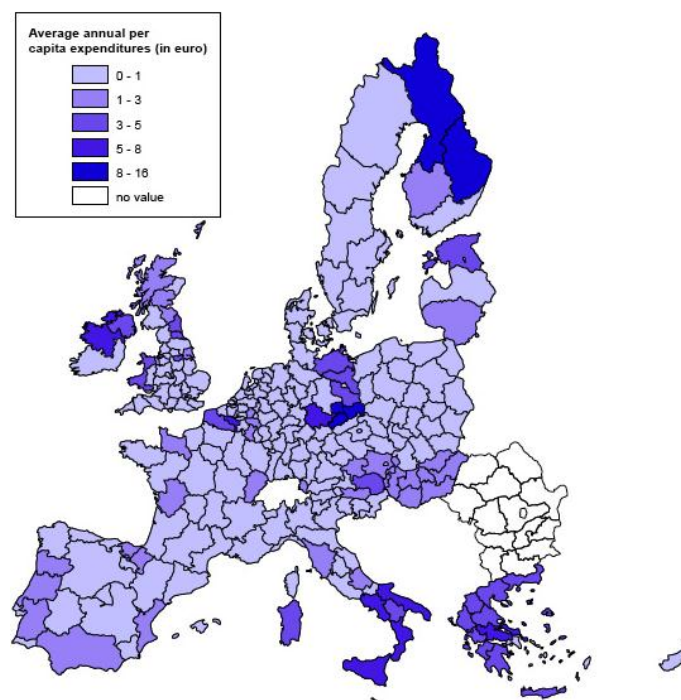
Innovation and Technology Transfer

Figure 12 maps, for NUTS 2 regions, average annual per capita expenditure on *Innovation and Technology Transfer (I&TT)*. The highest average annual per capita expenditures were recorded in the German regions of *Leipzig* (DED3), *Dresden* (DED2) and *Chemnitz* (DED1) with annual expenditures between €14.5 and €15; followed by the Finnish regions of *Itä-Suomi* (FI13) with €13 and *Pohjois-Suomi* (FI1A) with €8.

Finland had the highest average annual per capita expenditure on *innovation and technology transfer*, equaling €5 spent per inhabitant; followed by Estonia, Greece and Ireland (about €4 spent per capita). Along with Estonia, regions in Hungary had the highest annual average expenditures in the EU10 on I&TT.

However, EU15 regions had a much higher average annual per capita expenditures than the EU10 average (€1.3 vs. €0.70 respectively); while Objective 1 regions spent on average €2 compared to €0.50 spent in Objective 2 regions.

Figure 12: Average annual per capita (NUTS2) SF expenditure (ERDF, ESF) on *Innovation and technology transfer* in 2000-06, euro per inhabitant



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

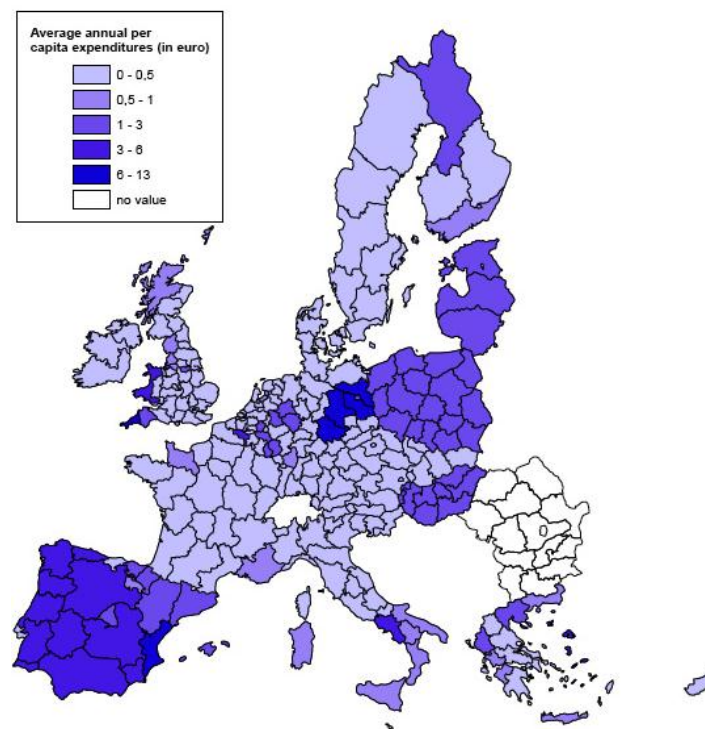
RTDI Infrastructure

As far as average annual per capita expenditure on *RTDI Infrastructure* is concerned (Figure 13), the top NUTS 2 region was *Sachsen-Anhalt* (DEE0), with an average annual spend of €13 per inhabitant. The region is followed by *Brandenburg – Nordost* (DE41) and *Brandenburg – Südwest* (DE42). Other top ‘outlier’ regions are from the United Kingdom (*Cornwall and Isles of Scilly*) Spain (*Comunidad Valenciana*), France (*Réunion*) and Greece (*Voreio Aigaiio*).

However, on average, the highest annual per capita expenditure, on RTDI infrastructure was in Spain with €3 spent per inhabitant; followed by Portugal (€2.8), Lithuania and Luxembourg (both with €2.6), and Latvia (€2). EU15 and EU10 regions spent similar amounts on RTDI infrastructure on an average annual per capita expenditure basis: €0.92 and €0.91 respectively. This shows the considerable focus of EU10 regions on RTDI infrastructure during the three years in which they received funds during the Programming Period 2000-2006.

The difference is more marked between types of regions with Objective 1 regions spending on average €1.9 compared to €0.26 in Objective 2. This difference is logical and expected given the higher absolute levels of funding in the former as well the need for these regions to reinforce their capacity to undertake R&D.

Figure 13: Average annual per capita (NUTS2) SFs expenditure (ERDF, ESF) on ‘*RTDI Infrastructure*’ in 2000-2006, euro per inhabitant



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Funding business innovation through EU Structural Funds

Business innovation expenditure, as was the case for core RTDI, was financed through three funds: ERDF, ESF and EAGGF. A total expenditure of €20 billion, accounting for 11% of all SF (ERDF ESF) in the period 2000-2006, was split 44% from the ERDF, 56% from the ESF and 1% from EAGGF. While the ERDF allocated funding in all business innovation related fields, the ESF did not support *Environment-friendly technologies for SMEs*. On the other hand, the EAGGF supported only *business advisory services* and *shared business services* for SMEs and *Workforce flexibility*.

The ERDF and the EAGGF focused on *shared business services for SMEs* (36% and 92% of the total ERDF and EAGGF expenditure in business innovation, respectively), whereas the ESF strongly supported *Workforce flexibility* (representing almost all of the ESF expenditure on business innovation, or 19% of all ESF expenditure for all FOIs). As a result, business innovation amounted to 7% of total ERDF resources spent compared to 19% of total ESF and 1% of total EAGGF resources.

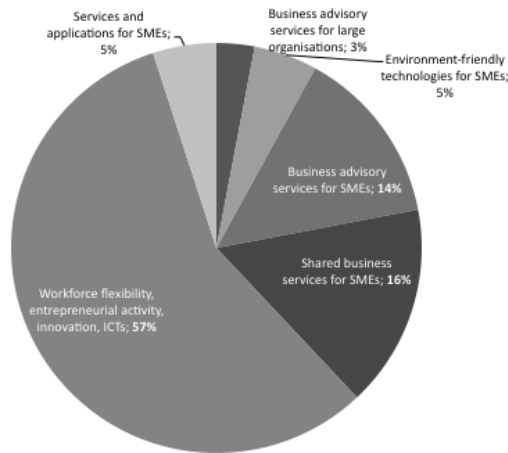
Figure 14 shows the thematic focus of business innovation expenditures (all three funds combined). Workforce flexibility, entrepreneurial activity, innovation, ICTs received 57% of total business innovation investment

(€11.4 billion) followed by shared business services for SMEs with 16% (€3.3 billion) and business advisory services for SMEs with 14% (€2.8 billion).

The top 10 regions in terms of spending on business innovation relative to total SF expenditure are presented in Figure 15; which also indicates the absolute expenditure per region. *South Western Scotland* (UKM3) had the highest share of expenditure on business innovation in the EU25; of which 56% was spent on *shared business services (including incubators)* and 28% of all SF business innovation expenditure in the region.

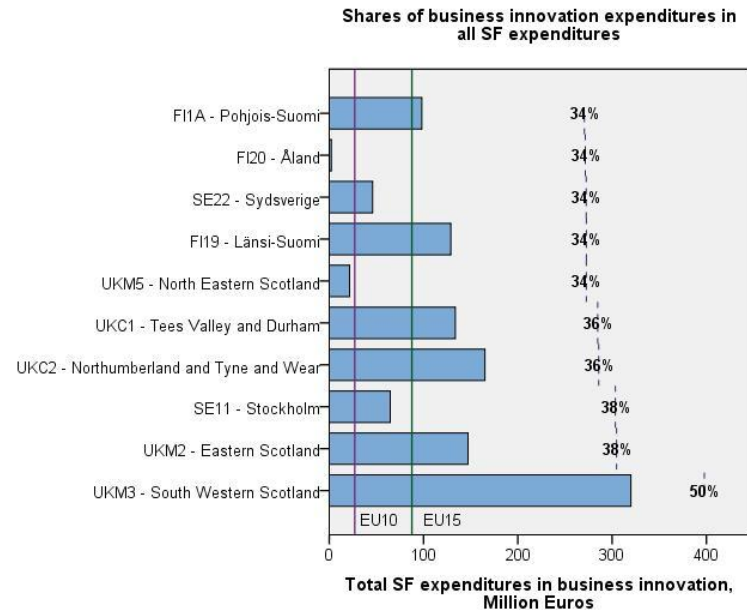
Structural Funds for RTDI

Figure 14: Thematic priorities of business innovation expenditure in the Programming Period 2000-2006



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Figure 15: Business innovation expenditure (ERDF, ESF) in 2000-2006, top 10 regions



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

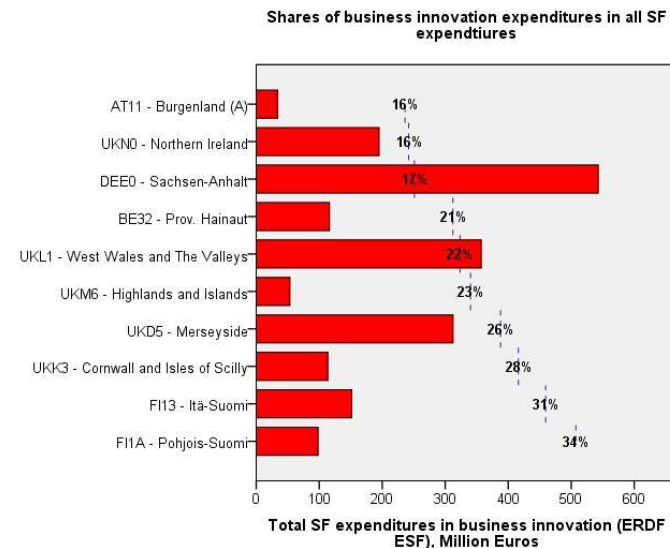
EU15 regions spent around 15% on business innovation compared to 9% in the EU10. This gap is even large when looking at absolute expenditure. EU15 regions spent around €88 million on average compared to only €27 million in the EU10. All of the top 10 regions were

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Objective 2 regions from only three EU15 Members States (Finland, Sweden and the UK); with only a part of the region of *Pohjois-Suomi* (FI1A) being Objective 1.

Figure 16 presents the top 10 Objective 1 regions in terms of the share of business innovation as a percentage of all SF expenditure. Objective 1 regions spent considerably less on average (9%) of all SF expenditure on business innovation compared to Objective 2 regions (17%). This contrasts with the relatively small difference of slightly less than 2% between Objective 1 and Objective 2 regions for core RTDI expenditure

Figure 16: Expenditure in business innovation (ERDF, ESF) as a percentage of all SF in Objective 1 regions, top 10 regions 2000-2006



Source: Data warehouse Directorate General Regional Policy European Commission(December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

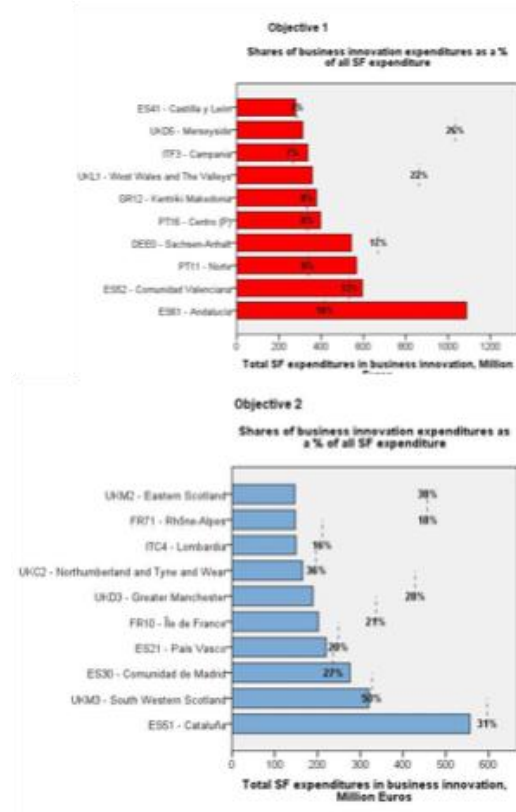
Pohjois-Suomi (FI1A) was the top Objective 1 region with the highest percentage expenditure on business innovation (34% of total SF expenditure) in the EU25. However, absolute expenditure was only €98 million, one of the lowest absolute expenditure in the top 10 Objective 1 regions, just behind *Burgenland* (AT11) and

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Highlands and Islands (UKM6). All top 10 Objective 1 regions are from the EU15 with a noticeable presence of regions from the United Kingdom (five in the top 10).

As can be seen from Figure 17 the scale of absolute expenditure varied markedly between Objective 1 and 2 of regions. Whereas the top Objective 1 region, *Andalucía* (ES61), spent around €1.1 billion the top Objective 2 region, *Cataluña* (ES51), spent only about half of this amount (€556 million). An interesting point from Figure 17 is the presence of Spanish and British regions. Two Objective 1 regions, *West Wales and The Valleys* (UKL1) and *Merseyside* (UKD5), are in the top 10 regions both in terms of percentage and absolute expenditure indicating business innovation as a top priority in these regions towards. The same was the case for the Objective 2 regions of *South Western Scotland* (UKM3), *Northumberland and Tyne and Wear* (UKC2) and *Eastern Scotland* (UKM2).

Figure 17: Expenditure in business innovation (ERDF, ESF) as a percentage of all SF in Objective 1 and Objective 2 regions, top 10 regions 2000-2006



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Figure 18 maps NUTS 2 regions based on average annual per capita expenditures on business innovation. *Região Autónoma da Madeira (PT30)*⁴ is the top region with an average annual subsidy of €45 per inhabitant; followed by *Extremadura (ES43)* and *Ciudad Autónoma de Ceuta (ES63)* with expenditure of €37 and €34 respectively.

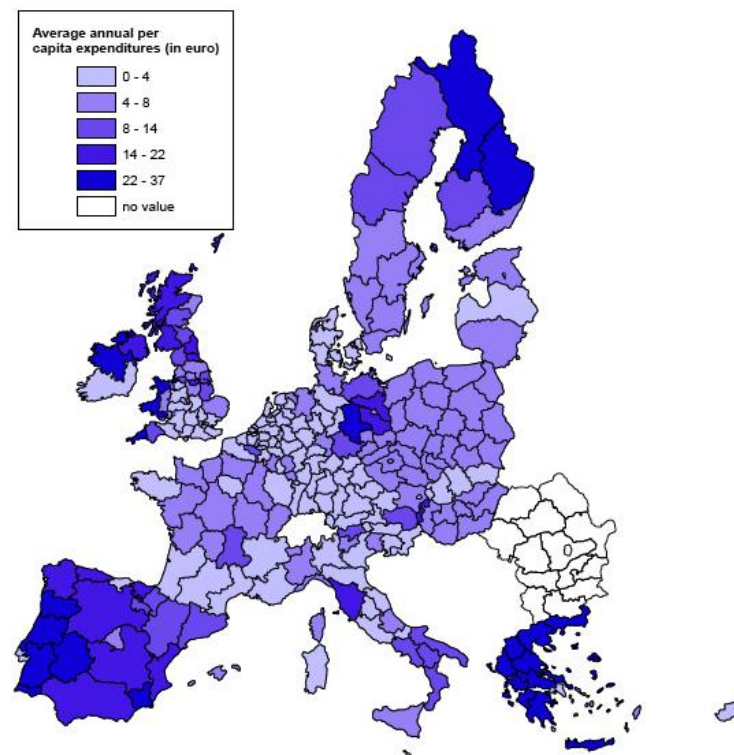
Only nine regions granted more than €30 on average every year to business innovation.

At country level, Greece had the highest average annual per capita expenditure of €26; followed by Portugal (€22), Finland (€18) and Spain (€16).

There were considerable differences between EU15 and EU10 regions in terms of average annual expenditures (€9 and €5 respectively) and between Objective 1 regions (€13) and Objective 2 regions (€5). If the latter result reflects overall scale of resources available to Objective 1 regions, the former result could be considered more paradoxical given that a key weakness of the innovation systems of the new Member States lies precisely in the rates of innovation of enterprises and the need for them to absorb new technologies and adopt new organisational practices in order to close the significant manufacturing productivity gap with the EU15.

⁴ This region is not presented graphically in Figure 18.

Figure 18: Average annual per capita (NUTS2) SF expenditures (ERDF ESF) to business innovation in 2000-2006, euro per inhabitant



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

III RTDI allocations in Structural Funds 2007-2013 & comparison with 2000-2006

The SF contribution to RTDI allocations in the 2007-2013 Programming Period

This section looks at RTDI allocations at the regional level for the 2007-2013 SF programming period and discusses trends and characteristics for both the Convergence regions and Regional Competitiveness and Employment (RCE) regions for ‘core’ RTDI and business innovation funding. As was the case for the 2000-2006 period, the RTDI allocations analysed concern both the ERDF and the ESF.

Figure 19 gives an overview of SF allocations in the 2007-2013 period: 11% of total SF budgets are allocated to ‘Core RTDI’, more than double compared to 2000-2006 (5%); while allocations to business innovation were of 14% of all SF allocations, an increase of 3 percentage points compared with the 2000-2006 period. Thus the ‘extended’ RTDI funding, encompassing both core RTDI and business innovation, represented around 25% of total SF funding, an increase of about 10% when compared with 2000-2006. In absolute terms, SF allocations for the 2007-2013 period to core RTDI and busi-

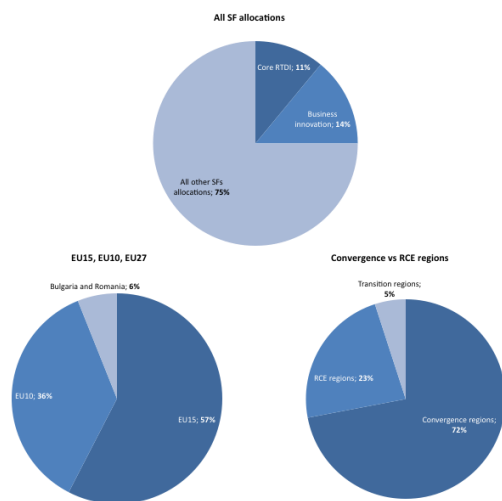
ness innovation amounted to €31 and €39 billion, respectively.

