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An analysis of the role and impact of Research Performing Organisations' participation in the Framework Programmes

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List of abbreviations

Abbreviation	Term
AC	Associated Country
AIRTO	Association for Independent Research and Technology Organisations - UK
AT	Austria
BE	Belgium
BG	Bulgaria
CERN	Centre Européen pour la Recherche Nucléaire (European Organisation for Nuclear Research)
CNR	Centro Nazionale per la Ricerca (National Research Council)
CNRS	Centre National de la Recherche Scientifique (National Centre for Scientific Research)
CORDA	Common Research Data Warehouse
CSIC	Consejo Superior de Investigaciones Científicas - Spanish National Research Council
CY	Cyprus
CZ	Czech Republic
DE	Germany
DG RTD	Directorate-General for Research and Innovation
DK	Denmark
EARTO	European Association of the Research and Technology Organisations
EC	European Commission
EE	Estonia
EL	Greece
EMBL	European Molecular Biology Laboratory
ENEA	National Agency for New Technologies, Energy and Sustainable Economic Development
EPO	European Patent Office
ERA	European Research Area
ERC	European Research Council
ERDF	European Regional Development Fund
ES	Spain
EU	European Union
EY	Ernst & Young
FEDIT	Federación Española de Centros Tecnológicos
FI	Finland
FP	Framework Programme
FR	France
HES	Higher and secondary education
HR	Croatia
HU	Hungary
ICT	Information and Communication Technologies
IE	Ireland
IND	Industry (Private for profit companies excluding education)This abbreviation was used in the CORDA database for FP6.
IPR	Intellectual Property Rights
IT	Italy
JRC	Joint Research Centre
KET	Key Enabling Technology
KPI	Key Performance Indicator
LT	Lithuania
LRF	Large Research Facilities
LU	Luxembourg

Abbreviation	Term
LV	Latvia
MS	Member State
MT	Malta
NL	Netherlands
NMP	Nanosciences, Nanotechnologies, Materials and new Production Technologies
OTH	Others
PCT	Patent Cooperation Treaty
PL	Poland
PRC	Private for profit companies (excluding education). This abbreviation was used in the CORDA database for FP7.
PT	Portugal
R&D	Research and Development
REC	Research Organisation (i.e. organisations only or mainly established for research purposes)
RO	Romania
RPO	Research Performing Organisation
RTI	Research, Technology and Innovation
RTO	Research and Technology Organisation
SE	Sweden
SI	Slovenia
SK	Slovakia
SNA	Social Network Analysis
TRL	Technology Readiness Levels
USPTO	US Patent and Trademark Office
UK	United Kingdom
WIPO	World Intellectual Property Organisation

EXECUTIVE SUMMARY

Context, objectives and approach

This study is conducted in the context of the evaluation of the European Union Framework Programmes for Research, Technological developments and Demonstration Activities (FPs). It is one of the preparatory studies being undertaken for the overall ex post evaluation of the FP7 (2007-2013). It aims at assessing the participation of Research Performing Organisations (RPOs) in FPs, the impact of FPs on the different dynamics and functioning of RPOs in the EU as well as the role of RPOs in the development of the FPs and EU research and innovation policy.

The scope of the study covers FP6 and FP7 funded research projects that involve the participation of RPOs' based in the EU28 Member States and some RPOs based in Associated and Third Countries (e.g. the US).

The current report presents the results of the evaluation based on information collected through primary and secondary sources of information. Primary data collection has been conducted through in-depth interviews with representatives of selected RPOs across 16 MS, Norway, and the US, as well as with European associations of RPOs and representatives of the European Commission. Secondary sources have been used to collect both qualitative information from literature reviews and quantitative information from various databases (e.g. CORDA[1] and Scopus[2]). The information gathered has been analysed using various techniques, including bibliometrics and social network analyses.

Where possible, results have been differentiated across the four different types of RPOs that have been classified in this study: Scientific Institutes, Research and Technology Organisations, Government Labs and Large-scale Research Facilities.

Results of the evaluation

Participation patterns of RPOs

RPOs are the second largest group of FPs beneficiaries, after universities, in both FP6 and FP7, having received 31% of the overall funding in FP6 and 28% in FP7. Considering the significant increase of overall funding from FP6 to FP7, these shares correspond to more than double the funds allocated to RPOs from FP6 to FP7 (EUR 4.7 billion in FP6 and EUR 11.1 billion in FP7). This increase is mirrored by increases in the average funding per RPO (EUR 1.7 million in FP6 and EUR 4.1 million in FP7) and in the average number of instances of participation (+67%) rather than in the number of RPOs participating in FPs, which remained quite stable at around 2,700 organisations. The most active types of RPOs are Scientific Institutes and Research and Technology Organisations, which together received nearly 90% of all the FP funding allocated to RPOs.

The participation pattern of RPOs is similar to that of universities, with an increasing share of funding received under FP7, even if, universities, like private companies, have improved their relative positioning in comparison to RPOs in terms of both share of funding received and role played in projects (comparatively, fewer RPOs have been coordinators of projects).

Overall, there is no specialisation per specific programme of FPs, nor per thematic area, in terms of the funds allocated to RPOs aligned to the weight of the specific programmes and the thematic areas within the FPs. However, when looking at participation patterns per type of RPO, some specialisation emerges, with regard to specific programmes in FP7. Although Research and Technology Organisations are active in all FP programmes and thematic areas, the analysis shows that RTOs tend to be more specialised in 'Cooperation' and 'Euratom', while Scientific Institutes appear more active in 'Ideas', 'People' and 'Capacities'. With regard to thematic areas, large Scientific Institutes tend to have rather diversified portfolios of projects across different themes, with some focus on 'Marie-Curie Actions', 'ICT' and 'Health', while Research and Technology Organisations focus more on 'ICT' and 'Nanosciences, Nanotechnologies, Materials and new Production Technologies'.

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[1] CORDA contains data on key characteristics of projects and participants for both FP6 and FP7. Data includes but is not limited to information on the number of projects per participant, amount of funding allocated per project/participant, the country in which participants are based and the specific programmes, themes and funding schemes of projects.

[2] Scopus contains information on publications and citations, it has been used for the bibliometrics analysis.

Geographical location and national R&D priorities also impact thematic specialisation. RPOs located in EU13 are more specialised in 'Research potential of Convergence Regions' while EU15 based RPOs are very active in 'ICT' and 'European Research Council'.

Several factors are critical to the success of RPOs in FPs participation, both at the individual organisation level and at the national one. RPOs consider the availability of solid networks, the participation in established scientific communities recognised at European level and the availability of dedicated resources with appropriate operative and managerial skills to participate in FPs calls as the most relevant factors determining the success in participating in FPs. The broader characteristics of MS, such as public spending in R&D, infrastructures and on general national R&D priorities, influence RPOs' participation

These factors position European RPOs at different levels of performance. Top performers are large umbrella organisations with diversified portfolios, mainly located in EU15 Member States. This means that there is a rather concentrated distribution of funds. The top 20 RPOs in FP7 received 41% of the overall funding to RPOs in FP7, with RPOs located in France and Germany together receiving 45% of that total. Such a concentration is due to a self-reinforcing process through which RPOs that originally have better infrastructures and enhanced financial resources are more active in FPs, thus attracting more financial resources and strengthening their network of international partners. As a result, RPOs located in EU13 countries still lag behind RPOs located in EU15 countries. They receive only a small share of RPO funding and receive an average amount of funding per project, 20% of that received by RPOs based in EU15 countries. Besides the self-enforcing process mentioned above, other contextual factors are relevant to explain EU13 RPOs' positioning: an average lower public expenditure on R&D in EU13 countries, smaller internal markets for RPO services, and a relatively small size of new research organisations.

The study also investigates the factors leading to, or hindering, RPOs' participation in FPs. The most relevant factors encouraging participation relate to the possibility of increasing networks and reputation. In general, organisations claim that participating in FPs has improved their quality of research and their access to complementary expertise, and has enhanced their research competencies and the skill level of their personnel. Participation in FPs induces a further broadening of networks through a process of "network sharing" by which RPOs tend to bring their own network into consortia. Since RPOs tend to very often be in consortia with both universities and private companies, this process of "network sharing" has led to more and more collaborations between RPOs and private companies. The incidence of participation with private companies under FP6 was 16% and rose to 33% under FP7 - while still maintaining a high level of collaboration with universities.

Another important aspect leading to participation is the willingness of RPOs to look for other economic resources when national ones are rather limited. However, due to the co-financing principle, RPOs located in Member States with higher government spending in R&D and with research priorities aligned to the European research agenda, tend to be better placed in entering the FPs. Others are not always able to find the internal resources needed for co-funding.

Differences also emerge between organisations based in the EU15 and those located in the EU13, in relation to issues that tend to reduce RPOs' willingness to participate in FPs. For the former group, the administrative burden of application procedures and the perceived scarce degree of detail in proposal evaluation outcomes (especially for unsuccessful proposals) are the main problems, while for the latter group the main issues relate to their lack of networks with potential partners, weak in-house skills in writing/designing proposals and the lack of R&D funding at national level. RPOs associations play an important role in facilitating the participation in FPs and overcoming some of these issues by informing RPOs about international calls or even supporting their members in preparing applications.

Scientific outputs and impacts

Scientific outputs and impacts are assessed in the study through the analysis of publications and patents of a sample of RPOs participating in FPs. In evaluating the results of the analysis it is important to keep in mind that scientific outputs by no means fully represent the overall contribution of FPs in supporting research in Europe. They can only show the direct links between FPs and beneficiaries' activities, but cannot portray the overall progress in scientific research due to the human development and the virtuous knowledge sharing mechanisms which FPs support. This is particularly true for those RPOs which are, generally, more active in applied research fields characterised by low publication rates. Analysis of outputs is hampered by the fact that most RPOs keep track only of the most basic statistics about their scientific outputs without, for example, identifying the origin of funding.

On the basis of the KPIs used to measure the contribution of RPOs to scientific literature, these organisations tend to be less prolific in comparison with universities.

Participation in FPs does not significantly impact the publication patterns: RPOs with the highest publications rates have on average about 1%[3] of their publications directly linked to FP-related projects, and this percentage is not always correlated to the funding received.

Top performing RPOs in terms of number of publications tend to be large umbrella organisations operating in multiple scientific fields. Although Scientific Institutes operating in neurosciences and environmental sciences are, in general, the most prolific in terms of quantity of publications in peer reviewed journals, the organisations with the highest rate of publications deriving from FPs are Research and Technology Organisations.

The impact of FPs appears higher in terms of number of patents registered stemming from FP-related projects, although the share remains small. Research and Technology Organisations are the type of RPO with the largest number of registered patents of which around 5% derives directly from FP7-related projects. Scientific Institutes have a significantly lower number of patents but have similar rates of patenting related to FP7. Research and Technology Organisations are more prolific in comparison with Scientific Institutes, partly as a consequence of their preference to participate in those thematic areas with a heavy component of innovation rather than research, and partly because of a higher propensity to patent their results.

The limited number of RPO patents is mainly due to the characteristics of the research conducted such as technological readiness and commercialisation potential or the field of research. Life sciences, social sciences and humanities research usually lead to the publication of scientific articles instead of a registration of a patent, while patenting is more frequent for research in physical sciences and engineering. From the RPOs taken into account for this analysis, it seems that these organisations tend not to focus on patenting. Rather, they tend to transform research into innovation creating partnerships with private companies, creating start-ups or spin-offs to test the commercialisation of a product stemming from research, or providing technical expertise to private companies.

A key result of the study is that innovation-oriented RPOs tend to be based in countries with high expenditures in R&D. They also have relatively high patent application rates related to FPs. Specifically, Scientific Institutes and Research and Technology Organisations are the most inclined to innovate both within and outside the FPs. Top performing RPOs in terms of patenting numbers are French and German RPOs operating in Nanosciences, Nanotechnologies, and Materials and new Production Technologies (NMP), followed by those in the health sector.

Impact of FPs on different dynamics and evaluation of the RPOs in Europe

In general, FPs had a relatively significant impact on European RPOs in several ways. First of all, in terms of funding incidence and related diversification of funding sources, but also in terms of internal and external organisation: FPs have stimulated thematic specialisation of RPOs, have supported the development of cross-border partnerships to compete on the international playing field and have led to the intensification of staff-exchanges and human resource development. In addition, FPs also had a relevant impact on the national research policies, leading to the harmonisation across EU Member States both in terms of procedures and in terms of thematic areas of research.

In terms of funding, FPs have become an increasingly important source for RPOs. The share of organisations which receive more than a fourth of their funding from the FPs substantially increased (9% under FP6 to 26% under FP7). The increasing importance of EU funding has motivated organisations to pursue internal re-organisation in order to achieve a higher EU specialisation for example by setting up new "European" teams, external funds units or specialised education structures. These organisational changes helped RPOs to increase their participation in FPs.

FPs have also impacted the type of research conducted by RPOs. On the one hand "Europeanisation" (partly fostered by FPs) pushes RPOs towards higher engagement in medium- to long-term research in the fields driven by the public interest (some organisations interviewed

[3] These results may slightly underestimate the actual effect of FP participation to scientific output since most RPOs do not register complete statistics on their publications on scientific journals directly stemming from FP projects.

reported an increase in the scope of the themes treated after the participation in FPs). On the other hand, RPOs still cannot abandon the short- to medium-term orientation towards services required by the industry.

In terms of European RPOs' competitiveness FPs, by promoting international partnerships, helped RPOs to overcome the problem of national lock-in and helped them to compete on an international scale. Several organisations interviewed had positive remarks on the impact of FPs in enhancing cross-border cooperation among European RPOs. The share of projects involving cross-border cooperation in which RPOs have participated was close to 80% in FP6 and above 70% in FP7, with the reduction not resulting from a lower propensity of RPOs towards cross-national collaborations, but rather to the introduction in FP7 of new programmes such as the European Research Council that do not always require international cooperation. RPOs based in EU13 Member States most frequently partnered in consortia with universities and RPOs from Germany and the UK, followed by France, Italy and Spain. Such cross-border collaborations have led to improved knowledge sharing and the transmission of skills. More generally, these collaborations have influenced the development of participating researchers RPOs, of which those interviewed expressed that participation in the FPs led to development of their human resources through the acquisition of new skills and via sharing knowledge with other researchers. In addition, participation in FPs encouraged a higher level of interconnectivity between research organisations and researchers overall – with, amongst others things, a positive effect on the mobility of researchers within Europe.

FPs also had an impact on national reforms and research policies. FPs encouraged some harmonisation of national research programmes to the EU Research Agenda. FPs enhanced homogeneity in European practices for funding research and innovation, the diversification of funding sources and greater orientation towards collaborations with industry.

The contribution of RPOs to the development of FPs and the EU research policy

The literature tends to support the thesis that RPOs have played a major role in making progress towards creating the ERA and the Innovation Union, mainly through active participation in FPs. Traditionnally, many RPOs are thought to be positioned in the middle of the Knowledge Triangle connecting academia with industry and government. RPOs enabled knowledge sharing amongst these actors and worked as a link among them.

RPOs have contributed to the development of EU research policy, especially through associations which support them in creating critical mass and common improvements for their associates and communicating the emerging interests in a more structured way to the European Commission. Other means of communication include their participation in committees, advisory groups, public consultations and regular feedback on a number of position papers. EARTO, the association representing the interests of 350 RTOs across EU, regularly publishes position papers and open letters addressing major topics in EU research policymaking. The European Commission regularly consults EARTO as a part of its standard consultation procedures.

Thanks to their versatility and ability to work on basic and applied research and their high flexibility in cooperating with industrial and academic partners, RPOs have great potential in influencing the design of future research and innovation policy to face the key societal grand challenges.

Concluding remarks

RPOs are major players in developing the European Innovation System, in making progress towards creating ERA and the Innovation Union. A major role is to provide a link amongst academia, private sector and government, enabling the transformation of research into innovation.

FPs have contributed to improving the quality of RPOs' research, supporting their internationalisation and encouraging cross-border knowledge transfer. Thanks to FPs, RPOs have increased their networks – in other Member States, in academia and in the private sector - and diversified their funding sources.

The study highlights some points for attention. Specifically, the high concentration of funding, both in terms of number of beneficiaries and geographic location, which may hinder the ability of the European Union to exploit the full potential of its "resources of innovation". Some RPOs, regardless of their research capacity, lack in-house skills and experience with FPs funding procedures, or have difficulties in developing their networks and accessing the most acknowledged communities of researchers at EU level. Networking opportunities and training programmes targeting RPOs could support these organisations to compete with current top performers in the future.

Another point for consideration is the lack of availability of objective measures and statistics to describe the RPO sector or to capture RPOs' research outcomes. All of which cannot be captured solely by the number of publications or the number of registered patents. RPOs are not all the same: participation patterns and specialisations vary depending on the nature of the RPO. Thus measuring their impact on the scientific community, and more generally their ability to "transform research into innovation" would require taking into account the specific characteristics of each organisation, either being a Scientific Institute, a Research and Technology Organisation, a Government Lab or a Large-scale facility.

1. INTRODUCTION

1.1. The study

1.1.1. Objectives and scope of the study

This study was conducted in the context of the evaluation of European Union (EU) Framework Programmes (FPs) for Research, Technological developments and Demonstration Activities. It is one of the preparatory studies being undertaken for the overall ex post evaluation of the FP7 (2007-2013).

This study addresses Research Performing Organisations (RPOs)[4] with the aim of assessing the participation of RPOs in FPs, and contributing to the improvement of the design and management of FPs and, more specifically, of Horizon 2020. In addition, the study is intended to examine the impact of FPs on the different dynamics and functioning of RPOs in the EU and the role of RPOs in the development of the FPs and EU research and innovation policy.

The evaluation has been organised to provide answers to different evaluation questions relating to the following four areas:

- RPOs' participation patterns in FPs;
- RPOs' scientific outputs from their participation in FPs;
- The impact of FPs on the dynamics and evolution of RPOs in Europe;
- The contribution of RPOs to the development of FPs and EU research policy.

The specific evaluation questions addressed in the context of this study and the respective analytical elements to answer them are presented in the following section.

The scope of the evaluation covers FP6 and FP7 funded research projects that involve the participation of RPOs. For FP7, a specific focus has been placed on the specific programmes "Ideas", "Cooperation", "Capacities" and "People". The main focus of the study is on RPOs based in the EU28 Member States (MS). RPOs from other country groups (Associated and Third Countries) have also been covered (i.e. Norway and the United States).

1.1.2. Contents of the document

The current report is divided into three chapters. The first chapter (current chapter) presents a short reminder of the objectives and scope of the study, an overview of the key methodological aspects and caveats, a description of the classification of RPOs, and some background on the role and trends of participation of RPOs in FPs. The second chapter presents the key findings of the report and is subdivided into four sections reflecting the key four areas of evaluation mentioned in the previous section. Each of the four sections has in turn been subdivided into sub-sections to present results in relation to each specific evaluation question[5] (Table 1). The third and final chapter provides an overview of concluding remarks and related recommendations. Additional details on methodological aspects and additional data are presented in the annexes to this report.

Table 1: Guide to the reader per evaluation question

Evaluation themes	Evaluation questions	Part in the report
1. ANALYSIS OF PARTICIPATION PATTERNS	To what extent have RPOs participated in FPs (FP6, FP7) compared with other main beneficiaries (Higher and Secondary Education Institutes –HES and Private for Profit Organisations -PRC)?	2.1.1
	What are the new trends in the RPOs' participation? Which are the differences between EU15 and EU13?	
	What are the RPOs' participation patterns per specific programme, per	2.1.2

[4] After analysis and discussion with stakeholders the term Research Performing Organisations replaced the term Research and Technology Organisations (RTOs), that was originally used in the terms of reference to indicate different types of research organisations. RTOs are indeed just one of the four different types of RPOs that we identified as being in the scope of this study.

[5] Evaluation questions have been directly sourced from the tender specifications of the current assignment. They have sometimes been slightly readapted for the purpose of organising more efficiently the findings.

	thematic area and per funding scheme?	
	What was the EU contribution (funding) to RPOs' projects? (per FP, per Specific programmes, per thematic area and per country)	
	What are the RPOs participation patterns per country?	2.1.3
	What are the factors that motivate the RPOs to participate in FPs? Are there factors which could discourage RPOs from participating? (e.g. by using control groups) Who is not participating and why?	2.1.4
	What are the factors which can determine the success or the failure of RPOs in participating in FPs?	2.1.4.2
	To what extent do the specificity of the national research policy and the characteristics of RPOs organisation at national level influence the participation of RPOs in FPs?	2.1.4.3
	What are the strategies of RPOs regarding their participation in collaborative projects, as well as in training and mobility actions (coordinators or partners)? Which are the patterns of their networking related to their participation in the FPs?	
2. SCIENTIFIC OUTPUTS	What has been the scientific output related to the RPOs participation in FPs? Have the projects been fully and well implemented? Are there any other scientific outputs?	2.2
	What has been the short-term scientific impact related to the RPOs participation in FPs?	2.2.1
	What has been the long-term scientific impact related to the RPOs participation in FPs?	
	What were (are) the top-performing RPOs in terms of the scientific output and impacts?	2.2.3
	What has been the impact of RPOs' participation in FPs on innovation and economy?	
	What are the main mechanisms that RPOs use for translating research into innovation?	2.2.5
	What are the main measures RPOs use for measuring their impact in terms of innovation?	2.2.6
	Are there RPOs which are more inclined to innovate than others and what are the main drivers of this innovation orientation?	2.2.4
3. IMPACT OF FPS ON DIFFERENT DYNAMICS AND EVOLUTIONS OF THE RTOS IN EUROPE	To what extent have the FPs contributed to the organisation of RPOs of European level?	2.3.1
	To what extent have the FPs contributed to improvement of EU RPOs' competitiveness at European and global level?	2.3.2
	To what extent have the FPs contributed to the human resources development of RPOs in the EU?	2.3.3
	To what extent have the FPs contributed to increasing the collaboration between RPOs and universities and between RPOs and industry sectors?	2.1.5.2
	To what extent have the FPs contributed to the development of cross border cooperation activities of RPOs?	2.1.5.3
	How have the FPs influenced the national reforms of research system and of RPOs functioning in EU Member States? (a special attention to be given to the reform process in EU 13 countries)	2.3.4
	What has been the role of FPs to the dynamics and the evolutions mentioned above compared with other European and national research programmes? (the synergy between different programmes)	2.3.5
4. THE CONTRIBUTION OF RTOS TO THE DEVELOPMENT OF FPS AND THE EU RESEARCH POLICY	To what extent have the RPOs contributed to the set-up and the improvement of the FPs?	2.4.1
	To what extent has the participation of RPOs to FPs contributed to the development of ERA?	2.4.2
	What is the role of RPOs in the development of EU research and innovation policy?	2.4.3

The report is complemented by 40 RPO case studies covering 16 MS, which are presented in a separate document and should be considered as an integral part of this report. The case studies provide, for each RPO analysed, an overview on national research policies, some key indicators on R&D expenditure and detailed primary information obtained through in-depth interviews with RPO representatives.

1.1.3. Overview of the key methodological elements

The current report is based on information collected through primary and secondary sources of information. Primary data collection has been conducted through in-depth interviews with RPOs

across 16 selected MS, Norway and the United States, as well as European associations of RPOs and representatives of the European Commission. Secondary sources have been used to collect both qualitative information from literature reviews and quantitative information from the CORDA and Scopus databases: CORDA (including SESAM and RESPIR) have been the main sources for several axes of analysis, while Scopus has been used to analyse the publication patterns of RPOs. The information gathered was analysed using various tools, including bibliometrics and social network analysis.

Figure 1 provides an overview of how different methodological tools have been used to address the questions related to the four main areas of the evaluation study.

Figure 1: Methodological tools used for producing evidence for answering the evaluation question

	PARTICIPATION PATTERNS	SCIENTIFIC OUTPUTS AND IMPACTS	IMPACTS ON THE DYNAMICS AND EVOLUTIONS OF RPOS IN EUROPE	CONTRIBUTION OF RPOS TO THE DEVELOPMENT OF FPS AND EU RESEARCH POLICY
IN-DEPTH INTERVIEWS	Self-reported outcomes in terms of objectives & achievements, success factors and barriers to participation	Self-reported assessment of outputs and impacts	Description of the key changes in the organisation of European RPOs	Information on the extent to which RPOs contributed to setting up and implementing the EU research and innovation policy
ANALYSIS BASED ON THE ECORDA DATABASE	Awarded funds, number of participations and RPOs by: theme, specific programme, multi-disciplinarity of projects, country, EU15 and EU13	Publication and patents data based on SESAM and RESPIR, respectively	Figures on patterns of collaboration between RPOs and universities & RPOs and industry sectors	
BIBLIOMETRIC AND PATENT ANALYSIS		In-depth analysis on the selected RPOs based on publication data (Scopus) and patent data (EPO)		
SOCIAL NETWORK ANALYSIS	Analysis of collaborative experiences of RPOs			

With regard to the in-depth interviews, altogether 56 interviews have been performed, distributed as follows: 40 interviews were conducted with RPOs in 16 MS and used to complete the case studies that have been included in a separate document accompanying this report; 16 interviews were conducted with EC representatives, RPOs associations, RPOS that did not participant in FPs and non-EU RPOs.

The production of descriptive statistics and graphs based on data from CORDA allowed the evaluation team to complete the analysis of participation patterns in FP6 and FP7, considering various dimensions such as the number of instances of participation, the allocation of funding, participation patterns by specific programme, thematic areas and funding schemes, differences between EU13 and EU15 based RPOs, and participation patterns by MS.

The bibliometrics and patent analyses have been performed to analyse scientific outputs and impacts. They were implemented combining information from different sources, whereas the analysis of publication patterns has been conducted in relation to the 40 case studies of RPOs, only when information was available in Scopus. The patent analysis was conducted in greater detail for the case studies of RPOs and more general statistics where produced on the basis of the RESPIR database.

The Social Network Analysis (SNA) has been used together with descriptive statistics to analyse the patterns of collaboration between RTOs. CORDA has been used as the main source of information for producing statistics also for the SNA.

1.1.4. Caveats and limitations of the methodology

Analysis using CORDA has encountered some limitations related to the possibility of comparing data between FP6 and FP7, the availability of some data, and the possibility of performing an in-depth analysis by type of organisation, considering that CORDA uses the single label "REC" for all types of Research Performing Organisations.

In regards to the comparison of data between FP6 and FP7, two main issues have been addressed: the correspondence of the thematic areas and the different labelling of beneficiaries in the two FPs.

CORDA reflects the structure of FPS in terms of thematic areas, which differ from FP6 to FP7. Thus, in order to allow for a comparison between results across FPs, the evaluation team has mapped the thematic areas between FP6 and FP7 (Table 2). Based on this mapping, the evaluation has adopted, when possible, the labels used in FP7 to report the results both in this report and in the accompanying document with the case studies. For the thematic areas in FP6, for which a direct correspondence with the FP7 is not possible, the evaluation team has retained the label used in FP6. A similar mapping was not feasible at the level of specific programmes, but this is not a major issue as the correspondence based on themes allows for a more detailed analysis.

Table 2: Correspondence of thematic areas between FP6 and FP7

FP6	FP7
Information society technologies	Information and Communication Technologies
Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices	Nanosciences, Nanotechnologies, Materials and new Production Technologies
Food quality and safety	Food, Agriculture, and Biotechnology
Life sciences, genomics and biotechnology for health	Health
Aeronautics and space	Space
	Transport (including Aeronautics)
Sustainable development, global change and ecosystems	Energy
	Environment (including Climate Change)
	European Research Council
Specific measures in support of international cooperation	Activities of International Cooperation
n/a	Research potential of convergence regions
Citizens and governance in a knowledge-based society	Socio-economic sciences and Humanities
Horizontal research activities involving SMEs	Research for the benefit of SMEs
Human resources and mobility	Marie-Curie Actions
Research infrastructures	Research Infrastructures
Science and society	Science in Society
Support for the coherent development of research & innovation policies	Coherent development of research policies
New and emerging science and technologies	n/a
Policy support and anticipating scientific and technological needs	n/a
Support for the coordination of activities	Coordination of research activities
	Regions of Knowledge
	Joint Technology Initiatives (Annex IV-SP1)
	General Activities (Annex IV)
Euratom	Fusion Energy
	Nuclear Fission and Radiation Protection
Research and innovation	n/a
n/a	Security

Source: authors' elaboration based on desk research

As for the categorisation of beneficiaries, the evaluation has adopted a re-categorisation of FP6 labels for beneficiaries into FP7 labels (Table 3). The category "PUB" is only used in FP7 whereas the category "N/A" is only used in FP6. Such categories are reported in general with figures just for FP6 and FP7 considered separately; in some instances, however, figures of OTH and N/A or OTH, N/A and PUB are added together in order to simplify the comparison across FPs.

Table 3: Correspondence in the categorisation of beneficiaries

FP6	FP7	Full name
HES	HES	Higher Education (i.e. organisations only or mainly established for higher education/training, e. g. universities, colleges);
IND	PRC	Industry (i.e. industrial organisations private and public, both manufacturing and industrial services such as industrial software, design, control, repair, maintenance);
	PUB	Public institutions
OTH	OTH	Others
REC	REC[6]	Research (i.e. organisations only or mainly established for research purposes);
N/A		Undefined

Source: authors' authors' elaboration based on desk research

Some data was missing in CORDA, impacting the bibliometrics and patent analysis. The CORDA database component for publications –SESAM- only reports information for FP7 and without direct reference to the institution for which the publication was produced. Implementing the bibliometrics analysis required a cross-tabulation of information from the Scopus database and SESAM due to the limited sample of the case studies of RPOs. Similarly, the CORDA database for patents – RESPIR - reports only information for FP7. In this case, however, the name of the organisation registering the patent is reported, and this allowed for a more extensive analysis in relation to innovation aspects. As a result, some of the key conclusions on the performance of RPOs in FPs in relation to scientific outputs are based on a reduced and statistically non representative sample, and therefore should be considered with caution.

An additional limitation arising from the use of the CORDA database is that it does not allow for a direct distinction between different typologies of research organisations grouped under the unique label REC.[7] The scope of the current study includes all different types of organisations falling under the label REC in CORDA and any problem connected to the precise categorisation of different RPO categories is inherited in our analysis, and in the sampling strategy adopted. For most of the analysis implemented in this study, RPOs were considered as a whole without a distinction between more specific categories.

In order to account for the specific characteristics of different organisations, we have adopted a categorisation of RPOs in four types and reclassified the case studies of RPOs accordingly. For some aspects of the analysis based on the CORDA database, the categorisation has also been extended to the top 100 RPOs in terms of the level of funding in FP7. The categorisation was implemented after the sampling from CORDA based on individual scrutiny of each selected organisation by the evaluation team. The next section introduces the four different categories of RPOs.

Finally, the responses gathered through in-depth interviews do not always allow for a clear differentiation of the answers in relation to the various options provided in the questionnaire. Results contained in the report can still be considered of interest in terms of emerging trends in RPO behaviours and attitudes within FPs. Furthermore, the trends emerging from the analysis of responses by interviewees are complemented by the figures contained in CORDA.

1.1.5. Defining RPOs

As mentioned, the terms of reference offer an implicit definition of RPOs, which is rather wide. Because terminology in this area is not standardised, the evaluation has used the following classification, in which the first three categories build on a taxonomy proposed by Arnold, Barker and Slipersæter (2010) and the last on mapping work done for the Commission in relation to the launch of the idea of a European Research Area (Technopolis, 1999).

[6] The abbreviation REC corresponds with the group of institutions that in this report are categorised under the label RPO. Graphs based on CORDA indicating the category RPO are based on aggregates produced using the label REC.

[7] The same lack of a precise categorisation of RPOs is common to EUROSTAT and OECD, that do not distinguish unambiguously between different types of RPOs, limiting the analysis by type of organisation. Indeed, the need for having robust data, for example on RTOs in narrow sense, was stressed also in a position paper by EARTO published on the 13 March 2014: " EU R&I policy & data-driven decision making – knowing your innovation ecosystem actors: data on European RTOs

In contrast to focusing on legal form or ownership (OECD, 2011) (Racine, Goldberg, Goddard, Kuriakose, & Kapil, 2009), the classification adopted for this study is based on the organisations' history and functions, and provides a simple way to understand complex organisations that is appropriate for developing policy.

- Scientific research Institutes
  - Doing 'big' science that is dependent upon large-scale or expensive equipment;
  - Doing 'little' science that could also be done in universities;
- Government Labs
  - Producing knowledge needed for legislation and regulation;
  - Producing public goods on behalf of the State;
- Publicly funded Research and Technology Organisations (RTOs), whose primary aim is to produce industrially relevant knowledge and support innovation in business. In Europe, they are organised in the European Association of RTOs (EARTO);
- Large-scale Research Facilities (LRFs), which are typically intergovernmental arrangements to establish and share research facilities.

Table 4 provides an overview of these four types of RPOs and illustrates their key characteristics. A unique definition and clear classification of RPOs is not always straightforward, since some of them may present elements typical of different categories.

Table 4: Types of RPOs

Name	Description
Scientific Institutes	Scientific institutes produce new fundamental or applied knowledge with larger institutes also providing research infrastructure. Historically, some scientific research institutes have their origins in Research Councils or Academies of Science, which were simultaneously funding and performing research. Such institutes have a high share of core funding in their income. In most parts of Western Europe, the funding and performing functions were separated decades ago. In the former Soviet bloc, Academies of Science controlled institutes up to the end of the 1980s. Since then, some of these countries such as Estonia have separated out the remaining scientific institutes as independent organisations or transferred them to universities; others like the Czech Republic continued the old integrated Academy model, while at the same time developing research capacity in the universities, which in former times focused on teaching. The literature suggests that scientific institutes follow a similar logic to that of universities and tend to do fundamental research and respond opportunistically to external incentives.
Government Labs	Government laboratories produce new applied knowledge to support the missions of their parent ministries and generally monitor and measure things relevant to those missions. Regulation-oriented labs are likely also to test, measure, certify and sometimes carry out standardisation. Sometimes referred to as 'sector' institutes (or in US terminology 'mission' labs), government labs are generally owned by the state but can also be company-operated. Often, these labs also do routine monitoring for government, which is not R&D based but supports their research and is needed for regulation or emergency responsiveness. In many countries, Government laboratories are subject to a much greater pressure to be socially useful in addition to fulfilling their scientific and regulatory tasks. This is causing the distinction between them and the RTOs to blur. According to Georghiu, et al. (2008), the trends of government labs under the European Research Area (ERA) are a growing focus on internationalisation (although they still have very national character), difficult integration (due to ownership and governance patterns) and scope for provision of research and technical services for the European market (although local markets and delivery remain important because of the SME clientele).
Research and Technology Organisations (RTOs)	RTOs or 'applied industrial research institutes' focus on generating applied knowledge and carrying out R&D with and for industry. They may have a special task to support SMEs or low-capability firms. They focus on user- or problem-oriented research for the benefit of society and normally win the greater part of their funds competitively. RTOs are, on the European level, represented by the European Association of Research and Technology Organisations (EARTO). Eurotech is a sub-set of EARTO that brings together the top directors of high-level technological know-how organisations.
Large-scale Research Facilities (LRFs)	A considerable number of large-scale research facilities were established in the decades following World War II. However, since the start of the FPs fewer have been set up presumably because the FP and the growing scope and importance of the EU provides simpler and more flexible arrangements for building and sharing research infrastructures.

To some extent, the different types of RPOs tend to have different thematic specialisations. Scientific Institutes can be active in almost any field of research. They are often, but not always, oriented towards more fundamental types of research. In contrast, because Government Labs address societal missions, they tend to be more applied and address fields of less direct importance to industrial innovation. In contrast, RTOs' work in applied fields, which are largely relevant to existing industry. These are usually areas that involve a large degree of engineering or other 'translational' activities rather than fundamental research, as in mechanical, electrical, electronic and materials research. Their specialisation also reflects the research that was industrially relevant in the period of their foundation and growth; there are thus, few RTOs active in support of the creative industries including games and media, even though these are increasingly based on very sophisticated knowledge production. RTOs generally steer clear of the sciences, such as life sciences and chemistry, that underpin the so-called 'science based industries'. Companies in these industries generally communicate directly with Scientific Institutes or universities.

The logic of the Large-scale Research Facilities is not thematic, but based on cost and scale. Many were set up under international agreements that predate the FPs, in order to share the cost of very large experimental equipment (such as at CERN), or to do work in areas where scale is economically advantageous (as with EMBL). Obviously, some of the work they do is at a very fundamental level – again the example of CERN is a good one.

1.2. The background

1.2.1. Trends in the RPO sector

Previous research on European RPOs (Arnold & Barker, 2014) suggests that key drivers of change in the sector include:

- Increasingly sophisticated demand. In all domains, RPO customers grow increasingly sophisticated over time. With industrial development, production becomes more technology-intensive. Therefore, industrially-oriented RPOs increasingly move towards more demanding research, as some of their knowledge and services become more commonplace and at some point can be delivered by the private sector. Eventually, market-facing RPOs move away from simple product and process development and training for unsophisticated users, and move towards research-intensive cooperation with sophisticated users, typically helping break knowledge or capability bottlenecks in users' innovation processes.
- Convergence. In both science and technology, there is increasing convergence of technologies and disciplines (MIT, 2011) giving rise to scientific fields such as bioinformatics, systems biology and computational linguistics and 'hyphen technologies' (micro-electronics, bio-nanotechnologies, etc.) cutting across previous boundaries. Some research has an increasingly systemic character (ESF, 2009). At the same time, users are producing increasingly complex products requiring access to multiple technologies.
- Globalisation is widely discussed as a change driver in the institute world, but its implications vary. Scientific Institutes share scientists' propensity to cooperate internationally. This happens more in 'basic' than applied disciplines and in smaller rather than larger countries, as well as for extra-scientific reasons such as former imperial links (Frame & Carpenter, 1979). Motivations for international research cooperation that apply to RPOs include: accessing cutting-edge and complementary knowledge and partners; tackling large or complex problems; sharing infrastructure; accessing funds or customers abroad; accessing geographically specific research subjects or data; accessing markets or regulatory/standardisation domains; and improving RPOs' reputations (Edler, et al., 2007).
- Core funding. There are pressures on RPOs to increase their proportion of competitive funding and reduce dependence on 'core' funding. They are expected to more efficiently produce countable outputs such as scientific publications and patents. These changes result both from a political desire to share the cost of RPOs with industry, and from interest in better monitoring and measurement of the use of public funds.
- Larger RPOs thematic specialisation must constantly be shifting, driving them towards a wider range of disciplines. Similarly, the rising capabilities of users pose increasingly challenging and complex problems, to which the solutions are typically cross-disciplinary. There has been a long-standing drive towards having larger, more polytechnic RPOs. This process began twenty years ago in Norway (Skoie & Ødegård, 1990) and has seen a consolidation of much of the RTO effort into SINTEF (Gulowsen, 2000).

The abovementioned trends have to be considered as an important point of reference for the findings obtained through the aspects analysed in the current study. More specifically, they are useful in explaining the attitudes of RPOs towards polytechnicity, organisational strategies and scale and orientation towards more fundamental or applied research.

The analytical framework at the basis of this study acknowledges the following three key features of Research, Technology and Innovation activities:

- Systemic nature: RPOs are part of a research, technology and innovation system, whose players and flows contribute to the development and performance of the system.
- Network nature: related to the systemic nature of research, technology and innovation activities. It consists of the interdependence of contributions and the profile of RPOs as part of a vast ecology of players (firms, universities, technological centres, industrial/sectorial associations, governmental agencies).
- Holistic nature: RPOs' contribution can be defined as various types of knowledge inputs, ranging from research results (basic vs. applied) to the training and availability of highly skilled people, which can make a significant contribution for firms' activities and economic growth.

1.2.2. The role of RPOs in Framework Programmes

FPs have existed for the last 30 years and have progressively contributed to strengthening the research system across the European Union. FPs have gradually increased in terms of size and scope. The evolution in participation patterns of RPOs is deeply connected to the changes that have gradually been introduced across the various editions of FPs.

Trends of participation in FPs have increased over time thanks to a continuous growth in the budget allocated through FPs. While FP5 started with a budget of EUR 15 billion and FP6 with EUR 19 billion, FP7's budget was increased to EUR 56 billion. Horizon 2020, spanning over seven years, has a budget of roughly €80bn. The growth of the budget has corresponded to a gradual broadening of the scope, -with FP6 covering 7 themes, FP7 10 and H2020 13 (six under industrial leadership and seven under "societal challenges"). Participation in FPs is open to legal entities (e.g. research institutes, universities and industry including SMEs), but also natural persons from any country in the world. In general, there are no restrictions to participation for EU MS and Associated Countries.

During FP6 and FP7 the main focus has been research, whereas in Horizon2020 the scope has been enlarged to include innovation. The role of the RPOs, as providing the 'glue' that holds the FP together, has long been recognised (Arnold, Clark, & Muscio, 2005) (Avedas, 2009). It has been especially important in relation to parts of the FP that aim at supporting small firms, but applied RTOs also play a major role in relation to the KETs.

Box 1: Overview on FPs

The focus of FP6 has been in structuring, integrating and strengthening the ERA. FP6 was organised into two specific programmes:

- "Integrating and strengthening the research area" composed by two blocks: "focusing and integrating European research", whose objective was to strengthen European excellence in several thematic areas, and "strengthening the foundations of the ERA," whose objective was to tackle weaknesses of the European research and focusing on enhancing integration of research and innovation activities in Europe, improving skills and quantity of European researchers, reinforcing research infrastructures of highest quality across EU MS and developing structural links between the scientific community and society at large.
- "Structuring the European research area," which aimed at the harmonisation of research and innovation policy across Europe through the development of synergies, by supporting coordination activities and the coherent development of research and innovation policies.

The structure of FP7 evolved by redefining specific programmes in a more functional way with respect to the arising need to develop research and innovation in Europe:

- Cooperation enhancing the degree of interaction between universities, RPOs and public authorities has represented the logical evolution of the first block of FP6 - focusing and integrating European research, subdivided in very similar thematic areas.
- In FP7 a dedicated theme was created for space and security separating it from aeronautics that was included in the transport theme. More resources were also explicitly assigned to aspects such as energy and environment that were explicitly set up in two specific themes.
- Ideas with the objective of enhancing frontier research, and with research that can be conducted in any specific area. Participants of this programme are individual researchers, who are working in MS or AC. The programme is managed through the European Research Council.
- People to provide researchers support in mobility and career development both at the European level and internationally. This theme was in part continuing the second theme Block of FP6 emphasizing the development of people rather than infrastructures (which in FP7 are covered in Capacities presented next). The programme is implemented through a series of Marie Curie Actions.
- Capacities to support research capacities to strengthen the knowledge economy including enhancing research infrastructures, the research for the benefit of SMEs, Regions of knowledge,

research potential science in society, coherent development of research policies and international cooperation.

H2020 has substantially changed the overall organisation following a three pillars approach based on excellent science, industrial leadership and societal challenges.

Over the last three editions of FPs, there has been a continuous improvement to broaden the participation in FPs. One tangible effect has been the introduction in FP7 of a unique rate to cover costs instead of three separate rates in FP6. The unique rate has been maintained in H2020. The time to grant has been gradually reduced passing from a period exceeding 12 months in FP6 to 12 months in FP7, and to 8 months for the first projects issued in H2020. The burden of checks for financial viability has been gradually restricted to partners of higher weight in consortia passing from FP6 to FP7 and limited only to coordinators in the case of H2020.

A common factor of participation in FPs relates to the two fundamental principles of "excellence" and "co-funding" which tend to be crucial in determining distribution of funds and participation patterns of different organisations in FPs. The capacity of countries and research organisations for spending in research activities is a key determinant of success for participating in FPs, together with the ability of delivering excellent results. As a result organisations based in countries with better quality institutions, investing more in research and innovation activities as well as an agenda more aligned with priorities expressed in FPs, enjoy a clear comparative advantage in participating in FPs.

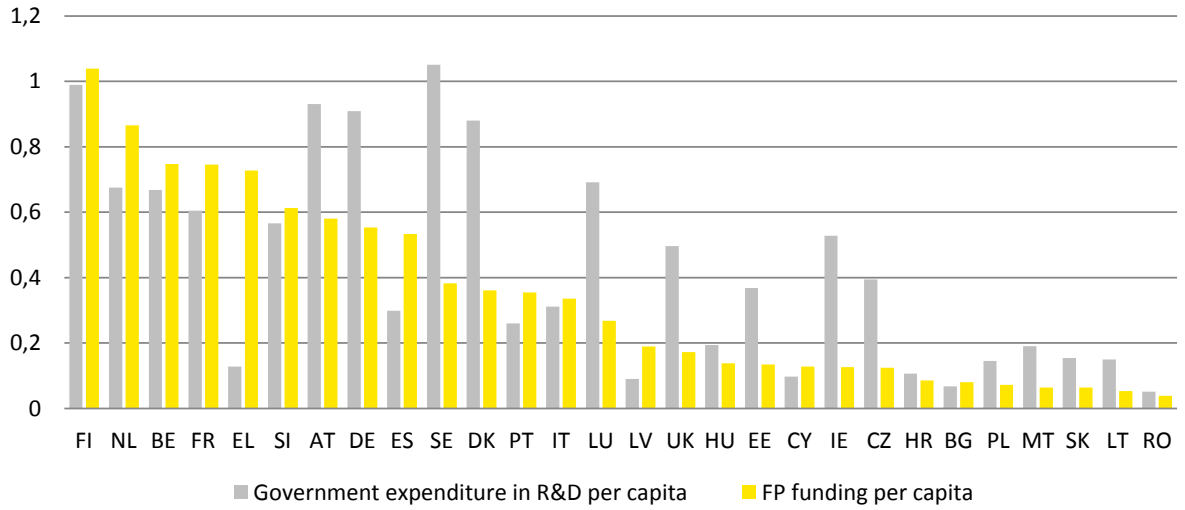
RPOs turn out to be crucial for the success of the ERA due to their fundamental role for both research and innovation. The organisations make significant contributions to all five dimensions of the ERA outlined in Europe 2020. First, they are major knowledge generators and providers, supporting EU policy and competitiveness. Second, RPOs – and in a particular way the RTOs - are strong components of the "knowledge triangle" by virtue of their intense cooperation, on the one hand, with universities and other research institutes, and on the other hand, with the innovation processes of producers in industry and the State. Third, they provide public as well as traded knowledge goods within and beyond the EU. Fourth, they already have strong societal missions and are well positioned to tackle many of the "grand challenges" ahead, such as climate change, environment, ageing, health and food supply. Responding to these is typically a societal task that will also include economic actors on a large scale. Fifth, sustainable development is part of this societal mission and is universally recognised by the RPOs not only as a duty but also as a major opportunity for them.

1.2.3. The importance of national research systems' features

The patterns in allocation of FPs funds across MS is strongly related to the amount of government expenditure observed in each individual MS. Figure 2 provides an overview of the distribution of funds in relation to FPs and the MS capacity of investing in research activities as captured by government expenditure in R&D (GERD)[8]. EU13 MS (with the exception of Estonia and the Czech Republic) tend to show capacity of investing in research activities that is on average markedly lower in comparison with that observed in EU15 MS, with the subsequent marked difference also in terms of EC funds received.

[8] Both indicators are weighted by the population and standardised in order to make them easier to be compared.

Figure 2: Comparison between total government expenditure per capita and EC funding allocated in the context of FP7[9]



Source: authors' calculations based on the CORDA database and Eurostat data –GERD 2012

The EU15 countries include the largest MS in the EU. Inevitably, their combined weight affect their influence on and in the FPs.

RPOs in the EU15 have developed under diverse circumstances, so there is not the kind of systemic uniformity that can be observed in post-Soviet systems. In many cases, there is a well-established RPO system in EU15 countries. This has often involved the State taking over all or some of the funding of earlier branch research associations. In some cases – notably in Germany and Austria – the RPOs (e.g. Fraunhofer and the Austrian Institute of Technology) were established directly by the State. Government labs tend to be separate from the other RPOs, though there is a growing tendency to partially merge them into national RPO networks. This happened to some degree in the Netherlands before the Second World War, while in Finland a recent reform that restructures the RTOs and labs is beginning to have the same effect.

Scientific research institutes in the EU15 systems, tend to be rather separate from the other kinds of RPOs, which are funded in different manners and organised in different networks. In Germany, the Max Planck institutes are highly autonomous organisations within the Max Planck Society. In France, Spain and Italy, however, there are national organisations that run scientific institutes in a more integrated way. In this way, they resemble in some respects the Soviet academies.

The long history of the EU15 RPOs combined with the high investment in R&D in these countries and their absolute scale explain why their RPO systems are in general larger than those in the EU13 countries. That in turn reinforces their success in the FPs, in which they tend to take strong leadership roles.

Some features might need to be taken into account when comparing EU15 and EU13 countries. In many EU13 MS, the research and innovation systems inherited institutions and traditions from the period before 1989.

Although the civil research sectors in Central and Eastern European MS were well developed under the Communist regime, there was traditionally a limited need for RPO services. Former industrial R&D institutes provided the basis for an RPO network, but necessitated substantial assistance to adapt to their new role.[10] In many countries, this opportunity was never taken.

Academies of sciences have traditionally played central roles in Central and Eastern European regions and their research ecosystems. Their prominent role was based on the Soviet research systems. Academies of Sciences were politically strong (sometimes having ministry status), with their constituent institutes often having a narrow focus on specific scientific fields (resulting in large numbers of institutes). Institutes under the Academies of Sciences were previously fully funded and their research agendas were under the total control of the institutes themselves. As a result, researchers did not face competition and peer review was often more focused on political

[9] Data has been standardised by the range of the minimum and maximum value observed across MS.
[10] Tiscar, J.R. ed. (1994), The future of research and technology organisations in Europe. European Commission.

conformity than quality. This had negative impacts on the quality of the research. Capital equipment was often of low quality, resulting in an emphasis on theoretical rather than empirical work. Working links among Academy institutes were negligible and links with other actors in the economy virtually non-existent.

Aside from the institutes under Academies of Sciences that focused predominantly on basic research, there were a large number of industry institutes focused on a particular branch of industry, rather than a field of technology. These institutes were funded in many cases by the government. During the Communist era, research institutes were part of a system in which R&D was not performed 'in-house' within enterprises and therefore was not directly driven by production needs or market demand.[11] The link with industrial enterprises was therefore indirect and they operated according to the State Plan. On the side of industrial enterprises, there were no real incentives to engage in R&D and to link with research institutes. When enterprises performed research in the centrally governed system, they usually suffered from an excessive number of employees, low efficiency and too many non-research activities.[12]

Although there have been major developments and institutional shifts in the EU13 since their accession to the EU, Academies of Sciences still remain important players, which makes the EU13 research systems different from those of EU15. In some countries, academies of sciences, that are most frequently public organisations, represent umbrella bodies for a range of research institutes and also carry out research on behalf of the government. However, their position is not yet properly clarified in many of the EU13 countries, they are struggling to find new roles and positions within their respective research systems, to find what type of research to focus on (basic or applied) and to find an appropriate division of labour with the other research performing sectors, such as private for-profit organisations or universities (the research performance of which has been growing in the EU13 MS in recent years).

Shortly after the fall of the previous regimes in the EU13 countries, many industrial enterprises lost their markets and were forced to re-orientate their activities towards Western Europe. Academies of Sciences have become less politically powerful and their funding has been drastically reduced. The institutional funding of some institutes has been totally withdrawn, forcing them to seek contract R&D for domestic and foreign enterprises. However, these institutes needed to undergo a deep transformation to acquire the necessary knowledge of industrial processes.

New research organisations (excluding universities and private for-profit research performers) have been emerging in the EU13 countries only recently and these new RPOs are still relatively small compared with those in the EU15.

These factors result in the EU13 RPO sectors still being in some sense underdeveloped and under transformation. Research systems in the EU13 continue to undergo structural change and one of the negative implications of this appears to be their reduced capability in terms of successfully responding to the FP calls.

[11] Racine, J.-L. et al. (2009), Restructuring of Research and Development Institutes in Europe and Central Asia.
[12] European Commission (2004), The RECORD Experimental Map: Innovative Research Organisations in European Accession Countries.

2. KEY RESULTS

The objective of this section is to provide an overview of results for the four areas of analysis. The results presented are mainly aggregated at EU28 level, although some statistics are provided by Member State and at EU15 and EU13 level. The underlying data on which the following sections have been based can also be found in Annex 2 and in the document accompanying this report presenting the case studies.

2.1. Participation patterns

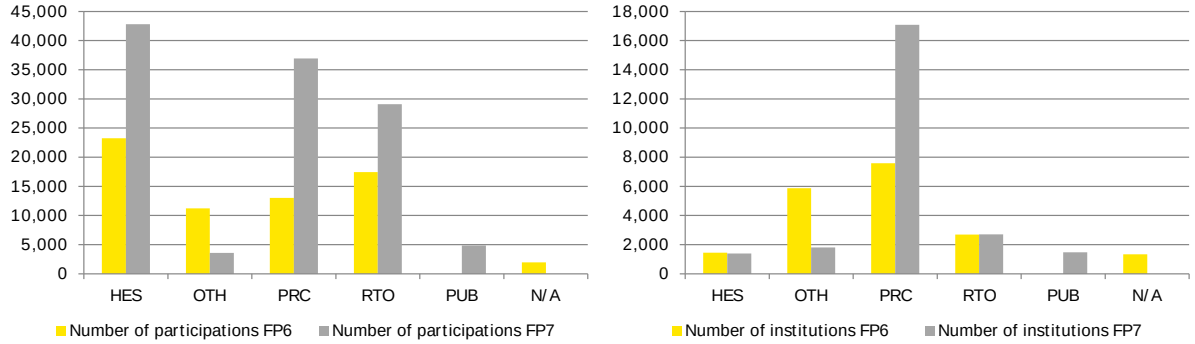
2.1.1. Participation of RPOs in FPs compared with other main beneficiaries

RPOs are the second largest beneficiary of FPs after universities. Their participation patterns are similar to those of universities, with a sharp increase in participation vis-à-vis a stable number of organisations involved in FP6 and FP7 and a high concentration of funds in a small number of organisations. Despite the increase in participation, the relative share of funding awarded to RPOs has overall decreased in comparison with universities and private companies, except for collaborative projects where it remained stable. The most active organisations are Scientific Institutes and RTOs, which together attracted around 90% of the funding.

The number of RPOs participating in FPs has been relatively stable under FP6 and FP7: 2,690 RPOs participated in FP6 and 2,703 in FP7. Despite the stable number of organisations, the patterns of participation have been characterised by a strong increase from FP6 to FP7 both in terms of the number of instances of participation and in the amount of funds allocated.

Figure 3 provides an overview on the instances of participation and the number of institutions involved per type of beneficiary. RPOs have indeed increased their participation in projects also assuming different roles, as coordinators or participants, accounting for more than 29,000 participations[13] in FP7. This represents a strong increase (67%) in comparison with the number of instances of participation in FP6 and a strong increase in the average number of participations for each RPO, with a ratio of number of organisations to number of participations from 15% in FP6 to 9% in FP7. This pattern is similar to that of universities (HES), which also increased their level of participation significantly with, like RPOs, a relatively stable number of institutions involved. Private companies (PRC) show instead a different pattern, with both a sharp increase in the number of participations and in the number of institutions (Figure 3), in line with the new objective of FP7 of fostering the technological basis of industry for boosting international competitiveness.

Figure 3: Overview of the number of participations and of institutions in FP6 and FP7



Source: authors' calculations based on the CORDA database

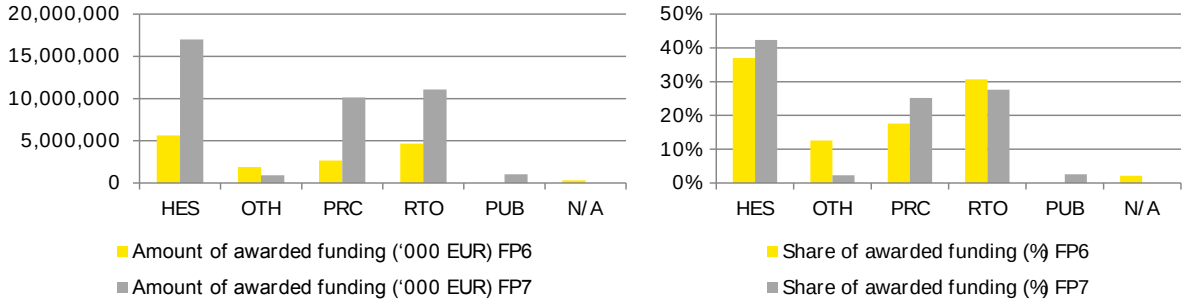
The increased number of participations has been associated with a strong increase in the resources allocated to RPOs, which grew from EUR 4.7 billion in FP6 to EUR 11.1 billion in FP7, making RPOs the second largest beneficiary after universities in both FP6 and FP7. The average funding per RPO grew from EUR 1.7 million in FP6 to EUR 4.1 million in FP7, but remains much lower in comparison

[13] One project can be participated by more than one RPO. The number of projects in which RPOs participated passed from 5,926 in FP6 to 12,422 in FP7. There was an overall increase in the number of projects financed through FPs passing from the total of 9,196 in FP6 to 23, 203 in FP7.

with that of universities, which reached an average of EUR 12.2 million per institution in FP7[14]. The average funding per participation for RPOs, which increased from EUR 267,728 in FP6 to EUR 381,085 in FP7, is instead in line with the average funding per participation for universities and private companies[15].

The increase in the number of participations and in the amount of funding allocated is of course also the result of the sharp increase in available resources for FPs. Still, it has to be noted that RPOs reduced their share of funding passing from around 31% in FP6 to around 28% in FP7, with an increase of the share of funding for universities and private companies[16] (Figure 4).

Figure 4: Patterns in the distribution of awarded funding per beneficiary



Source: authors' calculations based on the CORDA database

The distribution of funds is highly concentrated, with 20 RPOs attracting around 41% of total funding allocated to RPOs in FP7 (Figure 5), with no significant changes in comparison with FP6. The types of RPOs that tend to dominate the top 20 are Scientific Institutes[17] (12) and RTOs[18] (7), with a more limited participation of Large-scale Research Facilities (only the European Molecular Biology Laboratory) and no Government Labs.

[14] For universities, the average funding per institute passed from EUR 3.9 million in FP6 to EUR 12.2 million in FP7; for private companies the average funding per organisation passed from EUR 0.35 million in FP6 to EUR 0,6 million in FP7.

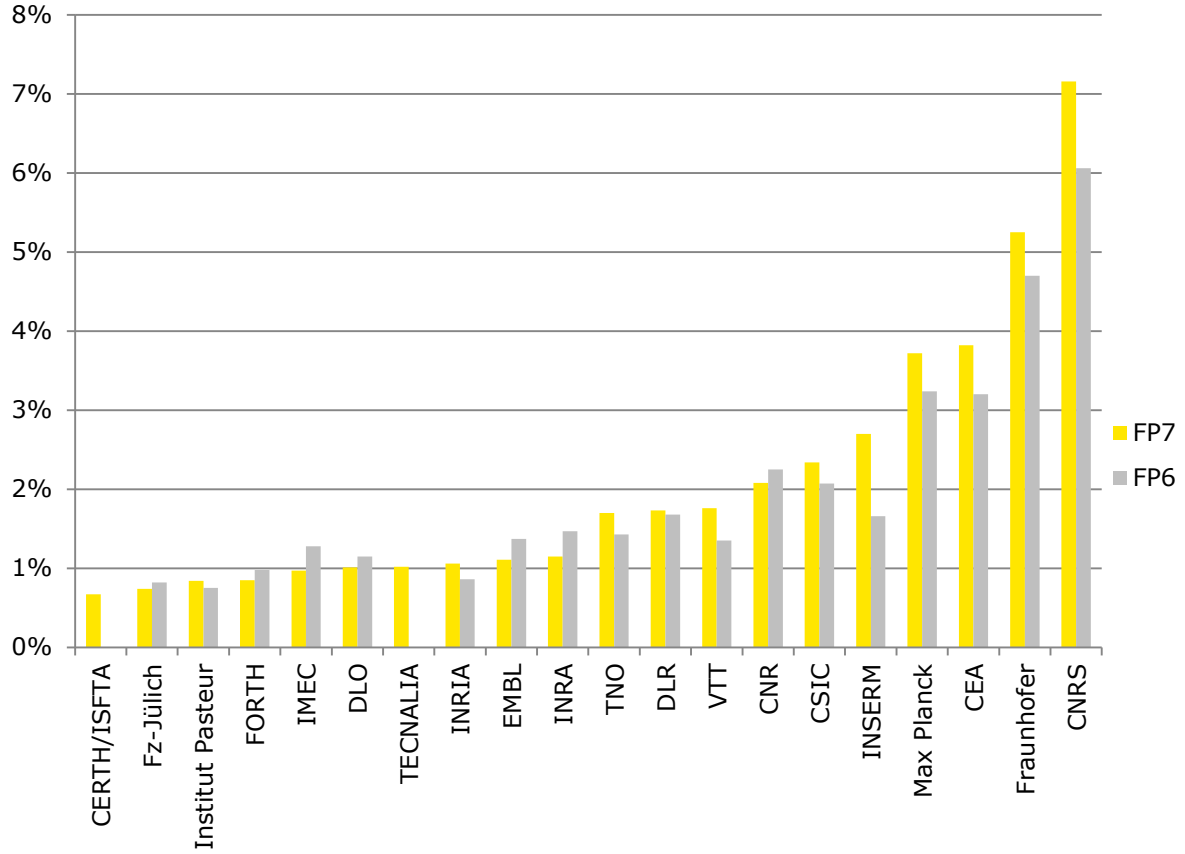
[15] For universities, the average funding per participation increased from EUR 242,046 to EUR 397,204; for private companies the average funding per participation from EUR 205,150 to EUR 274,108.

[16] The share awarded to universities has increased from 37% to 42% and the one awarded to private companies from around 18% to around 25%.

[17] Centre National De La Recherche Scientifique (CNRS), Max Planck Gesellschaft, Institut National De La Sante Et De La Recherche Medicale (Inserm), Agencia Estatal Consejo Superior De Investigaciones Cientificas (CSIC), Consiglio Nazionale Delle Ricerche (CNR), German Aerospace Center (DLR), Institut National De La Recherche Agronomique (INRA); Institut National De Recherche En Informatique Et En Automatique (INRIA); Stichting Dienst Landbouwkundig Onderzoek (DLO), Foundation For Research And Technology Hellas (FORTH); Institut Pasteur, Forschungszentrum Jülich GmbH.

[18] Fraunhofer-Gesellschaft, Commissariat A L Energie Atomique Et Aux Energies Alternatives (CEA), VTT Technical Research Centre of Finland Ltd, Netherlands Organisation for Applied Scientific Research (TNO), Fundacion Tecnalia Research & Innovation, Interuniversitair Micro-Electronica Centrum Vzw (Imec), Ethniko Kentro Erevnas Kai Technologikis Anaptyxis (CERTH/ISFTA).

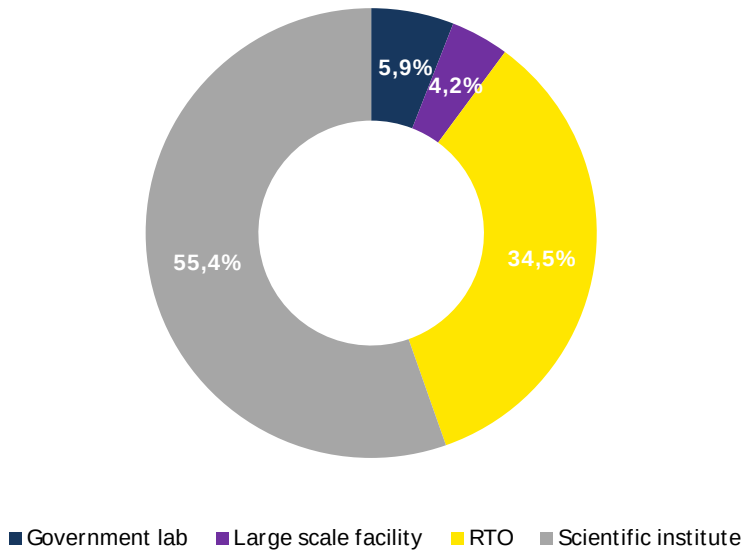
Figure 5: Most funded RPOs in FP7, relative ranking and comparison with FP6 performance



Source: authors' calculations based on the CORDA database

Looking at the distribution of funding by different types of RPOs[19], Scientific Institutes and RTOs receive most of the funding (respectively 55,4% and 34,5%), while Government Labs and Large-scale Research Facilities receive together less than 10% of the funding (Figure 6).

Figure 6: RPOs' funding by type

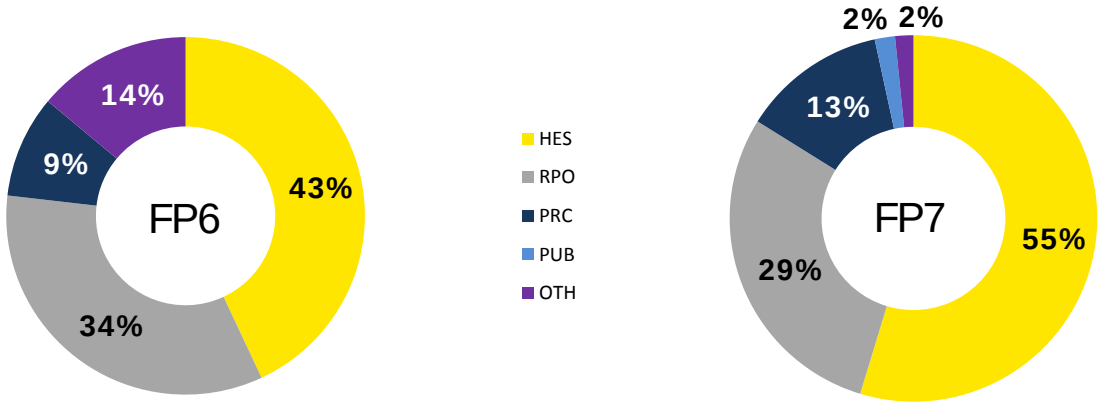


Source: authors' calculations based on the CORDA database

[19] All the estimations on the RPOs' internal classification from hereafter are based on the top 100 RPOs for funding received in FP7, accounting for nearly 60% of the total RPOs' funding.

Finally, the role that RPOs play in projects has slightly changed from FP6 to FP7. The share of projects in which RPOs were coordinators decreased, passing from 34% in FP6 to 29% in FP7, whereas both universities and private companies have played an increasing role as coordinators; universities and private companies have substantially increased their share of coordinated projects, with this figure increasing from 43% in FP6 to 55% in FP7 and from 9% in FP6 to 13% in FP7 respectively (Figure 7).

Figure 7: Percentage of projects in which a beneficiary was coordinator FP6-FP7



Source: authors' calculations based on the CORDA database

RPOs located in EU13 countries still lag significantly behind RPOs located in EU15; they receive a very small share of the RPO funding, with the average funding per participation standing at less than 20% of that allocated to RPOs in EU15 countries. They are also host to none of the RPOs in the list of top funded organisations. Their positioning has worsened from FP6 to FP7, both in terms of number of organisations participating and share of funding. The most active organisations are Scientific Institutes.

Most of the funding to RPOs is allocated to EU15 MS (Table 5). RPOs located in EU13 countries still lag behind, receiving only 6% of RPOs' funding in FP6 and 5% in FP7.

This is not surprising, given that, as discussed in section 1.2, the capacity to have funding in FPs is correlated with the national expenditure in R&D and the features of national R&D systems. EU13 countries have lower expenditure in R&D, systems with still a limited need for RPO services, a non-clear positioning of the Academies of Sciences (that are still important players of EU13 MS, and a relatively small size, compared with EU15, of the new research organisations that have recently emerged. All these features, which contribute to a more limited capacity to attract resources by RPOs located in EU13 countries, are not compensated by cohesion objectives of FPs, which rather target excellence in research and innovation.

Based on the argument above, however, significant amounts of resources allocated to RPOs in EU13 MS could not be expected, and what is worth noting is that the share of funding to RPOs allocated in EU13 countries decreased from FP6 to FP7 (even though only slightly), and that the average funding per RPO and participation is less than 20% of the average funding in EU15 MS in both FPs[20]. In comparison, the number of RPOs participating from EU13 also decreased from 664 in FP6 to 630 in FP7.

[20] For FP6, the average funding was EUR 2.2 million in EU15 and EUR 0.4 million in EU13; for FP7 EUR 5.1 million in EU15 and 0.8 million in EU13.

Table 5: Comparative perspective of the share of funding distributed to RPOs and number of participations of RPOs in EU15 and EU13

		EU15	EU13
Number of RPOs	FP6	2,026	664
	FP7	2,073	630
Number of participations	FP6	15,209	2,243
	FP7	26,387	2,691
EC funding ('000 EUR)	FP6	4,402,699	269,694
	FP7	10,575,319	505,871
Share of EC funding (%)	FP6	94.2%	5.8%
	FP7	95.4%	4.6%

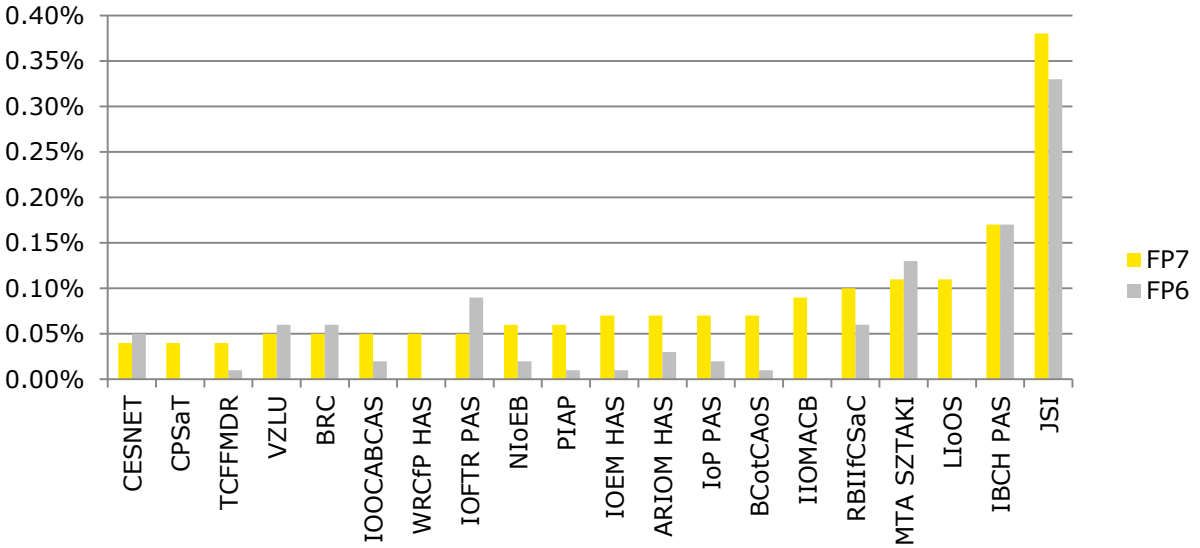
Source: authors' calculations based on the CORDA database

Given the limited role of RPOs located in EU13 countries within FPs, it is not surprising that no RPO based in EU13 countries is listed within the top 20 RPOs for funding (Figure 8). The first RPO in the EU13 ranks as 41st (it was ranked as 44th in FP6), with the second ranked at 91st and the third at 143rd.

When analysing the distribution of funds within EU13, the pattern is similar to the one observed at the aggregate level: the top 20 EU13 RPOs receive 40% of the funds allocated to EU13 based RPOs (that corresponds to 2% of the overall funds awarded during FP7 to RPOs).

What differs from the general patterns is the distribution per type of RPO, which shows a higher presence of Scientific Institutes[21] and a lower presence of RTOs[22].

Figure 8: Most funded RPOs in FP7, relative ranking and comparison with FP6 performance (EU-13)[23]



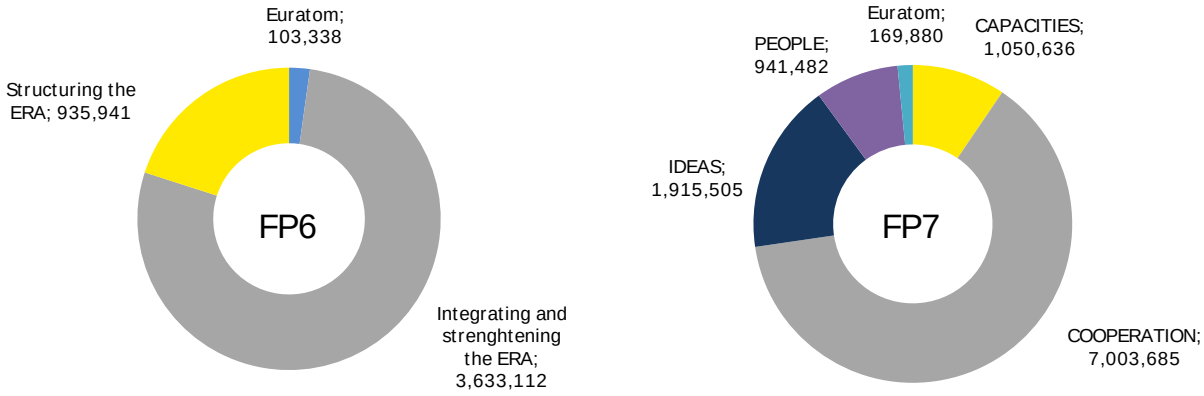
Source: authors' calculations based on the CORDA database

[21] With many of them having started their experience in FPs with FP7 –Latvian Institute for Organic Synthesis, the International Institute of Molecular and Cell Biology, the Wigner Research Center for Physics and the Center of Physical Sciences and Technology.
[22] Only one RTO is in the top 20, the Jožef Stefan Institute based in Slovenia
[23] CESNET (Zajmove Sdruzeni Pravnickych Osob); CPSaT (Center for Physical Sciences and Technology); TCFFMDR (The Cyprus Foundation For Muscular Dystrophy Research); VZLU (Aerospace Research And Test Establishment (VZLU)); BRC (Biological Research Center); IOOCABCAS (Institute Of Organic Chemistry And Biochemistry - Czech Academy of Sciences); WRCfP HAS (Wigner Research Centre for Physics – HAS); IOFTR PAS (Institut Of Fundamental Technological Research-PAS); NIoEB (Nencki Institute of Experimental Biology); PIAP (Industrial Research Institute For Automation); IOEM HAS (Institute Of Experimental Medicine – HAS); ARIOM HAS (Alfred Renyi Institute Of Mathematics – HAS); IoP PAS (Institute of Physics – PAS); BCotCAoS (Biology Centre of the Czech Academy of Sciences); IIOMACB (International Institute Of Molecular And Cell Biology); RBIIfCSaC (Ruder Boskovic Institute); MTA SZTAKI (Institute for Computer Science and Control – HAS); LIoOS (Latvian Institute of Organic Synthesis); IBCH PAS (Institute of Bioorganic Chemistry – PAS); JSI (Jožef Stefan Institute).