Overall, the EU15 regions, which account for about 57% of all SF planned funding, represent about 60% of all allocations to core RTDI. This overall funding split represents a considerable reduction if compared with 2000-2006 (93%), signalling a reallocation of resources in favour of the EU10, and Bulgaria and Romania.

The EU10, which received 36% of Structural Fund resources, account for 37% of all allocations to core RTDI; while Bulgaria and Romania with 6% of the SF budget only account for 3% of all allocations to core RTDI.

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Figure 19: Characterisation of SF allocations in the Programming Period 2007-2013



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

In relative terms, Convergence regions allocated less than their share in total SF to core RTDI (72% and 68%) while RCE regions, which received 23% of total funding, accounted for 27% of core RTDI.

Figure 20 presents the top 10 regions in terms of the highest intensity of core RTDI allocation in total SF allocations. *Bratislavský kraj* (SK01), at 49%, is the EU27 region with the highest percentage share of core RTDI in

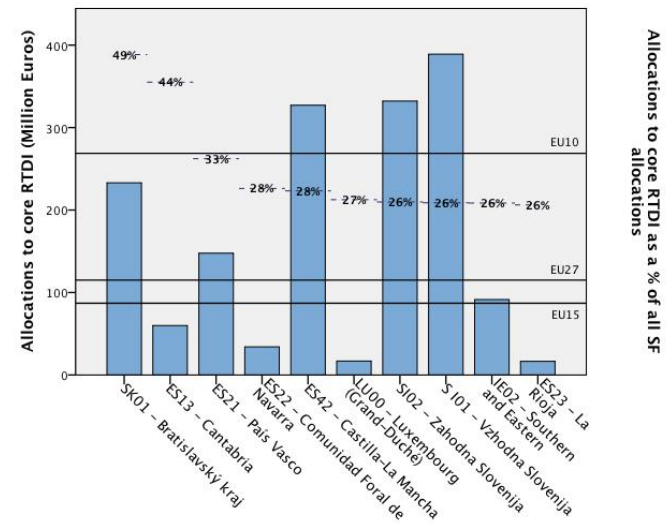
its SF allocations. This contrasts with the top region in the period 2000-2006 (Comunidad Foral de Navarra) with only 20%. EU10 regions allocated an average of about 13% to core RTDI compared to 12% in EU15 and EU27 regions. In 2000-2006 the corresponding allocations were considerably lower at only 4% for EU10 and 5% for the EU15. This shows a considerable reshuffling of priorities between the two periods. The top regions are from Slovakia, Spain, Luxembourg, Slovenia and Ireland corresponding to four EU10 regions and three Convergence regions.

Figure 21 shows the share of core RTDI relative to all SF for the top 10 Convergence and RCE regions and their absolute financial allocations. The absolute allocations for Convergence regions are considerably higher than those of RCE regions (average of €257 million compared to €50 million). The average percentages between the two groups also differ: 10% for Convergence regions and 13% for RCE regions. The average percentage expenditure is considerably higher than in the period 2000-2006: an increase of 5.8% for Convergence regions when compared with Objective 1 regions and an increase of 9.2% for RCE regions when compared to Objective 2 regions. RCE regions have larger percentage allocations than Convergence regions, which was not the case in 2000-2006.

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Castilla-La Mancha (ES42) is the Convergence region with the highest percentage (28%) of total SF allocated to core RTDI. With €327 million in absolute terms, the region has the lowest absolute allocation in the top 10 Convergence regions. This low absolute value is comparable with the highest registered value of €319 million in Cataluña (ES51) in the top 10 RCE regions. The percentage allocation and absolute values are considerably higher than those of the top Objective 1 region in 2000-2006, which were only 18% and €52 million. Regions from the Czech Republic (all Convergence regions) and Spain (mostly RCE regions) are the most prevalent in the top regions on percentage allocations.

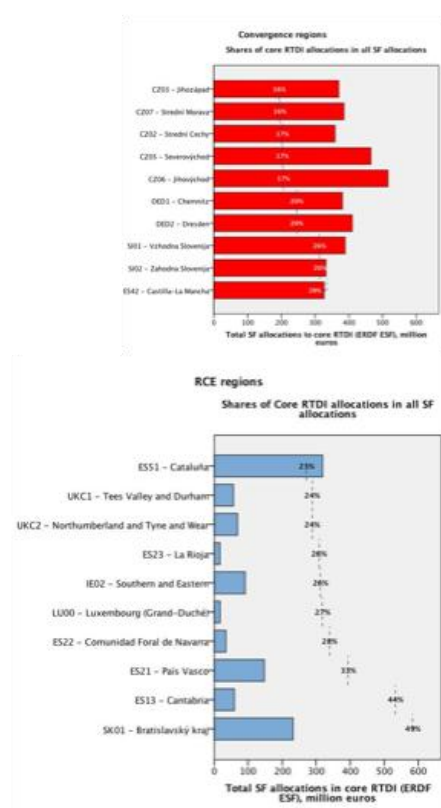
Figure 20: Allocations to core RTDI (ERDF ESF) in 2007-2013, top 10 regions



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

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Figure 21: Allocations to core RTDI (ERDF ESF) in 2007-2013, Convergence and RCE top 10 regions as a percentage of all SF allocations



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

As it can be seen from Figure 22 there are considerable differences between the top Convergence and RCE regions in terms of absolute allocations. Spanish regions are the most prevalent in the top regions in terms of absolute allocations to core RTDI, with seven of the top 20 regions, five being RCE regions. This contrasts with the large presence of German regions in 2000-2006 as shown in Figure 8. Andalucía (ES61) is the Convergence region with the highest absolute allocation to core RTDI in the 2007-2013 period with €1.5 billion, representing about 5% of all SF allocations to core RTDI in the current period. Andalucía was also the leading region in absolute terms in 2000-2006. In the 2000-2006 period, these allocations represented only about 13% of all SF allocations to the region. Sachsen-Anhalt (DEE0) is the leading RCE region, accounting for a third of the allocations of the top Convergence region, with €423 million or about 14% of all SF allocations in the region. The regions of *Severovýchod* (CZ05), *Cataluña* (ES51) and *Bratislavský kraj* (SK01) are leading regions in terms of both share and absolute allocations to core RTDI.

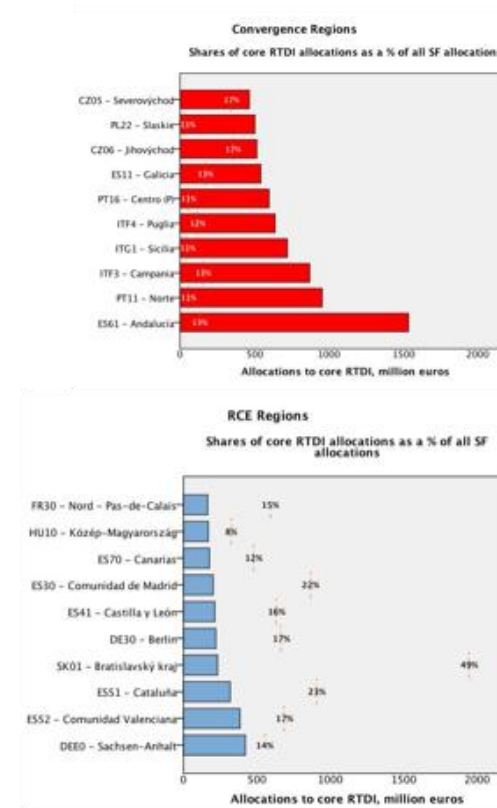
Figure 23 complements the previous analysis and maps NUTS 2 regions based on average annual per capita allocations to core RTDI. Bratislavský kraj (SK01) is the top region with an average subsidy to core RTDI of €55 per inhabitant, followed by regions in Slovenia and the

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Czech Republic. This contrasts with the 2000-2006 period, where the top 60 regions were EU15 regions.

Slovenia has the highest average annual per capita expenditure on core RTDI of €51 followed by the Czech Republic (€40 spent per inhabitant), Estonia (€38) and Slovakia (€32).

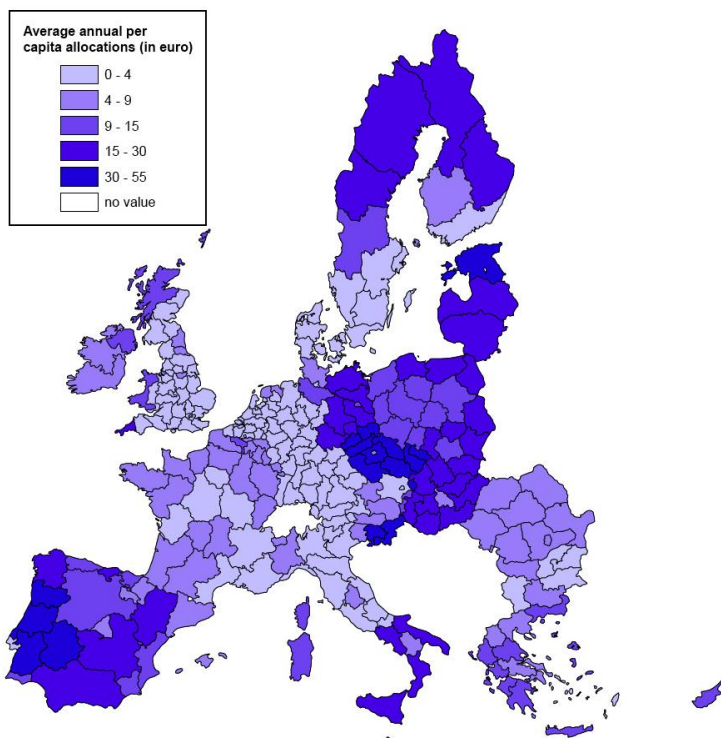
Figure 22: Allocations to core RTDI in top 10 Convergence and RCE regions, 2007-2013



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

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Figure 23: Average annual per capita (NUTS2) SF allocations (ERDF ESF) to core RTDI in 2007-2013, euro per inhabitant



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

All regions increased considerably their absolute per capita subsidies to core RTDI in comparison with the 2000-2006 period. The EU10 regions have much higher average annual per capita allocations for core RTDI than EU15 regions: €25 in 2007-2013 in comparison with €2 in 2000-2006 for EU10 regions; compared to €7 and €4 for EU15 regions. Regions in Bulgaria and Romania allocated on average €4 annually per inhabitant to core RTDI. Convergence regions allocated on average €21 compared to €4 in RCE regions.

The main difference with the 2000-2006 period is that all of the top regions and countries are EU10 regions and most of them (with the exception of Bratislavský kraj) are Convergence regions.

Core RTDI allocations by category – 2007-2013 period

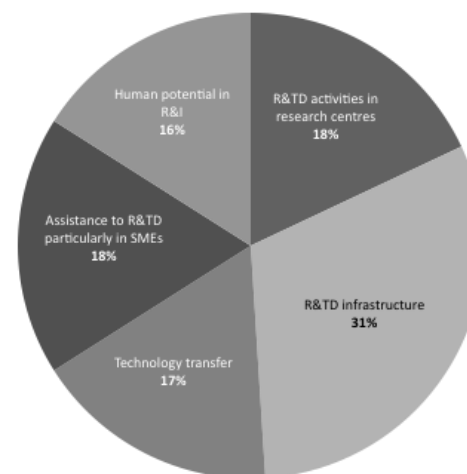
Core RTDI allocations are divided into five main categories: (i) *R&TD activities in research centres*; (ii) *R&TD infrastructure and centres of competence in a specific technology*; (iii) *technology transfer and improvement of cooperation networks*; (iv) *assistance to R&TD particularly in SMEs*; and (v) *Developing the human potential in the field of research and innovation in particular through postgraduate studies*. Each of these categories represents about 2% of total SF allocations, with the exception of *R&TD infrastructure and centres of compe-*

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tence in a specific technology that accounted for 3%. *Technology transfer and improvement of cooperation networks* had the same percentage share of total SF when compared with 2000-2006 but the absolute amount increased from €3.2 billion in 2000-2006 to €5.5 billion in 2007-2013. The relative and absolute allocations of total SF expenditure to *R&TD infrastructure* increased from 2% and €2.8 billion in 2000-2006 to 3% and €9.6 billion in 2007-2013.

Figure 24 presents core RTDI allocations within the five thematic categories. The leading category is *R&TD infrastructure and centres of competence in a specific technology* with 31% of total allocations to core RTDI, followed by *R&TD activities in research centres* and *assistance to R&TD particularly in SMEs* (both with 18% each), *technology transfer and improvement of cooperation networks* (17%), and *Developing the human potential in the field of research and innovation in particular through post-graduate studies* (16%).

Figure 24: Thematic focus of core RTDI allocations in the Programming Period 2007-2013



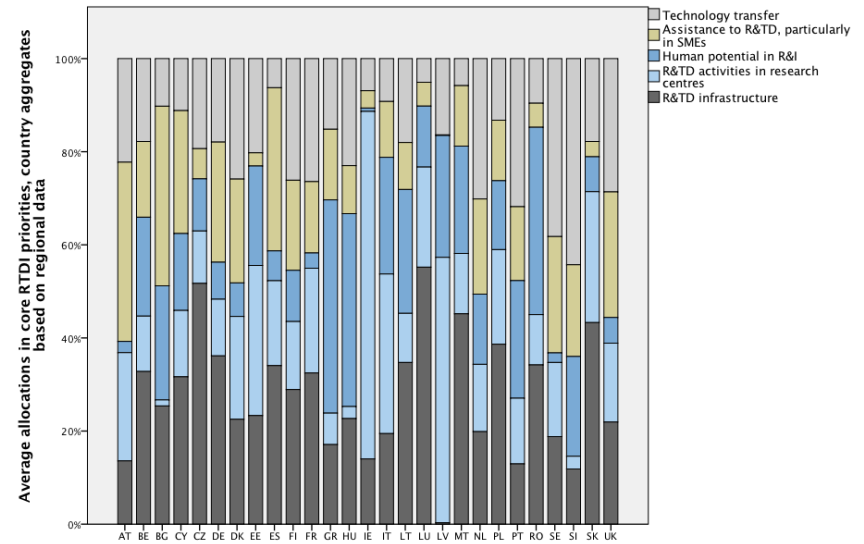
Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

When compared with 2000-2006, allocation distributions within the priorities in 2007-2013 are similar with the exception of *R&TD infrastructure* that has been given a slightly higher priority in 2007-2013 (1% more than in 2000-06).

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In terms of the average share of thematic priorities per country (Figure 25) Belgium, the Czech Republic, Finland, France, Lithuania, Luxembourg, Poland and Slovakia, focus mainly on R&TD infrastructure and centres of competence in a specific technology, In contrast, Portuguese and Dutch programmes focused on technology transfer and improvement of cooperation networks; Greece Hungary and Romania, prioritised Human potential in the field of research and innovation through post-graduate studies; whereas assistance to R&TD for SMEs was a main focus in, Austria, Bulgaria and Spain.

Figure 25: Average core RTDI allocations in the Programming Period 2007-2013, percentage of total



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Support for business innovation from SF allocations

Compared to the 2000-2006 period, the allocated share of SF budgets going to business innovation has doubled to reach €38.5 billion or 11% of the total SF budget in 2007-2013. Business innovation is defined by the following categories for 2007-2013: (i) Investment in firms directly linked to research and innovation; (ii) Advanced support services for firms and groups of firms; (iii) Services and applications for SMEs (e-commerce, education and training, networking, etc.); (iv) Other measures to stimulate research and innovation and entrepreneurship in SMEs; (v) Assistance to SMEs for the promotion of environmentally-friendly products and production processes; and (vi) Other investment in firms.

The thematic focus of business innovation allocations in 2007-13 is presented in Figure 26. The top priorities were: Other investment in firms (a rather general category that could include investment of all types, including physical capital that may or may not be innovative) with 36% of all allocations; Investment in firms directly linked to research and innovation with 23% and Other

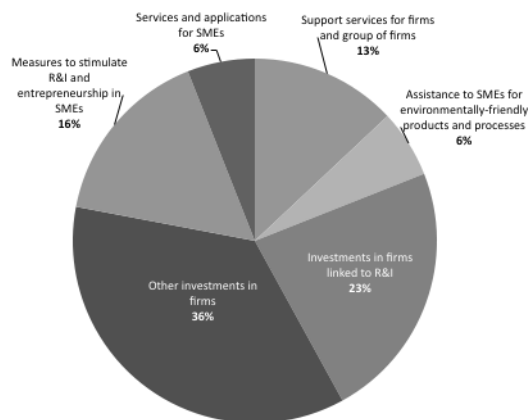
measures to stimulate research and innovation and entrepreneurship in SMEs with 16%.

When compared to expenditure in 2000-2006, the share of funding going to Assistance to SMEs for the promotion of environmentally-friendly products and production processes increased by 1% despite only focusing on SMEs in 2007-2013. The share allocated to Services and applications for SMEs remained unchanged at 5% compared to the previous period.

⁵ Two of these categories are comparable to the business innovation FOIs for 2000-2006: FOI 162 - Assistance to SMEs for the promotion of environmentally-friendly products and production processes (although the target was both SMEs and large businesses in 2000-2006); and FOI 324 - Services and applications for SMEs.

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Figure 26: Thematic priorities of business innovation allocations in the Programming Period 2007-2013



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

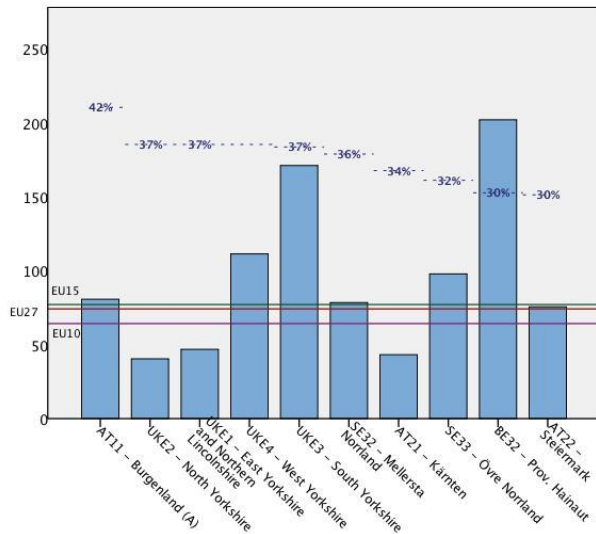
As it can be seen from Figure 27, the top 10 regions in terms of the share of SF allocated to business innovation in 2007-13 have changed completely compared to 2006-13. Burgenland (A) (AT11) is now the region with the highest share of business innovation funding in the EU27. All of the top 10 come from only four Member States of the EU15 (Austria, Belgium, Sweden and the UK), eight are RCE regions while the remaining two,

Burgenland (A) (AT11) and Prov. Hainaut (BE32), are transition regions.

EU15 regions spent an average of 15% on business innovation, similar to 2000-2006, while EU10 regions spent 13%, an increase from about 9% in 2000-2006. However, in absolute terms, EU10 regions are allocating considerably more on average €314m, compared to €106m in EU15 regions. This represents a major adjustment with respect to 2000-2006, when EU15 regions spent around three times more than EU10 regions (€88 million and €27 million, respectively).