2.1.2. RPO participation patterns per specific programme, per thematic area and per funding scheme

Figure 9 displays the allocation of funding for RPOs by specific programme in FP6 and FP7. Of the EUR 4.5 billion received by RPOs in FP6, the vast majority was absorbed by the specific programme "Integrating and strengthening the ERA", followed by "Structuring the ERA" with nearly 1 billion. Of the EUR 11 billion received by RPOs in FP7, EUR 7 billion were received for participating in the "Cooperation" programme, nearly EUR 2 billion were linked to participation in the "Ideas" programme, EUR 1 billion in Capacities, EUR 1 billion in "People" and a minimal residual share in Euratom[24].

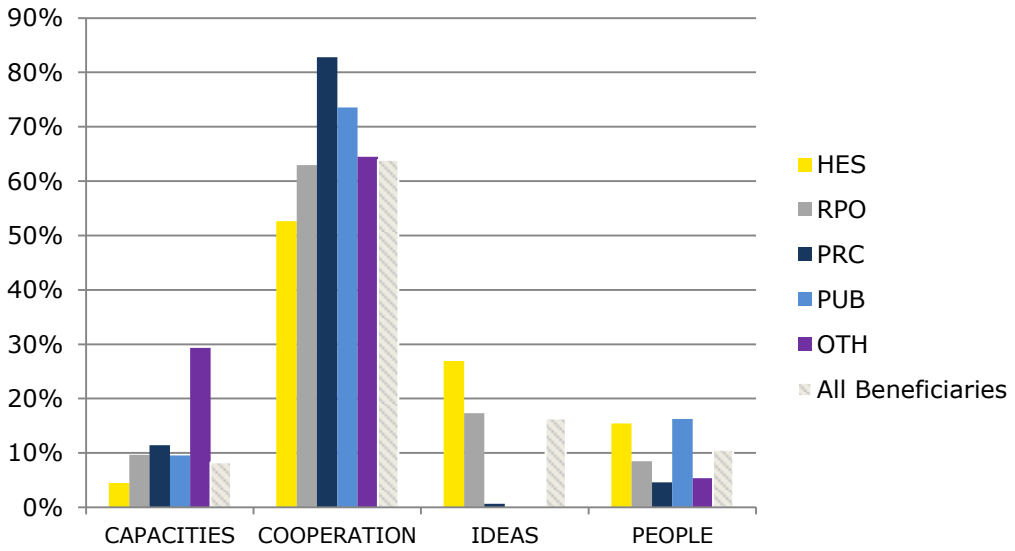
Figure 9: Distribution of funds received by RPOs by specific programme, comparison FP6-FP7 ('000 EUR)



Source: authors' calculations based on the CORDA database

The distribution of funding per programme of RPOs in FP7 mirrors the overall distribution of funding per specific programme and is different from that of other beneficiaries, which tend to show higher levels of specialisation in some specific programmes (Figure 10).

Figure 10: Distribution of funding by specific programme and by beneficiary



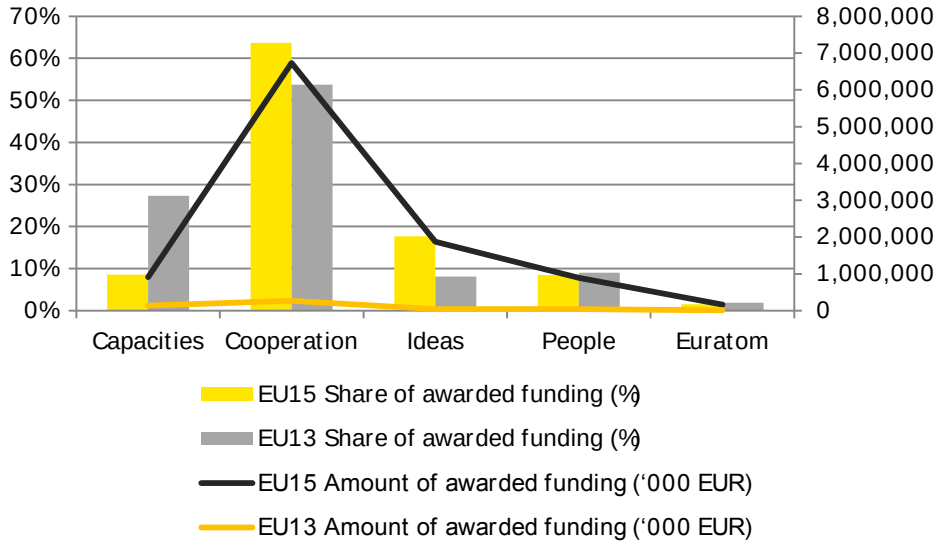
Source: authors' calculations based on the CORDA database

The largest share for both EU15 and EU13 countries is the "Cooperation" programme, which accounts for 64% and 54%, respectively, in line with the weight of this programme in the FP7. EU13 MS are relatively more specialised in the "Capacities" programme[25], reflecting the more

[24] It should be noticed that the distribution mirrors the overall distribution of funds across specific programmes without significant differences.
[25] In EU13 27% of funding went on "Capacities" versus the 9% in EU15.

intense need of RPOs in EU13 countries to address, among other areas, research infrastructure, research potential, the coherent development of research policies and international cooperation - consistently with the differences in the national research and innovation systems as described in section 2.1.

Figure 11: Distribution of funds per RPOs based in EU15 and EU13 countries by specific

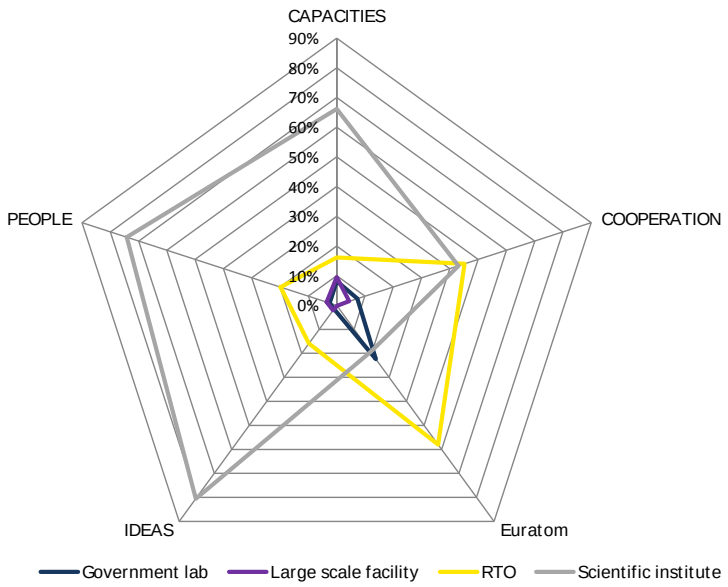


Source: authors' calculations based on the CORDA database

Different types of RPOs exhibit heterogeneous patterns of participation in FPs. For FP7, RTOs are clearly specialised in Cooperation and Euratom.

As for the involvement in the specific programmes, it is worth highlighting the different participation patterns of different types of RPOs. While Scientific Institutes clearly play the dominant role in respect to more than half of the programmes, with their presence being almost absolute in IDEAS and PEOPLE, they have lower weight with respect to RTOs in Euratom and Cooperation. Furthermore, Government Labs appear sharply specialised in Euratom, whereas Large-scale Research Facilities – although still representing a minor share – tend to be more active in CAPACITIES.

Figure 12: Comparative perspective of RPOs participation in specific programmes by type

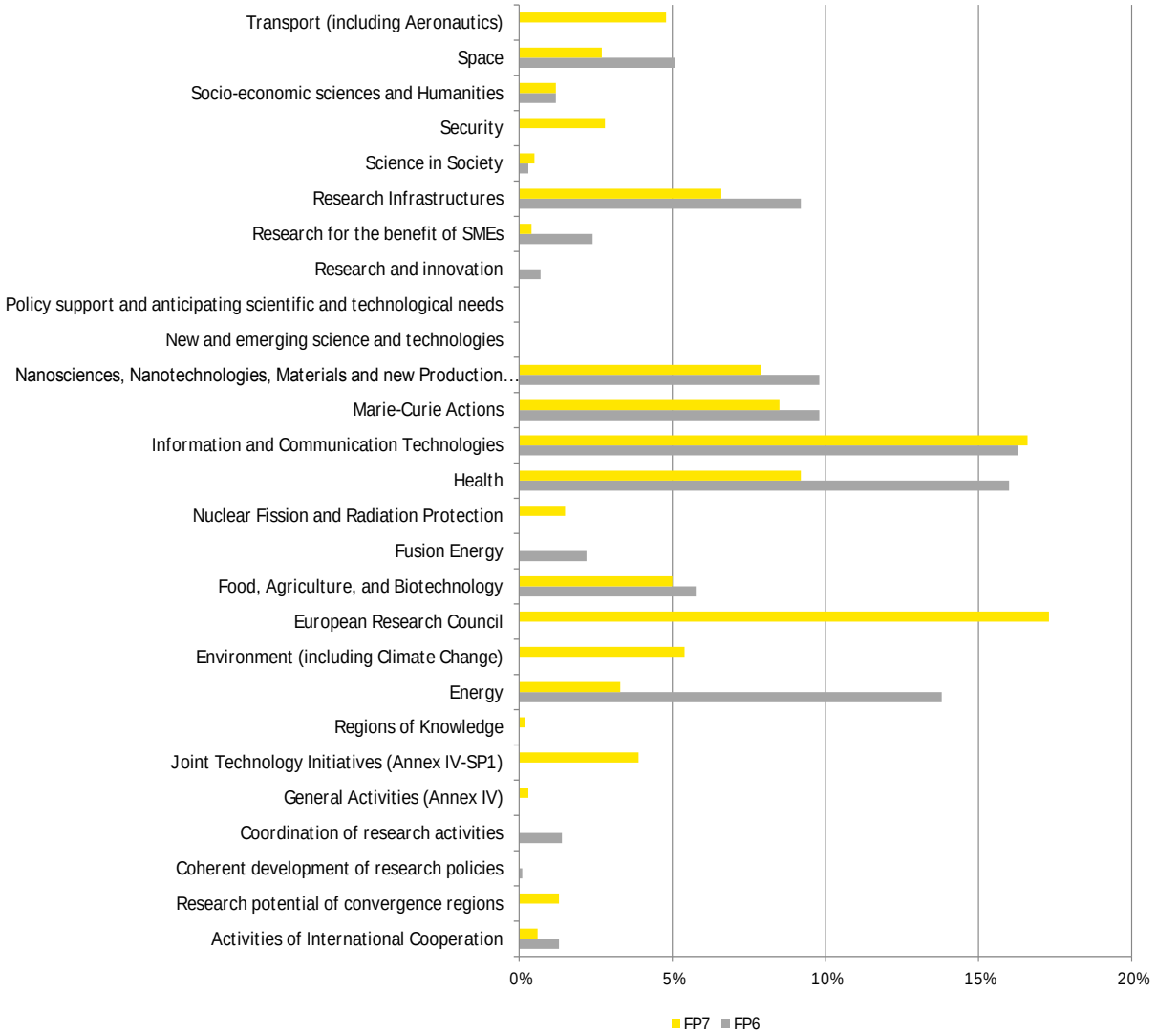


Source: authors' calculations based on the CORDA database

Patterns of participation across thematic areas are largely determined by the dimension of the single components and programmes. ICT is the largest single component in FP7 and this is visible in the patterns of participation of RPOs. During FP7, RPOs have been particularly active in the European Research Council. "Collaborative projects" represented more than the half of the total financial resources that were allocated to RPOs. The characteristic of polytechnicity is common for large RPOs, which tend to participate in many thematic areas of FPs.

Figure 13 presents the patterns of participation by thematic area as captured by the evolution of shares of awarded funds in FP6 and FP7. The proportion of funds allocated under each theme is generally aligned between the two FPs, with the exception of health, which has markedly decreased from around 17% in FP6 to 9% in FP7. This is mainly determined by the overall allocation of funds across single components of the programme. Other differences are mainly due to old/new themes that appeared/disappeared passing from FP6 to FP7. Energy for example significantly decreased, but its decrease is partially offset by the introduction of the new theme environment (ENV) in FP7. Differences are also due to the new theme ERC in FP7, which has absorbed a share exceeding 17% of the total amount of funds. ICT is the theme in which RPOs have participated the most, through established groups of participants among RPOs, universities and large enterprises[26]. Other projects in which RPOs have taken part mostly relate to the environment, energy (14% of total funding in FP6 and 9% in FP7) and health (16% in FP6, 9% in FP7).

Figure 13: Patterns of participation by theme passing from FP6 to FP7



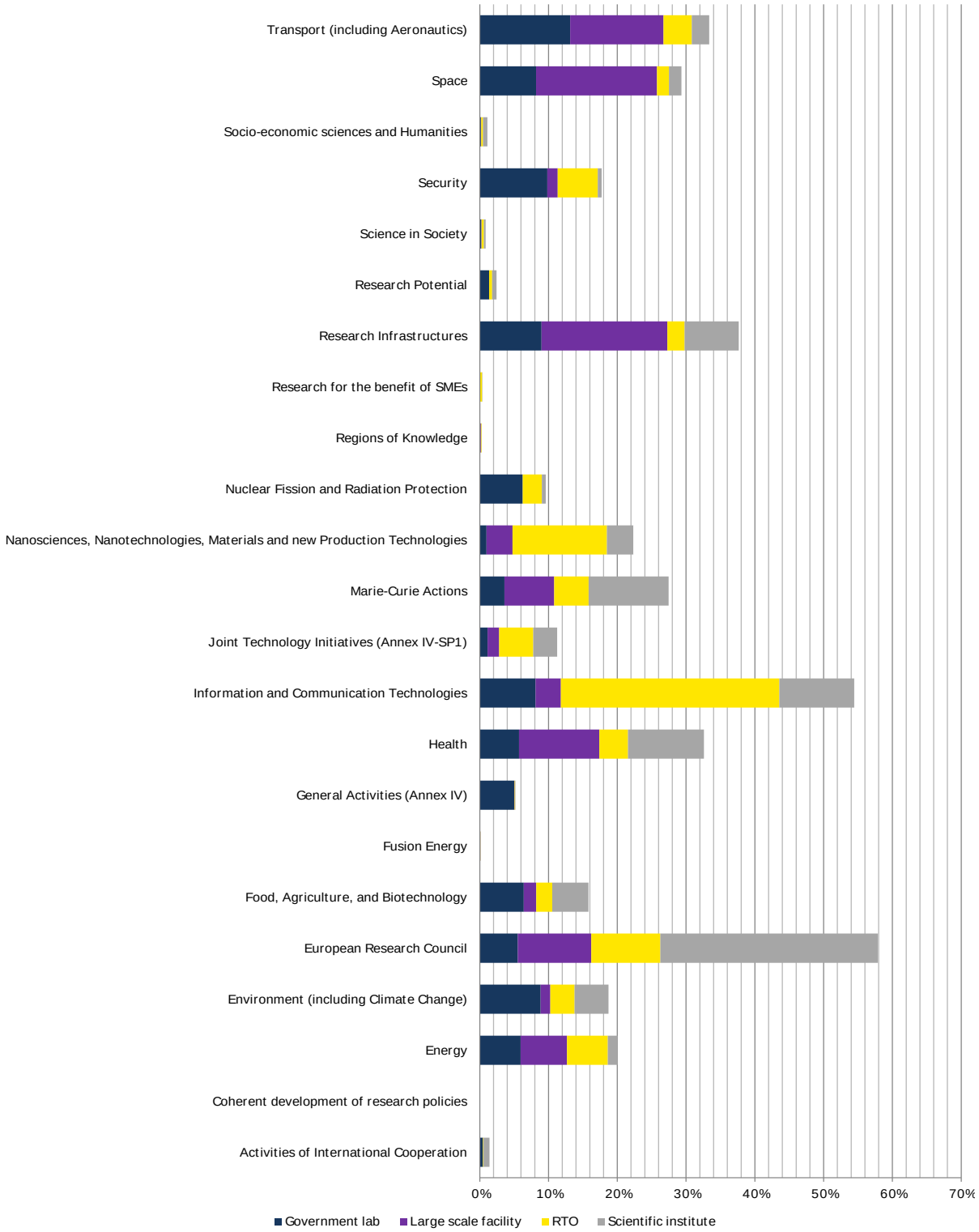
Source: authors' calculations based on the CORDA database

Based on the analysis of the top 100 RPOs (Figure 14), RTOs appear particularly active in ICT and Nanoscience, while Scientific Institutes are mainly active in the European Research Council,

[26] Interim evaluation of the ICT research in the 7th Framework Programme (2010), Catalysing European Competitiveness in a Globalising World by Alain Bravo, Gonzalo Léon, Terttu Luukkonen, Hartmut Raffler, Staffan Truvé, Ziga Turk, Steve Wright and the Editor Erik Arnold.

followed by Marie-Curie Actions, ICT and Health. Concerning Large-scale Research Facilities, their presence is particularly pronounced in Research infrastructure, Space and Transport (including Aeronautics). Interestingly, Government Labs have a more even distribution of their funding across most of the themes, with a moderately larger involvement in Transport and Security.

Figure 14: Patterns of participation by theme in FP7, breakdown by RPO type

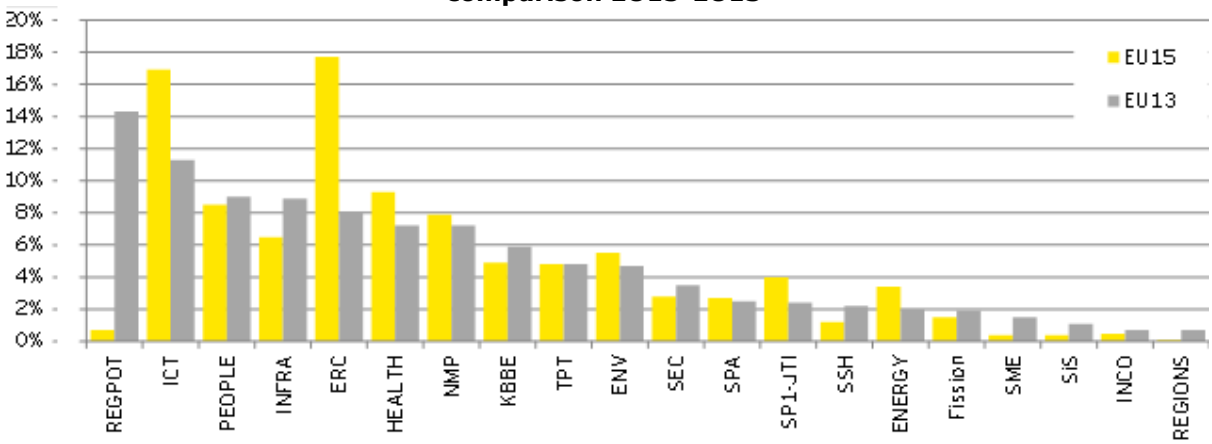


Source: authors' calculations based on the CORDA database

Results from case studies of RPOs tend to confirm the polytechnicity of large RPOs, as discussed in section 1.2. For example the RTO VTT in FP7 has participated in a variety of thematic areas, predominantly ICT, Energy and NMP, but also health, transport, research for the benefit of SMEs and food agriculture and biotechnology. Scientific Institutes covered in our case studies, such as CNR in Italy and CNRS in France, are large umbrella organisations with a diversified portfolio of participations similar to that of larger RTOs. CNR tends to participate more in ICT, People, and NMP, but also in health and infrastructure. CNRS is more focused on People and ERC related projects.

EU15 and EU13 RPOs show different patterns of participation across FP7 themes. As expected, EU13 RPOs appear to be relatively more specialised in the "Research potential of Convergence Regions" theme, which accounts for 14% of the funding (for EU15 RPOs, the same theme accounted for less than 1%). Actions under this heading were indeed aimed at identifying the needs and opportunities for reinforcing the research capacities of emerging and existing centres of excellence in convergence regions, which may be met by Structural and Cohesion funds. The widest gap in the patterns of participation between EU13- and EU15-based RPOs is observed for ERC. This is consistent with the objective of this thematic area of promoting excellent research through competitive funding. ICT is also a thematic area where EU15-based RPOs tend to perform markedly better with respect to EU13 based RPOs, where the 'key ingredients for success' are the presence of infrastructure and the alignment of national policies with the digitalisation of public services. The European Research Council and ICT themes have channelled a substantial amount of funding distributed through FP7, accounting respectively for 16% and 18% of the overall funding received by EU15-based RPOs.

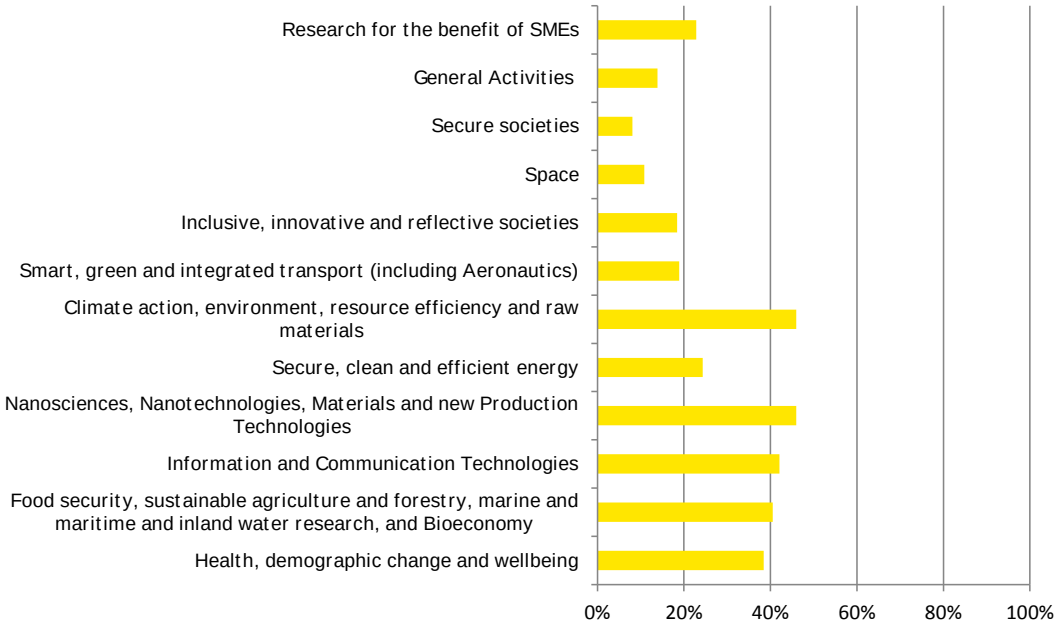
Figure 15: FP7 - Breakdown of funding by theme (as % of total RPOs funding), comparison EU15-EU13



Source: authors' calculations based on the CORDA database

With regard to participation in Horizon 2020, the main activity areas for RPOs are "climate action, environment, resource efficiency" and "nanosciences, nanotechnologies, materials and new production technologies" (Figure 16). In this case, it should be noted that there is no differentiation in the patterns of participation in relation to different typologies of RPOs.

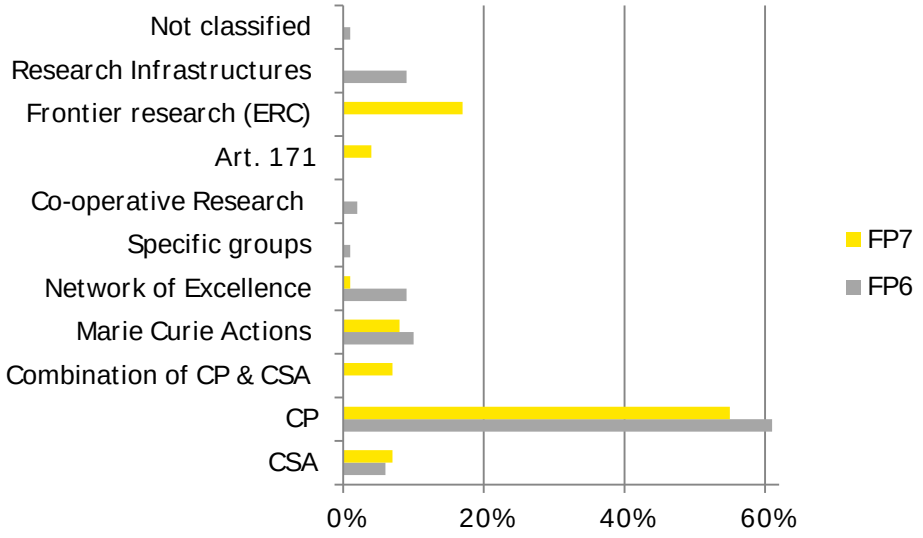
Figure 16: Level of organisation's participation in the areas of Horizon 2020



Source: authors' elaboration based on interviews with RPOs' representatives

Given that the bulk of FP funds were distributed under "Cooperation", "Collaborative Projects" is the funding scheme through which around 60% of financial resources were allocated both in FP6 and FP7. This funding scheme corresponds to the fusion of two funding schemes in FP6 - "Integrated Projects" and "Specific Targeted Research Projects,"- which together accounted for around 61% of financial resources awarded in FP6. The funding scheme "Networks of Excellence" has decreased substantially, from around 9% of funds in FP6 to around 1% in FP7. The remaining differences are mainly due to the suppression/creation of old/new themes from FP6 to FP7. For example research infrastructure accounted for 9% of awarded funding to RPOs in FP6 and was discontinued in FP7. The largest funding scheme introduced in FP7 was ERC, accounting for around 17% of funding for RPOs (Figure 17).

Figure 17: Allocation of funds to RPOs by funding scheme for FP6 and FP7

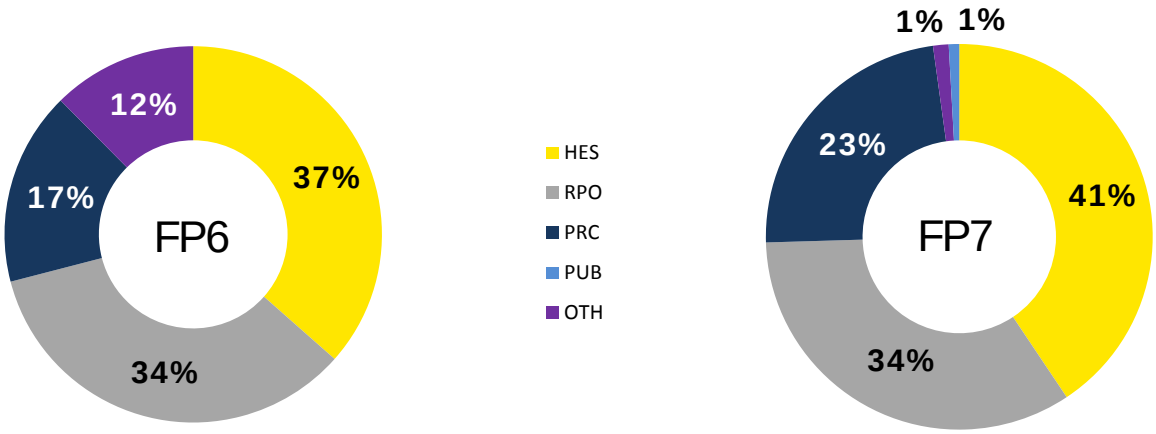


Source: authors' calculations based on the CORDA database

In order to further investigate RPOs' strategies, it is interesting to look at their approach to the main funding schemes in comparison with the other beneficiaries.

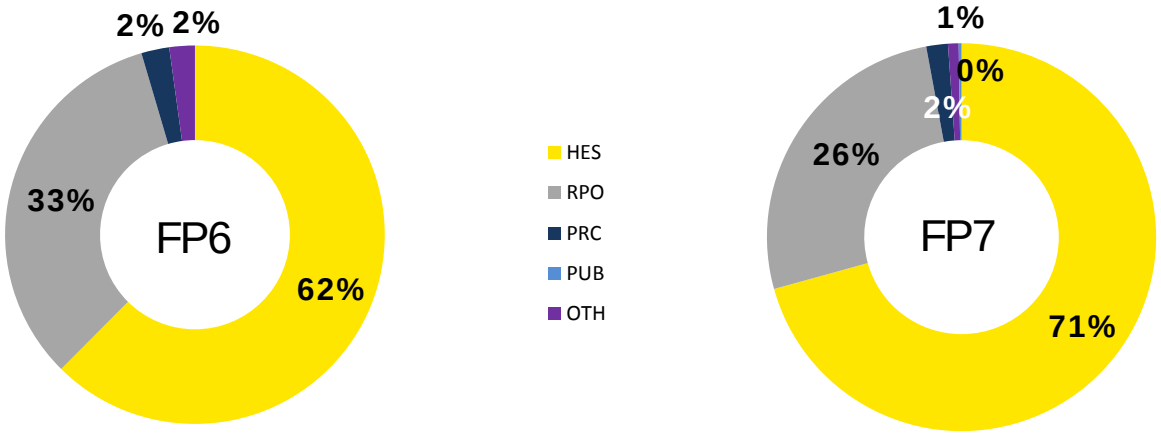
Figures 18, 19 and 20 show that the role of RPOs in Collaborative Projects has not significantly changed between FP6 and FP7, with their presence as coordinator remaining slightly above one third of the total in both FPs. When comparing this trend with the remaining figures, one can observe a certain stability of RPO participation as coordinator in Collaborative Projects, compared with a moderate decrease in the remainder of the funding schemes.

Figure 18: Percentage of projects for the funding scheme "Collaborative Projects" in which a beneficiary was coordinator



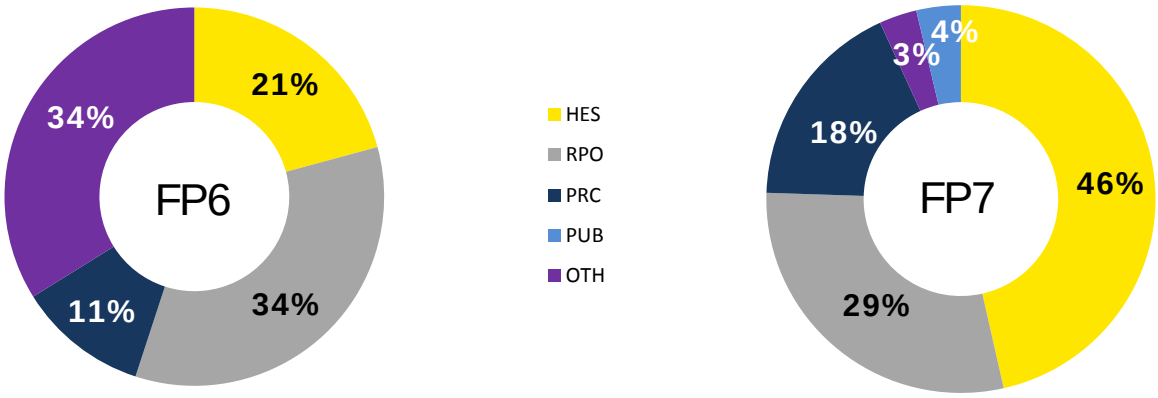
Source: authors' calculations based on the CORDA database

Figure 19: Percentage of projects for the funding scheme "Marie Curie Actions" in which a beneficiary was coordinator



Source: authors' calculations based on the CORDA database

Figure 20: Percentage of projects for the remaining funding schemes in which a beneficiary was coordinator



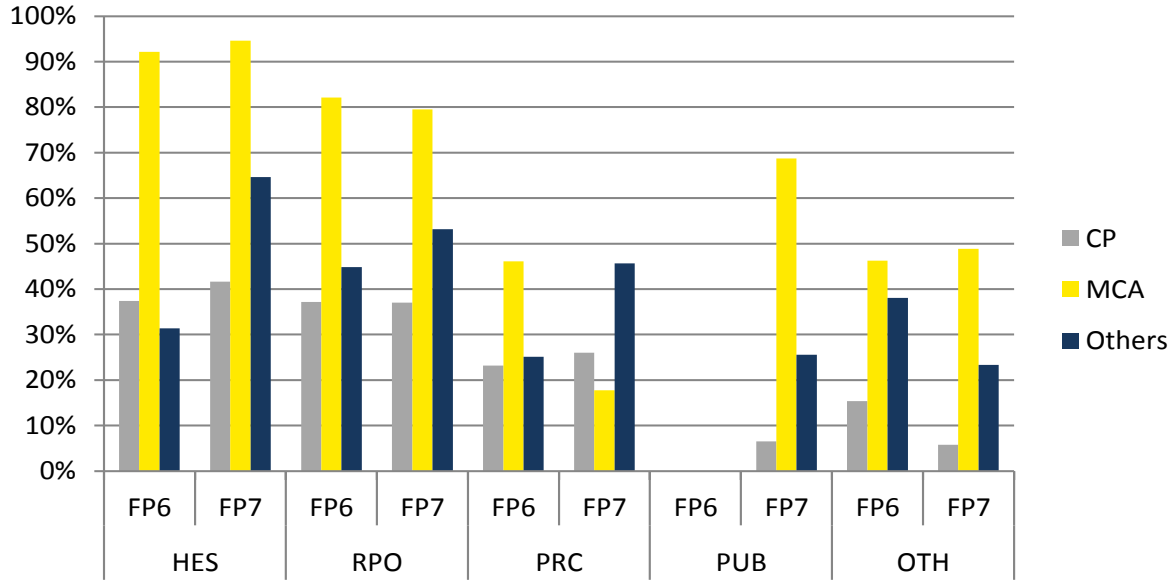
Source: authors' calculations based on the CORDA database

However, these figures are influenced by the total number of projects in which RPOs took part, as compared with other beneficiaries. Another interesting index may be the likelihood of an RPO being a coordinator controlled by the number of projects carried out.

The following graph provides a comparison of such an index across different types of beneficiaries, highlighting some noteworthy trends. HES and RPOs remain overall the institutions that most likely assume the role of coordinator. Differences between the graphs are moderate, and may be explained by a change in the average number of project participants. This may be the case for

HES, RPOs and PRC having increased the probability of being a coordinator in Collaborative Projects. However in respect to MCA trends, the probability of being coordinator is more varied, with a slight increase for HES, a modest decrease for RPOs and a significant decline for PRC. Concerning the remaining funding schemes, all three institutions show a significant increase, even though the growth for RPOs lags behind the other two. Finally, OTH show a significant reduction in their probability of being coordinator in Collaborative Projects and in "Other" funding schemes, as well as a fractional increase in respect to MCA.

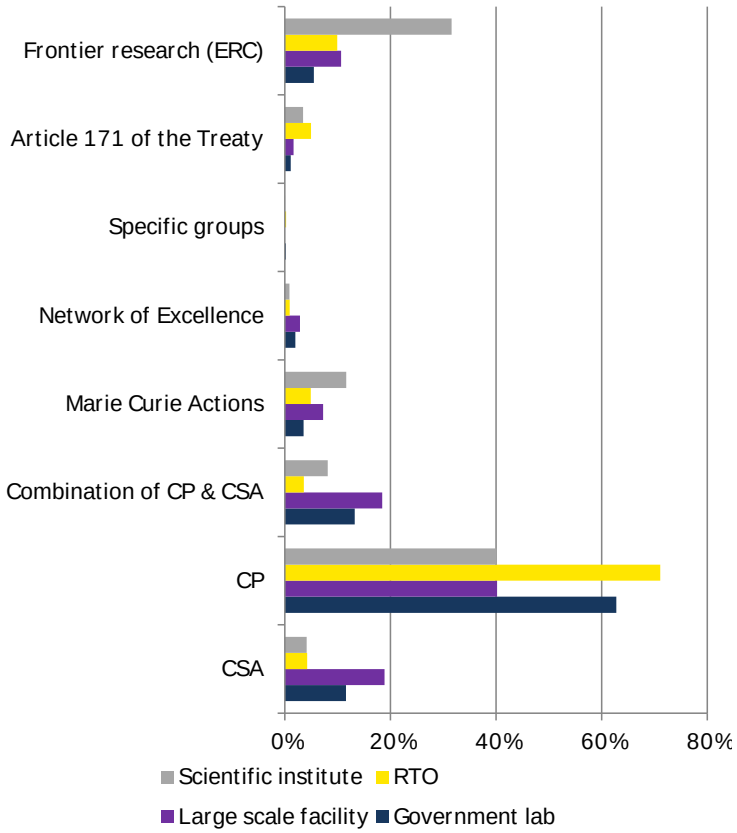
Figure 21: Relative likelihood of being a coordinator by beneficiary and funding scheme, FP6-FP7



Source: authors' calculations based on the CORDA database

Going further, it is possible to differentiate the analysis by funding scheme for each type of RPO. Scientific Institutes, while having as a first source of funding Collaborative Projects like the rest of RPOs, substantially hinge on Frontier research. RTOs appear to have a more polarised funding distribution, with Collaborative Projects (CP) accounting for more than two thirds of the their total funding. A similar pattern may be traced for Government Labs. Large-scale Research Facilities, on the contrary, aside from a still significant share accounted for by CP, heavily rely on Coordination and Support Action (CSA) and Combination of CP & CSA (Figure 22).

Figure 22: Allocation of funds to RPOs by funding scheme for FP7 per RPO type



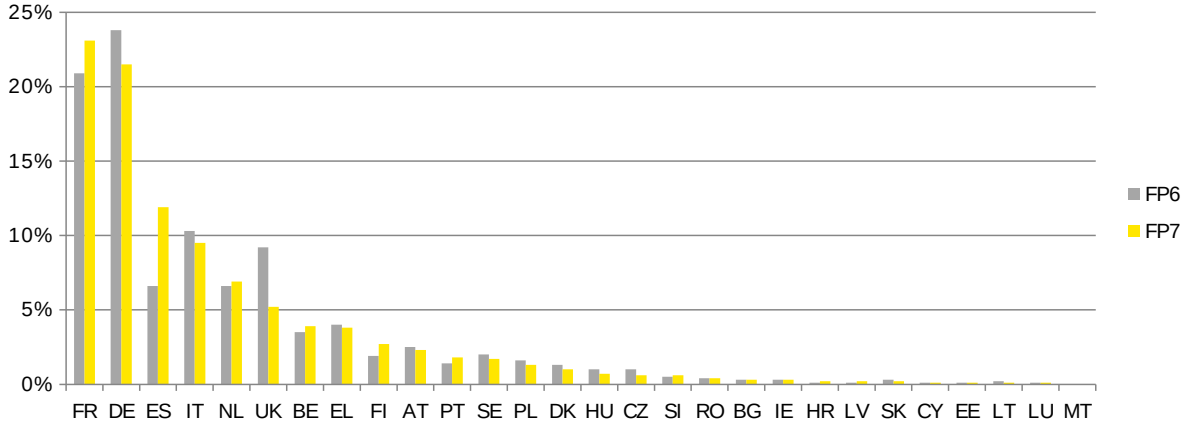
Source: authors' calculations based on the CORDA database

2.1.3. RPOs participation patterns by MS, associated and third countries

French and German RPOs strongly participated in FPs, Spanish RPOs have significantly increased their participation, whereas the opposite can be observed for RPOs in the UK. RPOs based in associated countries have maintained the same share of awarded funding (6%) in both FP6 to FP7, with Norway- and Switzerland-based RPOs attracting the majority of funds. RPOs based in third countries have reduced their participation rate from 3% to 2%, with Russian RPOs attracting the highest share of funds

The overall distribution of funding to RPOs across MS has not substantially changed between FP6 and FP7. The two MS attracting most of the funding for RPOs are Germany and France, with the former being at the top of the ranking in FP6 and the latter gaining the top position in FP7. Two other MS have seen their shares of funds markedly change from FP6 to FP7; Spain has increased its share from around 7% in FP6 to 12% in FP7, and the UK has seen its share decrease from around 9% in FP6 to 5% in FP7 (Figure 23).

Figure 23: Allocation of funds by MS as a share of total funds to RPOs for FP6 and FP7

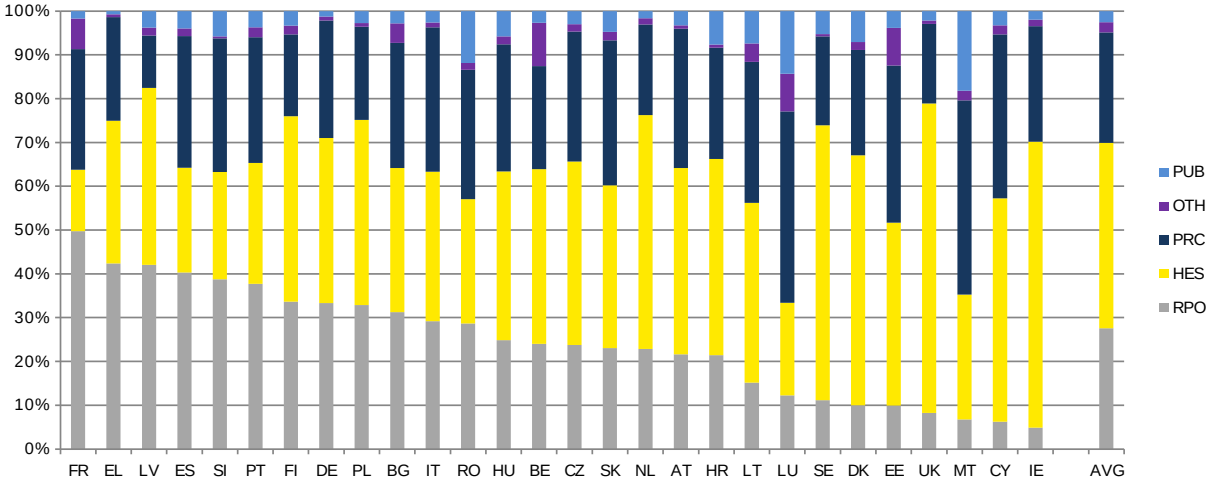


Source: authors' calculations based on the CORDA database

Aside from the absolute participation, it is crucial to investigate the approach of RPOs to the FPs also in comparative terms. Once again, at the left end of Figure 24, France absorbs nearly 50% of total funding. However half of the "Top 10 countries" in terms of absolute amount of funding received by their RPOs is now left outside the list of Top 10 countries for percentage of MS funding absorbed by RPOs. In particular, Austria, the Netherlands and the United Kingdom, despite accounting for a large share of RPO funding in absolute terms, show a relatively low performance of their RPOs when compared with the remaining beneficiaries.

Scanning the graph from left to right, it is noteworthy that in most cases the reduction in the share of funding received by RPOs tends to be offset by an increase in the HES' share. However, following the same direction, it is possible to trace a relative increase in the presence of PRC and OTH.

Figure 24: Relative allocation of funds by MS among different beneficiaries - FP7



Source: authors' calculations based on the CORDA database

The success story of Spanish RPOs is worth presenting in greater detail. The participation of Spanish RPOs in FP7 increased with more responsibilities and a higher diversification in terms of participation: more involvement in public-private partnerships, greater responsibilities in the scientific side of the projects, long-term networks with several European partners. In addition to this, Associations such as FEDIT (Federación Española de Centros Tecnológicos) have assisted RPOs in strengthening their collaborative links with Spanish firms, also boosting the participation of private companies in FPs. Several companies decided to participate with a scientific partner, which facilitated the development of their technological requirements. This partner is often an RPO member of the association.

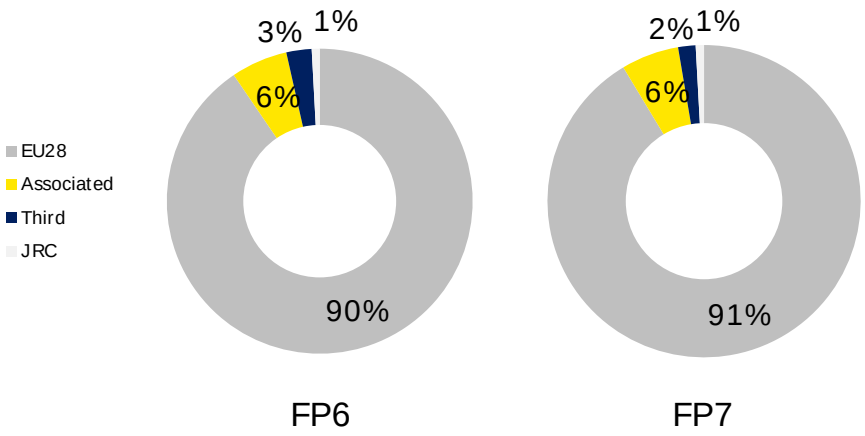
According to respondents, there are several reasons behind the increase in Spanish participation:

- Better funding conditions from FP6 to FP7;
- Better orientation to innovation results in projects;
- FPs give more importance to industry needs;
- Worse (and unstable) funding conditions in national R&D&I programmes;
- Better attitude to international collaboration among RTOs;
- Better preparation on the side of RTOs: more interested in coordinating proposals, better management skills; and
- Large increase in the number of proposals from Spanish RTOs.

In this regard, it should also be noted that FEDIT reported some problems that its members are experiencing in H2020 - mainly the lower success rates and uncertainty of funding models.

MS absorbed 90% of the overall funding going to RPOs in FP6 and 91% in FP7. The remaining resources have been mainly awarded to RPOs in Associated Countries – 6% both for FP6 and FP7. Third countries received a share of 3% in FP6, and slightly less (2%) in FP7. The remaining 1% of funds is awarded to the Joint Research Institute (Figure 25).

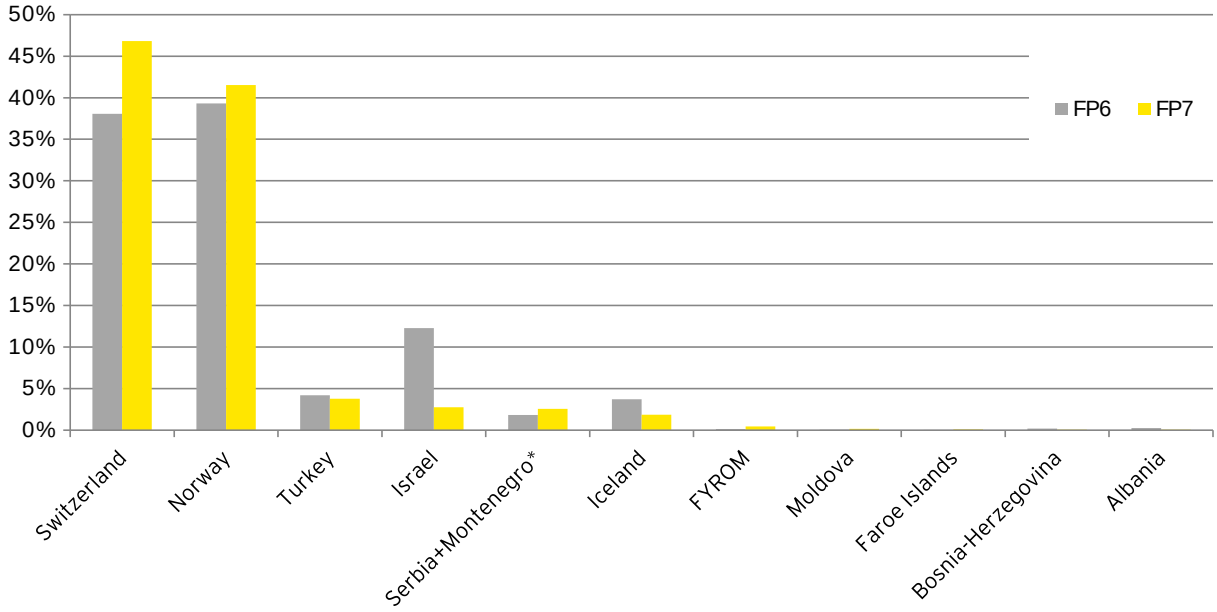
Figure 25: Breakdown of FP funding by type of country



Source: authors' calculations based on the CORDA database

RPOs based in Norway and Switzerland attracted more than 85% of funding going to RPOs in Associated Countries. The remaining share (less than 15%) is mainly distributed across RPOs based in Turkey, Israel, Serbia & Montenegro and Iceland. RPOs based in FYROM, Moldova, Faroe Islands, Bosnia-Herzegovina and Albania had low levels of participation in FPs.

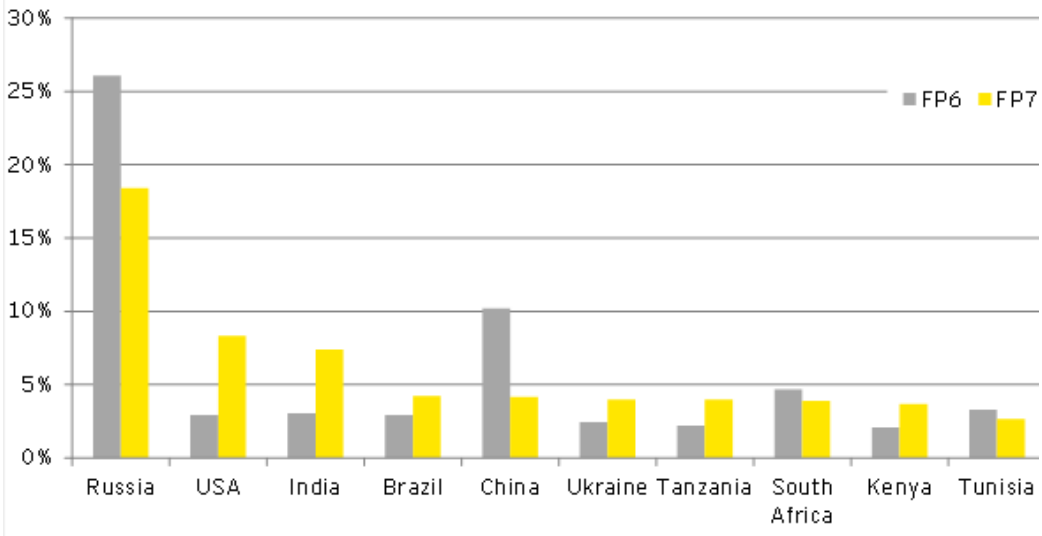
Figure 26: Associated Countries – Breakdown of FP funding by country (as % of total funding)[27]



Source: authors' calculations based on the CORDA database

RPOs based in the Russian Federation show the highest FP participation rate of all third countries. However, the share of RPO participation accounted for by Russia has substantially decreased from more than 25% in FP6 to around 18% in FP7. Chinese RPOs show the same pattern of decreasing funding from FP6 to FP7. RPOs based in the US and India increased their overall share of participation among third-countries considerably.

Figure 27: Third Countries – Breakdown of FP funding by country (as % of total funding)



Source: authors' calculations based on the CORDA database

2.1.4. Factors behind RPOs participation in FPs

2.1.4.1. Factors that motivate or discourage RPOs from participating in FPs

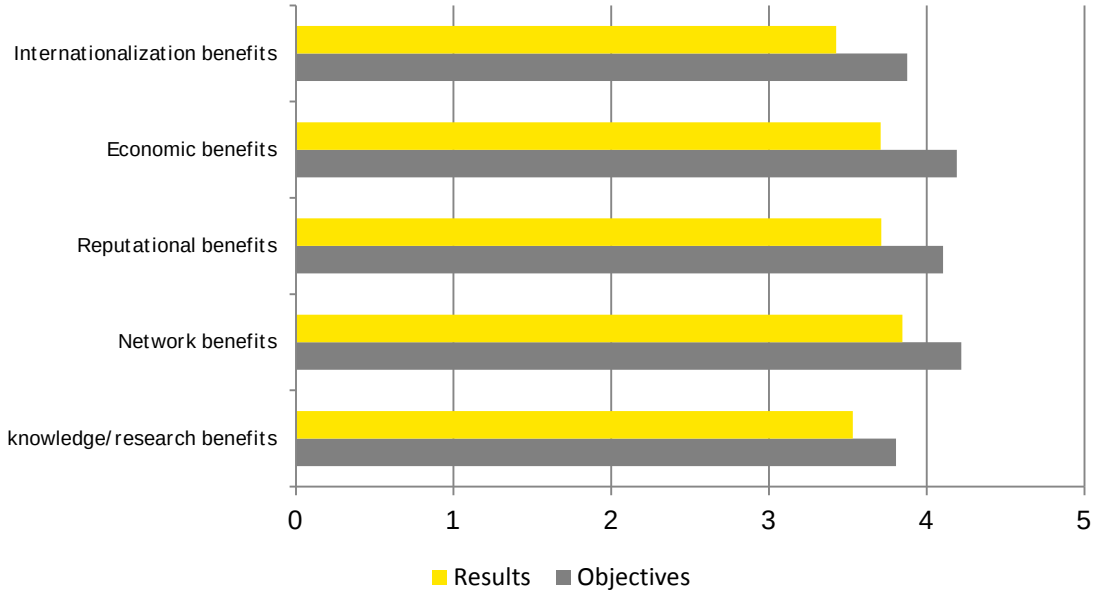
Participation has been mostly motivated by networking, with economic and reputational motives also being important. There is not much differentiation in terms of the motivations of RPOs or the achievements obtained from participation

[27] In the FP6 CORDA dataset, Serbia and Montenegro counted as a single country and the figures concerning these two countries have been aggregated together in the chart above.

Our analysis suggests that the most important objectives leading to the participation of the FPs are related to economic benefits, networking and reputation (Figure 28).

Overall RPOs –with no differences among the various types of RPOs- are satisfied with how FPs allowed them to reach these objectives.

Figure 28: Objectives and results from participation



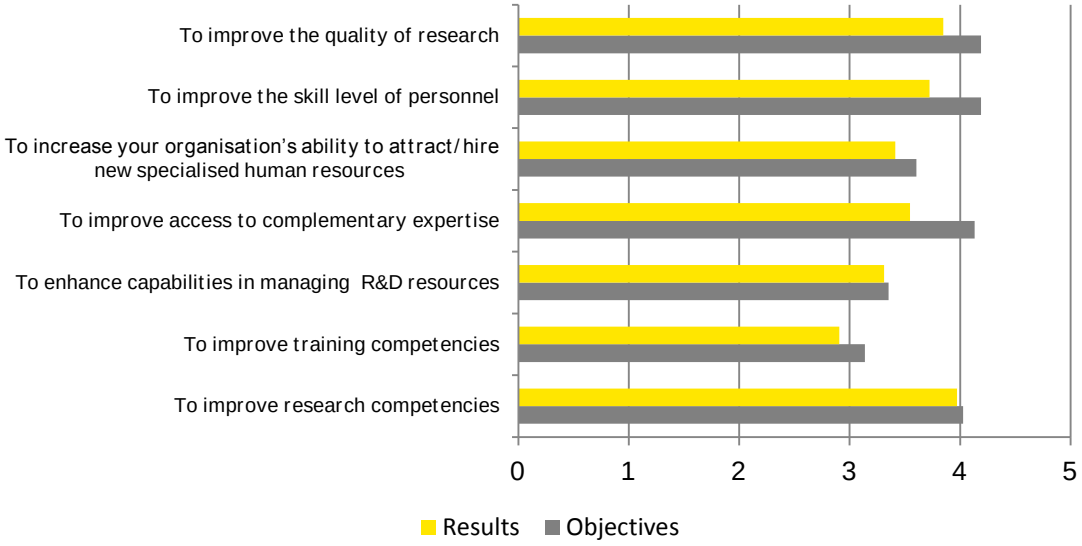
Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

Our results are in line with another study[28] focused on the reasons for participation in the FP7 within Norwegian research organisations, which concluded that "Access research funding", "Develop new or improved relationships or networks", "Develop and extend internal knowledge and capabilities" and "Address specific scientific or technical questions, problems or issues" were the most prominent reasons.

Our analysis went a step further in understanding specific objectives underlying the general objectives reported in Figure 28. As shown in Figure 29, which focuses on the benefits of knowledge, the most important specific objectives leading to participation in FPs were to: improve the quality of research, increase access to complementary expertise and enhance the skill level of the personnel and research competencies. Improving training competencies does not appear to be a major objective. The objectives where major results have been achieved are those related to the improvement of the quality of research and the enhancement of the research competencies.

[28] Åström, et al., 2012

Figure 29: Objectives and results in terms of knowledge

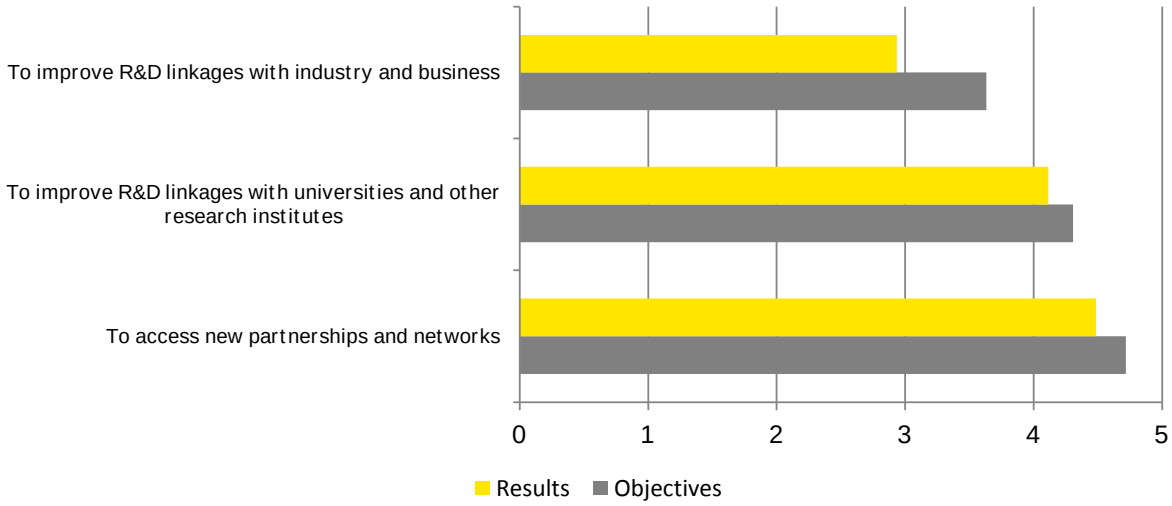


Source: in-depth interviews with RPOs' representatives. Legend: 1: "Not at all" - 5: "To a very large extent".

As for the networking objectives (Figure 30), the most important specific objective and result is the access to new partnerships, followed by the opportunity to strengthen research ties with universities and other research institutes.

In particular, FP7 has provided an interesting opportunity to work with new and different partners and to enhance the pre-existing network developing activities in new areas. For many RPOs, FP7 allowed access to useful local partnership . Particularly for RPOs in the medical area, an important objective is to access international networks of academic research (even more important when dealing with rare diseases).

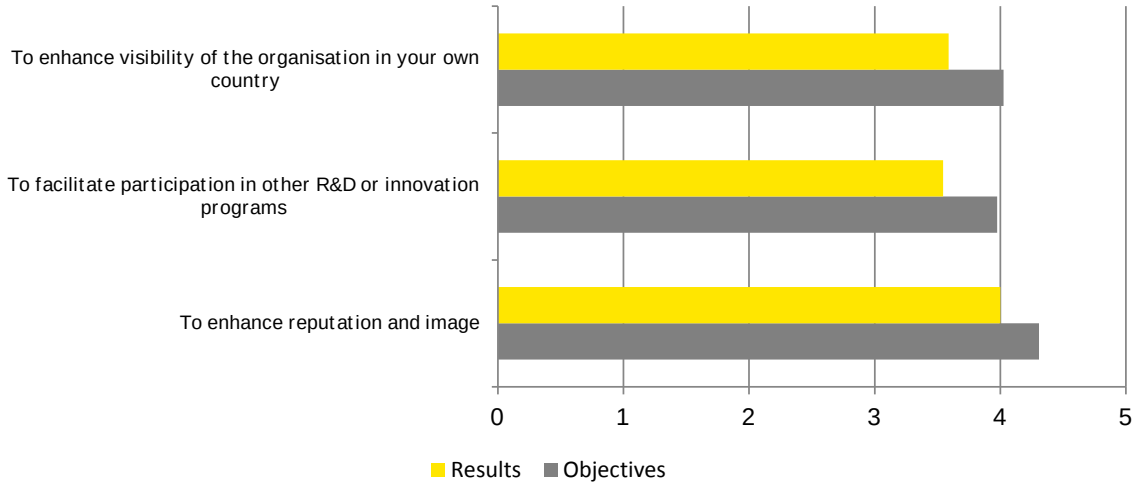
Figure 30: Objectives and results in terms of network



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

In terms of reputation (Figure 31), the main specific objectives relate to the enhancement of the RPOs' reputation and image, and FPs have allowed to meet them. The enhancement of reputation, image, and accountability is relevant both at the national and international level.

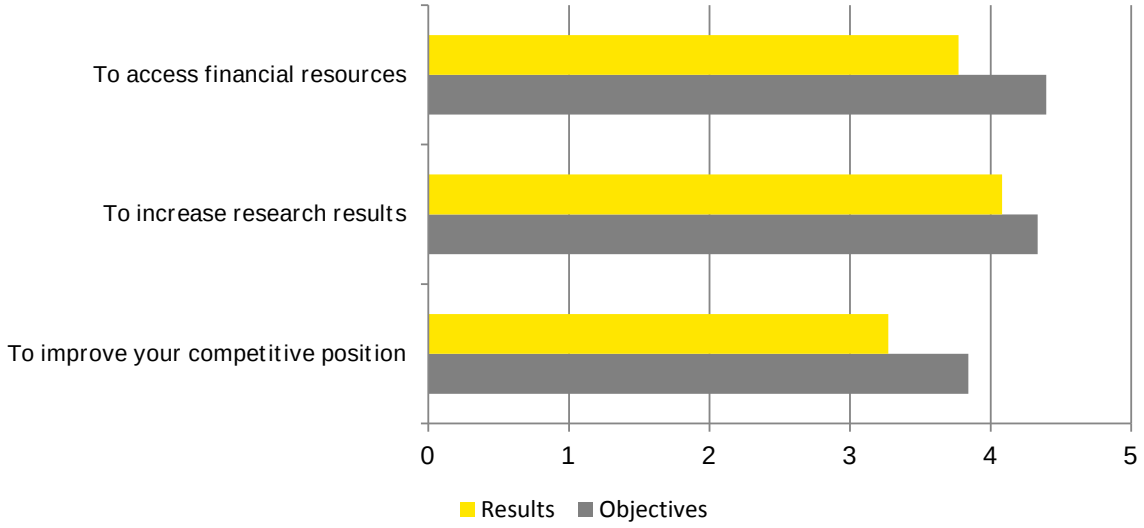
Figure 31: specific objectives and results in terms of reputation



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

In terms of economic benefits, the increase in research results appears to be the most important specific objective of participation, as well as the objective for which the best results were obtained. The increase in access to financial resources also appears to be an important objective, especially for non-profit organisations, for which the funding coming from programmes like the FPs is very important to finance projects and ideas. The improvement in competitive position does not seem to be relevant.

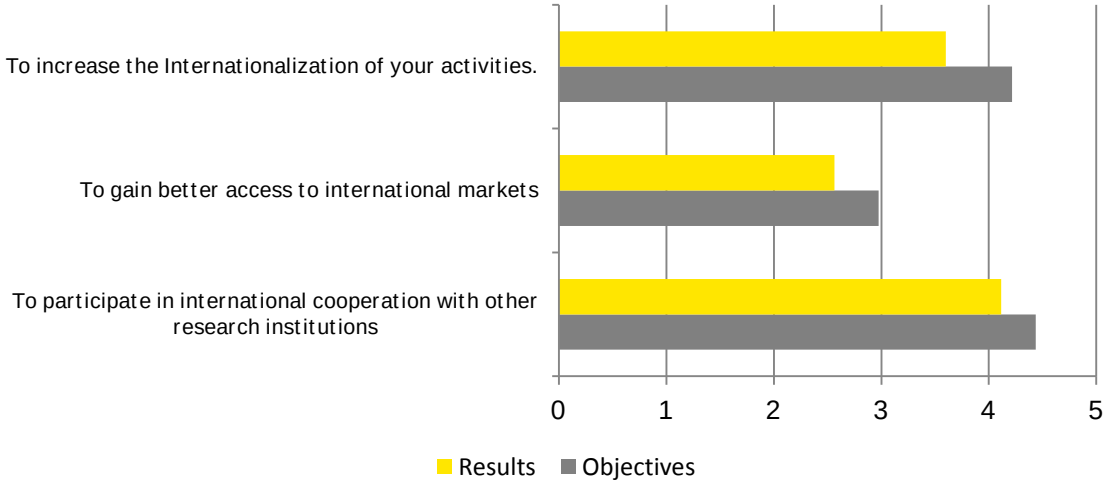
Figure 32: Specific objectives and results in terms of economic benefits



Source: in-depth interviews with RPOs' representatives. Legend: 1: "Not at all" - 5: "To a very large extent".

Concerning the objective of internationalisation (Figure 33), international cooperation with research institutions is a relevant specific objective and an important result of participation. Access to the international market is neither a relevant specific objective nor an important result of participation.

Figure 33: Leading and results in terms of internationalisation benefits



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

The recent report by de Silva and Andersen (2015) focuses on the contribution of RTOs in narrow sense in the EU activities, and provides an overview of the main benefits of RTO participation in FPs, which are very much in line with those identified for RPOs and described above. In addition to this, the two authors stress the uniqueness of EU funding with respect to other sources, such as national and industry funding. The uniqueness is linked to the fact that EU related projects require more expertise, larger funding and physical resources. EU projects offer the opportunity to participate in projects of medium- to long-term perspective in a wide range of Technology Readiness Levels (TRLs), ranging from concept to market. In cases where there are synergies with other industrial and national funding sources, the value added from engaging EU projects is magnified.

In summary, the analysis suggests that participation has been mostly led by the objective of networking (mainly in terms of access to new partnership), economic, financial and reputational benefits (in terms of reputation and international visibility). To a large extent, these objectives have also been achieved.

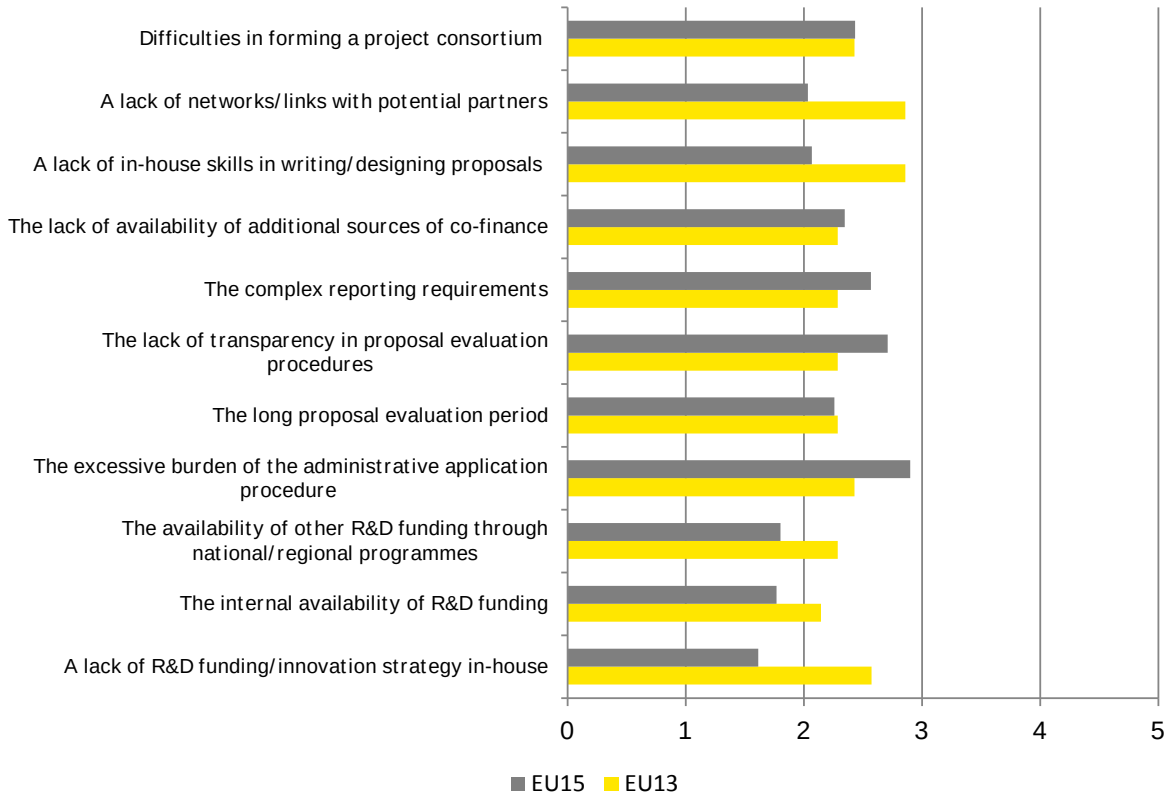
No obstacles prevent participation of RPOs in FPs. The administrative burden of application procedures and a lack of clarity in evaluation are often mentioned as factors hindering participation, especially by small Scientific Institutes that have not centralised the administrative tasks in a dedicated team. On the contrary, RTOs suggested that oversimplification could be detrimental to the transparency of the process, yet expressing concerns on the administrative burden connected to audits.

In general, RPOs do not perceive any major barriers to participating in FPs.

Figure 34 provides an overview of the key reasons reducing RPOs willingness to participate in FPs, differentiating between responses from RPOs in the EU15 and RPOs in EU13 countries. Even though the size of the sample of RPOs interviewed is not large enough to provide statistically significant results, some interesting trends can be observed. In the EU15, there is general agreement on the fact that the main barriers to participation relate to the administrative burden connected to application procedures and the lack of clarity in relation to evaluation decisions (especially in the case of non-successful proposals). These barriers are mainly perceived by Scientific Institutes that do not have a centralised team dedicated to administrative tasks. RTOs, that have a long lasting experience of participation in FPs, are more confident with the fulfilment of administrative requirements for participation, and envisage the opposite risk of oversimplification with detrimental effects on the overall transparency of the process. The key factors underlined in EU13-based RPOs are the lack of networks with potential partners, of in-house skills in writing and designing proposals and the lack of R&D funding.

Government Labs tend to experience relatively higher difficulties in creating project consortia and a lack of network links with potential partners. In addition to this, Government Labs suffer from a lack of information or assistance.

Figure 34: Issues reducing willingness to participate in FP6 and FP7 calls



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

Some RPOs have highlighted the lack of co-funding sources as a possible barrier to participation: RPOs based in national contexts with priorities for investment in research and development that are not aligned with the overall framework set up at European level, have a comparative disadvantage with respect to RPOs based in countries with funds allocated to the same research fields that are promoted through FPs. Typically, RPOs which are more exposed to this problem are smaller Scientific Institutes operating in environments with reduced resources for co-funding. These results should be framed within the context of increasing administrative simplification that has been introduced in FP7, as summarised in its main elements in Table 6.

Table 6: Main administrative simplifications introduced with FP7

Reduction of ex-ante controls and revised protective measures for financially weak participants (SMEs and high-tech start-ups)
Reduction of the number of certificates on financial statements to be provided with periodic cost claims (below EUR 375,000)
Introduction of a unique registration facility, avoiding repeated requests for the same information
Streamlining of the project reporting requirements
Progress towards optimised IT tools ("e-FP7") as a mean for rationalising all interactions
Improvements to the services and guidance documents for applicants

Source: European Commission, COM(2010) 187

RTOs have expressed particular concern for the burden arising from EU audit and control approach: The process that is currently set out in multiple Regulations sometimes uses different definitions, and would need to be harmonised. RTOs find audits to be more efficient when performed on the basis of trust. As time is essential to create trust, the high turnover of staff in auditing bodies is an obstacle for the creation of the desired level of trust. Furthermore, RTOs would like to have more transparency in the criteria used for selecting research organisations to be audited.

The need for further improvement in administrative procedures was also flagged in the Interim Report for FP7 (Annerberg, Begg, Acheson, Borrás, Hallén, Maimets, Mustonen, Raffler, Swings, and Ylihonko, 2010: Chapter 8). Even though the self-assessments by officials responsible for different areas of FP7 are reasonably positive about the efficiency of the programme, issues like: excessive time to contract and unexplained variations between different themes, overly demanding

reporting obligations, as well as duplicating documents and inconsistency in the application of rules or implementation of procedures were all cited as issues to be further addressed.

A study referring to the Austrian case (Arnold, et al., 2010) underlines that the most important obstacles to participation are the administrative barriers in all their different forms, i.e. "administrative burden for preparing the proposal", "administrative burden for managing the project" and "administrative burden for reporting". Non-administrative barriers included "little chance of getting the project proposals approved". These issues, which reflect a kind of return-on-investment thinking, are important at both organisational and individual levels. For inexperienced participants and non-coordinating organisations, "the risk for repayment obligations" is considered a greater barrier".