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Figure 27: Business innovation funding in the SF, 2007-13, top 10 regions



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Figure 28 maps NUTS 2 regions based on average annual per capita expenditures on business innovation. Região Autónoma dos Açores (PT20)⁶ is the top region

⁶ This region is not represented graphically in Figure 28.

with an average annual subsidy of €136 per inhabitant; a considerable increase from the period 2000-2006, when the top region spent €45 per inhabitant (*Região Autónoma da Madeira*). All three top regions are Portuguese, as the Azores are followed by *Alentejo* (PT18) and *Norte* (PT11) with expenditures equal to €79 and €55 respectively. In the 2000-2006 period, the top regions for per capita investment on business innovation were mainly Spanish. In total, only 9 regions allocated more than €50 per capita on average annually to business innovation.

Portuguese regions allocated the highest average annual per capita grants to business innovation, equalling €52 per inhabitant (double the investment rate of the top regions, from Greece, in the 2000-2006 period); followed by Hungary (€43), Greece and Poland (both with annual average allocation of €30).

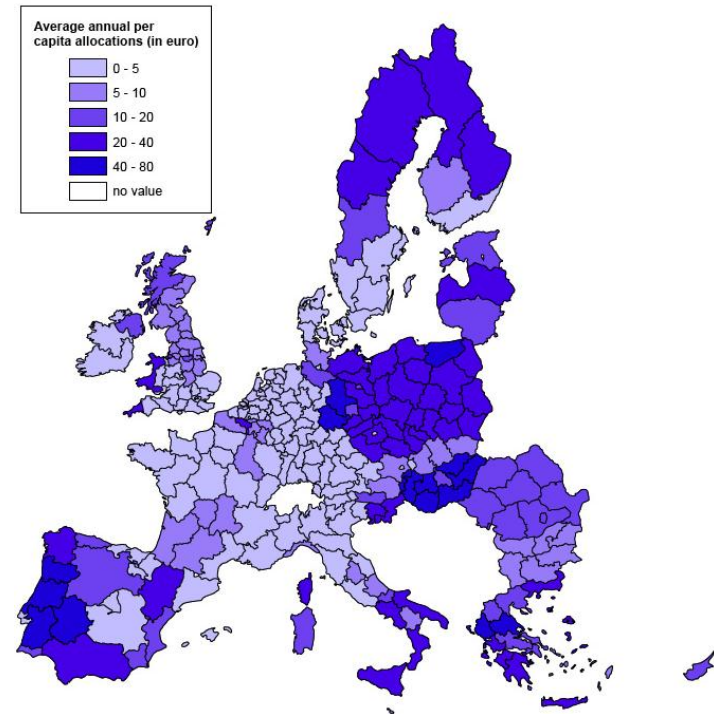
EU10 regions invested considerably more on an average annual per capita basis for business innovation than EU15 regions: €26 and €11 respectively (Romania and Bulgaria €10). This represents a complete reversal of position shift of compared with the 2000-2006 period, when EU15 regions spent almost the double than EU10 regions (€9 and €5 respectively).

Convergence regions allocated on average €29 compared to €5 in RCE regions; representing more than a doubling for Convergence regions compared to 2000-06 (€13

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spent by Objective 1 regions); while no change is shown on average annual allocations for RCE regions compared with expenditures in 2000-06.

Figure 28: Average annual per capita (NUTS2) SF allocations (ERDF ESF) to business innovation in 2007-2013, euro per



inhabitant

Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Comparing RTDI allocations and expenditure between the programming periods 2000-2006 and 2007-2013

This section analyses differences in expenditure patterns in 2000-2006 compared to allocations to RTDI in 2007-2013. RTDI is the sum of core RTDI and business innovation, which gives a complete view of the use of SF in support of the knowledge economy.

Figure 29 shows the average share per country of RTDI allocations as a percentage of all SF in 2000-06 and 2007-13. During 2007-2013, Slovenia has the largest average share allocated to RTDI (41% of the SF budget) followed by Finland (37%), Austria (37%), Sweden (34%) and Denmark (34%). Compared to the top countries for 2000-2006, the UK has dropped out of the top 5 ‘SF RTDI spenders’ to be replaced by Slovenia; despite increasing the share of RTDI spending from 25% to 32%.

Considering the way patterns of expenditure have changed between the two periods, most EU10 regions show large percentage increases. Slovenia is the most dramatic example with an increase from 12% to 41%. Other Member States with notable increases between the two periods are Latvia (increase of 19 percentage points), Slovakia (19 points), Luxembourg (18 points),

the Netherlands (17 points) and Portugal (15 percentage points). Only Finnish regions show a decrease, from 42% to 37%; remaining, nevertheless, Finland second in the EU27 in terms of the share of SF allocated to RTDI in 2007-13.

Figure 30 shows the percentage increase in RTDI expenditure as a share of all SF expenditures in 2000-2006 compared to allocations to RTDI as a share of total SF budgets in 2007-2013. It shows the increase or decrease in shares at the regional level compared with the averages for the EU15, EU127 and the EU27. Regions located above zero have increase the share of RTDI between the two periods; whereas the share of RTDI decreased for regions below zero. On average, EU12 regions increase the share of RTDI by 12 percentage points; while, in contrast, EU15 regions only increased the by about 8 percentage points. Luxembourg, Latvia and regions in the Netherlands, Portugal, Slovenia and Slovakia registered particularly high increased shares to RTDI compared to the EU15 and EU10 average.

The regions with the highest percentage increases in RTDI spending between the two periods are Cantabria (ES13), followed by *Kärnten* (AT21), *Bratislavský kraj*

⁷ Data for Bulgaria and Romania are only available for the period 2007-2013 as they were not yet members of the EU prior to the current programming period.

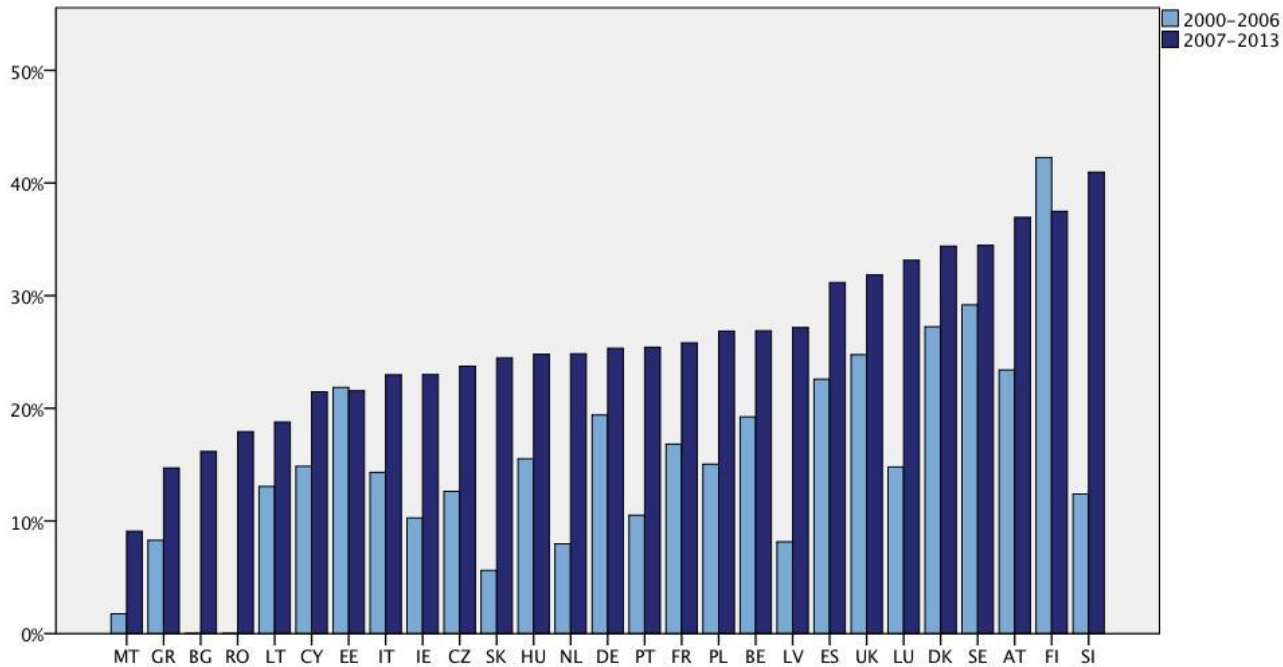
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(SK01) and *Corse* (FR83); all of which are RCE regions in 2007-2013. Compared to the EU27 average increase of 9 percent, there are some regions with large percentage decreases such as *Cataluña* (ES51) with a decrease of 17 percentage points; *Île de France* (FR10) drop of 13 percentage points; *Provincia Autonoma Bolzano/Bozen* (ITD1) (-15 percentage points-; *Stockholm* (SE11) (-26 percentage points); and *East Anglia* (UKH1) (-12 percentage points). Interestingly, the regions of *Cataluña* (ES51), *Provincia Autonoma Bolzano/Bozen* (ITD1) and *Stockholm* (SE11) were outlier regions in business innovation expenditure in the period 2000-2006, and thus the considerable decrease in RTDI shares between the periods 2000-2006 and 2007-2013 may represent a 'saturation' of RTDI capacity. Additionally, all of these regions were already Objective 2 regions in 2000-2006.

Overall, Convergence regions increased their share of RTDI in SF budgets on average by 12% compared to 8 percentage points for RCE regions. Given that in absolute terms, the majority of funds are allocated to the former, the SF could be considered to be making a major financial contribution to closing the 'innovation gap' between advanced and less-developed regions.

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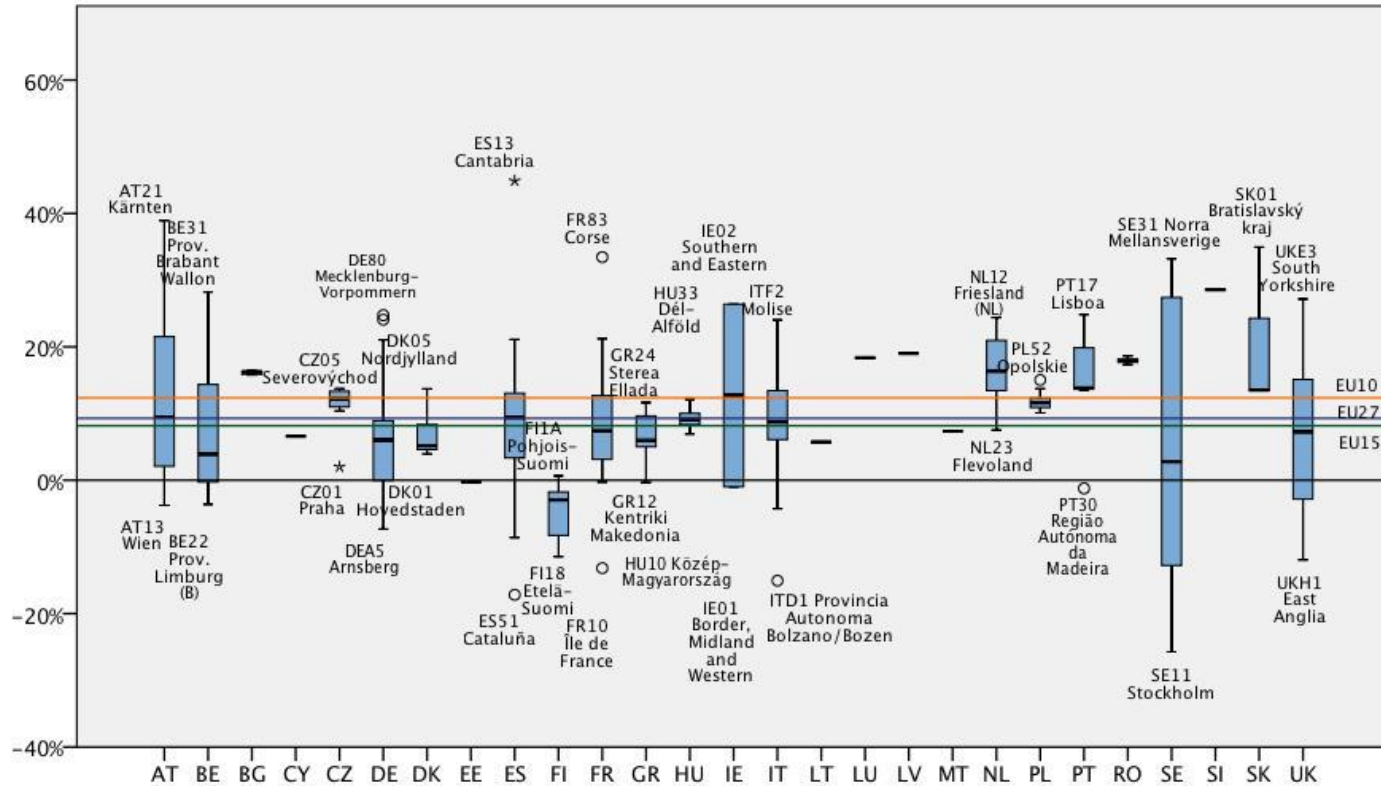
Figure 29: Average shares in RTDI as a percentage of all SF expenditure/allocations, 2000-2006 and 2007-2013



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

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Figure 30: Increase in shares between RTDI expenditure as a percentage of all Structural Fund expenditures in 2000-2006 vs. allocations to RTDI in 2007-2013



Source: Data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

IV SF expenditures on RTDI investments and performance

This chapter examines if there are visible causal effects of the investment on RTDI through the Structural Funds on regional performance. This is done by looking first at SF and gross expenditure on R&D (GERD); and then considering the effects observable at the level of innovation activities of enterprises.

Structural Funds expenditure on RTDI and regional gross expenditures on R&D

The potential scale of impact of SFs investment can be estimated by considering the relative importance of SFs as a source of investment on RTDI at the regional level. A possible approach is to look at the proportion of SFs investments on core RTDI relative to GERD. GERD is defined by the OECD (2002) as *the total intramural expenditure on R&D performed in a territory during a given period*. An adapted version of core RTDI that excludes “*innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes*” is used for this analysis⁸.

⁸ The FOI “*Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes*” (Programming Period 2000-2006) was excluded from

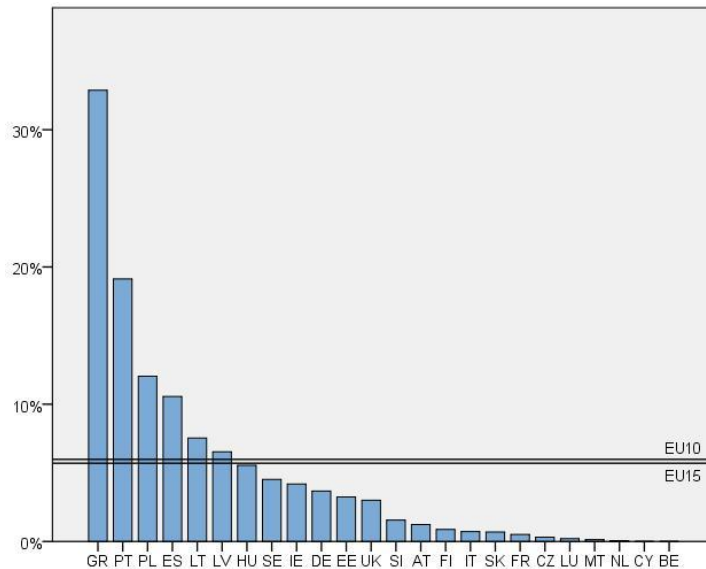
Figure 31 presents the SFs expenditures for 2000-2006 to core RTDI (excluding technology transfer) as a percentage of GERD in the same period at the country level.

On average, in the EU25, SF spending on core RTDI as a percentage of GERD was the highest in Greek regions at 33%; followed by Portugal (19%), Poland (12%) and Spain (11%). These were the only countries where SFs core RTDI funding represented more than 10% of GERD. This suggests the important role of SFs in these regions as a lever for RTDI investment. Other countries above the EU25 average of 6% were Lithuania (8%) and Latvia (7%).

the analysis, because the interpretation of the authors is that the category is beyond the scope of what GERD comprises when following the Frascati definitions (2002). Including this would lead to an over-estimation of the role of SFs in GERD.

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Figure 31: Structural Funds expenditures in core RTDI as a percentage of GERD in the region, country averages: Programming Period 2000-2006



Source: Eurostat and data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

During 2000-2006, the region of *Voreio Aigaio* (GR41) had the highest ratio of SFs expenditures on core RTDI

relative to regional GERD at 69%. The region spent around €15 million on core RTDI (excluding technology transfers) through Structural Funds, while the regional GERD for the period was about €22 million. Other top regions are *Ionia Nisia* (GR22) with a proportion of 68%, *Cornwall and Isles of Scilly* (UKK3) and *Dytiki Makedonia*(GR13) with 64%.

The top 55 regions with the largest proportions were Objective 1 regions during 2000-2006, with the exception of *Övre Norrland* (SE33) and *Mellersta Norrland* (SE32) that had Objective 1 and Objective 2 areas. Nineteen of these 55 regions increased their performance between both periods: nine of these regions became RCE regions in the period 2007-2013; while another 10 regions became ‘transition’ regions.

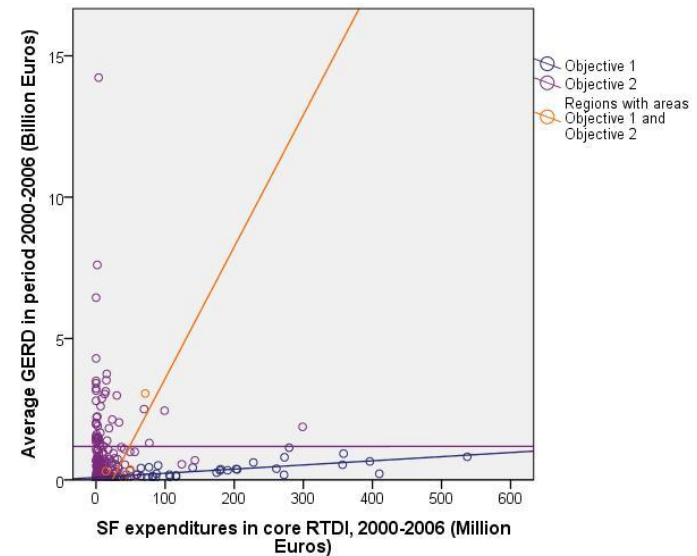
On average, the ratio of core RTDI through SF to GERD was 5.9% for EU10 regions and 5.6% for EU15 regions. However, the SF are a much more important source of support for GERD in the Objective 1 regions than in the Objective 2 regions: 13% and 0.5% respectively.

Figure 32 shows the relationship between SF expenditures in core RTDI and regional GERD for the period 2000-2006. An interesting feature is that Objective 2 regions have relatively homogenous values of GERD and also spent relatively little on core RTDI through the SFs compared to Objective 1 regions. The latter, in contrast

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have lower levels of GERD and more varied and high expenditures on core RTDI through the SF. The relationship between the two variables is stronger in regions with Objective 1 and Objective 2 areas and slightly weaker for Objective 2 regions. There is almost no relationship between the two variables in Objective 1 regions.

Figure 32: Structural Fund expenditures in core RTDI vs. GERD, 2000-2006



Source: Eurostat and data warehouse Directorate General Regional Policy European Commission (December 2009), Regional estimates by Unit C3 DG REGIO; data analysis by Technopolis Group.

Structural Funds expenditure on RTDI and human resources for science and technology

It has been estimated that if the objectives set initially by the Lisbon Agenda, and now reaffirmed in the Europe 2020 strategy of boosting investment in R&D to 3% of GDP are to be met, there is a need for corresponding increase in the number of people with scientific and technological qualifications.