Widening the analysis to other countries, Arnold (2010) confirms that one of the greatest barriers to participation has been the administrative complexities of the FPs. Although this has been a major concern and a subject of complaint for a number of years, it is also a barrier that some countries and participants have learned to live with over the years.

To highlight the extent to which the excessive burden of the administrative application procedure is perceived by RPOs as a barrier to participation, Table 7 reports some insights from respondents.

Table 7: Burden of the administrative application procedure perceived by RPOs

Insight	Description
Trouble for coordinators	One RTO mentioned the problems of being a project coordinator, due to dealing with the complex administrative requirements which were reported as "too time-consuming".
Unrequested organisational changes	Because of the administrative burden, several RPOs reported the need for a dedicated "grant office" within the organisation. Such a department would let researchers focus on their research activity, relieving them of administrative tasks.
Disproportion of burden between stages	One RTO believes that in a 2-stage selection procedure, efforts needed in the second phase are disproportionate compared to the short timeframe and the low success rate – unlike the first phase, when it is relatively "easy to have the proposal approved".

Source: in-depth interviews with RPOs' representatives

According to one Dutch RPO operating in the clinical sector, the time horizon of four years can be too short for projects in the field of clinical research. In projects where there is the need to use animals for tests in the laboratory, it is sometimes recommended to maintain the same consortium, so that environmental costs can be reduced, as well as the number of animals used for the tests. In cases where one project is continued through another, maintaining the same team would also ensure protection of the intellectual property rights of the first group of participants. The same RPO suggests an increase in the time horizon to eight years. A German RPO underlined that the time span is too short for basic research funding, and added that in general organisations engaged in basic research have fewer opportunities to get funding.

Another German RPO participating in FPs underlines that calls should be clearer and better focused. On a similar note, another participating RPO - "it is out of proportion - the space dedicated to feedback compared to the proposal length, more detailed reports could be a solution. Sometimes it is not clear why a proposal is rejected". Also other RPOs have expressed a preference for more detailed information on non-successful proposals to ensure greater transparency of decisions and constructive suggestions for future participation.

Some RPOs have reported the difficulty to recover their infrastructure costs because if they had to charge them when formulating the financial proposal they would not be competitive. Furthermore, in some countries, national institutions directly or indirectly contribute to covering the infrastructure costs and this might further affect the competitiveness in the markets. This would require also harmonisation of MS laws.

Some additional barriers that have been flagged up by individual respondents were:

- Misalignment between RPOs objectives and the themes proposed in FPs;
- RPOs have resources that are sometimes fully occupied by the core research activities and participation in proposals is therefore very limited;
- The lack of in-house internal knowledge on project management; and
- The complex reporting requirements.

Obstacles reported by researchers that have only marginally or not directly participated in FP projects are aligned with those reported by interviewees that have been directly involved in FP projects. The different obstacle they encounter relates to the lack of previous experience in FPs of newly formed groups of researchers.

The obstacles and barriers mentioned by researchers that have participated only marginally or not at all in FPs are similar to those perceived by the participants:

- Paper work during the project;
- Heavy reporting;
- Requiring support from administrative personnel;
- Difficulties in understanding permission/ethical approval the research group has to obtain;
- Difficulty in finding enough partners to allow participation; and
- The availability of alternative sources of funding at the national level.

One of the non-participant researchers observed a general mismatch between timespans of projects and their general research objectives. The impression of the respondent was that objectives stated in the calls are sometimes not proportional to the defined budget and timeline. With reference to the timeline, calls appear much more aligned to the needs of the industry than to those of RPOs, whose research usually takes more time.

Low rates of funding have been also mentioned as an issue that can reduce participation in FPs for some RPOs. Funding rates are indeed considered low in relation to the resources that are necessary to both in order to submit the proposal and manage the administrative aspects of the project. For this reason, RPOs often prefer to focus their attention and resources on national and local opportunities that prove to be more balanced in terms of level of funding and competition, and that are less complex in terms of contracts, not having the international dimension of FPs contracts that is an extra obstacle typical of FPs.

For RPOs with a very specific focus on certain research themes, participation in FPs is subject to the availability of projects related to those themes. Especially when the focus on specific research themes is linked to the annual allocation of subsidies from national governments, RPOs have no incentives in diverting resources from their core activities. At the same time, especially for smaller RPOs, it is difficult to transfer ideas bottom-up and contribute to setting up the research agenda of FPs.

All the above mentioned problems could be exacerbated when a group of researchers is newly created, considering also that new-comer participants usually encounter much more difficulties in clearly understanding the objectives of the calls and they might not have the necessary network to take part in such projects.

Some additional factors hinder a higher participation of RPOs in the **EU13 countries**.

Researchers based in those countries have both lower experience in networking with their colleagues in the EU15 and lower visibility at international level, so that partnering with them is not necessarily the first choice of researchers in EU15. As a result, partnerships that generate ideas for projects often do not involve EU13 research organisations, arguably under-utilising their potential. There is a common perception among EU13 researchers that the focus of FPs and of their calls has been defined without fully taking into account the interests and specificities of the EU13 MS. Overall, lobbying efforts of EU13 research organisations in Brussels is not effective.

Another barrier is the lack of structural measures at the national level to help researchers with their applications, which results in a lack of capacity for proposal drafting. As it is not easy to pay external consulting services for the proposal preparation, most of the time proposals are fully written in-house, with limited project management and administrative capacities.

Finally, differences in governance between FPs and ERDF funding represent another barrier to participation in FPs for RPOs based in the EU13. Whereas FPs are implemented centrally from Brussels, structural funds are administered through national operational programmes. In addition to having different foci and aims compared to the FPs, national operational programmes are generally perceived as less bureaucratic, less selective (with a correspondingly higher application success rate) and overall easier to access.

2.1.4.2. Factors that determine the success or failure of RPOs participation in FPs

The strategic alignment of both RPOs and national research agendas with the key objectives of FPs is a very important factor of success in participation.

The focus of FPs on the principles of co-funding and excellence directly determines the most important success factors for participation. The alignment of the priorities of RPOs with the strategic lines of FPs is key in determining the success in participation. As a result, RPOs that receive core funding from national institutions in the priority areas of the FPs are naturally at an advantage in participating.[29]

The recent report by De Silva and Andersen (2015) concludes that the abovementioned factors are crucial also for RTOs, together with the ability to have a bi-univocal constructive exchange with EU objectives and policies through the ability to influence and impact, adequate knowledge of administrative procedures and good capacity of discerning the right EU calls taking into account all factors (thematic area, commercial orientation, tangible and intangible benefits).

Previous experience and internal knowledge in writing proposals, together with established networks, are key success factors for participation.

Information collected through in-depth interviews suggests that one of the key success factors for RPOs in attracting funds, and thus participating in FPs, is the quality of their submitted proposals. The evaluation team investigated the aspects affecting the quality of proposals from the perspective of what is under the control of RPOs and what depends on information given by the EC.

As for internal factors, there are some differences between EU15 and EU13 RPOS: whereas the three most important ones for RPOs based in EU15 countries are internal knowledge, the right mix of expertise, and skills in designing and writing proposals. (Figure 35), For RPOs based in EU13 MS, the most important factors hindering participation are lack of experience in drafting proposals and limited experience in previous programmes.

It should be noted, however, that other factors are deemed relatively important. The existence of networks and collaborative support in drafting good proposals that in turn represent an advantage also when competing for funds at national level. Some RPOs stress the importance of teaming up with the right groups of institutions, which partly explains the low mobility in the distribution of funds.

It should be noted that responses do not differ across different types of RPOs.

Figure 35: Important factors in writing proposals

Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not important at all" - 5: "Very important".

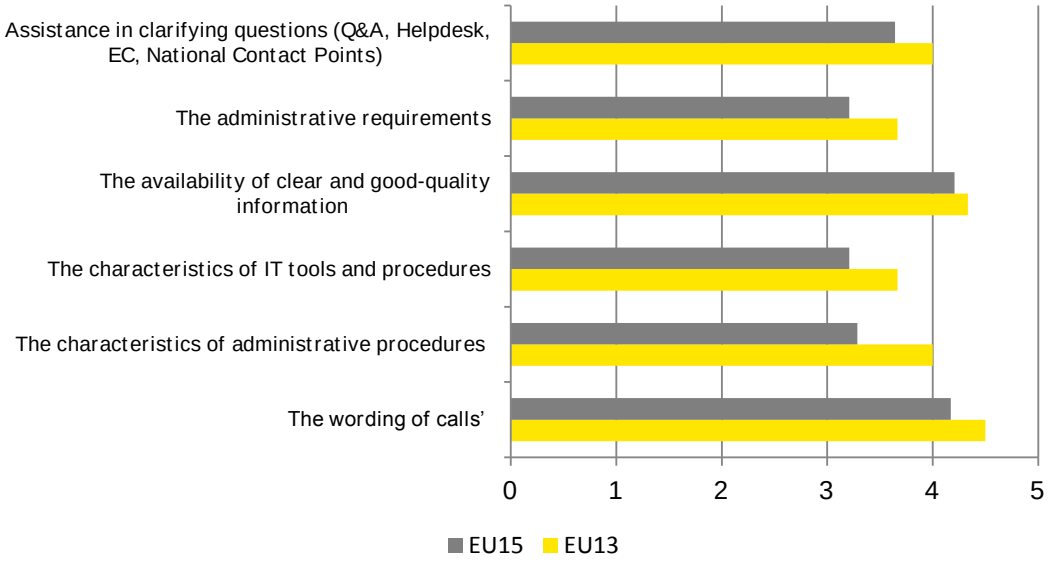
[29] Source: workshop with RPOs representatives held on the 25th June 2015.

With regard to the useful factors in writing proposals depending more on the EC, Figure 36 shows that the availability of clear and good quality information (for example brokerage events, dialogue themes, workshops or public access to evaluation guidelines) and the wording of calls are very important in both the EU13 and EU15. In this case, figures reported by type of RPOs show a slightly different pattern: RTOs, in comparison with Scientific Institutes, consider relatively less important the majority of the factors (with the exception of the wording of the calls that appears to be equally important for all types of institutions). Assistance in clarifying questions through Q&A of the EC, national contact points or any other helpdesk is the factor where responses show the highest level of differentiation.

It is also worth mentioning that some RPOs have expressed their preference for shorter periods between the submission of the proposal and the award of the project, as this would help to plan revenues and to retain experts.

In general, the characteristics of IT tools and procedures are perceived as secondary factors in writing proposals.

Figure 36: Useful factors in writing proposals



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not useful at all" - 5: "Very useful".

2.1.4.3. Influence of the national research policy on the participation of RPOs in FPs

A reduced availability of resources at national level is perceived by some RPOs as one of the key reasons for participating in FPs, however MS with higher levels of R&D spending attract higher shares of funds through FPs.

The elements of the socio-economic contexts influencing the decision to participate in FP6 and/or FP7 have been analysed in this study. The negative trends in funds allocated for research at national level have pushed many RPOs to increase their participation in FPs. The lack of – or decrease in – equally significant national public funding in their respective fields of competence has been pointed out as one reason behind their increased participation by several Spanish, German, French and Finnish RPOs.

The fact that reduced national resources push RPOs more towards FPs has been reported in the feedback provided by RPOs interviewed, although participation in FPs, thanks to the principle of co-funding, requires a certain amount of national resources. Self-reported results in this sense tend to be at odds with evidence reported from data showing that MS with higher capacity for investing in research activities, as captured by government expenditure in R&D, are participating more actively in FPs (see section 1.2.3). In some cases, this makes national institutions more proactive in setting up research priorities according to the international research agenda. For example, one RPO interviewed reported that a part of national funds is allocated proportionally to the share of international funds that the research organisation is able to attract.

In some other countries and sectors, for example in the medical sector in the Netherlands, where national funds are distributed on a non-competitive basis, participation in FPs can sometimes be seen as diverting resources from core activities. In such contexts, RPOs might still find an interest in participating in FPs for specific frontier research topics that are not covered by national funding (e.g. research on rare diseases).

An additional incentive for participation is the presence of associations at national or EU level, which promote the participation of both national and international RPOs in international calls. For example EARTO - the European Association of Research and Technology Organisations – has been mentioned by its members as a relevant factor easing their participation in FPs. At the national level, an example is provided by the Hungarian Association for Innovation (MISZ), which assists Hungarian RPOs in completing their applications.

Finally, one element of the socio-economic context that can influence participation is the size of the national market and demand for innovative products. Small markets with few potential partners increase RPOs willingness to engage in international cooperation with foreign organisations to find more opportunities (e.g. as mentioned by an RPO in Hungary). The need for product innovation in selected sectors also represents a reason to participate in international contexts– as in the case of organisations operating in the French food industry.

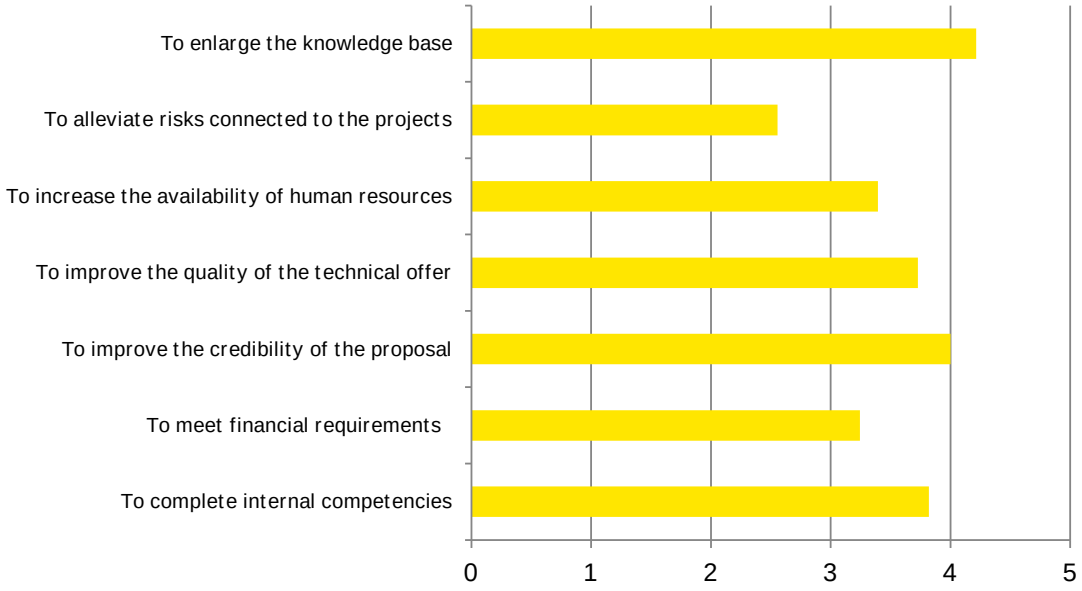
2.1.5. RPOs networking patterns

Collaborations are seen as a key factor to create interdisciplinary teams both in terms of knowledge base and complementary competencies that enhance the credibility of proposals.

The key reasons pushing all types of RPOs towards collaborative experiences are the enlargement of the knowledge base and the need to look for complementary competencies, mainly related to the fact that FPs require highly interdisciplinary teams. This latter factor has emerged as particularly important for Scientific Institutes.

In addition to this, collaboration with strong partners is seen as a key factor in enhancing the probability of success in proposals by enhancing their overall credibility and improving their technical quality especially by Government Labs.

Figure 37: Factors pushing RPOs towards collaboration with external partners

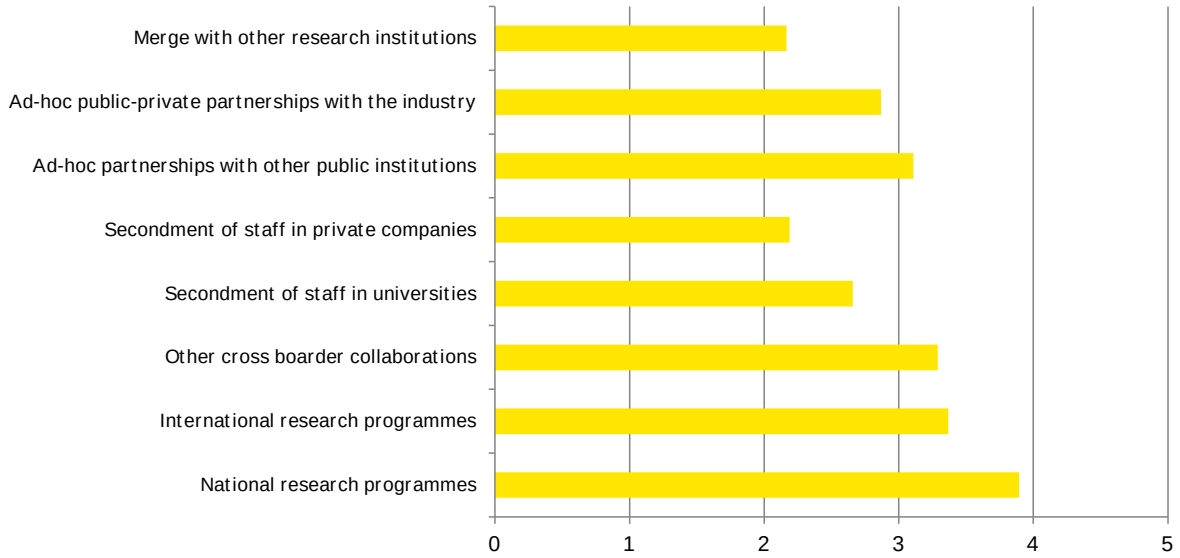


Source: in-depth interviews with RPOs' representatives. Legend - 1: "Not at all" - 5: "To a very large extent".

This study investigated the importance of collaboration with universities and industry, and how other means could have been developed in the absence of any FP funds. The results from interviews show that the principal means would have been national research programmes, which appear particularly important for Government Labs (Figure 38). Alternatively, other international research programmes are considered as an additional way to collaborate with private companies and universities, (which is considered equally important for Scientific Institutes and Government Labs). Some respondents underline that, at EU level, FPs have played an important role in both

creating partnerships with other RPOs and allowing for participation in large public-private partnerships.

Figure 38: Means used by organisations to develop collaborations with universities and private companies in the absence of any FP funds



Source: in-depth interviews with RPOs' representatives. Legend - 1: "Very unlikely" - 5: "Very likely".

2.1.5.1. New networking opportunities arising in the context of FPs

Most RPOs interviewed for the case studies claim they were able to expand their networks thanks to the participation in the FPs. RPOs usually entered consortia in which they already knew some of the partners. The fact that each RPO shares part of its pre-existent network generates a multiplicative effect of new partners for all participants in the consortium. A phenomenon that could be labelled as "network sharing" is thus observed.

The share of completely new and already known partners can vary depending on the characteristics of RPOs. For example, RPOs that are already known for their excellence in a given topic are usually relatively less dependent on the FPs for broadening their network. This also applies to RPOs of a relatively large size operating in sectors/themes that naturally have international connotations. Participation in FPs was very beneficial for smaller RPOs, which usually have access to a reduced sphere of potential partners limited to their home country.

Even though participation in FPs guarantees access to new partners, the duration of the collaboration in some cases is limited to the duration of the project. Once the financing linked to projects is over, it is difficult to find resources for the collaboration to continue, especially with partners from other MS or from third countries.

In general, the analysis underlines that FPs are a very good opportunity to test new collaborations. FPs also allow for contact with people at the management level, which stimulates discussions across RPOs on strategic aspects related to participation. In some cases, partnerships created in FP projects have continued in the context of other FP projects or through projects involving other international funding instruments. Some RPOs are currently cooperating with partnerships formed in the context of FPs, for instance, in projects in developing countries. Sometimes the existing partnerships were strengthened and led to new project collaborations outside the FPs.

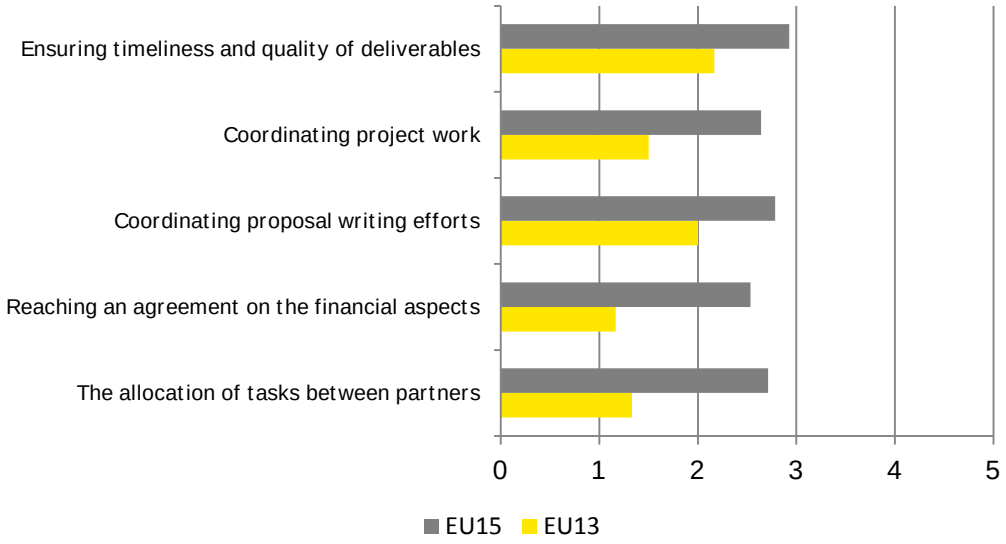
When collaboration continued, it was sometimes for the development of products in cooperation with industrial partners. Projects usually continue on the applied and technological development part, and related partnerships are more likely to continue on a national basis. Alternatively, collaborations also continued in the context of other European projects. In some cases, collaborations with partners from other MS or third countries continued thanks to alternative sources of funds provided by other institutions, such as international foundations.

A significant proportion of RPOs commented that, in general, there were no major issues encountered and that collaborations with external partners were overall a positive experience. Relationships usually run smoothly when there is an agreement on the financial aspects, and when

coordinators of the projects have solid project management skills (Figure 39). These factors ensure timeliness and quality of deliverables.

In isolated cases, difficulties were encountered in working with established networks of well-known partners. Coordinating the proposal efforts can sometimes present some problems: in cases where responsibilities are not well defined during the inception phase of collaborations, problems can be transmitted to the project, jeopardizing its implementation, for example with delays in the delivery.

Figure 39: Issues encountered during participation in FPs' projects



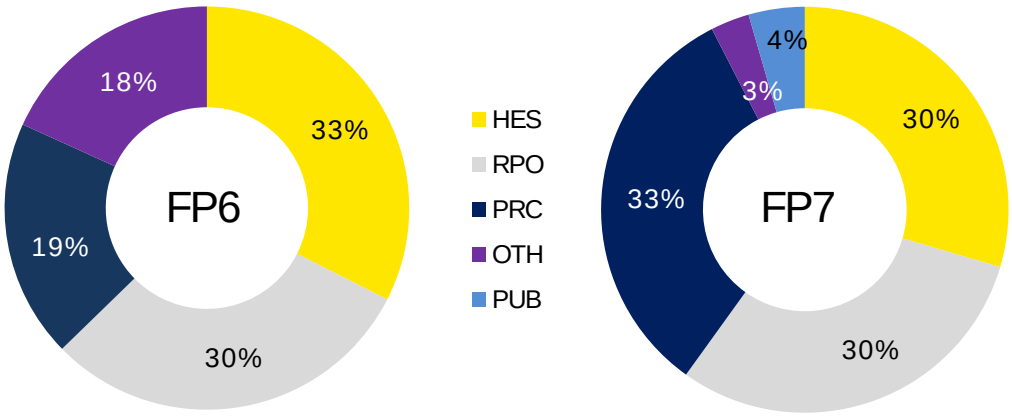
Source: in-depth interviews with RPOs' representatives. Legend - 1: "No extent" - 5: "Large extent".

2.1.5.2. Impact of FPs on the increase in collaboration between RPOs and universities and between RPOs and industry sectors

Moving from FP6 to FP7, RPOs have substantially increased their collaboration with private companies while maintaining a high level of collaboration with universities. RTOs tend to support the mobility of staff with industry and academia to widen their network in the long run.

Using data from the CORDA database, the study has examined the proportion of each type of beneficiary having collaborated with RPOs during FP6 and for FP7. The incidence of participation with private companies has substantially increased from 19% in FP6 to 33% in FP7- making private companies the most common type of partner for RPOs in FP7. Universities, that in FP6 were the most common partners (accounting for 33% of partners), slightly reduced their presence as partners in FP7, accounting for 30% of partners and thus becoming the second most common partner in FP7. Participations with other RPOs is also important, with a constant incidence of around 30% across the two FPs.

Figure 40: Breakdown of RPO's FP collaborations, by type of partner institution



Source: authors' calculations based on the CORDA database

The role that RPOs play in consortia with both universities and private companies is underlined also by other studies. The *Ex-post evaluation and impact assessment of funding in the FP7 NMP thematic area*[30] points out that RPOs can "play an important role as a linking pin between the universities and industry" by translating basic research results into relevant industrial applications. In addition, De Silva and Andersen (2015) report that RTOs facilitate the mobility of staff between RTOs, industry and academia. Exchanges with industry and academia are seen as a key enhancer of RTOs' network in the long run.

For more generalised evidence, the evaluation analysed the degree of multi-disciplinarity of projects by calculating the average size of the consortium by theme and by type of partner, and then by breaking up the average composition of consortia by type of beneficiary. The findings of the NMP report of 2015 tend to be confirmed, with consortia composed of 12 members on average, and with RPOs increasing their relative weight with respect to universities and leaving spare room for the access of commercial organisations when passing from FP6 to FP7. A similar pattern is observed also in the theme "Activities of international cooperation", where RPOs are on average the most frequent partners in FP7 with a substantial increase in comparison with FP6. Private companies have also increased their relative presence in this theme.

[30] European Commission (2015), Ex-post evaluation and impact assessment of funding in the FP7 NMP thematic area, by Technopolis Group and Fraunhofer ISI.

Table 8: Average partnership size by theme

Theme	FP6					FP7				
	HES	IND	REC	OTH/N-A	Total	HES	PRC	REC	OTH/PUB	Total
Activities of International Cooperation	1.6	0.2	1.5	0.6	3.9	0.8	0.7	2.3	1.3	5.2
Research potential of convergence regions						0.6	0.0	0.6	0.1	1.3
Coherent development of research policies	1.2	0.2	1.3	5.8	8.4	0.6	0.9	0.9	3.5	5.9
Coordination of research activities	0.6	0.1	2.7	8.3	11.7					
General Activities (Annex IV)						0.4	0.4	2.0	4.5	7.3
Joint Technology Initiatives (Annex IV-SP1)						1.8	4.1	1.4	0.2	7.5
Regions of Knowledge						1.9	3.4	1.6	4.3	11.2
Energy	3.6	3.0	4.0	3.4	14.0	2.2	4.5	2.4	0.8	10.0
Environment (including Climate Change)						4.0	2.6	4.1	1.2	11.9
European Research Council						0.8	0.0	0.3	0.0	1.2
Food, Agriculture, and Biotechnology	5.5	1.9	5.2	2.7	15.2	4.1	3.4	3.9	1.4	12.8
Fusion Energy	3.7	1.5	6.4	2.5	14.1	9.8	0.0	6.3	0.0	16.0
Nuclear Fission and Radiation Protection						3.8	3.5	5.3	0.7	13.4
Health	5.2	1.5	3.3	1.1	11.0	4.6	1.9	2.4	0.7	9.6
Information and Communication Technologies	4.0	2.8	2.1	3.2	12.2	3.0	3.3	1.9	0.5	8.7
Marie-Curie Actions	1.2	0.1	0.5	0.1	1.9	1.2	0.2	0.4	0.1	1.8
Nanosciences, Nanotechnologies, Materials and new Production Technologies	3.9	4.3	3.2	1.1	12.4	2.8	5.2	2.7	0.7	11.4
Policy support and anticipating scientific and technological needs	3.2	0.3	3.1	1.4	8.0					
Research and innovation	0.6	0.6	1.2	5.0	7.4					
Research for the benefit of SMEs	1.2	5.6	1.9	2.4	11.1	0.9	5.4	1.2	0.6	8.1
Research Infrastructures	4.2	0.4	4.9	1.1	10.6	4.9	1.1	5.9	1.3	13.2
Science in Society	2.7	0.1	1.1	2.1	6.0	3.8	0.9	1.8	2.1	8.6
Security						2.3	4.7	2.5	1.5	11.1
Socio-economic sciences and Humanities	8.5	0.0	3.1	0.7	12.3	5.6	0.5	2.3	0.9	9.3
Space	2.9	5.4	3.2	2.2	13.7	2.0	2.7	3.2	0.6	8.6
Transport (including Aeronautics)						2.3	5.8	2.4	1.0	11.6
Grand Total	**2.5**	**1.4**	**1.9**	**1.4**	**7.3**	**1.8**	**1.6**	**1.3**	**0.4**	**5.1**

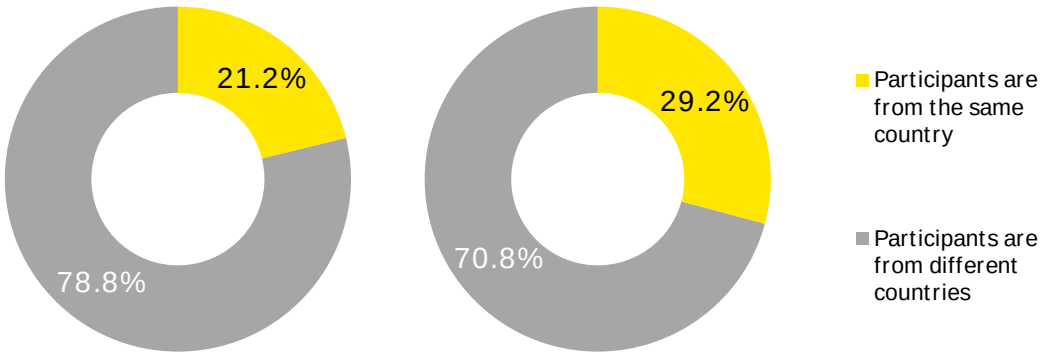
Source: authors 'calculations based on CORDA

2.1.5.3. Contribution of FPs to the development of cross-border cooperation activities of RPOs

FPs promote and foster cross-border cooperation of RPOs in Europe.

In addition to the interviewees who remark the positive impact of FPs for enhancing cross border cooperation across European RPOs (see section 2.1.4), statistics from the CORDA database confirm that most of the projects and activities implemented in FPs have a transnational connotation (see Figure 41). In FP7, the share of projects that implied cross-border cooperation of RPOs exceeded 70% and in FP6 the same indicator was close to 80%. As the reduction of projects implying international cooperation has been mainly prompted by the introduction in FP7 of new programmes such as the European Research Council, whose projects do not always imply international cooperation, the lower share for FP7 of projects implying international cooperation is not necessarily due to a lower propensity of RPOs for cross-border interactions, but rather to structural changes in the FPs.

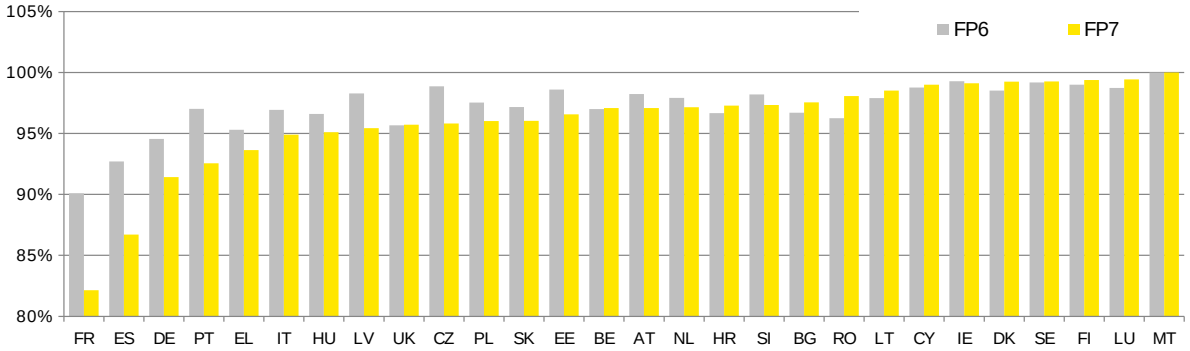
Figure 41: Share of projects with cross-border cooperation across countries



Source: authors' calculations based on the CORDA database

Focusing on the national level provides additional insight to interpret the aggregate figures above. It is interesting to note that countries having experienced the largest contraction in the share of cross-border projects – France, Spain, and Germany - are also those with higher levels of participation as coordinators in ERC related projects (Figure 42).

Figure 42: Share of projects with cross-border cooperation at MS level



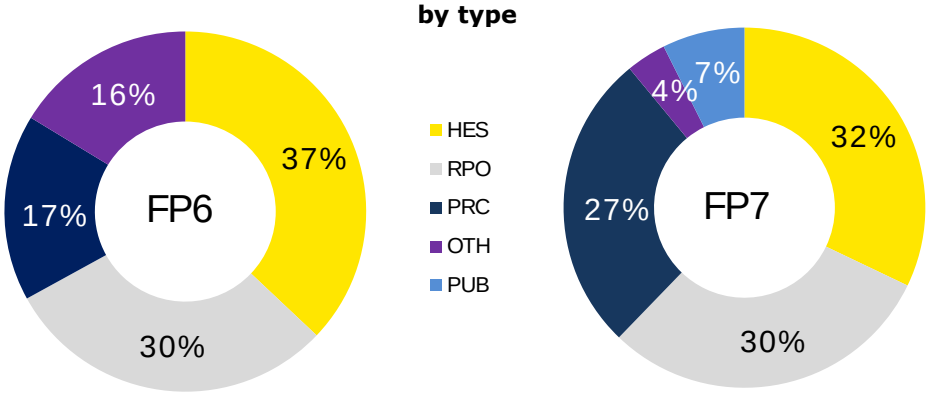
Source: authors' calculations based on the CORDA database

2.1.5.4. Focus on collaboration patterns of EU13-based RPOs

EU13 RPOs' most frequent partners in consortia have been universities and RPOs from Germany and the UK.

As RPOs in the EU13 show lower participation than RPOs based in the EU15, it is interesting to consider EU15 partners for EU13 RPOs. Figure 43 displays the distribution of partners from EU15 countries by type of beneficiary, for FP6 and FP7. The most common partners in both FP6 and FP7 were universities, accounting for 37% and 32% respectively. RPOs from EU15 countries were the second most common partner, with 30% in both FP6 and FP7.

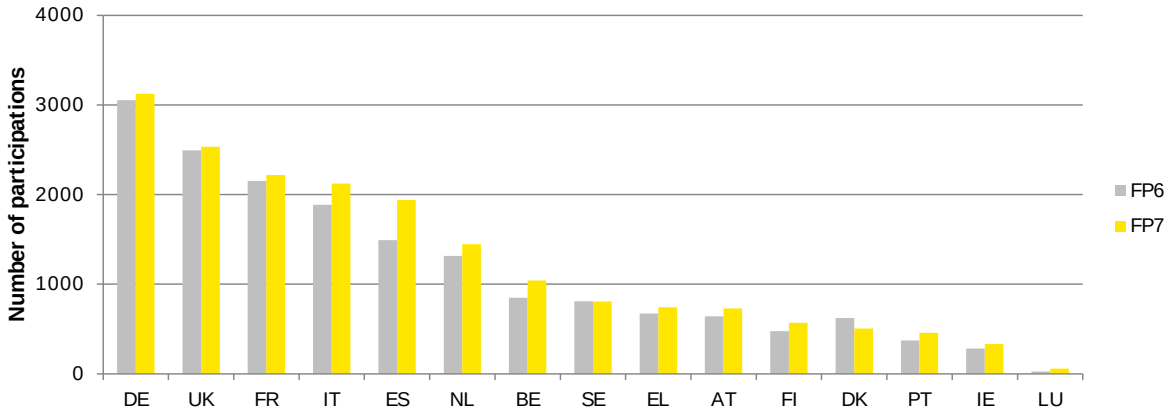
Figure 43: Most frequent EU-15 partners for EU-13 RPOs (as % of total participations), by type



Source: authors' calculations based on the CORDA database

Figure 44 provides an overview of the origin of EU15 partners for EU13 RPOs, and shows that German and UK RPOs are the most common partners. The remaining distribution of partners broadly reflects the overall distribution of participations by country.

Figure 44: Country of origin of most frequent EU15 partners for EU13 RPOs



Source: authors' calculations based on the CORDA database

2.1.5.5. RPOs networking pattern: Top RPO performers as network players

Key network players are EU-15 based, large scale RPOs with a diversified portfolio of research activities. Such RPOs have consistently maintained their position as top performers between FP6 and FP7, based on the number of interactions with other RPOs.

The analysis of the individual relevance of RPOs on FP networks – based on the number of each RPO relationship[31] – reveals the stability of the top 10 RPOs, across specific programmes and thematic areas, but also between FP6 and FP7.

These are predominantly based in EU15 MS. This RPOs' context adds that accessing knowledge, competences and FP funding is not just about individual relevance (scope of activities, reputation), but also about the ability to connect and partner with other RPOs, and access their respective networks. Indeed, the higher the number of relationships of an RPO, the higher its connectivity and, therefore, the greater its chance to access complementary resources (knowledge, skills, funding, reputation, markets).

Table 9 shows the top 10 RPOs for the three FP6 programmes based on their number of relationships in the corresponding networks. The EU15 RPOs' relevance as network players is confirmed across the following programmes:

- from France: Centre National de Recherche Scientifique (CNRS) with 411 and 301 relationships for ERA programmes, Institut National de la Sante et de la Recherche Scientifique (INSERM), and Commissariat a L'Energie Atomique (CEA);

[31] This analysis is based on the computation of the number of links that each RPO has in the network.

- from Italy: Consiglio Nazionale della Ricerche (CNR), Istituto Nazionale per la Fisica della Materia (INFM), Istituto per le Tecnologie Applicate ai Belli Culturali (CNR-ITABC);
- from Spain: Consejo Superior de Investigaciones Científicas (CSIC).

The only non-EU15 RPO featuring on the top 10 most connected RPOs is Ustav Jaderneho Vyzkumu Rez (UJV Rez) from the Czech Republic, with 98 relationships for nuclear research projects.

Table 9: FP6 Networks - Top 10 RPOs by programme[32]

SP1				SP2				SP3			
RPO	Country	EU	Links	RPO	Country	EU	Links	RPO	Country	EU	Links
CNRS	FR	EU15	411	CNRS	FR	EU15	301	SCK CEN	BE	EU15	98
CSIC	ES	EU15	332	INSERM	FR	EU15	237	UJV REZ	CZ	EU13	98
CNR	IT	EU15	318	MPG	DE	EU15	186	CEA	FR	EU15	94
INSERM	FR	EU15	301	CSIC	ES	EU15	174	KIT	DE	EU15	88
INRA	FR	EU15	273	CNR	IT	EU15	172	CIEMAT	ES	EU15	87
INFM	IT	EU15	270	INFM	IT	EU15	158	NRG	NL	EU15	86
CNR-ITABC	IT	EU15	265	CNR-ITABC	IT	EU15	151	JRC	BE	EU15	83
UC	IT	EU15	265	UC	IT	EU15	151	ENEA	IT	EU15	77
JRC	BE	EU15	256	CEA	FR	EU15	140	HZDR	DE	EU15	76
DLO	NL	EU15	253	STFC	UK	EU15	130	GRS	DE	EU15	72

Source: authors' analysis based on SNA.

By detailing the top 10 RPOs by programme based on the number of interactions in the FP networks, Table 10 confirms the stability of the following RPOs as key network players in the European Research and Innovation Arena: CNRS and CEA (France), CNR (Italy), and CSIC (Spain).

Table 10: FP7 Networks - Top 10 RPOs by specific programme[33]

Cooperation			Capacities			People			Ideas			Euratom		
RPO	Country	Links	RPO	Country	Links	RPO	Country	Links	RPO	Country	Links	RPO	Country	Links
CNRS	FR	336	CNRS	FR	727	SCK CEN	BE	87	MPG	DE	12	CNRS	FR	997
CNR	IT	266	Fraunhofer	DE	695	CEA	FR	85	CNRS	FR	10	MPG	DE	503
CSIC	ES	223	CNR	IT	633	ENEA	IT	75	CNR	IT	8	CSIC	ES	477
MPG	DE	183	CSIC	ES	538	IRSN	FR	66	CSIC	ES	8	INSERM	FR	219
TUBITAK	TR	167	JRC	EU	475	CIEMAT	ES	57	INSERM	FR	7	CNR	IT	216
Fraunhofer	DE	165	CEA	FR	472	JRC	EU	50	CEA	FR	6	FORTH	EL	150
DLR	DE	154	DLO	NL	469	PSI	CH	49	CRG	ES	6	INRA	FR	139
NERC	UK	147	TNO	NL	456	MTA	IL	47	ARMINES	FR	5	CEA	FR	131
CEA	FR	146	VTT	FI	450	CNRS	FR	46	KNAW	NL	5	MRC	UK	116
EMBL	DE	116	MPG	DE	373	Juelich	DE	45	INFN	IT	4	CERN	CH	106

Source: authors' analysis based on SNA

It should also be noted that, in line with the findings based on the share of funding, RPOs from Switzerland – Paul Scherrer Institute (PSI) and the European Organisation for Nuclear Research (CERN) – as well as Turkey – Scientific and Technological Research Council of Turkey (Tubitak) - emerge as key network players with a high number of interactions with other RPO partners.

[32] Number of links refers to the number of relationships of each RPO (network degree).
[33] Links refer to the number of relationships of each RPO (network degree).

2.1.5.6. RPOs networking pattern: stability of clusters per Specific Programme and thematic area

Depending on the specific programme and thematic area, FP networks between RPOs reveal clusters of organisations particularly connected, not just per se but with each other. From the clusters' structure, key RPOs emerge as transversal players, indicating self-reinforcing thematic communities of RPOs as FP beneficiaries.

While the density of relationships is an important feature of RPO networks' overall patterns, the advancement on the dynamics of RPO networking patterns in FPs benefits from the analysis of the cohesiveness of those relationships.

By extracting clusters of particularly connected RPOs, the study uncovers an important unit of analysis from a policy perspective, namely for the evaluation of the thematic and geographical reach of projects and the contribution of FPs to the development of research collaborations and the ERA.

The clusters' analysis[34] indicates the most cohesive sub-networks, to advance on who are the best connected RPOs in the FP network not just per se, but also between them.

The RPO clusters for FP6 and FP7 reveal relatively stable groups of RPOs across specific programmes and thematic areas. The principle is the larger the cluster, the more cohesive and inclusive relationships between RPOs are.

Among all specific programmes:

- FP6 integrating and strengthening the ERA ensures the largest cluster composed of 69 RPOs, in which each RPO is connected to 35 others;
- Cooperation ensures the largest and most inclusive FP7 cluster with 68 RPOs, in which each RPO is connected to, at least, 32 others, which is in line with the fact that this programme specifically fosters collaborative research across countries and types of organisations, namely private companies and universities. On the contrary, FP7 Ideas and People – due to the predominantly individual nature of projects – represent smaller clusters, not just in terms of number of RPOs, but also in terms of number of relationships.

When analysing the clusters' structure, that is, the RPOs belonging to that sub-network, the analysis shows that the same set of transversal RPOs in terms of individual network positioning also participate in these clusters. In this context, the following RPOs are not only highly connected[35] but also highly cohesive[36]:

- Consejo Superior de Investigaciones Científicas (CSIC);
- Centre National de Recherche Scientifique (CNRS);
- Forsschungszentrum Karlsruhe (FZK);
- Consiglio Nazionale della Ricerche (CNR);
- Istituto Nazionale per la Fisica della Materia (INFM).

These RPOs are located in EU-15 Member States, more specifically in France, Germany, Italy and Spain. As mentioned above, they represent a broad scope of activities, calling attention to the role of politechnicity in accessing and benefiting from FP funding. The scope of activity is important not just in terms of institutional reputation, but also as a critical mass to manage the administrative burden and the quality of projects. French-based CNRS acknowledges networking, namely the chance to improve R&D linkages and international cooperation with other organisations, as a key benefit in taking part in FPs. Italian-based CNR also pointed out the access to new working partners as a critical element of participation in FPs.

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[34] Assessed on the basis of the maximum *K*-core, that is, a subnetwork of organisations connected to one another by at least *k* others.
[35] Based on the number of relationships (degree).
[36] Based on the presence of clusters (maximum k-cores).

Figure 45: FP6 RPOs Cluster: Integrating and strengthening the ERA

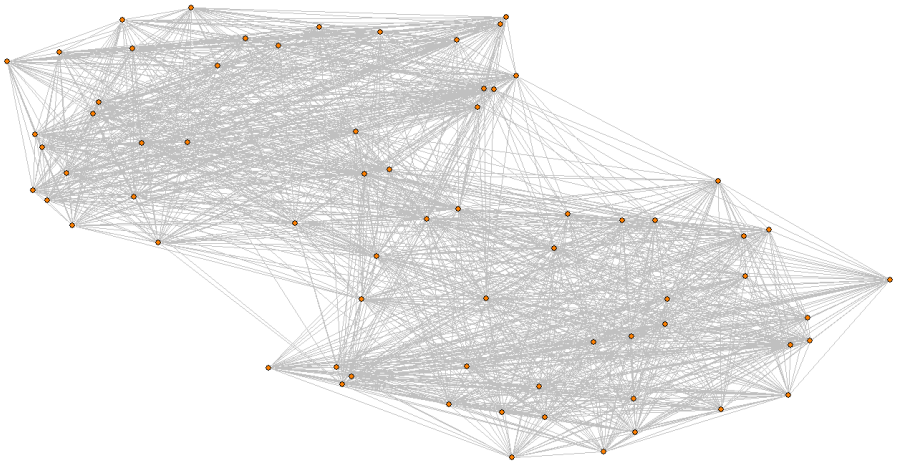

Figure 46: FP6 RPOs Cluster: Structuring the ERA

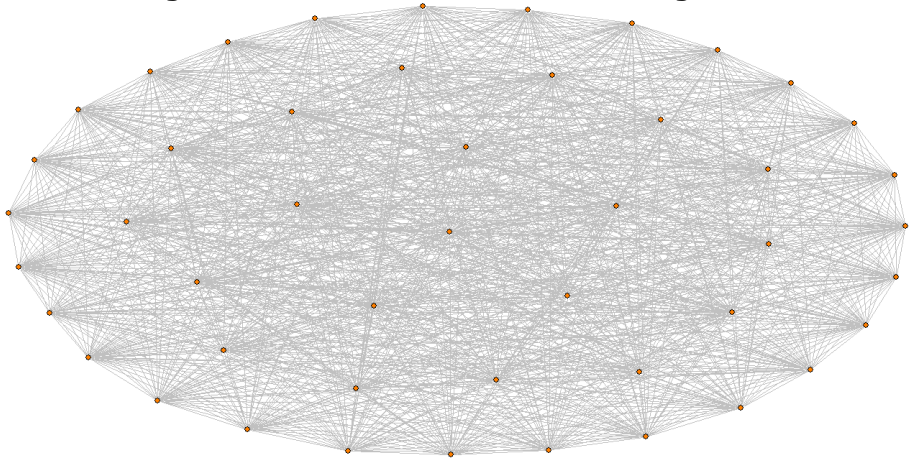

Figure 47: FP6 RPOs Cluster: EURATOM

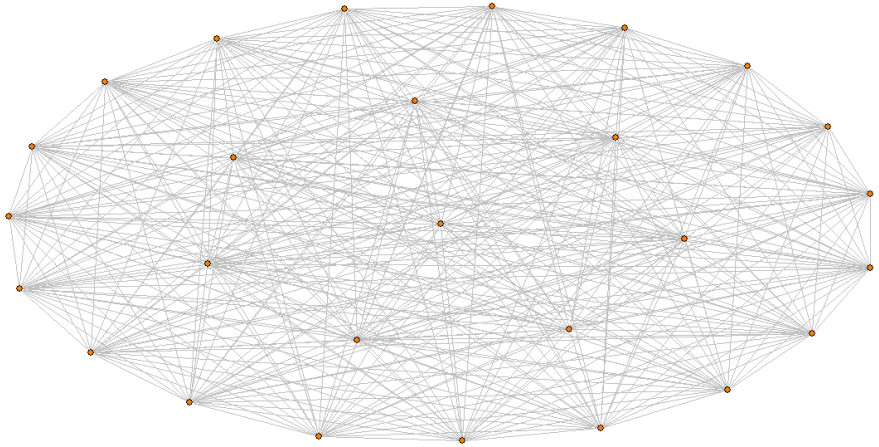

Table 11: FP6 RPOs Clusters per Specific Programme

FP6 RPOs Clusters	Cluster K-core	
SP	K	RPOs
SP1: Integrating and strengthening the ERA	35	69
SP2: Structuring the ERA	46	47
SP3: EURATOM	26	27

Source: authors' analysis based on SNA on Corda data.

Source: authors' analysis based on SNA on Corda data.

Figure 48: FP7 RPOs Cluster: Capacities

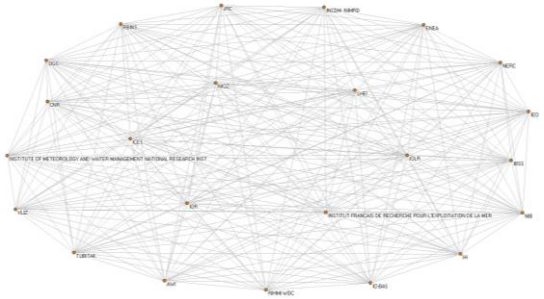

Figure 49: FP7 RPOs Cluster: Cooperation

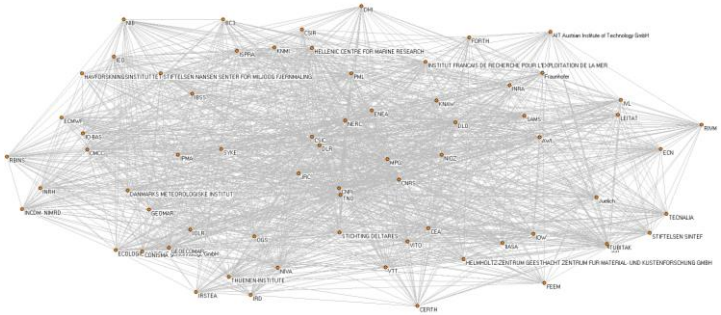

Figure 50: FP7 RPOs Cluster: Euratom

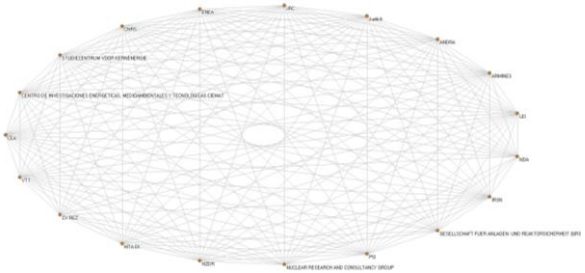

Figure 51: FP7 RPOs Cluster: Ideas

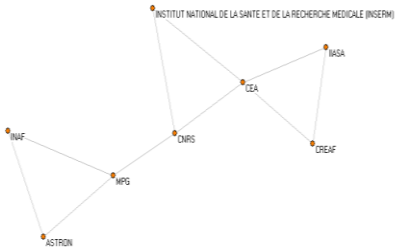

Table 12: FP6 RPOs Clusters per Specific Programme

FP7 RPOs Cluster	Max K-core	
Specific programme (SP)	**K**	**RPOs**
SP1: Capacities	22	23
SP2: Cooperation	32	68
SP3: EURATOM	17	19
SP4: Ideas	4	8

Source: authors' analysis based on SNA on CORDA data.

The clusters per thematic area for FP6 and FP7 reinforce this finding on the stability of key EU15 RPOs as forming relatively strong groups of organisations, whose interaction potentially reinforces the access to further FP funding. The existence of these cohesive groups of RPOs is a direct consequence of applying the two fundamental principles of excellence and co-funding as basic rules for participating in FPs. However, this may result in a self-reinforcing mechanism of participation, which may potentially limit access to a broader base of RPOs.

As it occurred for specific programmes, also for thematic areas, the clusters integrate a few common RPOs – CNR (Italy), CNRS (France), and CSIC (Spain) –not just in FP6 but also in FP7. These RPOs are, therefore, very strong players in the FP arena as they not only are able to maintain a number of relationships in a number of thematic networks (degree) but are also able to participate in clusters (interconnected groups).

Specifically, CNR and CNRS are the key players in FP networks, since they integrate clusters across six thematic areas, and promote a wide scope of research activities.

Table 13: Network Cohesiveness: Most relevant RPOs across FP and Thematic

RPO	Legal name	Country	Thematic areas
CNR	*Consiglio Nazionale delle Ricerche*	EU15 IT	- Transport (including Aeronautics) and Space - Coordination of research activities - Energy and environment (including climate change) - Food, agriculture and biotechnology - Nanosciences, nanotechnologies, materials and new production technologies - Research Infrastructures
CNRS	*Centre National de la Recherche Scientifique*	EU15 FR	- Transport (including Aeronautics) and Space - Energy and environment (including climate change) - Food, agriculture and biotechnology - ICT - Nanosciences, nanotechnologies, materials and new production technologies - Science in society
CSIC	*Consejo Superior de Investigaciones Cientificas*	EU15 ES	- Transport (including Aeronautics) and Space - Energy and environment (including climate change) - Food, agriculture and biotechnology - Health
JRC	Joint Research Centre – EC	Other	- Transport (including Aeronautics) and Space - Energy and environment (including climate change) - Nuclear fission and radiation protection, Fusion energy

Source: authors' analysis based on SNA.

By uncovering a set of thematic clusters of RPOs which particularly interact with each other, there is evidence that the FPs are contributing to developing the backbone of thematic research innovation communities in Europe, made of RPO partners, who have shown stability during FP6 and FP7.

Due to the collaborative nature of FP projects, the Social Network perspective demonstrates that accessing funds and improving knowledge is not only about individual reputation and internal competencies of the RPO, but also, and fundamentally, about the ability to network and ensure critical mass, both in the application and in the implementation stages of a project.

The top RPO performers in terms of participation and fund allocation for the various programmes and themes are also the key network players, which are better and more widely connected with other RPOs. Benefits such as accessing knowledge, complementary scientific expertise, and application know-how, have been generally pointed out in the interviews as rationales for collaboration and entering into FP networking arrangements.

The network perspective places emphasis on the scale and scope of RPOs activities. The top network performers (highly connected and highly cohesive organisations) are:

- EU15-based namely in France, Germany and Italy;
- Large in scale; and
- Broad in scope as they correspond to the national research agencies with a multidisciplinary orientation.

2.2. Scientific outputs

2.2.1. RPOs publication patterns

RPOs are very active in fields characterised by low publication rates and, on average, publish less than universities. Few publications are realised in the context of the FPs.

Assessing the contribution of RPOs - and their publications resulting from FP projects – in terms of their overall contribution within a given country -, requires an analysis of the distribution of RPOs by scientific field, and their share of publications by country. However, this information is not extensively available. As a result, the analysis is first based on information gathered from the individual case studies presented as annex of this report, before proceeding to examine selected scientific fields and selected countries.

The scientific orientation of the selected case studies suggests that many RPOs participate in projects related to applied disciplines such as engineering, environmental sciences or physics, while Bio-medical research and life sciences are less prominent (see Table 14).

Table 14: Scientific orientation of RPOs analysed in the case studies

Country code	Name of the organisation	Physics	Material sc.	Engineering	Chemical eng.	Chemistry	Biochemistry	Medicine	Agri & biology	Environment. sc	Earth sc	Energy
BE	IMEC	■	■	■				■				■
CZ	BIOTECHNOLOGICKY USTAV - AV CR, V.V.I.						■	■				
DE	DEUTSCHES PRIMATENZENTRUM GMBH						■	■	■			
ES	FUNDACION TECNALIA RESEARCH & INNOVATION								■	■	■	
FI	VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD	■	■	■	■	■	■					■
FI	RIISTA- JA KALATALOUDEN TUTKIMUSLAITOS								■			
FR	FONDATION TOUR DU VALAT								■	■		
FR	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	■	■									
HU	BAY ZOLTAN		■	■								
IT	ENEA	■		■								■
IT	CONSIGLIO NAZIONALE DELLE RICERCHE	■				■	■					
IT	FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	■	■	■								
IT	ISTITUTO NAZIONALE DI FISICA NUCLEARE	■										
NL	STICHTING HET NEDERLANDS							■				

Country code	Name of the organisation	Physics	Material sc.	Engineering	Chemical eng.	Chemistry	Biochemistry	Medicine	Agri & biology	Environment. sc	Earth sc	Energy
	KANKER INSTITUUT-ANTONI VAN LEEUWENHOEK ZIEKENHUIS							■				
PL	INDUSTRIAL CHEMISTRY INSTITUTE-POLISH ACADEMY OF SCIENCES				■	■						
PL	INSTITUTE OF METEOROLOGY AND WATER MANAGEMENT									■	■	
UK	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	■		■								
NO	HAVFORSKNINGSINSTITUTTET								■			
NO	STIFTELSEN SINTEF		■	■		■						

While the above suggests a thematic focus of RPOs in applied fields – several with a rather low propensity to publish scientific articles, –an overview of the overall contribution share of RPOs within a given country or scientific field, to assess the overall contribution of RPOs, as well as their contribution due to FP participation, is missing.

To investigate this aspect, given the lack of comprehensive information, the evaluation has selected three scientific fields (neuro sciences, computer sciences and environmental sciences) and analysed the publication patterns for RPOs in these fields. The guiding question is: are RPOs among the most prolific scientific producers within these fields? The publication period considered was 2011-2013 and the document types taken into account were articles, reviews, and conference proceedings.

In neuro science, roughly 162,000 publications were published. The main publishing country was the US, followed by the UK and Germany. In terms of the main publishing EU organisations, analysis found that the top 10 were located in the UK, France, Sweden, Germany, and Italy. In terms of type of organisation, there are only two RPOs: the French CNRS and French Institute of Health and Medical Research (INSERM).

Environmental sciences is a broader field, with 336,000 documents published in the period under study, the lion's share of which were articles. While the US is still the largest producer of scientific literature, China is already second, followed (with quite some gap) by the UK, Germany, and India. The most prolific organisations are mainly from the US or China, while the top EU performers are mainly organisations from the Northern and central MS. Two Scientific Institute umbrella organisations feature amongst the most prolific organisations (CNRS and CNR), as well as the rather large but scientifically focused German Helmholz Centre for Environmental Research.

Computer sciences is an impressively large field with almost 890,000 publications. However, this is largely due to conference papers, which make up almost 65%. With or without the conference publications, the main publishing countries remain the same and largely in the same order. China produces 23% and the US 19% of the computer science publications, followed (with a large gap) by Germany (6%) and Japan (5%). RPOs are largely absent from the list of main publishing organisations. On the contrary, a number of ICT firms can be found, such as INTEL, Microsoft Research, IBM or NTT. EU organisations are not among the top 20, but follow closely with the LMU Munich and Delft University. Among the most prolific organisations there are again only two French RPOs (French Institute for Research in Computer Science and Automation – INRIA and CNRS). INRIA's output is comparable with that of Microsoft Research.

If RPOs' contribution in scientific fields is limited compared with that of universities, it is also interesting to consider how they compare at national level?

The study selected a sample of the countries covered by case studies, namely Belgium, Sweden, Germany and Poland. While Belgium and Sweden both have a higher share of R&D performed by universities and low shares for the public sector R&D performance (between 15-30% compared with the higher education sector), Poland and Germany's government sector performs between 40-50% of R&D. For this analysis, the publication period has been limited to the year 2013 and the types of documents to articles and reviews.

Belgium and Sweden have a limited number of RPOs among their main publishing organisations. In Belgium, the most prolific RPO is featured among the top 10 publishing organisations, while in Sweden, two RPOs are in the range 17-20. In Poland and Germany, the absolute number of RPOs is higher. The first Polish RPO has slightly more than 20 universities occupying higher positions in the ranking with greater publication numbers, while the first German RPO is behind almost 30 universities.

These cases suggest that RPOs - in particular if they are not aggregated at umbrella level similar to the CNRS or the CNR – will not necessarily be featured among the main publishing organisations at national level. In fact, their publication numbers are rather limited when compared with many universities.

These few examples show that, in terms of scientific production rates, RPOs do not compare with universities. Only a few umbrella RPOs make it among the most prolific publishing organisations by scientific field. The study tentatively concludes that the scientific contribution of RPOs in general is much lower than that of universities. This may be due to the more applied orientation, as well as a less significant focus on publications as research outputs.

If this is the overall situation, one would expect an equally limited contribution of RPOs in terms of publications resulting from collaborative research within FPs.

In order to gain better insight on this, the study analysed the overall publication numbers of the RPOs for the year 2012, and identified the number of publications within the DG-RTD repository (SESAM), which are outputs from projects in which RPOs participated. The identified RPOs were involved in projects that generated about 9,700 publications. If one looks at one of the largest RPOs, the French Commissariat a l'Energie Atomique (CEA), this RPO was involved in projects that generated alone almost 2,700 publications. The evaluation identified 37 of these publications in Scopus and analysed whether the given RPO covered in the case studies was among the author(s) affiliation(s). Within SESAM, about 470 publications were identified that were co-authored by RPO-affiliated authors. Thus, within the pool of publications resulting from projects where RPOs participated, 4.8% of these were co-authored by RPO researchers.

As the SESAM database makes no yearly distinctions, only the publication figures for the RPOs in 2012 were extracted. 2012 is reasonably well covered in SESAM and it is fully covered in Scopus. Table 15 provides the publication numbers by RPO for 2012 based on Scopus, and the number of direct FP outputs for 2012 as validated through Scopus. The RPOs produced a total of 8,840 publications in 2012, out of these 55, corresponding to the 0.6%, were FP related publications. This suggests that the contribution of FP participation to the overall scientific output of the RPOs is marginal.

Interestingly, the distribution of FP-related publications does not appear to be correlated with the share of funding received. None of the organisations that declared having received more than 10% of its budget from the FPs have a SESAM/SCOUPUS ratio of publications higher than 1.5%. Thus, albeit the sample is rather small and it would be difficult to infer solid results, the table tends to show that a higher share of funding received from FP does not correlate to a higher share of FP-related publications.

[37] Not all 9,700 were identified. Since we checked titles in case of smaller publication figures and doi numbers in case of large ones (such as for CNR or VTT), information in the SESAM database may differ from what is in Scopus. This is in particular true for titles where spelling differences lead to no identification. For small cases with a limited number of publications, spelling variants were checked. Ideal is the doi number, however, this is not systematically provided in SESAM.

Table 15: Number of overall publications by RPO and FP output (2012) analysed in the case studies

Country	Name of the institution	Publications in Scopus	Publications in SESAM	Amount of contributions	Number of projects	Share of budget represented by FP related funds[38]	Scopus /Sesam ratio
BE	INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW	323	2	107,401,976	182	6-10%	0,6%
CZ	BIOTECHNOLOGICKY USTAV - AV CR, V.V.I.	33	3	475,000	3	6-10%	9,1%
DE	DEUTSCHES PRIMATENZENTRUM GMBH	119	0	3,215,908	2	11-15%	0%
ES	FUNDACION TECNALIA RESEARCH & INNOVATION	107	0	113,290,734	374	>16%	0%
FI	VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD	463	7	194,828,078	471	11%	1.5%
FI	RIISTA- JA KALATALOUDEN TUTKIMUSLAITOS	65	0	777,229	5	2.69%	0%
FR	FONDATION TOUR DU VALAT	40	0	198,652	1	<5%	0%
FR	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	132	8	422,915,212	745	9%	6.1%
HU	BAY ZOLTAN ALKALMAZOTT KUTATASI KOZHASZNU NONPROFIT KFT.	11	0	3,261,499	49	<5%	0%
IT	AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	408	4	46,465,224	156	14%	1%
IT	CONSIGLIO NAZIONALE DELLE RICERCHE	3,861	14	231,028,794	696	4.2-5-2%	0.4%
IT	FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	662	11	49,228,185	96	7%	1.7%
IT	ISTITUTO NAZIONALE DI FISICA NUCLEARE	1,726	6	49,247,722	86	6-10%	0.3%
NL	STICHTING HET NEDERLANDS KANKER INSTITUUT-ANTONI VAN LEEUWENHOEK ZIEKENHUIS	205	0	50,747,108	59	More than 16%	0%

[38] Self-reported figures.

Country	Name of the institution	Publications in Scopus	Publications in SESAM	Amount of contributions	Number of projects	Share of budget represented by FP related funds[38]	Scopus /Sesam ratio
PL	INDUSTRIAL CHEMISTRY INSTITUTE-POLISH ACADEMY OF SCIENCES	53	0	168,660	1	<5%	0%
PL	INSTITUTE OF METEOROLOGY AND WATER MANAGEMENT	9	0	543,200	7	<5%	0%
UK	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	25	0	45,736,856	91	<5%	0%
NO	HAVFORSKNINGSINSTITUTTET	260	0	12,835,817	42	N/A	0%
NO	STIFTELSEN SINTEF	338	0	117,072,647	204	Close to 10%	0%
Total		**8,840**	**55**				

Source: authors' calculations based on CORDA-SESAM and Scopus

The limited publication numbers estimated for RPOs at national and disciplinary level suggests that a limited number of direct contributions have been made to scientific publications overall. The non-identification of almost half of the selected RPOs in Scopus can also be a sign that several RPOs do not publish, or do no publish enough for the creation of an organisational profile in Scopus. In terms of their FP participation and direct contribution in the form of publications, several case studies showed no or very low numbers of publications resulting from FP projects.

The overall evidence suggests that the direct contribution of RPOs to scientific publications is limited. In terms of FP outputs, RPOs contribute marginally. Also within their publication profiles, FP outputs have a marginal role, with about 1% of annual publications stemming from FP funded research.

When interpreting results on the scientific output of RPOs in the context of FPs, it is also important to take into account the different types of institutions that are categorised under the broad label RPO (see section 1.1.5). The analysis of the publication rate per type of RPO has been carried out on the sample of the case studies. On average, Scientific Institutes are the institutions with the highest number of publications in Scopus with a total of 6,308 publications out of the 9 Scientific Institutes surveyed. RTOs are the organisations with the highest rate of publications derived from FP7 (1.3%) funding followed by Government Labs (0.8%) and Scientific Institutes (0.4%). The Science and Technology Facility Council in the UK is the only Large-scale Research Facility in the sample, for which Scopus reports 25 publications as opposed to 0 by SESAM.

In terms of the scientific impacts of RPO' participation, it can be assumed that the participation of RPOs contributes indirectly or directly to the scientific publications resulting from the FP, even if RPO researchers are not directly involved in the majority of FP publications. In terms of direct scientific impact, we can draw from limited evidence based on the citation numbers of FP publications compared with the overall impact of the RPOs' publications. There are a total of eight RPOs that have identified FP publications in 2012, which can be compared with the total output of the RPO in that year. The average citation per paper ratio of these eight RPOs was 5.6, while the ratio of their FP publications was higher with 7.1. In five cases, the FP output generated higher numbers of citations per publication, while in three RPOs, the FP publications were below the organisations' 2012 impact; thus, there is no clear indication that, in general, FP publications tend to be above average with respect to the publication outputs of an RPO. It can also be observed that higher FP impacts occur in RPOs with smaller overall publication figures, where the small number of FP publications can show a high impact. In comparison with those with an overall larger output, the FP publications have less effect.

If every RPO is taken into account, together with the fact that no FP output was produced by several (and thus a citation to publication rate of zero is applied), the overall citation impact of the RPOs would be 4.5, compared with 3.1 for the FP output (and lack thereof). In both cases, the numbers are too low to be robust and to be generalised for the RPO sector.

2.2.2. RPOs patents

A low share of patenting activities are realised in the context of FPs. Although these results are based on the RESPIR database, they might not be comprehensive enough to measure innovation activities in FPs.

As part of the monitoring system for FP7, participants have recorded IPRs resulting from the FP funding. While this database is neither complete nor error-free, it provides a first view on the distribution of patenting trends by type of organisation, country, thematic priority and funding scheme up to October 2014 – thus for the entire FP more entries can be expected. Patents for one and the same invention can be applied for at various national patent offices – in general, they are applied for where the applicants expect the patent to be applied and commercially used. Thus a single invention can be applied for several times. In order to classify a patent as a single innovation, it is necessary to limit the analysis to a single patent office otherwise there is a significant risk of double counting.

Currently, the database includes 1,414 patents, applied for at different patent offices such as the European Patent Office (EPO), the World Intellectual Property Organisation (WIPO), the US Patent and Trademark Office (USPTO), as well as national offices. Patents are not the only type of IPR covered in the database; there are also trademarks, designs, and copyrights, but these have not been analysed in this study.

For the 19 RPO cases examined,[39] there are two with rather high EPO patent numbers, but there are also seven without any EPO patent application at all. On average, the 19 RPOs have 49 EPO patent applications each. According to the RESPIR database, the 19 RPOs have a total of 48 registered patents, including 4 EPO registered patents. This number might potentially be slightly higher, since there are some applications that are not correctly labelled and thus cannot be assigned to any patent office.

Table 16, similar to what was reported in Table 15, compares the value of funding received with the resulting performance. As in the case of publications, patents appear to be very scarcely related to the amount of funding received, despite the overall results in terms of patents appearing slightly better than those of publications, with three RPOs having a RESPIR/EPO ratio of at least 15%.

[39] The number of RPOs case studies corresponds overall to 40 units. However, only 19 of them appeared to have patents in RESPIR and only for this restricted group of RPO it was possible to produce a complete analysis.

Table 16: Overview of patents for the RPOs in the case studies

Country	Name of the institution	EPO patents	Patents in RESPIR	EPO Patents in RESPIR	Amount of contributions	Share of budget represented by FP related funds[40]	RESPIR/ EPO ratio
BE	INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM VZW	541	12	2	107,401,976	6-10%	2%
CZ	BIOTECHNOLOGICKY USTAV - AV CR, V.V.I.	0	0	0	475,000	6-10%	-
DE	DEUTSCHES PRIMATENZENTRUM GMBH	3	0	0	3,215,908	11-15%	0%
ES	FUNDACION TECNALIA RESEARCH & INNOVATION	38	3	1	113,290,734	>16%	8%
FI	VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD	13	12	1	194,828,078	11%	92%
FI	RIISTA- JA KALATALOUDEN TUTKIMUSLAITOS	0	0	0	777,229	2.69%	-
FR	FONDATION TOUR DU VALAT	0	0	0	198,652	<5%	-
FR	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	48	7	0	422,915,212	9%	15%
HU	BAY ZOLTAN ALKALMAZOTT KUTATASI KOZHASZNU NONPROFIT KFT.	4	0	0	3,261,499	<5%	0%
IT	AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	36	1	0	46,465,224	14%	3%
IT	CONSIGLIO NAZIONALE DELLE	179	7	0	231,028,794	4.2-5-2%	4%

[40] Self-reported figures.

Country	Name of the institution	EPO patents	Patents in RESPIR	EPO Patents in RESPIR	Amount of contributions	Share of budget represented by FP related funds[40]	RESPIR/ EPO ratio
	RICERCHE						
IT	FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA	56	2	0	49,228,185	7%	4%
IT	ISTITUTO NAZIONALE DI FISICA NUCLEARE	5	1	0	49,247,722	6-10%	20%
NL	STICHTING HET NEDERLANDS KANKER INSTITUUT-ANTONI VAN LEEUWENHOEK ZIEKENHUIS	0	1	0	50,747,108	More than 16%	0%
PL	INDUSTRIAL CHEMISTRY INSTITUTE- POLISH ACADEMY OF SCIENCES	0	0	0	168,660	<5%	0%
PL	INSTITUTE OF METEOROLOGY AND WATER MANAGEMENT	0	0	0	543,200	<5%	0%
UK	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	32	0	0	45,736,856	<5%	0%
NO	HAVFORSKNINGSINSTITUTTET	0	0	0	12,835,817	N/A	0%
NO	STIFTELSEN SINTEF	13	0	0	117,072,647	Close to 10%	0%
Grand Total		968	46	4			

Source: authors' calculations based on CORDA-RESPIR and EPO

Nevertheless, results from the case studies do not point to a significant contribution to patents generated from FP research projects. In order to bring this finding into perspective, the study points to a recent dedicated patent analysis on the NMP patents of FP7 (Callaert et al, 2015), which confirms this position.41 While the study did not distinguish universities and RPOs (both were grouped as knowledge generating organisations), the authors claim that patents are a relevant, but not unique or sufficient, indicator to monitor innovative outputs of FP7 NMP projects and other outputs (e.g. trademarks, registered designs, scientific publications, open source agreements).

Our results suggest that RTOs are the type of RPO with higher patenting rate, both within and outside the context of FPs. The RTOs in the study sample have registered a total of 709 patents, of which around 5% are linked to FP7-related projects. Scientific Institutes also have a similar rate of patents related to FP7 projects (just below 5%), but the overall number of patents is substantially lower – 191 patents (even though the sample includes 9 Scientific Institutes and just 6 RTOs). These results tend to suggest that RTOs are more prolific in terms of innovation with respect to Scientific Institutes, and this is in line with the participation patterns of RTOs in thematic areas with a heavy component of innovation rather than research (see section 2.1.2). The 3 Government Labs for which data on patents was available reported a total of 36 patents, of which 3 were linked with FP7-related projects.

In terms of the impact of RPO participation on innovation and the economy, it is also possible to use as a proxy the number of patent applications, since patents are measurable signs of inventions. As mentioned above, in order to count a patent as a single innovation, it is necessary to limit the analysis to a single patent office to avoid double counting. Of particular interest are applications at the European Patent Office (EPO), as this allows analysis to designate a number of individual European countries – and thus markets. The following analysis focuses on EPO patents in the period 2007-2014 and FP patents in RESPIR, which basically starts only in 2010/2011.