The potential contribution of SF funding allocated to RTDI to improving the availability (head-count) of Human Resources employed in Science and Technology occupations (HRSTC) is clearly difficult to measure directly. However, it is worthwhile exploring trends in HRSTC compared to SFs budgets for specific human capital RTDI related FOI: *Training for researchers*; and *Developing the human potential in the field of research and innovation, in particular through post-graduate studies*. As training, attracting and retaining new S&T personnel also requires investment in RTDI infrastructure and a dynamic business innovation framework, the analysis is run at the level of the values of extended RTDI.

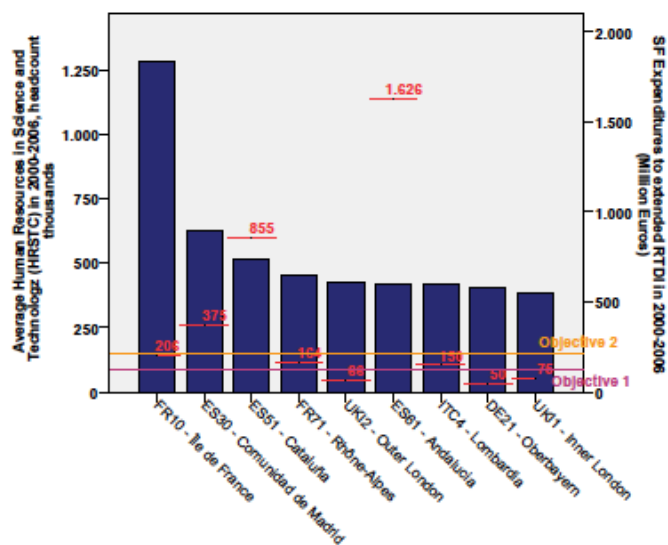
Figure 33 displays the top 10 ranked regions according to the average number of HRSTC between 2000-2006. All of the top regions are Objective 2 regions, with the exception of *Andalucia* (ES61). The second axe of the

figure (right side) shows the total SF expenditures to extended RTDI in 2000-2006. *Île de France* (FR10) has the highest average number of HRSTC.

There are important gaps between the average number of HRSTC in Objective 1 and Objective 2 regions. While Objective 1 regions have on average 89000 HRSTC; Objective 2 regions have 147000.

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Figure 33: Average Human Resources in Science and Technology (HRSTC) in 2000-2006, top 10 regions



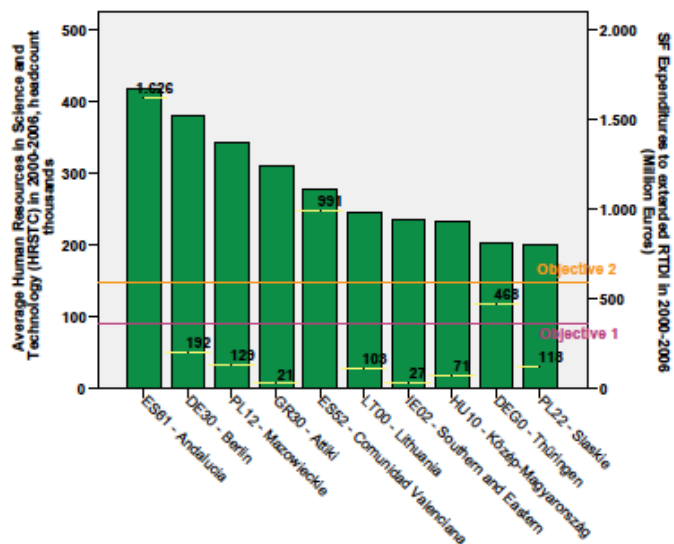
Source: DG Research Regional Key Figures Database (based on Eurostat) and data warehouse DG Regional Policy (December 2009); data analysis by Technopolis Group.

Figure 34 shows the top ten Objective 1 and regions with Objective 1 and Objective 2 areas according to the average number of HRSTC in the period 2000-2006. *Andalucia* (ES61) has the highest average absolute number of HRSTC, 419,000, and is also the region with the highest expenditure in extended RTDI among the top 10 ranked

regions. The concerted investment in RTDI in a ‘lagging’ region such as *Andalucia* clearly leads to quantitative shifts in human resource potential for S&T. However, further research on the link between SF RTDI expenditure and human resource indicators would be welcome.

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Figure 34: Average Human Resources in Science and Technology (HRSTC) in 2000-2006, top 10 Objective 1 and regions with Objective 1 and Objective 2 areas



Source: DG Research Regional Key Figures Database (based on Eurostat) and data warehouse DG Regional Policy (December 2009); data analysis by Technopolis Group.

Structural Funds expenditures on RTDI and patenting as a proxy for outcomes of innovation activity

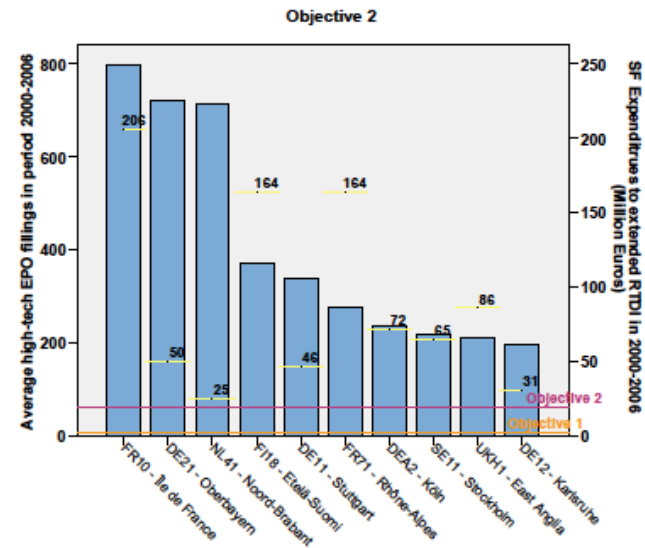
This subsection looks at the relationship between SF expenditures and allocations on RTDI and the output of innovation through the analysis of patenting activity. Patents are measured through average high-tech filings to the European Patent Office (EPO) in the period 2000-2006. Data was not available for 2007 onwards, which makes it impossible to do a comparison of the two programming periods or the effect of the first programming period on the second.

Figure 35 shows the top 10 ranked regions, all of which are Objective 2, according to the average number of high-tech EPO filings in the period 2000-2006. As a reference, a second axe (right side of the figure) shows the total SF expenditures to extended RTDI in 2000-2006 (including business innovation). The top 10 regions are from six EU15 countries: France, Germany, the Netherlands, Finland, Sweden and the UK. As expected, there is a significant gap between the number of filings in Objective 1 (an average of 6 high-tech EPO applications) and Objective 2 regions (62). Moreover, all of the top 10 regions are considerably above the Objective 2 average of high-tech EPO filings.

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Île de France (FR10) is the region with the highest number of high-tech EPO filings in the EU25, with a total average of 797 filings. This region is also the region with the largest SF expenditure on extended RTDI amongst the top 10 regions; followed closely by *Oberbayern* (DE21), with 722 filings; and *Noord-Brabant* (NL41) with 714 filings. These two regions had low absolute SF expenditures on extended RTDI: €50m and €25m respectively. Four out of the top 10 regions are German: *Oberbayern* (DE21), *Stuttgart* (DE11), *Köln* (DEA2) and *Karlsruhe* (DE12), which spent relatively low shares of SF on extended core RTDI compared with the other top regions.

Figure 35: Average high-tech EPO filings vs. SF expenditures to extended RTDI (million euro), 2000-06, top 10 regions (Objective 2)



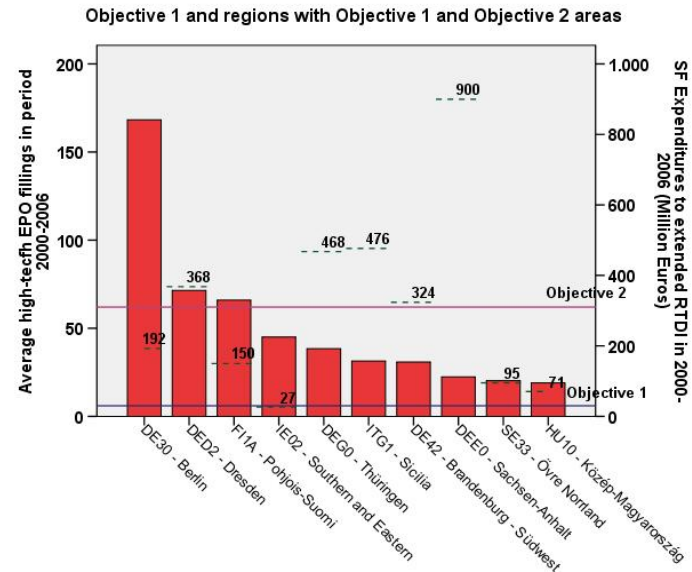
Source: DG Research Regional Key Figures Database (based on Eurostat) and data warehouse DG Regional Policy European Commission (December 2009); data analysis by Technopolis Group.

Figure 36 shows the top ten Objective 1 (and mixed Objective 1 and 2) regions according to the number of high-tech EPO filings during 2000-2006. Berlin (DE30) with 168, is followed by Dresden (DED2) with 71 and Poh-

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jois-Suomi (FI1A) with 66 are the only three regions in the ranking with a number of high-tech EPO filings above the average for Objective 1 regions. However, these top three regions have also relatively low values of SF RTDI expenditure when compared with the other top 10 regions.

Figure 36: Average high-tech EPO fillings vs. SF expenditures to extended RTDI in 2000-2006 (million euro), top 10 regions Objective 1 and regions with Objective 1 and Objective 2 areas



Source: DG Research Regional Key Figures Database (based on Eurostat) and data warehouse DG Regional Policy European Commission (December 2009); data analysis by Technopolis Group.

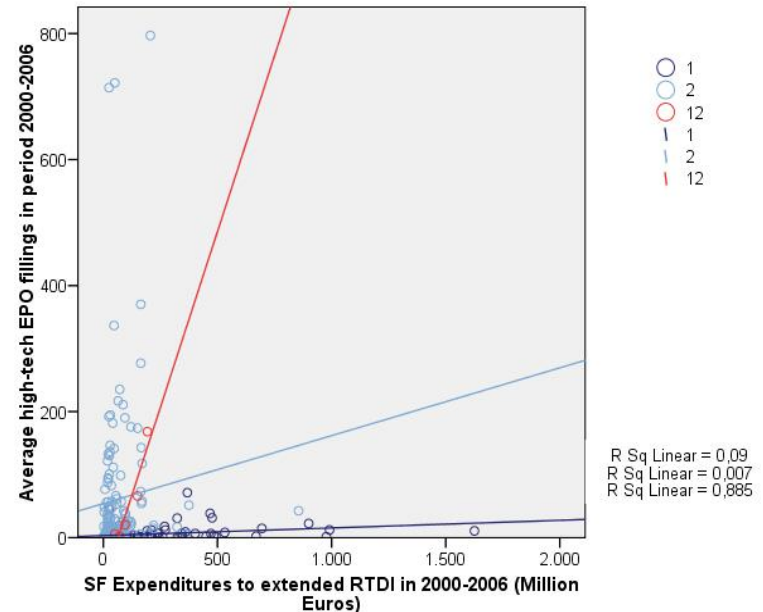
In the top 10, *Sachsen-Anhalt* (DEE0) has the highest absolute SF expenditures to extended RTDI of €900m. Out of the top 10 regions, the regions of *Berlin* (DE30),

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Pohjois-Suomi (FI1A), *Övre Norrland (SE33)* had both Objective 1 and Objective 2 areas.

It interesting to examine if there is any correlation between SF spending on extended RTDI and the average number of high-tech EPO filings at regional level. However, Figure 37, there is at best only a very weak relationship for Objective 1 regions, although in Objective 2 regions the relationship between the two variables is stronger. The relationship is more positive and stronger in the case of regions with both Objective 1 and Objective 2 areas.

Figure 37: Correlation between expenditures to extended RTDI and average high-tech EPO filings in 2000-2006



Source: DG Research Regional Key Figures Database (based on Eurostat) and data warehouse DG Regional Policy (December 2009); data analysis by Technopolis Group.

This result suggest that Objective 2 regions may be more likely to capitalise on SFs expenditures on core RTDI and business innovation to the benefit of the innovation activity of high-tech enterprises.

V Strategic coordination and synergies of SF spending with other major EU and national programmes

This section analyses the relationships between SFs at the regional level and other EU programmes, with a particular focus on the Fifth, Sixth and Seventh EU Framework Programmes for Research and Technological Development (FP5, FP6, FP7) and the FP's financial contribution to research activities at the regional level.

The total EU financial contribution to eligible countries in FP5 amounted to €12.7 billion and 15.5 billion under FP6. In the first two calls of FP7⁹, the EU awarded grants worth €11.1 billion. The EU27 accounted for 95%, 92% and 98% respectively of funding.

EU15 regions received an average of €55.8 million from FP5 and €59.3 million from FP6, compared to €33.5 million for EU10 from FP5 and €13.5 million under FP6. The significant reduction in average grants received per regions is due to a considerable increase in the number of EU10 regions between the two FP. While in FP5 there were only 12 EU10 regions participating, this number increased to 50 under FP6. In the first two calls of FP7

⁹ The data used here is based on an extraction from the eCorda database of DG Research carried out on 15/10/2009.

the EU15 regions received €51.3m on average compared to €11.5m for the EU10.

Objective 1 regions received €2.1 billion in FP5 and €2.2 billion in FP6, in comparison to €10 billion received by Objective 2 regions in FP5 and €12 billion under FP6. The first two FP7 calls awarded €801m to Convergence regions and €10 billion to RCE regions.

Figure 38 shows the total financial contributions of FP5, FP6 and FP7 based on data at NUTS 2 level. The top part of the figure shows the breakdown of FP funds in EU15, EU10 and EU27 regions. There are no major changes in the allocation of funds between the three FP. Regions in the EU15 received most of the grants and their shares of total EC grants remained stable at around 95%-96%. Their share initially decreased between FP5 and FP6, but remained stable between FP6 and FP7.

The bottom part of the figure shows the breakdown of total financial contributions to Objective 1 and Objective 2 regions in FP5 and FP6, and between RCE regions and Convergence regions in FP7. The shares of Objective 1 regions slightly decreased between FP5 and FP6 from 17% to 14%. In FP7, convergence regions received only about 7% of all EC grants. In contrast, the share of Objective 2 regions increased from 82% to 84% between FP5 and FP6 and under FP7, RCE regions were granted 90% of all funds.

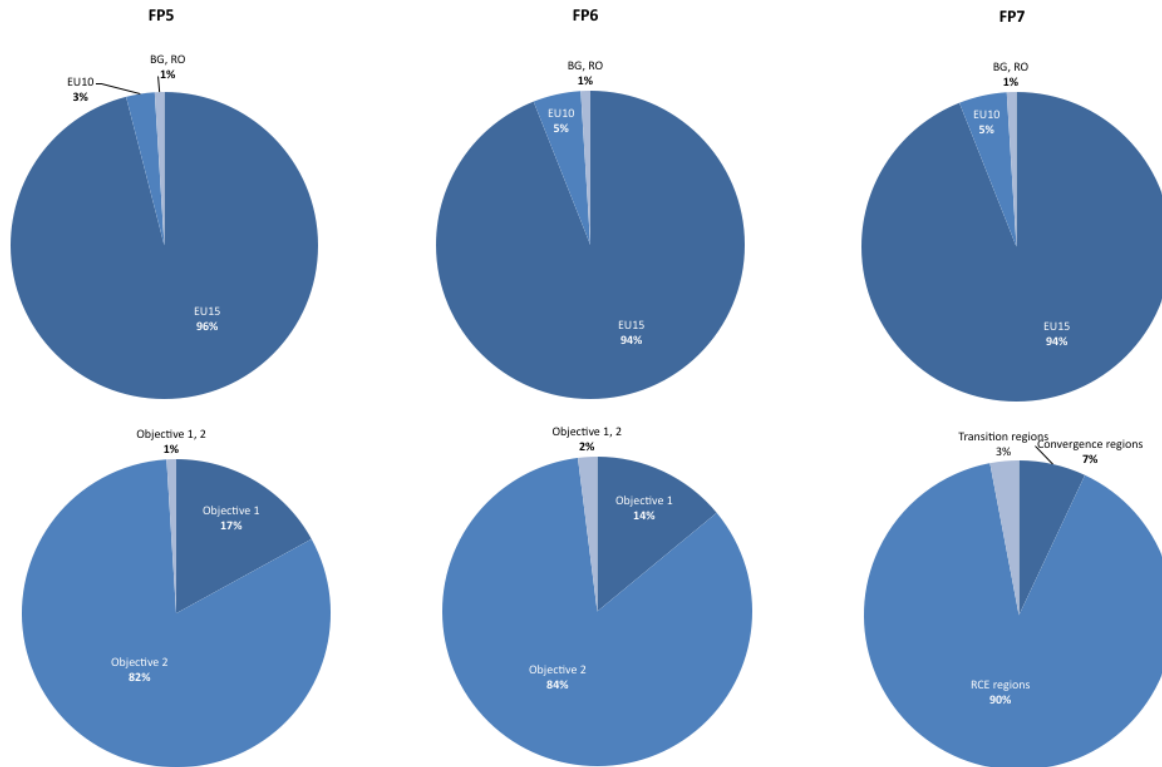
Structural Funds for RTDI

Figure 39, Figure 40 and Figure 41 show the top regions in receipt of FP funds: *Île de France* (FR10) received the highest EC contributions under the three FPs, increasing its participation in terms of shares of all funds from 8% in FP5 to 10% in FP7 (equalling €1 billion in FP5 and €1.1 billion in FP7). Along with the Paris region, the top three regions in terms of funding received remains the same across FPs, with *Oberbayern* (DE21) in second place, followed by *Greater London* (UKI1, UKI2) (FP5) and *Inner London* (UKI1) (FP6 and FP7).

In contrast, *Attiki* (GR30), which was in 4th position under FP5, fell to the 15th position in FP6 and 14th in FP7. Other regions that lost leading positions under FP5 are *Murcia* (ES62) and *East Anglia* (UKH1). In contrast, regions that increased their participation across FPs are *Etelä-Suomi* (FI18) and *Berkshire, Bucks and Oxfordshire* (UKJ1). Regions that remained consistently in the top 10 across FPs are *Lazio* (ITE4), *Lombardia* (ITC4) and *Köln* (DEA2).

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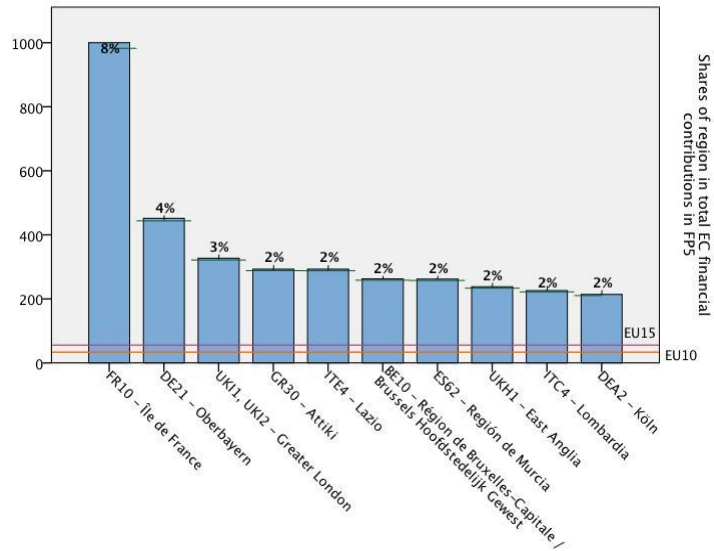
Figure 38: Comparative of EC total financial contributions in FP5, FP6 and FP7 (breakdown of totals)



Source: For FP5 and FP6 data, DG Research, Regional estimates and data analysis by Technopolis Group. For FP7 data DG Research Regional Key Figures Database (based on E-CORDA database)

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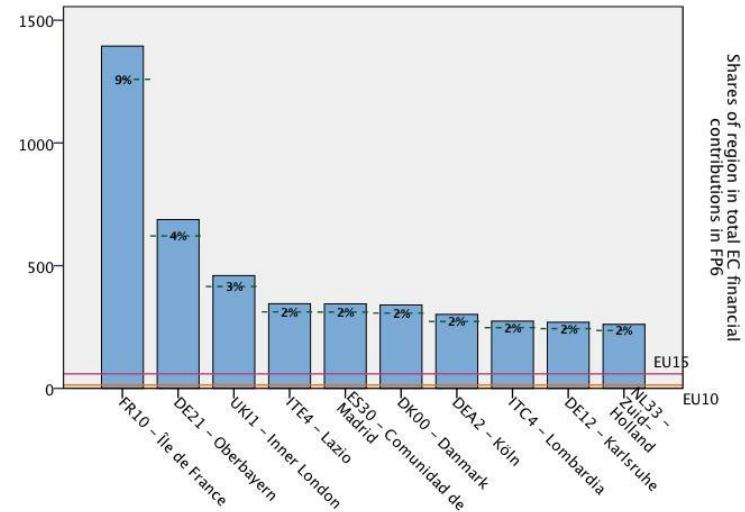
Figure 39: EU total financial contribution FP5 (million euro), top 10 regions



Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

It is also noteworthy that, with the exception of the regions of *Attiki* (GR30) and *Región de Murcia* (ES62) in FP5, all of the top regions are Objective 2 regions (2000-06) or RCE regions (2007-13).

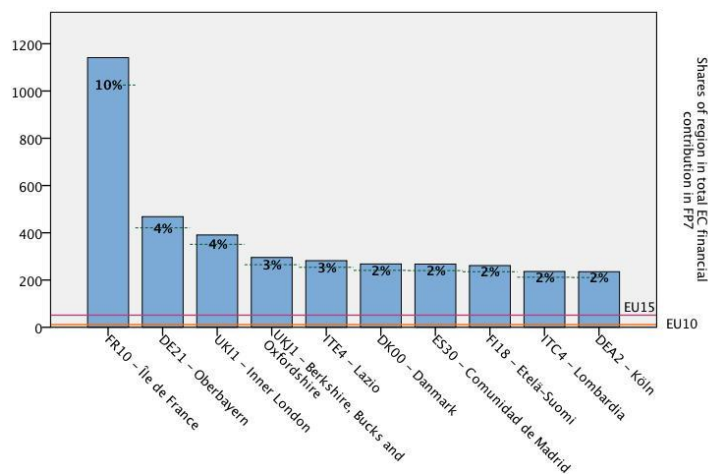
Figure 40: EU total financial contribution FP6 (million euro), top 10 regions



Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

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Figure 41: EC total financial contributions in FP7 (Million Euros), top 10 regions



Source: DG Research Regional Key Figures Database (based on E-CORDA database).

Figure 42 shows the top 10 Objective 1¹⁰, transition and convergence regions in terms of FP funds received. *Atti-*

¹⁰ Three regions in the top 10 received Objective 1 transitional support in the 2000-2006 period: (east) Berlin, Southern and Eastern Ireland, and Lisboa. Two other regions, Attiki (GR30) and Kentriki Makedonia (GR12) received Convergence transitional support in the 2007-2013 period.

ki(GR30) is by far the largest recipient of FP funds across all three programmes receiving: €293m under FP5; €231m under FP6 and €204m from the first two calls of FP7.

The top Objective 1 regions vary across FPs and change considerably under FP7; this may be due leading Objective 1 regions becoming RCE regions in the 2007-2013 period and thus leaving the ranking. Examples include *Berlin* (DE30), *Lisboa* (PT17), *Comunidad Valenciana* (ES52) and *South Yorkshire* (UKE3). In contrast, regions that are new to the ranking in FP7 are *Mazowieckie* (PL12), *Dresden* (DED2), *Estonia* (EE00) and *Thuringen* (DEG0). The only region that remained consistently in the top 10 across FPs is *Kriti* (GR43).

Figure 43 maps the EU's total financial contributions under FP5 at NUTS 2 level¹¹. As noted above, the *Île de France* (FR10) was the largest recipient of FP5 funds in the EU27, followed by *Oberbayern* (DE21) and *Greater London* (UK55). These regions received grants equalling €1 billion, €451m and €327m respectively. Denmark received on average €342 million, by far the highest average share under FP5; followed by Ireland and Finland with an average of €145 million and €137 million respectively.

¹¹ Regional data is in orange, while national data that could not be distributed statistically at the regional level is in light green.

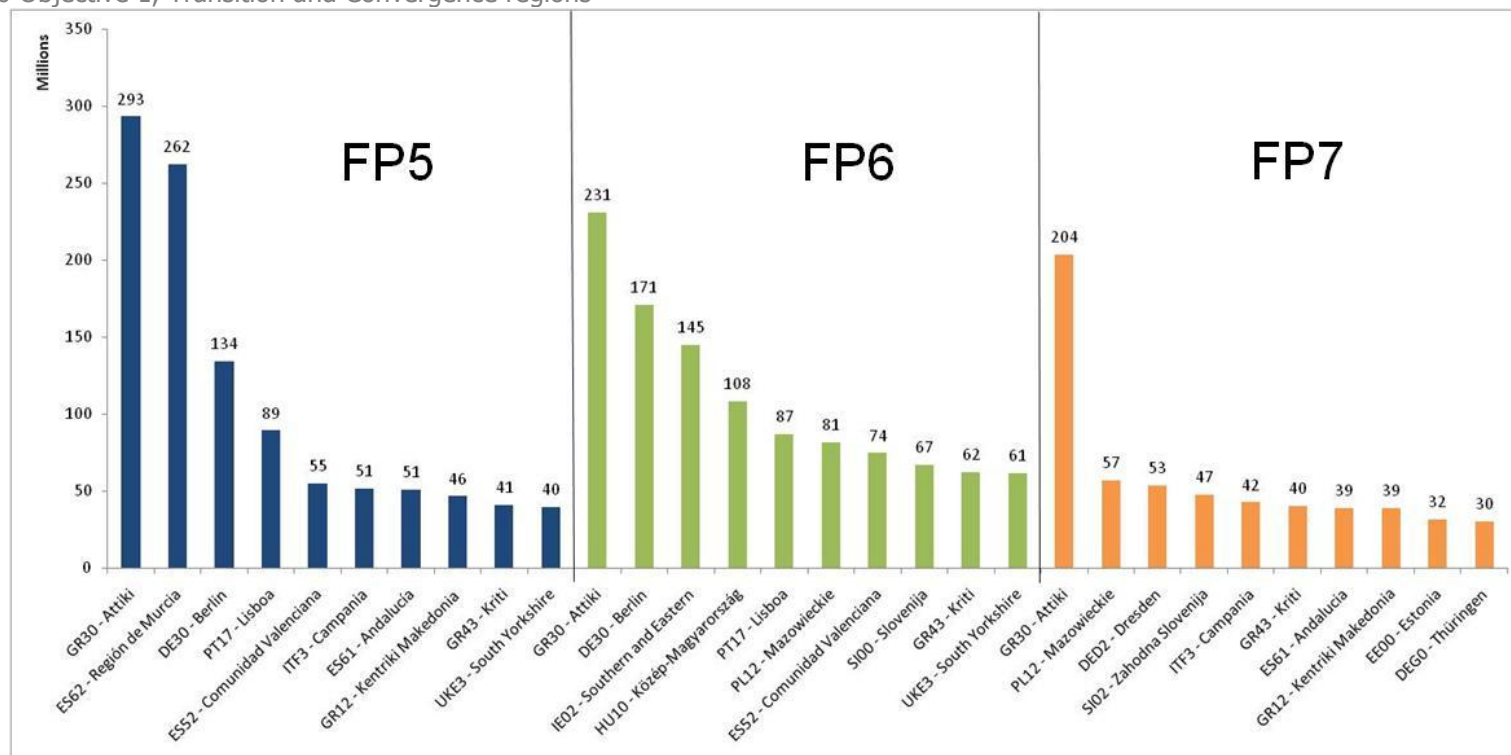
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At the country level, there are some clear outliers, which have the common feature of being large or capital cities. In the Netherlands, Sweden, Italy and the UK, there were major regional variations in terms of FP grants received. Amongst the EU10, only Hungary and Poland had an average regional funding above the EU27 average.

Figure 44 shows the European Commission's total financial contributions to NUTS 2 regions under FP6. *Île de France* (FR10), which received €1.4 billion under FP6, was excluded, as it is a considerable outlier when compared with the other EU27 regions.

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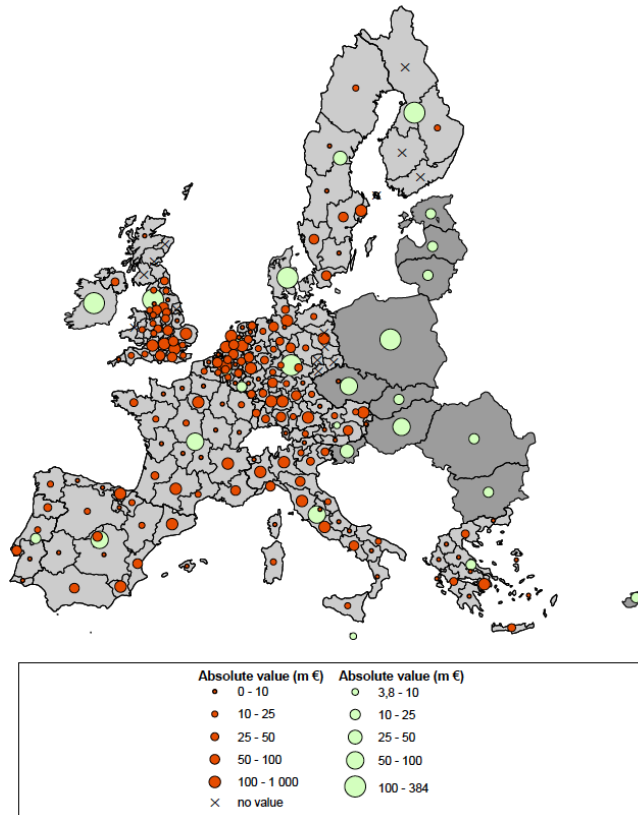
Figure 42: EU financial contribution - FP5, FP6, and FP7: top 10 Objective 1, Transition and Convergence regions



Source: For FP5 and FP6 data, DG Research European Commission, Regional estimates and data analysis by Technopolis Group. For FP7 data DG Research Regional Key Figures Database (based on E-CORDA)

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Figure 43: FP5 EU total financial contribution (million euro), NUTS 2 regions

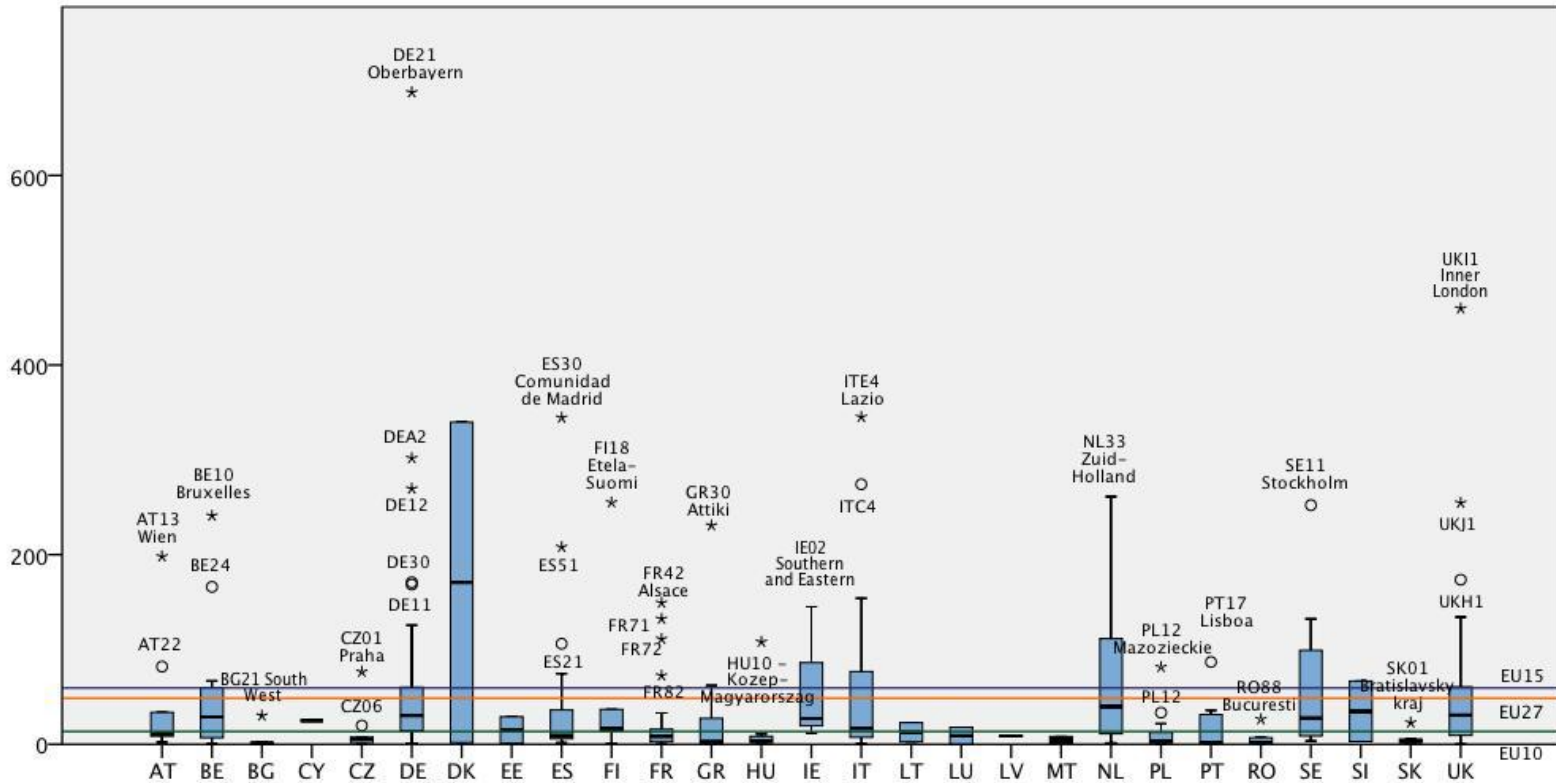


Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

The second placed region, Oberbayern (DE21) €698 million or about half as much as the Île de France (FR10). Denmark received €171 million, about 2% of all FP6 grants. The highest regional averages are in Denmark (€171 million), France, the Netherlands (both countries with an average of €76 million) and Sweden (€71 million). The outliers shown for each country in Figure 44 have the commonality of being capital and/or large cities. This is the case of Wien (AT13), Brussels-Capital (BE10), Oberbayern (DE21), Köln (DEA2), Karlsruhe (DE12), Berlin (DE30), Stuttgart (DE11), Comunidad de Madrid (ES30), Attiki (GR30), Lazio (ITE4), Lisboa (PT14), Stockholm (SE11), and Inner London (UKI1). Excluding the outliers, only the Netherlands, Italy, Germany and the UK show major regional differences in terms of FP grants received. This points to a regional specialisation of research activities. Bulgarian and Romanian regions have averages below the NMS average, but their outliers, *South West* (BG21) and *Bucaresti* (RO88), the capitals of both countries, received levels of funding from FP grants close to the EU27 average. Finally, Figure 45 shows the EC financial contributions per region in FP7. The top regions remains the same compared with the previous figures on participation in FP5 and FP6. Île de France (FR10) remains the largest recipient, with a total of €1.1 billion from the first two calls. The outlier regions and top regions remained mostly unchanged.

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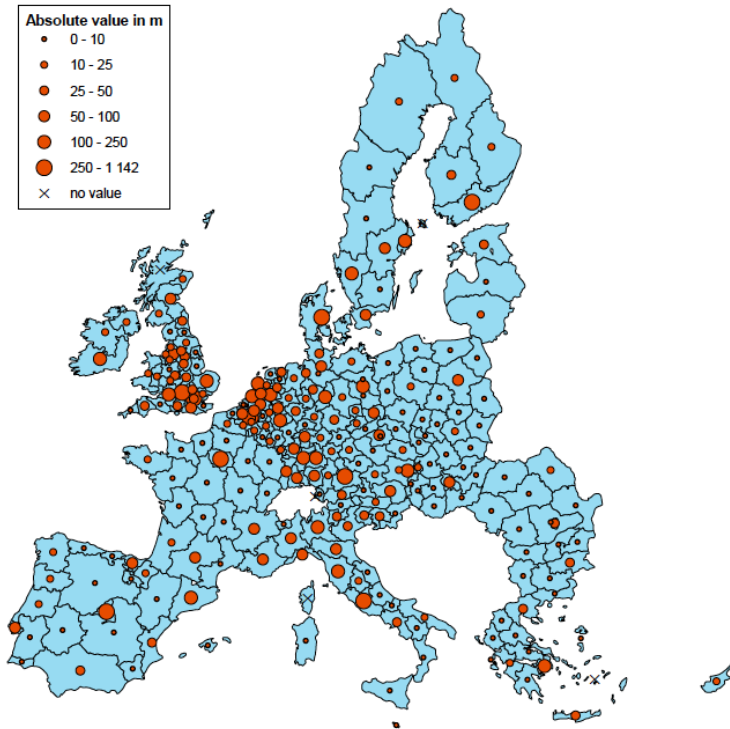
Figure 44: FP6 EU total financial contribution (million euro), NUTS 2 regions



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

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Figure 45: FP7 European Commission total financial contributions (Million Euros), NUTS 2 regions

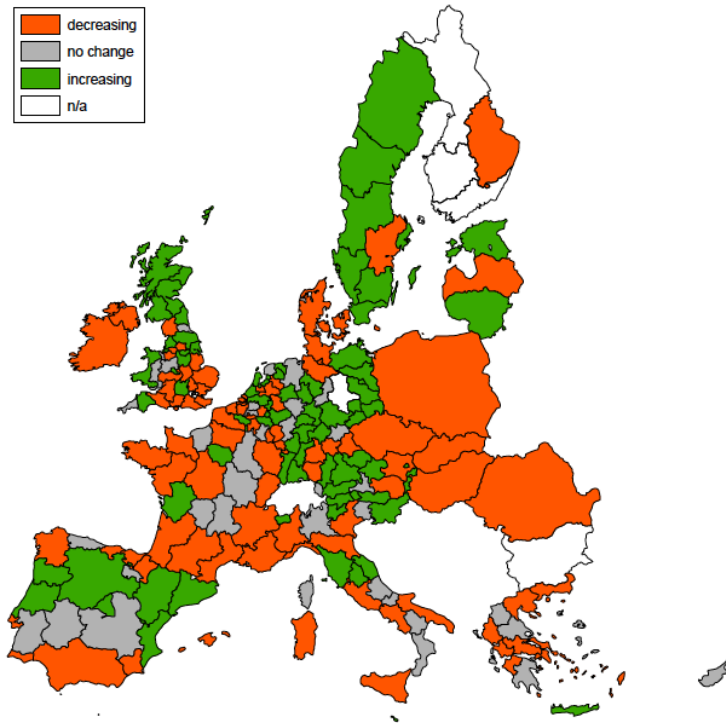


Source: DG Research Regional Key Figures Database (based on E-CORDA database)

Participation in FP7 is concentrated in regions in Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Sweden and the UK. The participation of EU10 regions remains low and generally below the EU27 average. Estonia has the highest EU10 regional average, with grants of €32m, followed by Slovenia with €27m and Cyprus with €20m. In order to understand the dynamics of regional funding patterns across FPs, Figure 46 and Figure 47 show the change in shares of regional participation between FP5 and FP6, and between FP6 and FP7 in percentage points. The changes are measured as an increase or decrease in the shares of the total EU financial contributions of a given region relative to total EU financial contributions for all regions per FP. As can be seen from Figure 46, regions increasing their participation between FP5 and FP6 are mainly from EU15 countries: Austria, France, Germany, Italy, Spain, Sweden and the UK. The top regional participations are also mainly large cities and capitals. Comunidad de Madrid (ES30) had the most important increase (1.8 percentage points), growing from €52m under FP5 to €344m in FP6. Other regions with considerable increases in participation are Île de France (FR10) with a 1.1 percentage point increase (from €1 billion in FP5 to €1.4 billion in FP6); Oberbayern (DE21) with 0.9 points (from €451m in FP5 to €688m in FP6); and Alsace (FR42) with a 0.7 percentage point increase (from €33m in FP5 to €149m in FP6).