The following aspects, based on the analysis of the NMP thematic area – which generated the largest number of patents for the RPO group – are particularly relevant:

- 44% of the registered patents are PCT filings, followed by the EPO and some large European national offices (35%), while the USPTO accounts for only 6%;
- A total of 290 NMP projects were identified in the database. Of these, 36% reported patent activities while 64% reported no patent activity;
- Survey results showed that other forms of IP are often pursued: trademarks (22%), design registrations (22%), opting for secrecy (60%), defensive publishing (20%) or open source strategies (27%) were mentioned;
- Some (economic) value-related indicators of project-related patents are lower than those for control patents. Project-related patents were found to be narrower in scope (in terms of national jurisdictions, number of applicants, and technological classes); and
- The patent data in the database represents a non-trivial underestimation of the actual patent output of the projects. The lower bound for the underestimation amounts to 56% of all patents related to the project activities. The upper bound for the underestimation would imply that the registered patents cover only 15% of all patents related to the project activities.

If the findings from the NMP thematic priority are generalised, it is possible to assume that the patent numbers – also for the case studies – are underestimating the direct contribution to innovation.

From the findings of the case studies and the overall patent figures by RPO, it is possible to identify some RPOs that are very actively patenting, for example the Belgian IMEC and the Italian umbrella organisation CNR. If the various patent offices are taken into account, both organisations have more than 1,500 patent applications and are the leading RPOs in terms of EPO patents.

If the main scientific fields of the RPOs are compared with patent figures, it is very clear that RPOs with dominance in physics, material sciences, and engineering have higher overall patent numbers than those in biochemistry or medicine, agriculture, or environmental sciences. RPOs patenting in general are likely to have at least one patent from FP projects. One may conclude that prior patenting experience is an important aspect for the generation of FP patents. Given that several NMP participants deliberately do not patent, it is also likely that this strategic decision is shared by a number of RPOs.

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[41] Callaert, J., et al (2015): Analysis of patenting activities of FP7 NMP projects. Luxembourg: Publication office of the European Union.

Thus, the main drivers of the innovation orientation (or not) of RPOs are:

- Opportunities are unevenly spread across technology readiness levels and thus commercialisation potentials of projects. Opportunities differ considerably between more basic, fundamental research and applied research. A large proportion of FP7 projects were in lower TRL levels (thus more basic research), which are less associated with patenting than at medium TRL levels;
- Linked to varying opportunities is the activity field in which an RPO is active. A stronger life science orientation will most likely generate predominantly publications, while engineering (in the widest sense) is the field with the highest likelihood for patents. The different patenting propensities are also clearly reflected in overall patent analyses by industry sectors;
- A possible hampering factor against an active IP strategy of RPOs arises from their role. In several thematic areas, they act as coordinators but not necessarily as work package leaders. If they do not have prior knowledge about IPR they may also not encourage it, or leave it to other partners.

For the sake of comparison with the contribution of other institutions, in the context of FPs, the RPO sector generated 33% of all registered patents. This is lower than the results reported by universities (45%) and higher than that reported by private companies (20%). While the majority of patents (63%) were generated from collaborative projects (CP), a substantial share of these are accounted for by RPOs.

Table 17: Number of FP-related patents by type of participant

Funding scheme	HES	REC	PRC	PUB & OTH	Grand Total
BSG	13	21	95	7	136
CP	347	373	159	7	886
CSA	119	23	1		143
JTI	3	2	6		11
MC	161	52	25		238
Grand Total	**643**	**471**	**286**	**14**	**1414**

Source: authors' calculations based on the CORDA database

Summarising the results just presented on outputs for research and innovation, even though RPOs overall did not achieve major results in terms of publications and patents in FPs:

- Top performing RPOs in terms of publications tend to be Scientific Institutes operating in fields such as neurosciences and environmental sciences;
- Top performing RPOs in terms of patents are French and German RPOs operating in Nanosciences, Nanotechnologies, and Materials and new Production Technologies (NMP), followed by those in the health sector.

2.2.3. Top-performing RPOs in terms of scientific outputs

In the FPs, top performer RPOs in terms of scientific output are….

Data on patents for FP7 has been used to extract the list of the top 20 RPOs in terms of patents produced (Table 18).

Table 18: Top 20 RPOs based on the number of patents registered in FP7-related

ID	RPO name	Country Code	Number of patents in FP7	Number of projects	EC funding (EUR)
1	Centre National De La Recherche Scientifique	FR	49	1.524	4,743,185,692
2	Commissariat A L'Energie Atomique Et Aux Energies Alternatives	FR	34	745	3,327,801,073
3	Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V	DE	33	1.228	5,226,806,929
4	Max Planck Gesellschaft Zur Foerderung Der Wissenschaften E.V.	DE	16	665	2,248,950,995
5	Pirkanmaa Hospital District	FI	15	2	17,678,880
6	Consiglio Nazionale Delle Ricerche	IT	13	696	2,608,746,954
7	Interuniversitair Micro-Electronica Centrum Vzw	BE	11	182	841,485,449
8	Eesti Maaviljeluse Instituut	EE	11	1	843,270
9	Forschungsverbund Berlin E.V.	DE	10	61	216,027,818
10	Agencia Estatal Consejo Superior De Investigaciones Cientificas	ES	9	701	2,253,501,793
11	Fundacion Publica Andaluza Para La Investigacion De Malaga En Biomedicina Y Salud	ES	9	2	5,568,308
12	Institut National De La Sante Et De La Recherche Medicale (Inserm)	FR	9	423	1,772,006,414
13	Austrian Society For Systems Engineering And Automation	AT	8	-	-
14	John Innes Centre	UK	8	46	149,815,587
15	Fundacion Cidetec	ES	8	33	137,625,929
16	Ricerca Sul Sistema Energetico - Rse Spa	IT	7	48	285,587,573
17	Institut National De La Recherche Agronomique	FR	7	283	89,506,086
18	Twi Limited	UK	7	-	-
19	Istituto Di Ricerche Farmacologiche "Mario Negri"	IT	6	-	-
20	Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek – Tno	NL	6	429	2,092,497,634
	Grand Total		276		

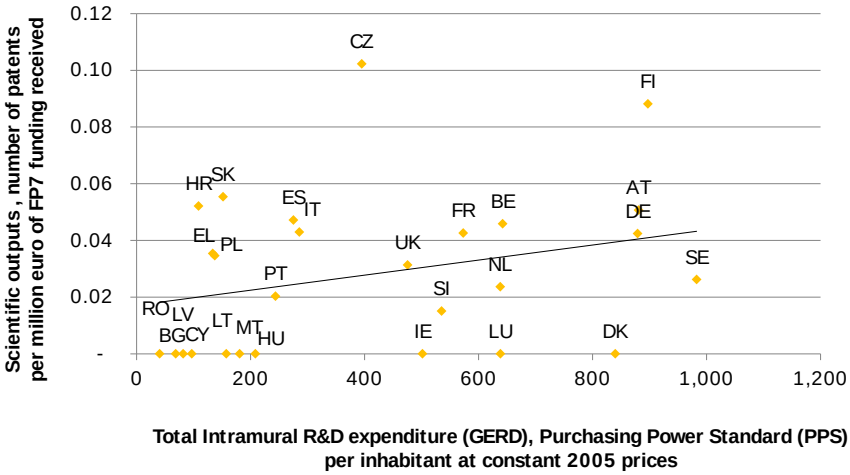
Source: authors' calculations based on the CORDA database

2.2.4. RPOs which are more oriented to innovate than others

RPOs which are more oriented to innovate in FPs are on average those based in countries with higher levels of government R&D expenditure. They tend to be RTOs or Scientific Institutes active in NMP, Health and Energy related projects.

To assess productivity in terms of innovation induced by FP related projects, the study team has constructed an indicator consisting of the number of patents per million of euros of funds received in FPs and assessed how such indicator is related to the overall amount of government expenditure in research and innovation at country level. In general, countries that have higher levels of expenditure in R&D tend to be more productive also in the context of FPs.

Figure 52: FP7 - Innovation of RPOs, correlation between patents per FP funding and country R&D expenditure (without the outlier Estonia)[42]



Source: authors' calculations based on the CORDA database

Results from the case studies suggest that Scientific Institutes (e.g. CNR) and RTOs (e.g. IMEC) are the most oriented to innovate both within and outside FPs.

NMP was in absolute terms the most popular type of patent obtained by RPOs, followed by health and energy (Table 19). The patents in the MC sub-programme are to be noted. While the majority is in the higher education sector, more than 20% include RPOs. This somewhat low share suggests that there is room for a potentially stronger involvement of RPOs as host organisations.

[42] As Estonia represents a positive outlier, in order to have interpretable graphic results, we excluded it from the scatterplot.

Table 19: Number of FP-related patents by type of participant and thematic priority

Thematic priority	Type of participant				Grand Total
	HES	REC	PRC	PUB & OTH	
Energy	29	58	6		93
Environment (including Climate Change)	2	15			17
Food, Agriculture and Fisheries, and Biotechnology	57	20	1		78
Health	133	92	31	5	261
Nanosciences, Nanotechnologies, Materials and new Production Technologies – NMP	109	133	59		301
Nuclear Fission and Radiation Protection	3	10	1		14
Security	3	1	5	1	10
Space	2	5	5		12
Transport (including Aeronautics)	7	12	30	1	50
Joint Technology Initiatives	3	2	6		11
General Activities		3			3
Research for the benefit of SMEs (BSG)	13	21	117	7	158
Research Infrastructures	2	28			30
Research Potential	119	19			138
Marie-Curie Actions (MC)	161	52	25		238
Grand Total	643	471	286	14	1414

Source: authors' calculations based on the CORDA database

2.2.5. Main mechanisms used by RPOs for translating research into innovation

RPOs use a variety of methods to translate research into innovation, depending on their size, thematic area and the nature of their research work.

RPOs play an important role in transforming research results into innovation, from the initial idea to the final application. EARTO (2014) conducted a study in which the contribution of RTOs to the industry competitiveness was showcased. RTOs are instrumental in bridging "the valley of death". In this effort, jointly with industry, RTOs can offer high level of knowledge, highly skilled human resources and sophisticated research activities. Although the individual mechanisms of translation from research into innovation vary in individual cases, in general, RTOs are active across 5 different strands:

- RTOs perform basic research with specific applicable outcomes;
- RTOs provide research infrastructures (including on contractual basis) to many stakeholders;
- RTOs perform strategic foresight and often conduct research "beyond" the contract;
- RTOs have competence needed to assess consumer needs and thus can better suit needs of industry when conducting research; and
- RTOs train their in-house experts.

Respondents of our study have mentioned a great variety of mechanisms to transform research into innovation. The mechanisms tend to vary according to the different strands in which RPOs are active, the nature of the projects, the field of specialisation and the size of RPOs. Some of these mechanisms are highlighted in the case studies presented as annex of this report and include for example:

- Creation of a committee/team demanded to innovation transferring (i.e. "Knowledge and Technology Transfer Officer", "Innovation management team" or "Technology Transfer Committee") responsible for liaising with private companies and assess the market potentials of RPOs' research (Institute for Primate Research, Germany; BAY-STRAT, Hungary, INFN, Italy; IIT, Italy)
- Supporting the creation of start-ups and initial co-ownership or creation of spin-offs (VTT, Finland; CEA, France; CNRS, France; Parmenides, Germany; IIT, Italy; IPPT, Poland)
- Development of joint projects/ventures with private companies in which researchers of the RPO provide their technical expertise (CTIFL, France; CSRI, Greece; TECNALIA, Spain)
- Development of initial prototypes later finalised with a private company (HITEC, Germany)

Horizontal to all types of projects and actors though are the mechanisms related to dissemination activities:

- Slides to be presented in workshops;
- Brochures to increase awareness on good practices;
- Documentaries; and
- Reports providing evidence for policy makers.

The more projects regard applied technological fields, in which RPOs tend to have a close cooperation with industrial partners and/or private companies, the more mechanisms tend to be recurrent (number of organisations mentioning mechanism in parenthesis):

- Assisting and directly participating in the creation of new start-ups through spin-off activities (6);
- "Pull-type" or "contract research", where the key objective and expected results are fixed ex-ante with the financier the research project (4);
- Marketable products (4);
- Prototypes to present the usefulness of research streams to industrial partners (3);
- Workshops/fora with industrial partners to promote new research ideas or better appreciate their needs in terms of innovation (2);
- Conducting upfront market analysis to have results oriented research (3); and
- Ventures participating to the financing of new ideas (2).

Where RPOs work on more basic research, more in line with academic standards, the main mechanisms are:

- Papers published in peer-reviewed journals (6);
- Participation in conferences (6);
- Scientific meetings and committee (3);
- Books (2); and
- Education and training activities (2).

Patenting activities are not often seen as the best mechanism to translate FP research into innovation, confirming considerations reported in previous sections. Participation in FPs tends to be perceived as a way for developing and consolidating knowledge to support access to policies for infrastructure. In addition to this, patents are not seen as an efficient tool to attach value to basic research, as it is very time consuming. However, some RPOs consulted (7) still report using patents as one of the ways to transform research results into innovation.

The literature confirms that RPOs carry out a wide range of activities. In a survey among the RPOs in Sweden carried out as part of the report, Arnold et al. (2010) showcased what categories of output prevail in the production of RPOs. The results showed that the variety of output is large, with many categories related to transforming research into innovation. Conference papers, new products or design, prototypes, articles, books and patents are some examples.

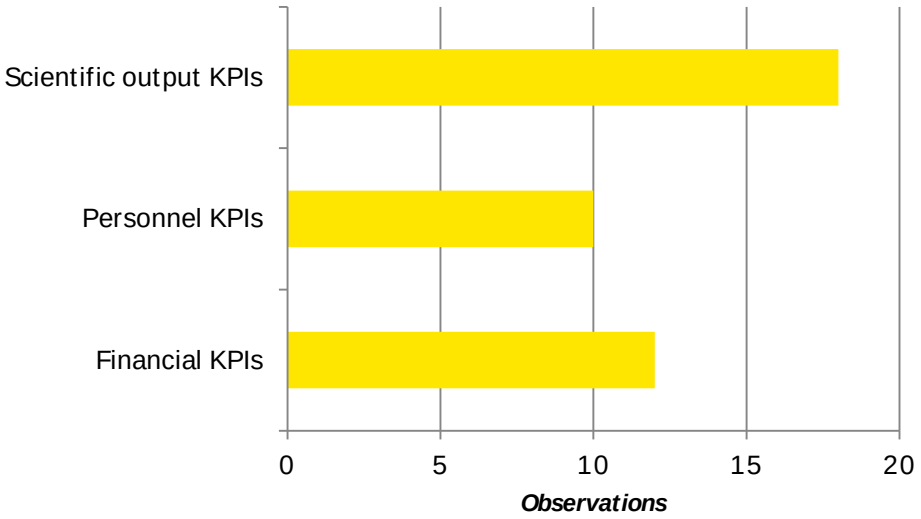
2.2.6. Main measures used by RPOs for measuring their contribution in terms of research and innovation

KPIs are often used to monitor research and innovation by RPOs, but very seldom with specific reference to FPs. In general, KPIs collected are not comparable across RPOs.

In general, the production of KPIs for monitoring research and innovation activities at RPO level very much depends on the size of the organisation. Small RPOs tend to produce a reduced number of KPIs, whereas larger organisations have a more structured set of indicators to monitor their activities. The results of the present study suggest that RPOs do not tend to adopt KPIs dedicated specifically to measure FP related outputs. In some cases, they keep track of the amount of research funds from EU projects or, to a broader extent, from international projects.

Three broad categories of KPIs are used by RPOs – scientific outputs, personnel and financial. Figure 53 shows that KPIs related to scientific outputs are generally the ones used more by RPOs, and these generally include publications and patents. Regarding personnel, most RPOs keep track of the number of researchers operating in their institutions, drawing a distinction with respect to the administrative staff. In some cases more specific information is added on the level of education of researchers, outgoing and incoming researchers as well as the number of researchers holding a Ph.D. Regarding the information relating to financial aspects, all RPOs compile budgets that can be more or less detailed depending on the dimension of the RPOs themselves.

Figure 53: KPIs used by RPOs interviewed, by type



Source: in-depth interviews with RPOs' representatives

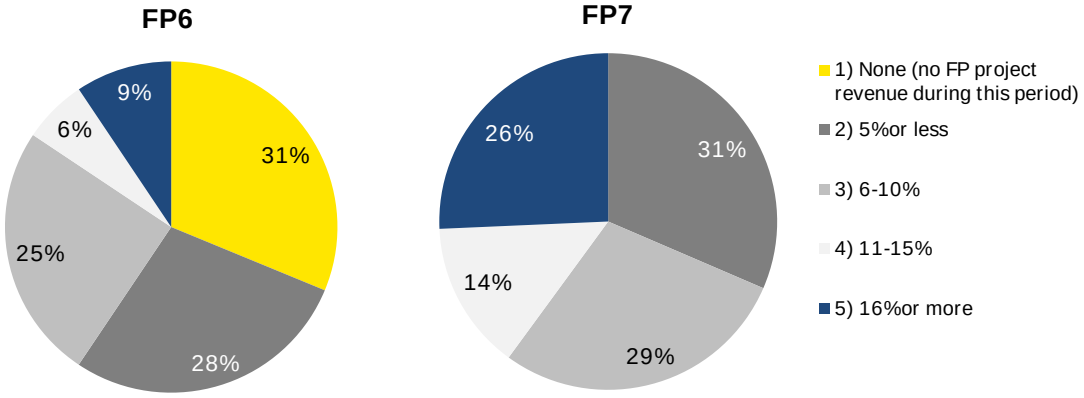
2.3. Impact of the FPs on the different dynamics and evolutions of the RPOs in Europe

2.3.1. Impact of FPs on the organisation of RPOs of European level

FPs have become an increasingly important source of funding for RPOs.

The numbers underlying the finding that FPs have represented an increasingly important source of funding for RPOs were already discussed in sections 2.1.1 and 2.1.2. In addition to this, respondents were asked to assess the proportion of their organisation's revenues stemming from R&D research projects funded through the FPs. FPs have become increasingly important in terms of the share of total RPO funding: while 31% of RPOs interviewed reported no revenues from FP6 projects, the number of RPOs with a share of revenues from FP projects increased from 9% of respondents in FP6 to 26% of respondents in FP7 (Figure 54).

Figure 54: Revenues from FP projects as % of total RPO revenues

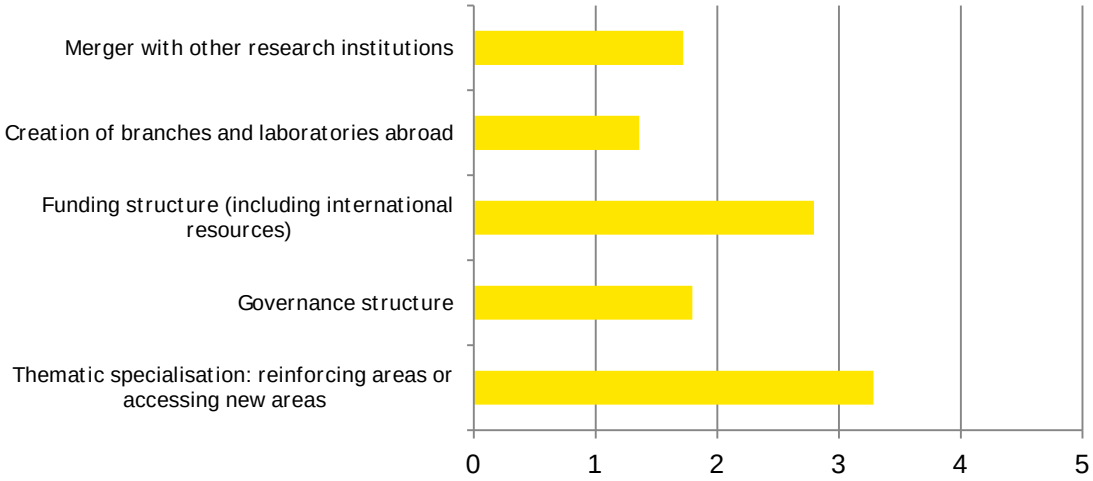


Source: in-depth interviews with RPOs' representatives

FPs did not bring major changes in the organisation of RPOs, but contributed to increasing diversification in funding sources and stimulated thematic specialisation.

The analysis of the respondents' answers suggests that participation in the FPs has not changed the organisational structure of RPOs in a significant way (Figure 55). A shift in thematic specialisation and diversification of funding have been the main impacts of FPs reported by RPOs. Some RPOs have explicitly reported an enlargement in the scope of themes treated after participation in the FPs. Some others have reported that they have adapted their research to better fit the needs of the EC. For example, one RPO with core specialisation in computer science has gradually broadened the scope of its research to robotics, which is an area funded through EC projects. Even if, to a lesser extent, FPs have also influenced the funding structure in relation to international sources - for some RPOs, FPs have represented an increasingly important part of their budget.

Figure 55: FPs impact on selected areas of RPOs



Legend - 1: "Not all" - 5: "To a large extent".

Source: in-depth interviews with RPOs' representatives

In a few cases, FPs have also impacted the internal organisation of RPOs. For example, this is reflected in the setting up of new "European" teams, external funds units or specialised education structures.

2.3.2. Impact of FPs on the improvement of EU RPOs competitiveness at European and global level

International partnerships in FP projects help EU RPOs to compete on a global scale.

Europeanisation and internationalisation has typically been a challenge for RPOs. Despite their significant contribution to European and international research programmes, RPOs tend to suffer

from national "lock-in" because of their respective national funding systems. While many RPOs have undergone major shifts towards Europeanisation and internationalisation in the last decades, most of them continue to operate mainly as national entities and thus under the competence and legislation of the EU Member States. They are trapped by the national subsidy logic, and struggle to serve their globalising customers – who instead build links with other knowledge organisations outside Europe (Åström, et al., 2012; Andersson et al., 2010; Arnold, et al., 2010).

Some RPOs may do better building scale at one location, and concentrating on national markets, but for many, greater Europeanisation and internationalisation offers considerable benefits. IMEC in Flanders is a good example where an RTO has been able to benefit in both regards, having acquired an internationally strong position by drawing in employment, capabilities and knowledge to the local economy, rather than by setting up laboratories abroad (Sörlin, et al., 2009).

FPs with cross-border cooperation as a cornerstone help RPOs to overcome the obstacle of national lock-in and to look outwards towards foreign markets. Having a consortium composed of research organisations from various Member States helps the RPOs to develop networks, build new partnerships and strengthen existing links. It can also motivate RPOs to establish a direct presence abroad and explore international research opportunities.

There is evidence that some of the larger RPOs are establishing local branches in other Member States. Fraunhofer is a good example of this trend, having established subsidiaries in Austria, Italy, Portugal, Sweden and the UK, and (outside of Europe) in the USA and Chile. It appears that such international expansion tends to be easier (for financial, organisational and other reasons) for larger RPOs and those based in 'old Member States' (i.e. in the EU15).

The exact influence of the FPs on increasing the global engagement of European RPOs is not clear, but the international (EU and non-EU) consortia will have helped to internationalise the activities, networks, and knowledge of RTO partners. Also, competition for FP funding is likely to have encouraged RPOs to strive for greater international competitiveness, and to compare themselves with other organisations across Europe and globally, rather than just within a national context.

2.3.3. Impact of FPs on the human resources development of RPOs in the EU

FPs have contributed to the development of cross-border trainings with positive effects on enhancing exchanges of staff and human resources, even though very often for relatively short periods. Marie Curie actions are more frequent in the case of larger RPOs. In general, the volume of outgoing and incoming researchers in the context of FPs remains quite limited.

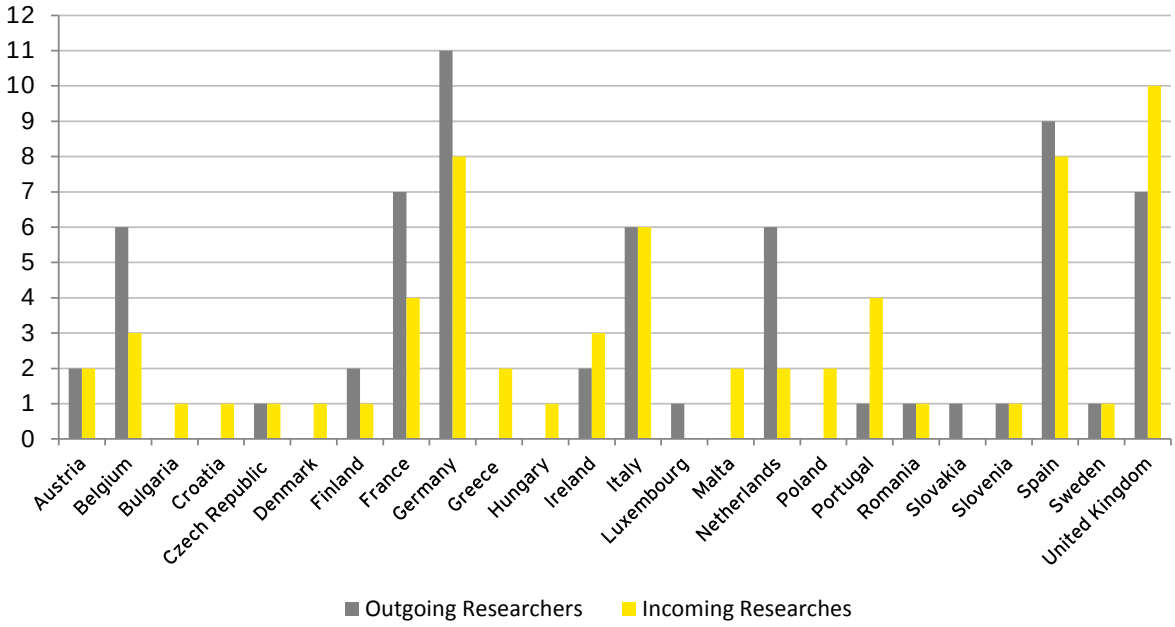
Cross-border training in the context of FPs is quite frequent and can take various forms. According to the interviewees, in most cases RPOs exchange researchers for short periods of time for ad-hoc training or working sessions for specific tasks within a project. This kind of exchange is typical for both smaller and larger RPOs and usually takes place in the form of meetings, seminars, workshops or short training sessions. Some respondents stressed the importance of such exchanges with other RPOs in building up the necessary skills within their teams of researchers.

Some smaller RPOs expressed difficulties in attracting talent in the context of FP projects.

More structured opportunities for exchanges such as Marie Curie Actions are frequent in the case of larger RPOs. However, it is generally difficult to obtain precise figures on the number of such exchanges.

Germany is the country attracting more researchers, followed by Spain, the UK and France. With regard to the origin of incoming researchers, countries that were mainly cited by respondents were the United Kingdom, Spain, Germany and Italy (Figure 56). Various respondents have indicated also third countries (e.g. US, Brazil, China, India).

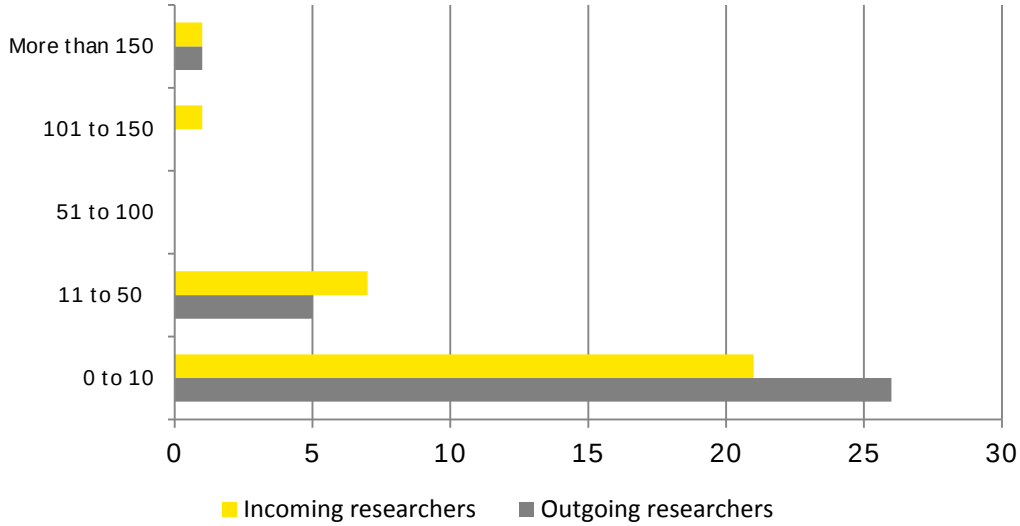
Figure 56: Trends in outgoing and incoming researchers



Axis Y counts the number of times a country was cited for outgoing/incoming researchers by RPOs Interviewed. Source: in-depth interviews with RPOs' representatives

When looking at the number of researchers and incoming researchers that received cross-border training as part of FP6 and FP7 projects, the results from interviews underline that, in most organisations, less than 10 researchers received cross-border training. More specifically, such training has been provided to outgoing researchers in just 26 organisations and to incoming researchers in 21 organisations.

Figure 57: Trends in outgoing and incoming researchers



Source: in-depth interviews with RPOs' representatives

Participation in FPs has contributed to the development of new skills and knowledge among RTO researchers.

There is little evidence on the specific impacts on the human resources development of RPOs – although as significant participants in the Framework Programme, the findings mentioned above are likely to apply also to the RPO sector in a significant manner. There are however, some clear differences. For example, the prevalence of Ph.D. degrees or other formal qualifications being obtained through FP-funded projects is lower amongst RPO participants compared with other types of organisation.

RPOs welcomed the adoption of the European Charter for Researchers and the Code of Conduct for their Recruitment, being aware that the working environment for researchers has to be continuously improved. As reported by EARTO (2013), its member RTOs are determined to implement the Charter, following open recruitment policies, using the EURAXESS jobs portal or developing strategies for gender equality. However, RTOs opposed the idea of the Charter being legally binding and supported this initiative only as a set of recommendations. Since its adoption, several EARTO members have been awarded the associated EU Human Resources Excellence in Research logo (i.e. IMEC, LIST, etc.), but in general, many RTOs consider that they are more qualified than the requested minimum requirements for obtaining the logo.

With regard to the present study, RPOs interviewed expressed a general perception that participation in the FPs has contributed to a development of their human resources. More in detail, the development of new skills and knowledge among existing researchers stands out as the factor for which FP participation has impacted the most, followed by the number of new requests for collaboration, and the creation of new research positions.

2.3.4. Impact of FPs on national reforms of research systems and of RPOs functioning in EU MS

FPs have contributed to harmonisation across EU MS both in terms of procedures and thematic areas.

In general RPOs have commented that there has been a greater diversification in the sources of funding and in some MS there has been a tendency to align with the EU funding strategy, both in terms of procedures and thematic areas (see sections 2.3.1), with FPs offsetting the observed decrease in national sources of funding, which is a trend observed in many MS.

Besides these impacts, some RPOs reported that the landscape of national research programmes have made them aligned to a certain extent with the EU level. This has been mostly reflected in the organisation of research competitions. In some cases, intellectual property rights rules, personal data policies and ethical questions have also been adapted to the EU context.

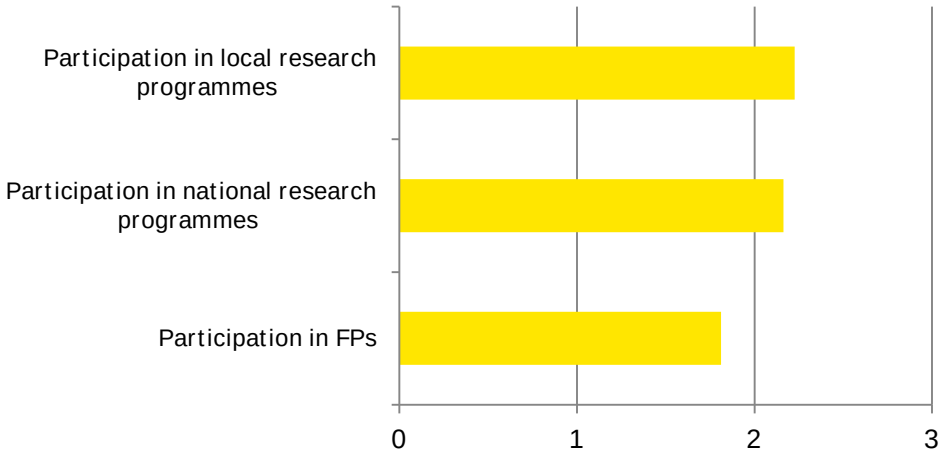
RPOs tended to underline the on-going dynamics of the research landscape in the EU. There is an overall decrease of basic national funding, which forces RPOs to look for other financial resources. This is also reflected in a gradual shift to programme-oriented funding. In terms of internal organisation, RPOs have to be flexible enough (for example to accommodate new types of funding) but at the same time show a certain level of stability. The RPOs across the EU are currently having a sort of two-fold role: the "Europeanisation" (partly fostered by FPs) pushes RPOs towards higher engagement in medium- to long-term research in the fields driven by the public interest. On the other hand, RPOs still cannot abandon the short- to medium-term orientation towards services required by the industry, and they even witness growing overlaps with private consultancies that tend to join RPOs in their purely commercial activities.

2.3.5. Impact of FPs compared with other EU and national research programmes

The role of FPs in affecting RPOs evolution dynamics has been less incisive than national research programmes due to high initial costs for preparing proposals and relatively reduced success rates

Participation in the FPs is perceived to be more risky/costly than national sources of funding (Figure 58). Participation in FP projects is expensive due to the initial investment to prepare the proposal and with a relatively low expected success rate. FPs are more expensive in terms of organisation and time with respect to national programmes, and preparing proposals for national programmes is on average considered easier and with a lower degree of competition. Moreover, the risk associated to FP projects is considered higher due to the need to collaborate with larger consortia, which require more complex administrative procedures and organisational arrangements.

Figure 58: FPs influence on national research system and the functioning of RPOs in Europe



Legend - 1: "Most risky/costly" - 3: "Least risky/costly".
Source: in-depth interviews with RPOs' representatives

2.4. The contribution of RPOs to the development of FPs and the EU research policy

2.4.1. Contribution of RPOs to the set-up and the improvement of the FPs

Setting-up EU research and innovation policy and tools to implement it (including FPs) is an organic process with variable dynamics over time and with many stakeholders and interest groups involved at different levels and to a different extent. This flexibility allows FPs to reflect on external changes and to better target the support. On the other hand, this process requires regular consultations and discussions. This applies also to RPOs, as a specific sector of research organisations. Therefore, RPOs' contribution to the EU research policy development is not significantly different from that of universities or other research performers. RPOs contribute to the development of FPs and the EU research policy in different ways. They act in this capacity either as individual organisations or grouped under associations which then act on their behalf. Involvement of RPOs and their associations (EARTO in particular) is exercised at different levels in the programming cycle, from high-level representations to working groups or even informal meetings with the Commission representatives.

It is generally difficult for RPOs to assess their contribution to the improvement of FPs. Larger RPOs tend to exploit all available channels to communicate with the European Commission

In general it is difficult for RPOs to provide an assessment of their contribution to the development of the EU research policy, the ERA and the set-up and improvement of FPs. Small RPOs do not feel that they have contributed much - due to their size they do not have great chances to influence EU policies. Only larger RPOs have a more structured approach for steering policies at the EU level. Participation in FPs is beneficial, particularly to large RPOs. Given the geographical distribution of these large RPOs – i.e. mostly non-present in the new member countries - there is an on-going issue of participation of the new member countries and their benefits from FPs.

Larger RPOs are active in using all possible channels to communicate with the European Commission and to push forward their suggestions for improvements and changes. Indeed, smaller RPOs report not having enough resources and personnel to engage with lobbying, whereas larger RPOs point out that lobbying through various channels usually provides them with a high return. Here below we list the main channels cited by RPOs:

- Associations support RPOs in creating critical mass on common improvements for their associates and communicating the emerging interests in a more structured way to the European Commission. In general, associations collect feedback on possible aspects of FPs that might need amendment/improvement/change and raise such points of discussion to the European Commission and other relevant stakeholders. For example RPOs contributed to setting up the

rules for participation in H2020 with regard to the large research infrastructure scheme that has finally been introduced by the European Commission;

- Committees are an additional opportunity for RPOs to influence EU policies through the participation of national contact points. National contact points nominated by the local ministries, or ministries themselves, are supposed to represent RPOs of the countries involved in committees;
- Advisory groups managed at the DG level are an additional opportunity for RPOs to take part in discussions with the European Commission on specific themes. However, experts taking part in such groups are supposed to bring impartial points of view based simply on their competency and to represent exclusively the general interest;
- Consultations, working groups, online surveys and/or meetings are additional opportunities for RPOs to be involved and contribute.