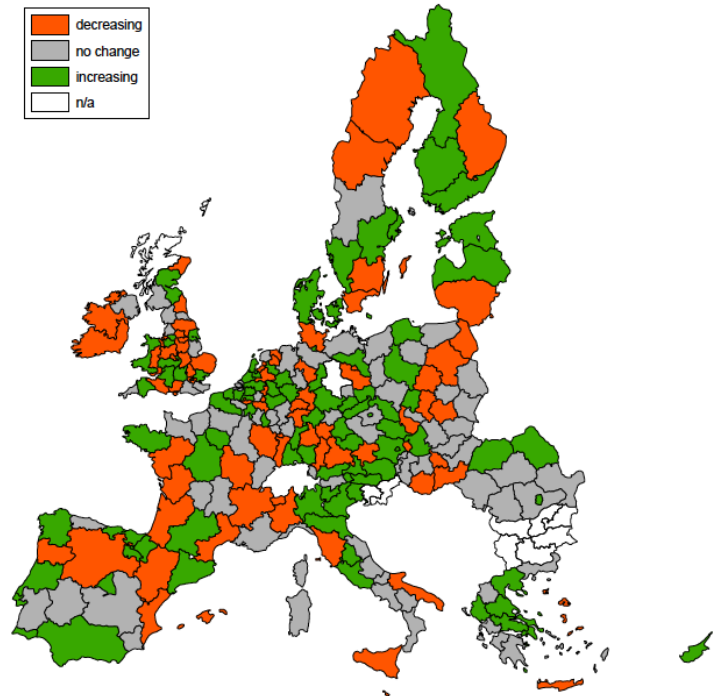
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Figure 46: Change in shares of regional participation between FP5 and FP6 in percentage points



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

Figure 47: Change in shares of regional participation between FP6 and FP7 in percentage points



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

Between FP6 and FP7 (see Figure 47) the regions increasing their participation are once again mainly from EU15 countries: Belgium France, Finland, Germany, Greece, Italy, the Netherlands, Spain, Sweden and the UK. In the EU12, the Czech Republic Estonia, Poland and Romania secured increased funding between the two FPs.

Île de France (FR10) had the most important increase equalling 1.2 percentage points, passing from 9% of all EC grants in FP6 to 10.2% in FP7. Other regions with considerable increases in participation are *Berkshire, Buckinghamshire and Oxfordshire* (UKJ1) with 1 percentage point increase (from €255m in FP6 to €295m in FP7; *Etelä-Suomi* (FI18) with 0.7 points (€255m in FP6, €261m in FP7); and *Braunschweig* (DE91) with a 0.6 percentage point increase (€70m in FP6 to €115m in FP7). The largest decrease was in *Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest* (BE10): a fall of 0.4 percentage points, from €241m under FP6 to €127m in FP7.

Centralised research institutions and their influence in regional participation in FP

Caution is required in data interpretation regarding regional participation in FP. It is reasonable to assume that there is a structural bias in countries with highly centralised research systems such as France, Italy and Spain.

The reason for the potential bias is that most research institutes are geographically spread across the country but have their headquarters in the capital and thus the capital-regions present over-blown figures for FP participation.

For example, in France 100% of FP participants of public research institutes (CNRS, Centre National de la Recherche Scientifique) have their headquarters in Paris, in the region *Île de France* (FR10). The same is the case for Italy and the CNR (Consiglio Nazionale delle Ricerche) located in the region of *Lazio* (ITE4) and for Spain and the CSIC (Consejo Superior de Investigaciones Científicas) located in the *Comunidad de Madrid* (ES30).

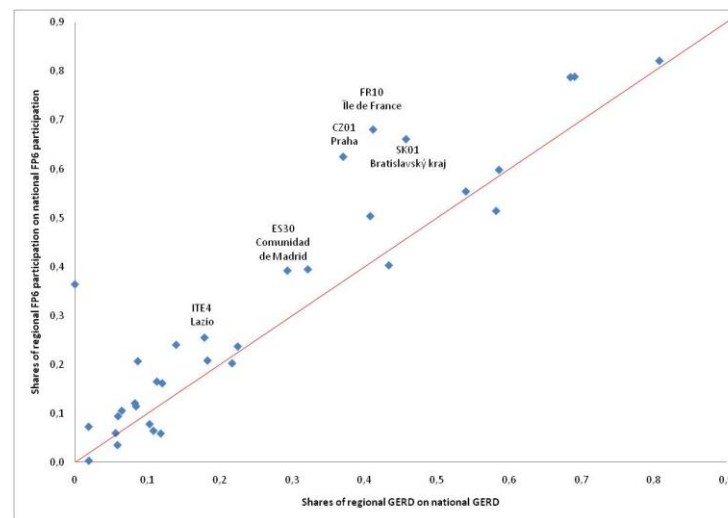
In an attempt to understand the importance of this potential bias, Figure 48 shows a comparison of the regional shares of GERD and the regional participation in FP6 for the outlier regions identified in Figure 44 (including *Île de France*), in order to understand if the positioning of the region at the national level in FP6 is a reflection of the structure of the national capacities. The figure shows that for most of the cases the share of the regions in GERD and FP6 funding follows the same pattern. Regions located above the red line in the figure are regions whose regional share on FP6 participation at national level is higher than the regional share of GERD and thus showing a potential over-estimation of the participation of these regions in FP. Special cases where the regional

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share of FP6 participation is considerably higher than the share of the region in total GERD in the country are *Île de France* (FR10) which difference is of about 27 percentage points, *Praha* (CZ01) with a difference of 25 percentage points, and Bratislavský kraj (SK01) with 20 percentage points of difference between both indicators. This over-estimation of the participation of these regions in FP has to be taken into account when drawing policy conclusions.

For the rest of the outlier regions the differences are not too large and thus suggest that their positioning in the top ranking of participation in FP is a fair reflection of the structure of the national research capacities.

Figure 48: Comparison of shares of regional GERD on national GERD and shares of regional FP6 participation on national FP6 participation



Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

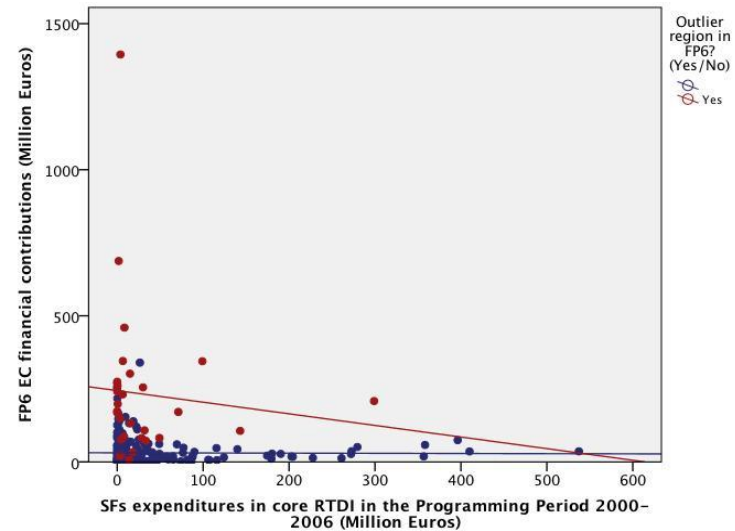
SF spending in the Programming Period 2000-2006 and participation in FP6 and FP7

Given the findings on FP funding, it is interesting to explore if there is any correlation between regional RTDI expenditure in the 2000-2006 SF period and participa-

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tion in FP6 and FP7. Figure 49 shows the correlation at regional level between SF expenditure on core RTDI in 2000-2006 and the EU's total financial contributions in FP6. The regions identified as outliers in Figure 44 and the rest of the EU25 regions are highlighted.

Figure 49: Correlation between Structural Fund expenditure on core RTDI in the Programming Period 2000-2006 and European Commission financial contributions to FP6



Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

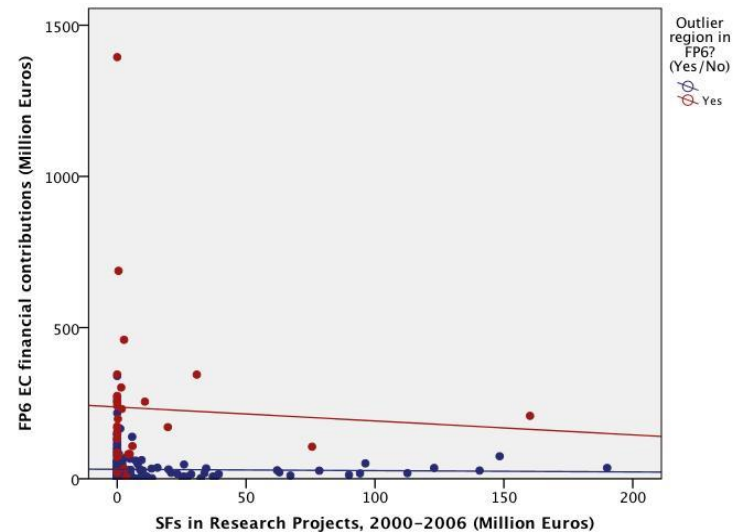
The results suggest no significant relationship between core RTDI expenditure and regional participation in FP6 for non-outlier regions, which means that regardless of the level of core RTDI SF expenditure, regional participation rates in FP6 remain unchanged. In the case of outlier regions, there is a weak negative correlation, meaning that as core RTDI SF expenditure increases, a region's participation in FP6 decreases. This negative rela-

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tionship raises the hypothesis that regions investing the most in core RTDI via the SF ‘lose interest’ in participating in research projects financed under FP.

Looking more closely at types of SF support and relationships with FP6, Figure 50 presents the correlation between expenditure on research projects based in universities and research centres in the 2000-2006 period and regional participation in FP6. As in Figure 49, there is no correlation for non-outlier regions, and a weaker negative relationship for outlier regions. For outlier regions this means that as SF funding for research projects increases participation in FP6 decreases but relatively less than the case of the correlation with core RTDI expenditures.

Figure 50: Correlation between Structural Fund expenditure on Research Projects in 2000-2006 and FP6 total financial contributions, million euro



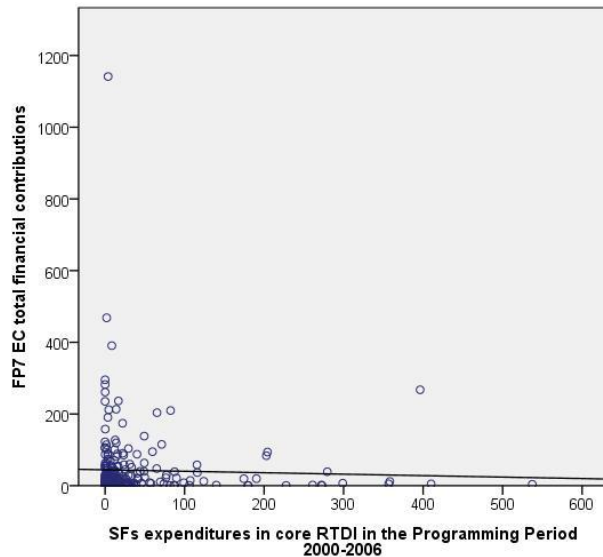
Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

An analysis that compares FP7 funding and SF investments in the 2000-2006 period makes more intuitive sense if it is assumed that there is a time lag between investment in R&D and achieving improved regional capability to participate in the competitive funding programmes of the FP. Figure 51 presents the correlation between SF expenditure on core RTDI in the 2000-2006

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period and the EU's financial contributions through FP7. However, the results show almost no correlation.

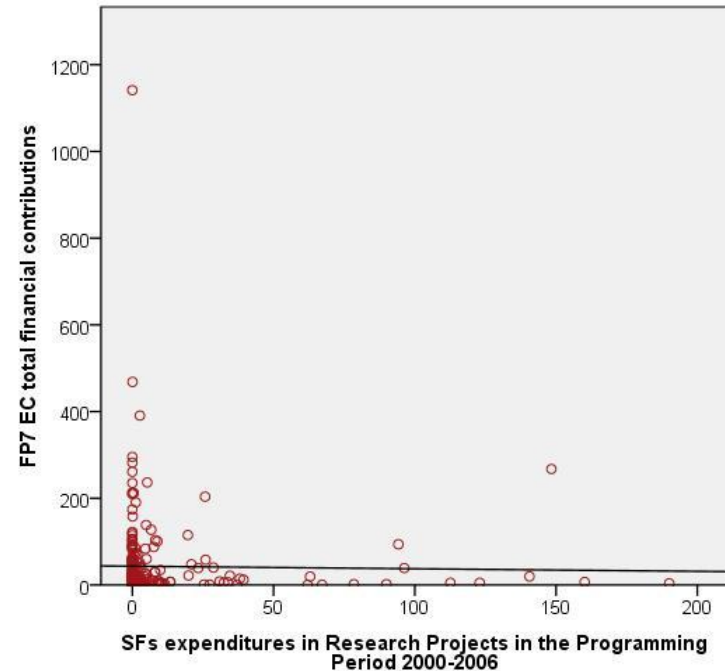
Figure 51: Correlation between Structural Fund expenditure on core RTDI in 2000-2006 and financial contribution from FP7, million euro



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group. For FP7 data DG Research Regional Key Figures Database (based on E-CORDA database)

However, see Figure 52 the correlation between expenditure on research projects based in universities and research centres in the 2000-2006 period and regional participation in FP7 is almost non-existent.

Figure 52: Correlation between Structural Fund expenditure on Research Projects in 2000-2006 and FP7 total financial contribution, million euro

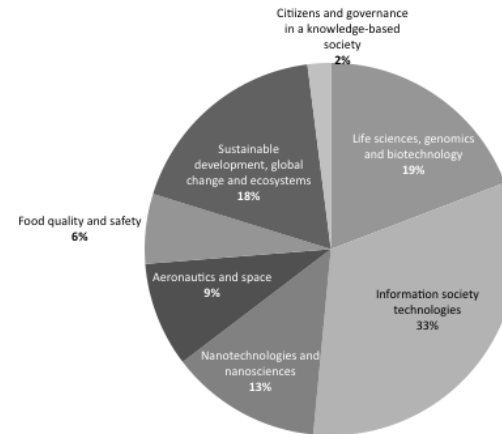


Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group. For FP7 data DG Research Regional Key Figures Database (based on E-CORDA database)

Comparing strategic R&D investment decisions in an European perspective

This sub-section looks at the strategic relevance of large infrastructure investments at the regional level, focusing on the example of biotechnology and nanotechnology related research projects financed by FP6. The choice of biotechnology and nanotechnology was made as it could be assumed that such key strategic technologies require significant investment in research infrastructure, science and technology parks hosting research-intensive firms and links with major research centres. Hence, regions seeking to implement a thematically focused RTDI policy could be assumed to have invested SF resources in support of this orientation. Figure 53 looks at the breakdown of FP6 funds by priority area in the programme 'Integrating and Strengthening the ERA'.

Figure 53: Priority areas of FP6, all EU financial contributions, shares of total in 'Programme Integrating and Strengthening the ERA'



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

Information Society Technologies received the largest percentage of FP6 funds under this Programme at 32%. This is followed by *Life sciences, genomics and biotechnology for health* (19%), *Sustainable development, global change and ecosystems* (18%), and *Nanotechnologies and nanosciences, knowledge based multifunctional materials and new production processes and devices* (13%).

Biotechnology research projects in FP6

Life sciences, genomics and biotechnology for health is one of the major thematic priorities in FP6. The priority is focused on the development of applications that enhance human health through fundamental and applied research and increasing the competitiveness of the biotechnology industry.

Figure 54 shows the top 10 regions to receive the largest amount of FP funds for research projects related to biotechnology (Priority 1). As for the overall analysis of FP6 research projects, Île de France (FR10) received the most FP funds for biotechnology related research projects with around 9% (or €219 million) of all grants. Inner London (UKI1) with about €148 million and Oberbayern (DE21) with €117 million followed. EU15 regions received an average of €11 million on FP6 biotechnology related projects compared to only an average of €2 million in EU10 regions. If compared to the overall FP6 top 10 participant regions only *Stockholm* (SE11) and *Berkshire, Buckinghamshire and Oxfordshire* (UKJ1) appear as new top participants, reflecting a possible specialisation of these regions in this priority area.

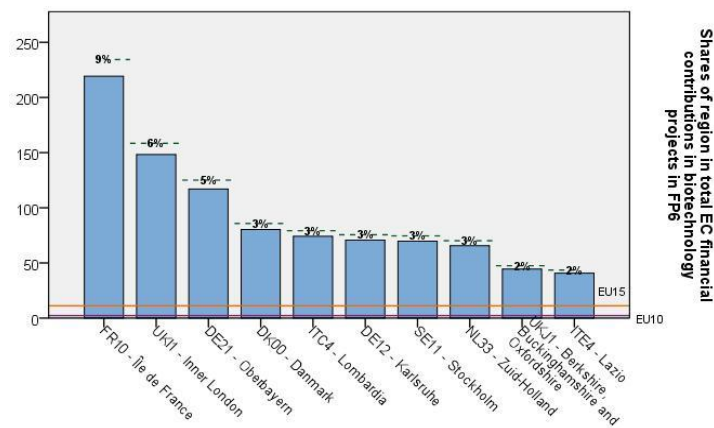
The top regions are all large cities or country capitals in Objective 2 regions. Compared to Objective 1 regions who received slightly less than €3 million Objective 2

regions received €14 million on average for biotechnology related projects.

Equally noteworthy is the analysis of the top 10 Objective 1 regions presented in Figure 55. The analysis compares Objective 1 and Objective 2 regional averages. Berlin (DE30) is the largest recipient of FP6 grants in biotechnology related research projects, with grants amounting to around €40 million.

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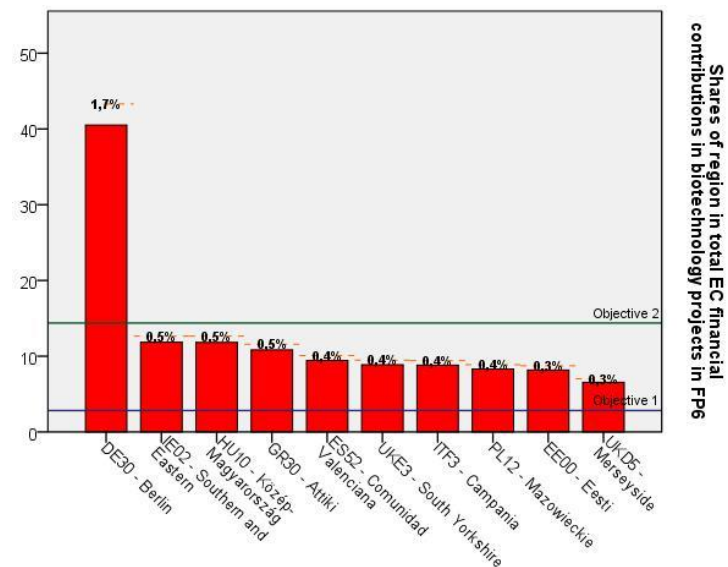
Figure 54: European Commission total financial contributions (Million Euros) in Biotechnology research projects in FP6, top 10 regions



Source: Directorate General Research European Commission, Regional estimates and data analysis by Technopolis Group.

The top two Objective 1 regions, *Berlin* (DE30) and *Southern and Eastern* (IE02) received partly transitional Objective 1 support, and hence were more developed, which could explain their performance. The rest of the regions are a mix from the EU15 (Greece, Spain, the UK, Italy) and EU10 (Hungary, Poland, Estonia).

Figure 55: EU financial contribution (million euro) in biotechnology related projects in FP6, top 10 Objective 1 regions



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

Nanotechnology research projects in FP6

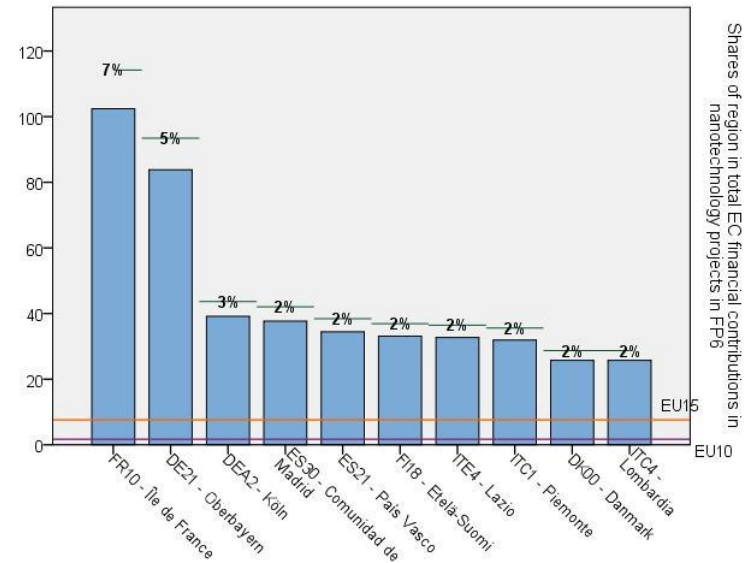
Research projects under the priority *Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices* focus on the production of critical mass capacities to develop and exploit high technologies at the basis of the prod-

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ucts, services and production processes of the future; including the development of new materials for applications in specific sectors like transport, energy, electronics and biomedicine.

Figure 56 shows the 10 regions that received the largest amount of FP6 grants for research projects related to nanotechnology (Priority 3). Similar to the analysis of all FP6 research projects, as well as biotechnology related projects, *Île de France* (FR10) received the most funds with around 7% (or €102m) of all FP6 grants to nanotechnology projects; *Oberbayern* (DE21) is the other considerable outlier receiving around 5% of all EC grants, equalling €84m.

Figure 56: EU total financial contributions (million euro) in Priority 3 (nanotechnology) research projects in FP6, top 10 regions



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

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The other top 10 regions, which received between 2% and 3% of all EU grants to nanotechnology (between €26m and €40m), are all EU15 Objective 2 regions and large cities from only six countries: Denmark, Finland, France, Germany, Italy and Spain. Indeed, Objective 2 regions received on average €8m for nanotechnology related projects compared to €2m in Objective 1 regions. Compared to the top regions for biotechnology related projects, UK regions are not in the top 10 for nanotech and are replaced by Spanish region.

EU15 regions received an average of €8m from FP6 nanotechnology related projects compared to only €2m in EU10 regions. The average for nanotechnology in EU15 regions is lower than the average for biotechnology projects (€11m).

Figure 57 compares the top Objective 1 and transition regions, with the averages of Objective 1 and Objective 2 regions. *Southern and Eastern* (IE02) is the largest recipient of FP6 nanotechnology related research projects, with grants amounting to around €18m. However, the total regional grants received by all Objective 1 top regions account for about 1% of all FP6 grants for nanotechnology projects.

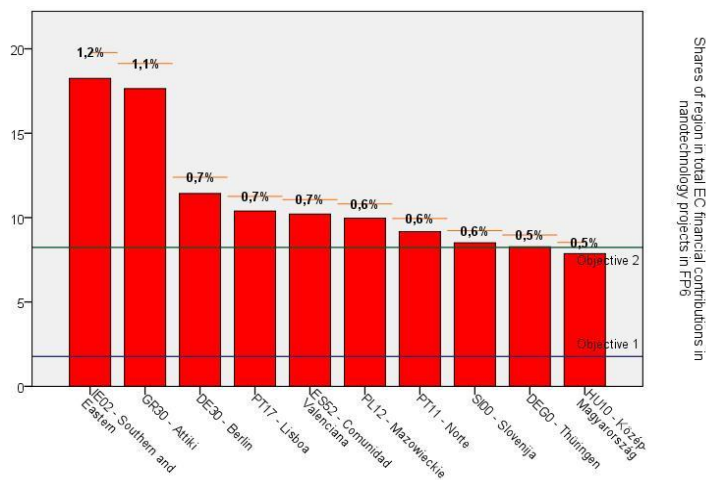
As was the case of biotechnology related projects, two of the top three regions *Southern and Eastern* (IE02) and *Berlin* (DE30) received transitional Objective 1 support

in some areas, which could explain their high ranking. *Attiki* (GR30) remains an important Objective 1 outlier. The rest of the regions are a mix from the EU15 (Greece, Portugal and Spain) and EU10 (Hungary, Poland and Slovenia).

Considering regional research specialisation based on grants received from FP6 research projects: *Praha* (CZ01), *Oberbayern* (DE21), *Comunidad de Madrid* (ES30), *Île de France* (FR10), *Rhône-Alpes* (FR71), *Lazio* (ITE4), *Lombardia* (ITC4), *Mazowieckie* (PL12), *Inner London* (UKI1) and *East Anglia* (UKH1) are specialised in both nanotechnology and biotechnology.

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Figure 57: EC financial contribution in nanotechnology related projects in FP6 (million Euros), top 10 Objective 1 regions



Source: DG Research European Commission, Regional estimates and data analysis by Technopolis Group.

In contrast, regions specialised in biotechnology alone are *Wien* (AT13), *Karlsruhe* (DE12), *Berlin* (DE30), *Comunidad Valenciana* (ES52), *Etelä-Suomi* (FI18), *Alsace* (FR42), *Toscana* (ITE1), *Zuid-Holland* (NL33), *Stockholm* (SE11) and *Berkshire, Buckinghamshire and Oxfordshire* (UKJ1). Whereas regions identified as specialised on nanotechnology research projects when compared to the national participation in FP6 are *Prov. Vlaams-Brabant* (BE24), *Köln* (DEA2),

Stuttgart (DE11), *País Vasco* (ES21), *Aquitaine* (FR71), *Attiki* (GR30) and *Piemonte* (ITC1).

Structural Funds and regional participation in the FP: nanotechnology and biotechnology success stories

In order to complement the analysis of the previous sections, this sub-section presents a series of ‘mini’ regional case studies of linkages between the use of the Structural Funds and the FP for supporting research and innovation initiatives. The regions selected for the analysis are ‘outlier’ regions in terms of their performance in the FP in either nanotechnology or biotechnology.

Linking universities, research institutes and industry for nanotechnology in Cologne

The region of *Köln* (DEA2), notably the cities of Aachen, Cologne and Bonn, has been particularly successful in linking nanotechnology research in universities and industry forming specialisation clusters and networks that are also internationally linked. This has included a track record of participation of the region across FPs. In order to understand whether Structural Funds have contributed to the development of nanotechnology *Köln* (DEA2), it is necessary to place them in the context of the national RTDI policy as well as that of the Land North Rhine-Westphalia (NRW).

Due in part to an initiative of the Federal Ministry of Science and Research, NRW hosts the largest number of nano-related actors and initiatives in Germany¹². A number of regional universities and research centres are involved in nanotech research and are mainly located in the Cologne, Bonn, and Aachen. Indeed, the latter city is a hotspot for nanotechnology research, development and commercialisation. The region hosts the RWTH *Aachen* and the Research Centre Jülich (FZJ) one of the strongest technical universities and a major public research centre focusing on advanced technologies. The research Centre Jülich incorporates, for example, the Centre for Nanoelectronic Systems for Information Technology. Proximity to the university is also the reason for major international companies such as Philips and Ford to locate their research centres in *Aachen*.

The university organises its nanotech-related departments in the “RWTH NanoClub” initiative. Other geographically close public organisations such as the three Fraunhofer Institutes based in *Aachen* and the FZJ are included in a number of initiatives such as clusters, networks and competence centres. Cross-border scientific research and technology transfer is equally a subject of an agreement since 2006 between the NRW and the Dutch province of *Limburg*; which links the RWTH

NanoClub and the Dutch Province’s NanoHouse. These structures offers assistance in product development, access to equipment and knowledge inside or outside the RWTH in the area of nanotechnology.

In terms of FP participation and funding, the region obtained €39.1m under FP6. This figure does not take into account the Fraunhofer Institutes (FhG), which are centrally accounted in the Fraunhofer headquarter region of *Oberbayern* (DE21). Higher education institutions received roughly 25% of FP6 funding; industry obtained the largest share with 38%, followed closely by the public research organisations with 33%. Given that all the FhG institutes in Germany involved in nanotech research obtained roughly €42 million, and eleven are situated in the *Cologne* region, it is likely that the region attracted additional FP funding. In particular, the two FhG institutes in the region obtained €1.4 million, but it is probable the overall share of the FhG in the region is higher.

The single most important player in terms of FP funding is the RWTH with roughly €8.5m, or 85% of the funding for the higher education partners. These grants were obtained from 20 research projects. In contrast, the universities of Cologne and Bonn were involved in five and two projects respectively. According to the RWTH’s project information website, there are 10 research projects funded by end 2009 under the FP7- NMP programme.

¹² See www.nao-map.de

In the 2007–2013 period, NRW will receive around €1.3 billion from the ERDF (Operational Programme 'North Rhine-Westphalia'), about €0.7 billion from the ESF. Another €210m are available for cross-border cooperation with Belgium and the Netherlands. With the ERDF OP, €635m are planned for the priority “Innovation and knowledge-based economy”¹³.

Since 2007, NRW has concentrated SF support on the further development of its strengths. Hence, location is no longer the main criteria for awarding grants, rather the quality of the planned project is decisive. The ERDF is allocated via competitive procedures and the Government aims at supporting R&D in the private sector as well as technology and knowledge transfer. Another key goal is the further development of 16 existing clusters with high growth potential in health, biotechnology, logistics, nanotechnology and microtechnology, chemical industry as well as environmental technology and the power industry.

Structural Funds grants are used for the Excellence Cluster initiative of the land “NanoMikro+Werkstoffe.NRW” (NMW.NRW), which has received co-funding of €2.7 million from the SF and the Land¹⁴. The RWTH Aachen

coordinates the “nano” components of the cluster. The city of *Aachen* will benefit for the first time in the 2007-13 period with €21 million planned for projects and €15 million for the support of the technology region. The investment is clearly linked to the reinforcing of nanotechnology infrastructure and R&D.

In the 2000-2006 period, the ‘mst.factory dortmund’¹⁵ (located in the neighbouring *Arnsberg* (DEA5) region) received SF grants). Through MST-Factory, since 2002, the city of Dortmund has created a regional competence centre for micro- and nanotechnology, with investment in this centre amounting to €45m, (€18m from the ERDF). Hence, the combined support of ERDF and FP funding has clearly enabled the wider region of NRW to strengthen its position in a key enabling technology field.

¹³ All relevant information from can be found at <http://www.ziel2-nrw.de>.

¹⁴ The SF funds are used for the cluster management and the organisation of the competition according to the list of recipients (see: [ziel2-nrw.de](http://www.ziel2-nrw.de)).

An overview of the clusters can be found at <http://www.exzellenz.nrw.de>

¹⁵ http://ec.europa.eu/regional_policy/projects/stories/details_new.cfm?pay=DE&the=51&sto=1570&lan=7®ion=1098&obj=ALL&per=2&defL=en

Biotechnology and nanotechnology in Estonia

Estonia is one of the top Convergence ‘regions’ in terms of participation in FPs and particularly on biotechnology research projects. The country has implemented different programmes in support of R&D leading to the development of several competence centres focusing on biotechnology and nanotechnology. The centres are partnerships aim at synergies between research in universities and the private sector that has been one factor contributing to an increased Estonian participation over time in FP6 and FP7.

The total budget of the Operational Programme (OP) ‘Development of an Economic Environment’¹⁶ is €1.7 billion and the Community assistance through the ERDF and Cohesion Fund amounts to €1.4 billion (approximately 41% of total EU Cohesion Policy funds invested in Estonia during 2007-2013). The objectives of the OP are complemented by investments from the Human Resource development programme supported by the ESF (11.5 % of the total funds).

Priority 2 of the economic development OP aims to improve the competitiveness of Estonian R&D through re-

search programmes and modernisation of higher education and R&D institutions. Investment is granted for the development of thematic R&D programmes targeted at long-term economic development focusing on the areas where Estonia has strong scientific potential, as well as for the development of centres of excellence, infrastructure and equipment of R&D and higher education institutions. Better international cooperation is one of the envisaged outcomes.

Most of the funding of the Competence Centre Programme¹⁷ has come through the ERDF. The programme was launched in 2003 as part of the first national R&D Strategy “Knowledge-based Estonia” for 2002-2006. During the 2004-6 funding period five centres were established of which three focused on biotechnology (the Competence Centre of Food and Fermentation Technologies¹⁸, the Bio-Competence Centre of Healthy Dairy Products¹⁹, and the Competence Centre for Cancer Research²⁰). In addition, an Estonian Nanotechnology Competence Centre²¹ has been established. In the 2007-13 funding period, one new centre related to biotechnology was established, namely the Competence Centre on

¹⁶ There are two other OPs under the NSRF for Estonia but they do not include specific research and development and innovation support.

¹⁷ See <http://www.eas.ee/index.php/for-the-entrepreneur/innovation/competence-centre-programme>

¹⁸ See <http://www.tftak.org/>

¹⁹ See <http://www.tptak.ee/>

²⁰ See <http://www.vtak.ee/>

²¹ See <http://encc.ee/>

Reproductive Medicine and Biology. This new centre started operations in 2008-09. During the 2007-2013 period, Enterprise Estonia, the national business support agency, will provide funding, co-financed by the ERDF, for each competence centre up to a maximum of €1.3m annually, limited to 70% of eligible costs.

A significant number of Estonian biotech organisations participate in FP7 projects, including the Competence Centre of Cancer Research (represented by Tallinn University of Technology in FP7 projects) and other private partners such as Quattromed, Celecure, Asper Biotech²², and Protobios²³. The group of researchers from the Competence Centre of Cancer Research were associated to the FP6 project ‘CANCERGRID’ (Grid aided computer system for rapid anti-cancer drug design) from 2007-09. The total FP6 co-financing for all participants is of €2.8 million²⁴.

²² FP7 project Gene therapy for inherited severe photoreceptor diseases (AAVEYE), see http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=1&CAT=PROJ&QUERY=012849c93d1c:573:4edcc96c&RCN=89476; others

²³ Source: Archimedes Foundation

²⁴ See http://cordis.europa.eu/fetch?CALLER=FP6_PROJ&ACTION=D&DOC=1&CAT=PROJ&QUERY=01284a0a057a:89f5:6ff950cc&RCN=85004

Biotechnology in Vienna

Vienna region is the top Austrian participant in FP, and is an outlier participant particularly in biotechnology projects. This case examines the impact of SF and FP on the biotechnology industry in Greater Vienna (Wien-AT13), which includes part of Niederösterreich and Burgenland. Vienna is the dominant Austrian region in the biotechnology sector and the vast majority of all Austrian Biotech firms (75% of total) are located in the region. The city also hosts the major players in the pharmaceutical industry as well as a number of key research institutes. However, the Vienna region started relatively late to promote actively the biotech sector. According to a recent study²⁵, public investment in infrastructure and seed capital has been decisive in the development of a regional biotech industry.

During the 2000-2006 period, the Objective 2 programme for the city of Vienna invested €45.8m (of which €18.9 million from ERDF and ESF). Under ‘Priority 2: Competitive business as the condition for job creation’ made available €17.1m (€4.9m of SF co-financing) in financial aid to start-up and venture capital,

²⁵ Technopolis, Fraunhofer ISI (2006): Life Science – Standort Wien im Vergleich. Study for the MA 27 EU-Strategie und Wirtschaftsentwicklung.

consultancy and support for networking, and the creation, modernisation and expansion of SMEs.

A number of infrastructure projects as well as business consultancy services were created during the period²⁶. Although a direct link to the growth of biotechnology firms is difficult to establish, a number of the new knowledge-intensive business firms created were able to make use of publicly funded infrastructure.

In the 2007-2013 period, Vienna has again its own regional OP: “Strengthening the regional competitiveness and integrated urban development in Vienna 2007-2013” with a total budget of around €50.3m (of which Community assistance through the ERDF amounts to €25.2m, or approximately 1.72% of the total investment for Austria under the 2007-2013 Cohesion Policy²⁷). The programme includes again infrastructures for spin-offs and innovative start-ups. However, in terms of technologies, only the IT sector is mentioned as “being in need to be better developed” in order to improve the location of Vienna as a science city.

In terms of FP participation, Austria obtained roughly €51m in the field of ‘Life sciences, genomics and biotechnology for health’. Organisations located in Vienna secured 65% of this sum. Higher education institutions

and industry have relatively similar shares of 40%, while public research bodies obtained 17%. The single most important public player is the Medical University of Vienna, which obtained 66% of the funding for higher education institutions. The University of Vienna and the University of Natural Resources and Applied Life Sciences obtained the remaining 34%.

Oberbayern and Berlin, traditionally strong and emerging biotech regions in Germany

Munich is the largest city located in the region of Oberbayern (DE21) and is historically viewed as a high technology city as it hosts some of the main German scientific institutions and one of the largest biotechnology clusters in the EU. The region has also developed an effective co-operation between science parks and private and public research institutions supporting a strong life sciences industry. In contrast, Berlin (DE30) is a late-comer to the German biotech industry, but has quickly become the second most important region for biotechnology. The region has important research clinics, universities and research centres on biotechnology and life sciences as well as internationally recognised pharmaceutical companies.

Oberbayern (DE21) hosts not only Germany’s third largest city Munich with 1.3 million inhabitants, but it is equally a leading technological region. It is the head-

²⁶ See <http://ziel2.wien.at>.

²⁷ See: <http://eu.wien.at/>

quarters for the two largest German science organisations: the Fraunhofer Society (FHG) and the Max-Planck-Society (MPG). During the 2000-06 period, Oberbayern was largely not eligible for Structural Funds support. However, for the programming period 2007-2013, the OP Bavaria has a total budget is around €1.8 billion and the Community assistance through the ERDF amounts to around €576m. Of this total, Priority 1 'Innovation and knowledge-based economy' has a total public budget of €194m (€115m from ERDF) allocated via competitive funding procedures. Organisations in Oberbayern would be eligible to compete.

The growth of a biotechnology sector dates back to 1995-96, when the region was among three winners of the first national competition for bio-regions "BioRegion", which provided funding for infrastructures, networking and coordination. In 1996, it had just established its first research building in Martinsried, when the biotech boom started and took off in the region. Munich's research and biotech scene is focused clearly on red biotechnology. The Munich Biotech Cluster is among the top four European biotech cluster, and is the leading one in Germany. Munich/Martinsried offers a large science park where several industrial and academic institutions are located. Together with the two universities, two applied universities, the university hospitals, three Max-Planck institutes and the German Research

Centre for Health and Environment, 20 thousand employees work in about 350 life sciences companies.

In terms of FP participation and funding, the region obtained €115m from the 'Life sciences, genomics and biotechnology for health' programme under FP6. FHG and MPG obtained together €64m that were registered to the region since the institutes have their headquarters there. Nevertheless, these funds were not necessarily spent regionally but rather in the institutes located across Germany. Universities obtained almost €26m, while industrial partners obtained almost €9m.

In contrast, in the 1996 "BioRegion competition, Berlin was among the lower ranked regions but has made up ground quickly to take the number two spot in German rankings for biotechnology. The region hosts the Charité²⁸, Europe's largest research clinic, as well as a number of universities, research centres and pharmaceutical companies.

For the 2007-2013 period, the ERDF OP for Berlin provides support under the 'Regional Competitiveness and Employment' objective. The programme's total budget is around €1.7 billion and Community assistance through the ERDF amounts to around €876m. The Berlin Senate decided that the funding will be used strategically for the further development of the biotechnology, medical

²⁸<http://www.charite.de/>

healthcare and IT sectors in the city²⁹. During the 2007-2013 period, the Charité will obtain slightly more than €16m to pursue R&D objectives; while biotech-related firms are also obtaining funding³⁰. Such support is critical to maintaining the competitive position of Berlin biotech within both Germany and EU level research programmes.

Biotechnology and nanotechnology world competitiveness poles in Rhône-Alpes

Rhône-Alpes is internationally known for its research and scientific competitiveness clusters and poles. The life sciences sector and nanotechnology sector are a main priority for the region and has resulted in the consolidation of biotechnology and nanotechnology poles. In 2008, Rhône-Alpes represented 15% of both total R&D expenditures and French patents. It is the third most important region in France for academic research in nanosciences and nanotechnologies with 40 laboratories and the second based on the number of researchers.

²⁹ Press communication 16/04/2008, available at http://www.berlin.de/imperia/md/content/senatsverwaltungsenwirtschaft/presse2/2008/04/efre_auftakt_16042008.pdf

³⁰ The list of funded projects is available at http://www.berlin.de/imperia/md/content/senatsverwaltungsenwaf/struktur/efre/efre2007_2013_beg_nstigtenverzeichnis_31122008.pdf (in German)

Out of the 14 research clusters active in Rhône-Alpes, two are directly linked to the life science sector: Infectiology, Immunology and Cancerology; and Handicap, Aging, Neurosciences. Two other have connections with the life science field and are impacted by bioscience and biotechnology: Sustainable Chemistry (bio-active molecules); Materials and Sustainable Development; and Plants Quality, Agricultures and Territories. Additionally, one is directly dedicated to nanotechnologies: the Cluster for Microelectronic, Nanosciences and Nanotechnologies.

Innovation and the Knowledge Economy is one of six priorities of the ERDF OP for 2007-13. Moreover, nanotechnologies and life sciences are identified, in both the ERDF OP and the State-Region Planning Contract 2007-2013, as the top two (of five) priorities for technological innovation in Rhône-Alpes. The financing of the Competitiveness Clusters is identified as a core action of priority 1 of the ERDF OP. Out of a total budget of €698m, Priority 1 represents €267m of which €120m come from ERDF, and €147m from national counterparts. In addition to the ERDF funding, by end 2009, €17m and €24m had been awarded under FP7 toward respectively biotechnologies and nanotechnologies projects involving regional partners.

The life science sector in Rhône-Alpes is organised in three cities: Lyon (cancer, viro-immunology, neurosci-

ences), Grenoble (biology, virology, nano-biosciences), and Saint-Etienne (medical devices, materials and biomechanics). LyonBioPole is a world class competitiveness cluster oriented towards the diagnosis and the production of vaccines. The pole, situated in Lyon and Grenoble, accounts for 28,000 jobs in biotech of which 2,500 in infectiology and micro-nanotechnologies (mainly located in Grenoble). World leaders such as Sanofi Pasteur in human vaccines or Merial in veterinarian vaccines participate to this Competitiveness Cluster.

Regarding nanotechnology, the most symbolic concentration of researchers, infrastructure and financial resources is Minatec in Grenoble, with 2,400 researchers, 1,200 students, 600 companies and business related activities, and all based on the same 20 hectares campus. Minatec is the backbone of the Competitiveness Cluster Minalogic (one of the three world Competitiveness Clusters in Rhône-Alpes). Minalogic represents 124 partners of which more than 100 SMEs. It was launched as a co-investment of national and EU funds for a total of €1.5 billion of which of €500 million were financed with national funds. ERDF funds are directed towards the creation of Structuring Platforms. These platforms are based on cross-complementary priorities, use and applications (science and market segments) and managed by both interests. For example the laboratories use the equipments

for the development of applications during the day while enterprises do during the night.

Biotechnology in Alsace

Alsace (FR42) has been identified as an outlier region due to its participation in biotechnology related research projects in FP6. In 2008, Alsace was ranked as the third French biotech region, accounting for 7% of French patents and 10% of total R&D expenditures in the field. Alsace launched the Competitiveness Cluster Alsace Biovalley in the mid 2000s including 31 partners (as of 2009) in seven main domains: target identification, screening and hit identification, lead optimisation, formulation, preclinical development, clinical development and manufacturing, and quality control.

The leading position of the region on biotechnology was confirmed by the creation of a cross-border Biotech Cluster in March 2010, which brings together a concentration of companies from South Baden (Germany), the Basle area (Switzerland) and Alsace.

In terms of SF funding, the ERDF OP targets, under priority 1 on “Innovation and development of entrepreneurship in the European area”, the improvement of the innovation system but with no explicit focus on biotechnology. However, a part of the €23m ERDF budget, divided into four measures, can support biotechnology projects.

Structural Funds for RTDI

The regional authorities are placing an increasing emphasis on the synergies and optimisation of funding and grants, and notably under the auspices of the Regional Agency for Innovation different actions focused on networking and exchange of ideas among biotechnology researchers and projects are being launched.

VI Main trends and conclusions

In the introduction, three main ‘research questions’ were set out as a framework for the analysis of data Structural Fund (SF) expenditure on research, technological development and innovation (RTDI) and on grants awarded by the European Union’s 5th to 7th Research Framework Programmes (FP5, FP6 and FP7):

- Is there evidence of an improvement over the last decade in the capacity of EU regions to increase the intensity of investment through the SF in favour of RTDI? In particular, are lagging regions improving their relatively lower capacity to absorb public funds earmarked for the promotion of innovation compared to more advanced regions?
- Are there identifiable regional (place-based) patterns of RTDI investments, supported by the SF, and are such ‘policy-mixes’ adapted to the strengths and weaknesses of regional innovation systems?
- Is there evidence that Cohesion Policy contributes to the excellence objectives of the ERA through increased participation of research and innovation actors in ‘less-favoured’ regions, particularly in Convergence regions, in the FP?

These conclusions summarise the available evidence, to reach, tentative, conclusions on each of the questions and to suggest further lines of study and research to deepen our understanding of the potential for synergies between EU instruments in favour of research and innovation post 2014.

A growing role of the Structural Funds as a RTDI support instrument

Since 2000 the EU Structural Funds, notably the ERDF, have become a key instrument supporting RTDI in European regions. This is confirmed by the substantial growth of SF spending on RTDI between the 2000-2006 and the 2007-2013 programming periods. In the 2000-2006 period, 15% of the SF interventions, about €29.5 billion, were devoted to various measures supporting research and innovation. Objective 1 regions in the EU15 were the main beneficiaries. Two Spanish regions, Cataluña and Andalucía were respectively the Objective 2 and Objective 1 regions, which invested in absolute terms the most in RTDI during 2000-2006.

From a cohesion perspective, a key issue is whether the SF are fostering a relative ‘catching-up’ of the Convergence regions with respect to their wealthier and more technologically advanced (on average) RCE counterparts. Closing an RTDI investment gap, between the two types of regions, while not sufficient, is clearly a start. In

Structural Funds for RTDI

the current 2007-2013 period, the amount invested in favour of RTDI has more than doubled to roughly €70 billion, or around 25% of the total SF budget. Planned SF investments in core RTDI in Convergence and RCE regions are, respectively, 10% (up from 4.5% in 2000-06) and 13% (up from 3.7%) of the total available SF budget. While in terms of the intensity of investment Convergence regions appear to lag, the absolute amounts invested are considerably higher in the Convergence than in RCE regions (an average per region of €257m and €50m respectively).

In order to compare like with like, average annual per capita expenditure on RTDI was calculated for both periods. Whilst in 2000-06, regions in Ireland (the highest per capita investment being €27 annually) and Germany had the highest per capita SF investment rates for RTDI and that all of the top 60 regions in terms of per capita expenditure were in the EU15, the situation has changed radically in 2007-13. Currently, the highest per capita allocations in RTDI are in the regions of the EU10 (new Member States), which have much higher annual per capita SF expenditure (€25) than in the EU15 (€7). Equally, Convergence regions are investing markedly more through the SF on core RTDI (€21) than the RCE regions (€4).

The relative importance of the EU's Cohesion Policy for regional RTDI is underlined by the substantial share of

GERD, notably in the Convergence regions, provided through the ERDF during 2000-06. With a substantial increase of SF expenditure on RTDI programmed during 2007-13, and an unlikely comparable growth of regional GERD, the SF will become the dominant source of funds in most Convergence regions. This will have important consequences for the design and implementation of regional RDTI measures, which will be influenced by ERDF guidelines and by an increasing political emphasis on the need to ensure synergies with other EU innovation instruments.

Given the substantial growth of allocations to core RTDI during 2007-2013, it may be expected that some regions will have problems to spend allocated resources for at least two reasons: the sheer scale of the increase and, notably in case of EU10, the introduction of more complex RTDI measures. Although they performed relatively well in terms of absorption in 2004-2006 period, the EU10 regions face a more demanding test in the 2007-2013 period given that they need to manage more complex and differentiated RDTI measures, which may prove more difficult to absorb. As for Romania and Bulgaria, despite being new comers to SFs, they have already allocated substantial amounts in core RTDI; given their lack of experience in SF programming and implementation, spending the allocated resources may prove challenging.

Interestingly, the data on absorption of planned allocations to core RTDI during 2000-2006, suggests that the top 10 regions which 'over-spent' against plan were essentially a group of Objective 1 (notably Greek and Hungarian) regions; while under-spenders were mainly Objective 2 regions (notably from Germany and Spain. The difficulty of 'more advanced' regions to absorb funds (often quite modest amounts in absolute terms) may point to absorption becoming more of an issue in regions where 'easy investments' in hard infrastructure have been made in earlier phases and where maintaining investment levels requires more concerted efforts at partnership and strategic planning.

Have there been changes over time on the focus of RTDI investments through the Structural Funds and is there evidence of a differentiated RTDI policy mix in regions related to levels of innovation performance?

In 2000-2006, one third of SF RTDI expenditure was invested in core RTDI measures, mainly technology transfer, RTDI infrastructure and research projects; whilst two thirds were invested in measures supporting business innovation. In the current period, the relative investment in the core RTDI measures has more than doubled and amounts to 11% of total SF investment compared to 5% in the previous period; whilst support to

business innovation has a 14% share, which is 3% points higher than previously.

The most significant shift between the two analysed periods occurred in terms of allocations in RTD infrastructure, which in relative terms increased from 2% to 3% of SF investments. In absolute terms it represented more than a threefold growth from €2.8 billion in 2000-2006 to €9.6 billion in 2007-2013. This is mainly a consequence of planned investments in Czech, Lithuanian, Polish, and Slovakian regions.

In 2000-2006, the leading regions in terms of investment in business innovation expenditure were to be found in UK and Nordic regions; EU15 regions spent three times more than EU10 regions; and Objective 2 (17% of all SF expenditure) spent relatively more on promoting more 'non-technological' forms of innovation, than Objective 1 (9%). In contrast, in 2007-13, EU10 regions are allocating considerably more on average (€314m) than EU15 (€106m) regions and in per capita terms, respectively €26 and €11. This reflects in part the inclusion of more general investment in business in this category reflecting the on-going need of enterprises in the EU10 regions to integrate technologies (created elsewhere) enabling productivity improvements.

A key difference in terms of strategic orientations in the 2007-2013 allocations, compared to the 2000-2006 peri-

od, is the greater thematic differentiation. Indeed, there is a more balanced distribution between different fields of expenditures in the SF-funded RTDI portfolio. An in-depth analysis of the regional SF expenditures and allocations at the level of individual fields of expenditures reveals differing importance given to categories of expenditure by different regions. For example, in the core RTDI in the 2007-2013 period regions in Slovakia, Poland, Luxembourg, Lithuania, France, Finland, the Czech Republic and Belgium focused mainly on R&TD infrastructure, while regions in Portugal and the Netherlands focused on technology transfer. Regions in Romania, Hungary and Greece focused the most on human potential in the field of research and innovation, whereas assistance to R&TD for SMEs was an average priority for regions in Spain, Bulgaria and Austria. Similarly diverse approaches are also apparent in various areas of business innovation funding.

Such trends in SF RTDI funding reflect a growth in differentiated strategies and approaches to the use of SF by regions. However, the extent to which strategies are well grounded in terms of their evidence based analysis of bottlenecks in regional innovation systems or the focusing of investments is sufficient to create “smart specialisation” requires the crossing of the data analysed in this booklet with the results of future thematic evaluation studies.

Regions appear to follow their own distinct paths in how they shape SF spending. Doing so they adapt the available SF instruments and their thematic scope to their specific needs and existing regional and national policy mixes. As a decentralised EU instrument, the SFs allow the Member States and regions to channel the support according to their strategic outlooks, political objectives as well as programming and implementation capacity. Indeed, the evidence analysed in this booklet suggests that regions use the SFs instrumentally to “fuel” measures associated with many policy fields, notably innovation, entrepreneurship and/or research policy. The influence of EU ‘strategic guidelines’ in increasing the overall spending on RTDI is unquestionable, but the definition of what is considered RTDI remains in the hands of Member States and, to a different degree, regions themselves. Clearly, the regional capacity to skilfully use the Structural Funds to complement existing and evolving regional policy environments is an important policy aspect, but further exploration of this issue remains outside the scope of this study.

The macro analysis confirms that, depending on the region and the area of intervention, the SFs may serve as an instrument aiming at territorial cohesion, competitiveness or research excellence. As for the latter, a significant share of SF spending has been devoted to typical research policy objectives, notably developing research

infrastructures and funding research projects. SFs have become a flexible multi-objective tool used differently in different regions. In general, the evidence suggests that while Convergence regions tend to use SF support as a comprehensive funding source encompassing research, innovation and entrepreneurship policies (notably in 2007-2013 period), the Competitiveness regions tend to focus relatively more on targeted support to business innovation.

Understanding the impact of SF RTDI spending on innovation performance and improving participation in the European Research Area

The study has looked at a number of key regional indicators for RTDI (GERD, human resources for S&T and patents) and their relation to SF expenditure for the 2000-2006 period. At the aggregate level analysed, it is difficult to identify, and above all attribute causality, effects of SF expenditure. More advanced regions (Objective 2, RCE) continue to have a significant advantage in terms of HRSTC, however, an Objective 1 region, Andalusia, is now amongst the top 10 in the EU. This clearly reflects, in part, the sustained investment through national, regional and Structural Funds in the region since 2000 on RTDI (the region has been amongst the top spends in absolute terms in both periods). A simple correlation exercise applied to an 'output' variable, patent filings at the EPO, suggests only a very weak relationship with SF

RTDI expenditure for Objective 1 regions and a stronger relationship for Objective 2 regions. At best the analysis tends to suggest that the dominant position in patenting of a number of leading regions in each Member States is unlikely to change rapidly. It is clear that there is need for more disaggregated analysis of the impact of SF RTDI expenditure on innovation performance and that such analysis needs to be built around a model that takes into account a broad set of potential variables affecting performance over a longer time period (e.g. in terms of innovation performance, SF RTDI investments made in 2000-2006 can be expected to start influencing standard RTD indicators only with a 4-5 year lag). In Objective 1/Convergence regions, where the ratio of SF RTDI expenditure to GERD is much higher, the ability to attribute an impact of the former on RTDI indicators will clearly be more likely than in Objective 2/RCE regions where the SF's are 'topping up' national public expenditure on research and innovation.

The analysis of the distribution of FP funding across the FP5, FP6 and FP7 (first two calls to end 2009) data underlines a continued an persistent dominance of the EU15 versus EU10 regions and of Objective 2 versus Objective 1 regions. There is no visible change over time in the performance of either EU10 or Objective 1/Convergence regions in appropriating FP funds (although the gradual 'transfer' of better performing former

Objective 1 and ‘transition’ regions towards Objective 2/RCE status) may in part explain this disappointing ‘standstill’. Moreover, the study found inconclusive results on the correlation between SF RTDI investments and participation in the FP. However, such analysis on the macro level needs to be done with caution given the ‘time-lag’ issue between investment in research infrastructure or teams in a region and the ability to compete in international programmes such as FP on the basis of ‘excellence criteria.

However, a series of ‘mini case studies’ (on nanotechnology and biotechnology top ‘outlier regions’ in terms of participation in the FP) provided some evidence, however, in regard to what has been demonstrated in previous studies and evaluations: regions do seek to coordinate the use of both SF and FP instruments in pursuit of their own research and strategies. They will do it more or less coherently depending on their RTDI profile and strategic governance. Needless to say, the SFs are an instrument that is significantly easier to control by the regions than FP. In practice, the SF can fund activities “normally” funded by research programmes thus supporting ‘research excellence’ objectives without the obligation to form international research consortia as in FP. Indeed, as a recent expert report (European Commission 2010) underlined, it is important to ensure that regional investment on RTDI (e.g. through the SFs) is focused on

‘excellent research of local relevance’ (for socio-economic development) while there is a good rationale for regional policy-makers to orientate ‘islands of excellence with low local relevance’ towards international competitive funding programmes.

Without being able to reach conclusive results at an aggregate level, this booklet proves the potential value of further more in-depth analysis and research on the three key research questions considered. The effects of the Structural Funds on improving regional research and innovation performance go far beyond the question of the patterns of direct expenditure on R&D or innovation projects and understanding the link between RTDI expenditure and regional socio-economic performance, and thereby cohesion, must be the ultimate objective of any analysis.

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