Additionally, RPOs report back that they try a range of other methods to influence EU-level policymaking. In some cases, they negotiate with national ministries and/or with national permanent representations at the EU. This relates also to establishing specialised offices of RPOs in Brussels so that they are closer to the European Commission. Besides that, RPOs also regularly give feedback on their participation (this study is an example) and they publish a number of position papers on the EU policies.

At the level of individuals, RPOs' representatives participate quite often in the evaluation of proposals and they are members of review panels for various projects.

2.4.2. Contribution of RPOs to the development of ERA

Even though it is difficult to quantitatively assess the role of RPOs in developing the ERA, literature suggests that RPOs play an important role in strengthening the European Innovation System and in creating the ERA.

Arnold, Clark and Jávorka theory (2010) underlines that RPOs play major roles in the European Innovation System, in making progress towards creating ERA and the Innovation Union. They increase the rate of innovation in industry by developing and helping implement new technology platforms, enabling companies and other producers to go beyond the limits of their internal technological capabilities, bringing both new and existing knowledge to bear by solving problems in the context of application.

Quantitatively, it is very difficult to measure the contribution of RPOs to the ERA as there are no indicators developed to do so. As a result, only a qualitative assessment of RPOs impact on the ERA can be made. Traditionally, RPOs are positioned in the middle of the knowledge triangle, connecting the academia with industry and government. Enhancing the knowledge triangle is one of the key objectives of the ERA development until 2020. As such, RPOs are in a position to directly contribute to shaping the ERA in the future, and successful development of the RPO sector means benefits for the whole ERA.

Additionally, as some of the European RPOs act as large research infrastructure providers (e.g. STFC and others), they also contribute to the ERA development through this role. Research infrastructures have become one of the priorities of the ERA and this has been reflected also in the design of FP7. Countries have developed their ESFRI Road maps and a lot of emphasis has been placed on infrastructure development.

RPOs also contribute to fostering knowledge transfer, which has always been at the core of the mission of such organisations. The sector is also active in open access and open data initiatives, in creating better conditions for researchers through e.g. open labour markets for researchers, gender mainstreaming and gender equality – all priorities of the ERA.

The ERA also has a national dimension – as it is composed of the 28 national research systems of the EU Member States funded from national tax revenues. Besides their European roles, RPOs therefore play an important national, regional and local role in contributing to the ERA development.

Although RPOs were the second largest beneficiary (after HES) in both FP6 and FP7, and therefore major participants in the programme, it is difficult to assess the extent to which the RTO activities detailed above that contribute to the development of the ERA can be specifically linked to their participation in the FPs.

2.4.3. Contribution of RPOs to the development of EU research and innovation policy

Based on the analysis presented (see sections 2.2.1 and 2.2.2), some features of the contribution of RPOs to the development of EU research and innovation policy can be identified:

- In terms of scientific outputs RPOs are specialised in applied disciplines such as engineering, environmental sciences and physics; their contribution in terms of scientific publications appears to be limited with respect to that offered by universities;
- RPOs contribution is stronger in applied disciplines such as engineering, environmental sciences or physics, while Bio-medical research and life sciences are less prominent;
- Their contribution to scientific fields is limited compared with universities, as expressed also by limited publication numbers estimated for RPOs at country level and at discipline level. Exception is made for large Scientific Institutes with publication outputs more similar to those of universities. Furthermore, there is no indication that publications conducted in the context of FPs have a wider impact and it is suggested that, within FPs, smaller RPOs tend to publish individual pieces of research with higher bibliometric impact;
- The participation of RPOs contributes indirectly or directly to the scientific publications resulting from the FP, even if RPOs researchers are not directly involved in the majority of FP publications; and
- RPOs do not strongly contribute to patents: even if RTOs in narrow sense tend to operate in more applied fields and show higher patenting figures with respect to Scientific Institutes, the share of patents implemented in the context of FPs by RPOs is low, with RPOs having a higher number of patents registered outside the context of FPs being the ones that tend to offer the higher contribution in terms of patents also within FPs.

Notwithstanding this, Arnold et al. (2010) assessed the social and economic impacts of the European RPOs and noted that no matter what approach is used, these economic impacts appear to be significant in size, and the authors set out a simple economic model considering four categories of impact:

- a "direct" component, representing the contribution of RPOs to GDP, i.e. their contribution to value added;
- an "indirect" component which incorporates the dependence on the RPOs of their (upstream) suppliers and (downstream) users of their outputs;
- a component representing Keynesian-type "multiplier" effects, whereby expenditures by RPOs and their employees stimulate activity in other sectors ("induced" impact); and
- social returns to investment in R&D activities, comprising private returns to RPOs and client organisations and "spill overs" to other sectors of the economy.

The result was that the RPOs are a collective force in European innovation that is of considerable size. Barge-Gil and Modrego (2009) evaluated the impact of RPOs on private companies. The findings showed that firms are able to recognize the influence of these relationships on different technical, economic, investment and intangible impacts and to roughly estimate their economic impact, and that several characteristics of these relationships affect the impact of RPOs.

Generally RPOs feel to have participated in a marginal way to set up the EU research and innovation policy, a slight improvement has emerged between FP6 and FP7.

Similarly to what was observed for the set-up of FPs, RPOs (at least larger RPOs) take a range of approaches to communicate with the EC in order to contribute to shaping the EU research and innovation policy. For example, representatives of some RPOs (e.g. Fraunhofer, AIT, etc.) are members of expert and advisory groups established and operated by the EC to advise on progress with the Innovation Union and ERA. Examples include Research, Innovation, and Science Policy Experts (RISE), or previously ERIAB, EFFLA, or the group of experts to assess the maturity of the research infrastructures on the ESFRI roadmap. Many larger RPOs also establish liaison offices in Brussels in order to be close to the European decision makers and to enable them to be flexible in reaction to any new developments in the EU R&I policy.

RPOs also make use of their associations and networks to increase their role in the policymaking. Based in Brussels, EARTO represents the interest of about 350 RTOs from across the EU Member States, including most of the larger ones, and helps to articulate their common views on relevant issues. EARTO regularly publishes position papers and open letters on a number of topics and is in touch with the EC, European Parliament and other EU bodies. The EC also regularly consults EARTO

as a part of its standard consultation procedures. The position of RPOs has been reflected in a number of EU policy papers (e.g. Innovation Union Competitiveness annual reports or ERA progress reports, etc.).

At a global level, some of the European RPOs are also members of WAITRO, which was founded under the auspices of the United Nations system and has consultative status with many of its specialised agencies.

At a national level, some RPOs are among the largest research organisations and thus represent important elements of the national research and innovation systems. Therefore, they play a very important role also in the articulation of national interests of the EU Member States that feed through the Council into EU research and innovation policy.

In relation to the role of RPOs in the framework of EU research and innovation policy, RPOs tend to be adaptive to the changing needs responding to external impulses. An analysis of the role and impact of Research and Technology Organisations' participation in the Framework Programmes shows that RPOs, and particularly RTOs, have gradually attempted to shape European policy in a bottom-up fashion. A good example of this are Public-Private Partnerships (PPPs) where actors are asked to take direct part in discussions on the web to create critical mass on various points of interest for the European debate on research.

PPPs are important opportunities of exchange between institutional bodies, research organisations and the industry. In FP7 were experienced two types of PPS[43]:

- Joint Technology Initiatives (e.g. the Innovative Medicines Initiative (IMI), Clean Sky, etc.) set up in fields of major public and industrial interest with large scale and long term goals and were implemented in Themes of the Cooperation specific programme; and
- Contractual PPPs (e.g. Factory of the Future, Energy- efficient Buildings) in which industry has a leading role in defining research priorities and an ad-hoc Industrial Advisory Group is set up to advise on the implementation and a multi-annual roadmap allows long term investment plans. With contractual PPPs the emphasis is more on relevance of industry and impact and the focus is on enabling industrial technologies.

Although most RPOs interviewed report general satisfaction in terms of outcomes for research and innovation from participating in the FPs, there is no clear evidence of a positive impact on research and innovation patterns. In general, FPs are more fertile for gradual rather than radical innovation.

The majority of RPOs interviewed expressed that participation in the FPs has led to an improvement in their research and innovation record. The increased access to funding has brought a virtuous circle in which higher reputation has enlarged the number of requests received for participation in additional projects.

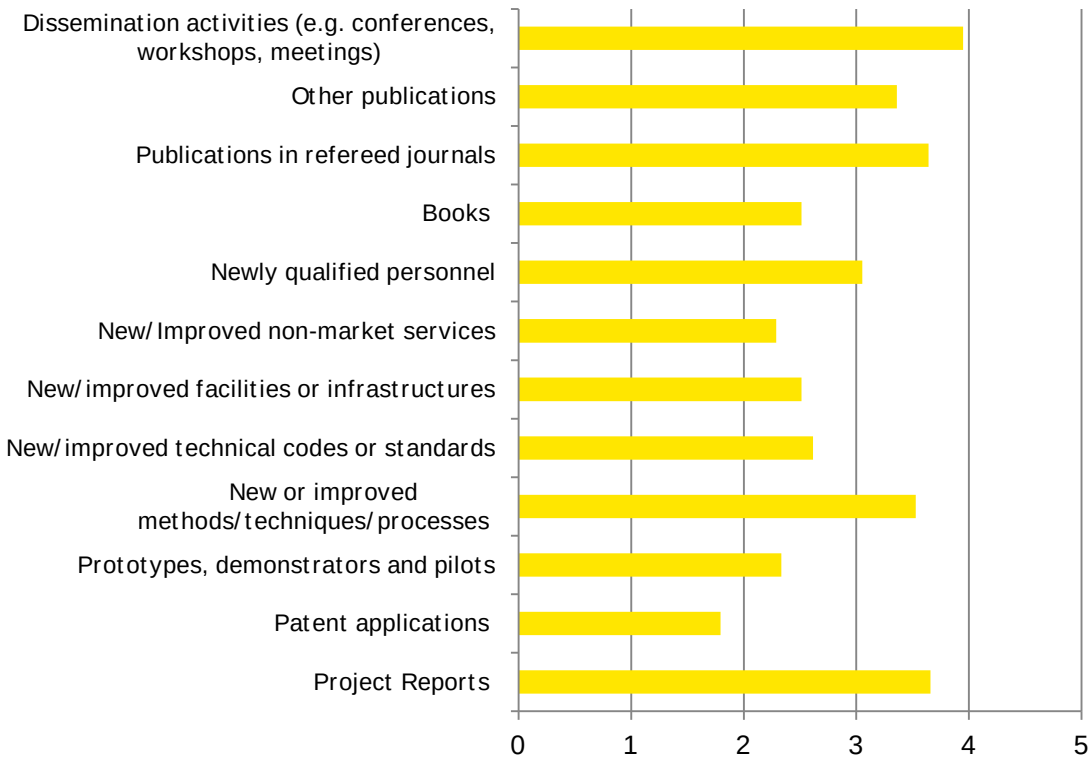
Other RPOs suggested that participation in the FPs increased the reputation and international visibility, the networking, collaboration and partnership opportunities, and the rate of scientific publications, and allowed them to learn new methodologies, improve techniques and increase research competencies/expertise. Only a very small number of RPOs registered marginal or no improvements.

Although RPOs are attracted to take part in FP projects, solid evidence is still missing to prove the causal link between FP participation and improved research quality (in other words, if FPs lift the quality of research-performing groups, organisations, regions, countries or clusters) (Arnold et al., 2011).

The impact of the programmes on patent applications, the creation of new/improved non-market services, and the production of prototypes and pilots seems relatively limited (Figure 59). This may be due to structural characteristics of the participating RPOs, as well as the setup and objectives of the FPs.

[43] Information was sourced from the document by José-Lorenzo Vallés "Public-Private Partnerships in FP7 and in Horizon 2020" presented in Dublin on the 20 June 2013 (http://www.euronanoforum2013.eu/wp-content/uploads/2013/07/J-L-Valles-KETS-DD-workshop.pdf).

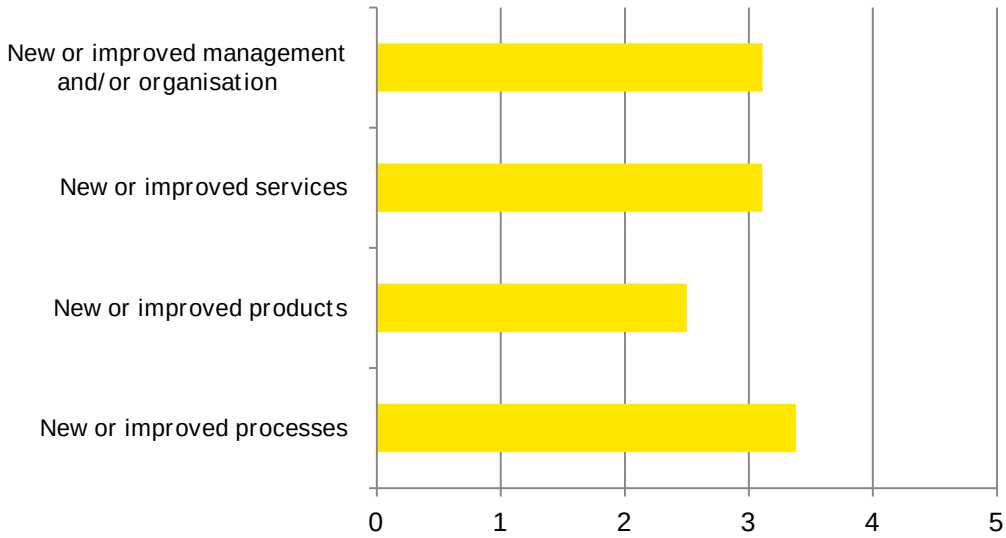
Figure 59: To what extent did participation in FPs increase the number of the following outputs



Source: in-depth interviews with RPOs' representatives. Legend_ 1 indicates "to no extent", 5 "to a large extent"

Taking into account the impact of participation on the types of innovation (Figure 60), it is clear that only the creation of new or improved processes seems to be somewhat led by participation. On the other hand neither the introduction of new or improved products, nor the introduction of new services or organisational improvements appear to be boosted by participation

Figure 60: To what extent RPOs achieved the following types of innovations as a result of participation

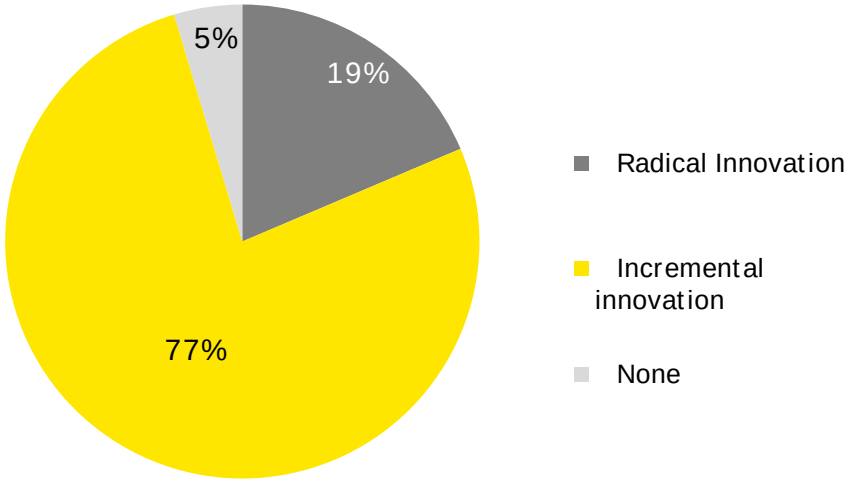


Source: in-depth interviews with RPOs' representatives. Legend- 1: "Not at all" - 5: "To a large extent".

When looking at the type of innovation, radical or incremental, research conducted in the context of FPs leads for the overwhelming majority of respondents to incremental innovation. The type of innovation outcome is often related to the nature of projects and also reflects the fact that the topics addressed by RPOs in the context of FPs generally require a more gradual approach to

innovation. Some RPOs prefer to locate the type of research they implement in between the two extremes of the spectrum.

Figure 61: Radical VS Incremental innovation

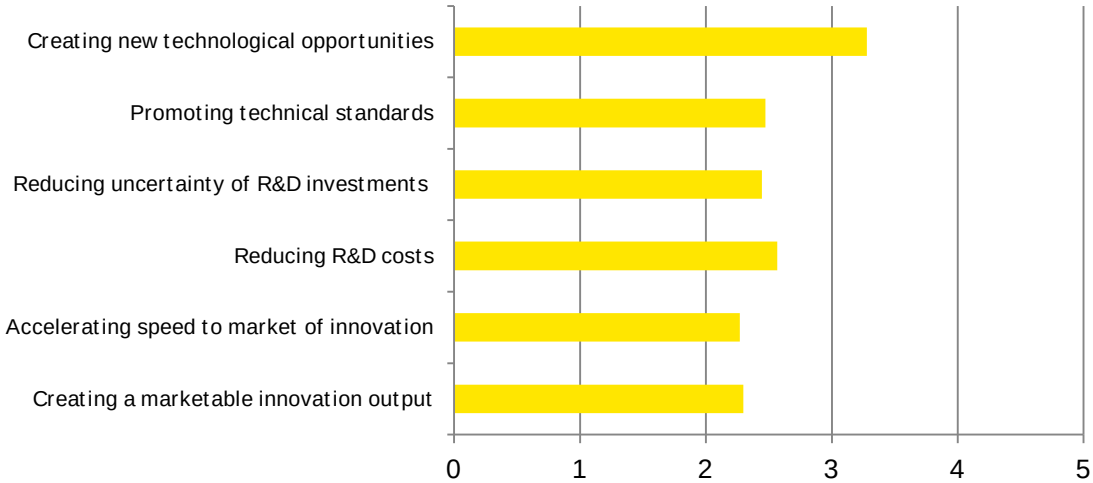


Source: in-depth interviews with RPOs' representatives

RPOs interviewed do not report major impacts in relation to innovation and the economy. The literature suggests that RPOs have a positive social and economic impact through various channels.

The impact of participation in FPs on innovation and competitiveness is perceived as relatively low, especially concerning accelerating speed to market of innovation and creating marketable innovation outputs (Figure 62). However, literature commented in section

Figure 62: Impact of own organisation's participation in FPs on innovation and competitiveness



Source: in-depth interviews with RPOs' representatives. Legend - 1: "No impact at all" - 5: "Very significant impact".

Arnold et al. (2010) assessed the social and economic impacts of European RPOs and noted that no matter what approach is used, these economic impacts appear to be significant in size, and the authors set out a simple economic model considering four categories of impact:

- a "direct" component, representing the contribution of RPOs to GDP, i.e. their contribution to value added;
- an "indirect" component which incorporates the dependence on the RPOs of their (upstream) suppliers and (downstream) users of their outputs;
- a component representing Keynesian-type "multiplier" effects, whereby expenditures by RPOs and their employees stimulate activity in other sectors ("induced" impact);
- social returns to investment in R&D activities, comprising private returns to RPOs and client organisations and "spill overs" to other sectors of the economy.

The result was that the RPOs are a collective force in European innovation that is of considerable size. Barge-Gil and Modrego (2009) evaluated the impact of RPOs on private companies. The findings showed that firms are able to recognise the influence of these relationships on different technical, economic, investment and intangible impacts and to roughly estimate their economic impact, and that several characteristics of these relationships affect the impact of RPOs (e.g. length of the relationship, existence of close interactions and receptivity to RPOs' services).

3. CONCLUDING REMARKS AND RECOMMENDATIONS

3.1. Concluding remarks

RPOs are one of the key beneficiaries in FPs, with an increasing share of funds received. Different types of RPOs show heterogeneous patterns of participation in FPs. For FP7, Scientific Institutes and RTOs tend to be the most active types of RPOs in FPs in terms of funding distributed. Scientific Institutes show patterns of participation more similar to those of universities, with a strong presence distributed across all specific programmes. RTOs have a clearer specialisation in Cooperation and Euratom.

RPOs participate very actively in FPs, with a share of attracted funding exceeding 28% in FP7. Thematic areas in which RPOs have participated more actively were energy & environment, health and ICT. This is mainly determined by the allocation of funds across single components of the programme. Scientific Institutes have a rather diversified portfolio of projects across the different themes, with more marked participation in Marie-Curie Actions, ICT and Health. RTOs appear particularly active in ICT and NMP.

The principle of excellence and the principle of co-funding prompt a self-reinforcing process by which RPOs that have better infrastructure and enhanced financial resources at the outset are more active in FPs and attract more financial resources, in addition to strengthening their networks of international partners.

The significant increase from FP6 to FP7 in funding allocated to RPOs has not been accompanied by a proportional increase in the number of RPOs participating in FPs. While the amount of funding has more than doubled (from around EUR 4.7 billion to around EUR 11.1 billion), the number of RPOs taking part in FPs has barely changed (increasing from 2,690 to 2,703). RPOs that were able to attract more funds during FP6, were also the ones experiencing higher award rates in FP7. Also the distribution of funds across countries has not substantially changed between FPs, with disparities increasing between EU15 and EU13. EU13 countries were able to attract around 6% of funds during FP6 and around 5% during FP7.

The distribution of funds is rather concentrated across the EU MS, with France and Germany attracting around 45% of awarded funds. Turnover and mobility in the organisations taking part in FPs is limited. The top 20 of performers in terms of the share of funds received has not significantly changed, nor has the overall number of organisations taking part in FPs.

There is a slightly increasing gap between the performance of RPOs based in EU13 countries and RPOs based in EU15 countries in favour of the latter.

The share of funds attracted by EU13 countries in FP6 was 6% and decreased to 5% in FP7. During FP7, more than 40% of RPOs fell within the three lower classes of the overall distribution of the allocation of funds. The three top performer RPOs in the EU13 are ranked respectively as 41st, 91st and 143rd in the overall ranking of all RPOs. In addition, while the number of participations has increased, the number of RPOs from EU13 MS has shown an opposite trend, decreasing from 664 in FP6 to 630 in FP7.

This can be seen as a result of the lower average investment rates in research activities of EU13 MS and the structural characteristics of their research systems with a non-clear positioning of the Academies of Sciences (that are still important players of EU13 MS), and the relatively small size, compared with EU15, of the new research organisations that have recently emerged.

The distribution between MS and associated/third countries has remained stable.

MS largely remained the main destination of funding, absorbing 91% of funding in FP7 (90% in FP6). Among Associated Countries, counting for 6% of total funding both in FP6 and FP7, Norway and Switzerland attract the majority of funding. Among third countries, Russia and USA are the countries with the highest participation.

Negative trends in the availability of sources at national level are pushing RPOs towards FPs. However, availability of national funds in the priority areas of FPs turns out to be an advantage for participation in the long term, due to the key principle of co-funding.

Interviews highlight a pattern by which some countries are pushed towards FPs to offset negative trends in the national funding. There is an overall reduction of basic national funding, which forces RPOs to look for other financial resources. However, this contrasts with the positive relationship between national resources and funding received through FPs stemming from the principle of co-

funding. The strategy of shifting towards FPs for offsetting lack of national resources for research has to be considered, at best, as a strategy that could produce partial results in the short term and only in those countries with established research infrastructures obtained through efforts from the recent past. In the long term, the requirement of jointly investing in national and FP research programmes is crucial in order to maintain success in attracting EU funding streams.

Belonging to strong networks is both a key success factor for entering and a key outcome of participation in FPs…

Belonging to established scientific communities recognised at European level tends to be a prerequisite to enhance the success rate of participation in FPs. Established networks of participants guarantee access to the necessary knowledge for writing successful proposals, as well as high reputation and credibility in the delivery of high quality and sound scientific and innovation outputs. In addition to this, working in multi-disciplinary teams is seen as key for both being awarded and delivering in the context of FPs.

The participation in FPs induces a further broadening of networks through a process of "network sharing" by which RPOs tend to bring in consortia from their own network of already known partners generating a multiplicative effect of the partners.

Fostering the existing networks of RPOs appears to be the key result emerging from the study. From a micro perspective, the study identified a set of RPOs - located in the EU15 area, and particularly from France, Germany, Italy and Spain - that are key players for a variety of thematic areas and for both FP6 and FP7. From a macro network perspective, the study also registered the relative stability on the structure of cohesive RPOs subgroups. Specifically, the most cohesive subgroups between FPs and for different types of projects (Health, Energy, Aeronautics, SME support, etc.) tend to present stable structures, meaning they are composed of similar RPOs in both FP6 and FP7.

… while RPOs from EU15 and EU 13 experience different obstacles to participation.

Respondents did not consider any barrier to participation as insurmountable. However, they do identify some issues as main elements which reduce their willingness to participate in FPs, with different responses from RPOs in the EU15 and RPOs in EU13. The former identify the administrative burden of application procedures and the lack of transparency in proposal evaluation procedures as the main issues, while the latter underline that factors like the lack of networks with potential partners, the lack of in-house skills in writing and designing proposals, and the lack of R&D funding as more likely to hinder their participation in FPs. This is particularly important considering that previous experience and internal knowledge and skills in writing high-quality proposals are deemed particularly relevant factors for success, both in the EU13 and EU15.

With regard to administrative burdens, RTOs in EU15 MS and AC have expressed their concern stemming from oversimplifications, which could be detrimental for the transparency of the overall participation process in FPs. However, RTOs have expressed a unanimous complaint concerning the administrative procedures of audits.

Enlargement of the knowledge base and the possibility to access complementary competences are reported as key factors for participation in collaborative projects.

Respondents have identified the possibility to enlarge the knowledge base, to improve the credibility of proposals and to complete internal competences as the main factors pushing RPOs towards participation in collaborative experiences and enhancing their probability of success in FPs. In addition, FPs have been identified as having an important role in creating partnerships and collaborations among RPOs.

Respondents expressed a general alignment between objectives and achievements connected to participation in FPs…

In general terms, the results of the analysis suggest that participants perceive a positive impact from participating in FPs. For the majority of RPOs interviewed, participation in the FPs has led to an improvement in the research and innovation record. Participation in FPs allowed RPOs to reach their objectives in terms of access to financial resources, networks (access new partnership) and reputational benefits (enhance reputation and image).

…However, evidence from data analysis suggests that FPs do not seem to have had a major impact on the publication and patenting activities of RPOs.

With regard to scientific outputs, RPOs experienced a relatively low rate of publications connected to FPs. Although measuring the actual number of scientific publications directly or indirectly stemming from the funding received through the participation in FPs is not feasible due to the lack of detailed data. Based on the evidence produced from the case studies analysed only a relatively low share of the overall number of publications by RPOs results are connected to FPs. This might be partially explained by the fact that RPOs are often active in applied fields characterised by a low propensity to publish scientific articles. Top performing RPOs in terms of publications tend to be large umbrella organisations operating in scientific fields such as neurosciences and environmental sciences.

Similarly for patenting activities, the results obtained through case studies do not point to a high impact of FPs on innovation. Top performing RPOs in terms of patents are French and German RPOs operating in Nanosciences, Nanotechnologies, and Materials and new Production Technologies (NMP), followed by those in the health sector.

The way RPOs tend to transform research into innovation and measure its impact is directly connected to their size and sector of specialisation.

All RPOs tend to use project related outputs to transmit knowledge in relation to their findings, such as slides, brochures, documentaries and reports providing evidence for policy makers. Larger RPOs specialized in more applied fields, tend to promote spin-offs, prototypes or ventures participating to the financing of new ideas.

With regard to the KPIs used for measuring innovation, most RPOs keep track of basic statistics relating to personnel (e.g. number of researchers), as well as scientific outputs such as patents and publications. The use of more sophisticated measures is directly connected to the size and nature of the work performed. In most of cases, RPOs do not distinguish on the basis of the origin of funding and, when they do, they use the broad distinction between national and international sources without specific reference to FPs.

FPs have contributed to enhancing homogeneity in European practices for funding research and innovation, the diversification of funding sources, and to a more pronounced orientation towards collaboration with industry.

Even though FPs do not appear to have induced major changes in the organisation of RPOs in Europe, they have clearly contributed to enhancing homogeneity in relation to the overall practices for funding research across EU MS. FPs have also constituted a novel source of funding in addition to the already existing sources at national and local level, and therefore contributed to boosting the diversification in the possible channels for accessing resources to finance research. FP7 has also marked a sharp increase in collaborations between RPOs and private companies, orienting the focus of projects in a more pronounced way towards the applied research fields.

FPs contribute to cross-border cooperation

In general, respondents highlighted the positive impact of FPs on the enhancement of cross-border cooperation among RPOs in Europe. The share of projects entailing cross-border cooperation remains high both in FP6 and FP7. It slightly decreased from FP6 – when it was close to 80% - to FP7, during which it remained higher than 70%. The main reason for the reduction observed can be found in the introduction in FP7 of new programmes, such as the European Research Council, whose projects do not always imply international cooperation.

FPs have helped RPOs to overcome the problem of national lock-ins and the lack of competition on an international scale, and also in developing new skills.

RPOs sometimes encounter difficulties in operating internationally, due to the differences that still persist in their national funding systems. The FPs, aside from contributing to the harmonisation of national systems, have also encouraged RPOs to overcome the obstacle of national 'lock-in' and develop networks, build new partnerships and strengthen existing links. In some cases, RPOs have also decided to establish a direct presence abroad to pursue international research opportunities more easily.

In general RPOs have only marginally participated in setting up the EU research policy. Only larger RPOs feel that they have had a relatively higher impact.

It is generally difficult to assess the contribution of the RPOs to setting up the EU research policy. Information gathered through interviews suggests that smaller RPOs did not feel they had many opportunities in influencing EU research policy, whereas larger RPOs tend to use all available channels to do so – associations, committees, advisory groups, and consultations. Literature tends

to support the thesis that RPOs have played a major role in making progress towards creating the ERA and Innovation Union, mainly through active participation in FPs.

RTOs are probably the institutions that are most involved in contributing to organisational activities in FPs. They participate in the discussion fora and steering committees either directly or by being through representation by associations such as EARTO.

3.2. Overview of the key areas of improvement

Our analysis has identified the following areas of improvement:

- **Obstacles in participating:** The lack of networks with potential partners and the weak in-house skills or experience in EU funding are obstacles to participation in FPs. The EU may not fully exploit the RPOs' potential, hindering RPOs' participation, notwithstanding the quality of research, but due to the inexperience/periphery of some RPOs with the funding process.
- **Lack of statistics**: despite the evidence of the importance of RPOs to EU research and innovation performance, there is a general lack of objective measures and statistics concerning RPOs and their performance. Available data and statistics are partially leaving uncovered some key aspects needed to evaluate outputs of RPOs in the context of FPs – for example data currently available does not allow evaluators to be conclusive when evaluating the link between FP participation and improved research quality. Furthermore, current sources of information do not allow for a systematic differentiation of the different types of organisations falling under the broad category of research organisations. Moreover, the current version of the database SESAM for publications and research outputs conducted in FP7 does not provide information on the institution where the researcher is publishing, which precludes the production of statistics on scientific performance of research organisations.
- **Award procedures:** RPOs often do not fully understand the reasons for rejecting or awarding proposals and, given the high cost in time and resources spent during the preparation of proposal themselves, they would expect more detailed feedback deriving from the evaluation process, especially for unsuccessful proposals.
- **Length of the projects:** the length of projects is not always proportional to the nature of the project itself. Basic research and some projects that involve clinical observation approaches might require longer time spans for attaining expected result in the most efficient way.
- **Involvement of RPOs in discussions:** RPOs, especially those of smaller size, are rarely involved in the discussion fora relating to the organisational aspects of FPs and the development of the EU research policy. A more inclusive logic for participating in such discussion fora is a prerequisite to enhance the critical mass for facing EU Grand Challenges.
- **Early stage in the creation of a "unified European market knowledge":** The ERA aim of creating a unified European market knowledge is a work-in-progress, which is partially hindered by the conflict of interests rising from the structure of RPO' funding. Specifically, RPOs are primarily funded by national sources and consequentially, they are re incentivised to primarily serve the national market. They get no extra reward for selling services across borders in Europe. On the other hand, doing so might expose the RPO to an accusation of misusing the funding received from the national government by using it to build capacities that are sold abroad. As a result, there is a tendency at national level to see their activities outside their country of origin as 'leakage of ideas' or a waste of national taxpayers' money. A more unified European market in knowledge and ideas would encourage restructuring and specialisation among the RPOs, thereby making better services available to firms wherever they are in the EU. In contrast, today the fragmentation of the European market for knowledge and ideas means that companies are offered less optimal services than would be the case if the common market in knowledge worked properly.

3.3. Recommendations

The table below reports recommendations in relation to the ten areas of improvement identified in the current study.

ID	Area of improvement	Recommendation
1	There is space for increasing the competition for funding and promoting excellent research	**EU-funded research programmes at the moment are relatively concentrated in a restricted number of top performers and in some EU15 countries. Lack of networks with renowned research communities and missing in-house skills in EU funding procedures hinder participation of RPOs, especially in EU13 countries.** Broadening the existing networks of participants should be seen as a priority for the upcoming years. Various initiatives could be

ID	Area of improvement	Recommendation
		taken in this sense: • Assessing the barriers encountered specifically by first time participants • Organising fora of discussions to convey useful knowledge on the best practices for participating with success in FPs; • Promoting harmonisation of general standards of allocating research funds at the national level to increase fairness in the competition for funds at the EU level; • Supporting RPOs in planning their activities and fostering trans-European cooperation, to develop common agendas and shared strategies; • Fostering international presence and cooperation, to enable RPOs to compete on a global scale; • Enabling specialisation of RPOs and preventing unnecessary duplications or overlaps in efforts and investments across sectors. Attention should be first focused on the identification of new potential RPOs that could be interested in participating in FPs.
2	Need for the definition of harmonised KPIs and statistics on RPOs in Europe and a better differentiation between the types of research organisations.	**Specific and harmonised statistics and more sophisticated measures on RPOs should be adopted across MS in Europe, also to better identify trends and areas of attention with a clear distinction of the different type of research organisations and their characteristics** The European Commission should invite Eurostat to establish clear definitions about RPOs and collect statistics about organisations, similarly to what is done for the university sector. The current version of the CORDA database for FP6 and FP7 should be enriched to distinguish between the different types of organisations. The four categories used for the current study could be used for this purpose.
	Current statistics on publications and patents for FP7 are not robust enough to be conclusive in assessing the scientific output and impact of FP funds	The current version of the SESAM database for publications in FP7 should be enriched to include a direct correspondence between the research outcome to institutions and not only to researchers.
3	RPOs often do not fully understand the reasons for rejecting or awarding proposals and have subsequently difficulties in improving their participation	**Either provide evaluation summary reports with more explanations or organise additional events to present common features of successful/unsuccessful proposals** Given the high cost for preparing valuable and competitive proposals, the evaluation summary reports should provide deeper description of the reasons underlying decisions, especially for unsuccessful proposals. Having more detailed evaluation summary reports would respond to the concerns expressed by various RPOs on the disproportion between the proposal length and the space dedicated to feedback. Alternative events providing additional insight on key success/failure factors should be organised.
5	The length of basic research projects is not always proportional to the nature of the project itself	**Projects on basic research should have longer time spans compared to applied research projects** Basic research cycles are naturally longer than applied research ones. Projects targeting basic research should be organised on timespans of four to eight years rather than two to four. This would also allow RPOs to retain researchers for longer periods and invest more in developing internal competencies. In general a clear correspondence should be ensured between the tasks to be performed and the budgets allocated to projects.
	RPOs, especially those of smaller size, are not very	**More inclusion should be already sought in the design of FP projects and communication could be strengthened**

ID	Area of improvement	Recommendation
	much involved in discussion with European Commission	**also during the implementation of the projects** Discussions and debates regarding the design of FP projects should be extended to smaller RPOs who are not often represented in structured associations and have less financial means to exercise influence and convey their needs to the European Commission. Sometimes it would be preferable to have more clarity on the mechanisms through which the Commission operates, and the channels through which RPOs could participate to the design of projects and submit new ideas. During the implementation stage, communications with the European Commission should be rendered easy and ensured on a continuous basis. Changes of project leadership within the European Commission should be managed with particular caution to avoid repercussions on the activities and deliverables of the assignments. While the universities and industry form strong lobby groups and a great deal of policy attention is focused on them, there is little attention to the RPOs, which are a kind of 'others' category in the FP (this is clear even from the fact that the RPO category includes so widely differing types of organisation with different goals). DG-RTD should develop a more strategic approach to RPOs otherwise the development of the EU research and innovation system will continue to be hampered because the opportunities represented by the RPOs are under-exploited.
6	Early stage of in the creation of a "unified European market knowledge"	RPOs should be supported in overcoming the dis-incentive to provide their services across borders. This might happen either diversifying their sources of income – which is an already ongoing trend – but also strengthening the position of RPOs in Europe. In particular the European Commission could: • Encourage the formation of supra-national consortia and even cross-borders mergers among RPOs, as already done with some Government Labs (for example via EUROMET); • Ensure that remaining barriers to cross-border trade in RPO services within the EU are removed; Consider providing incentives for RPOs to work within the EU but outside their home countries.

ANNEXES

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List of RPOs with the highest number of connections

List of RPOs with the highest number of connections - FP6

RPO Name	Country code	Area
MAX PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V.	DE	EU15
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FR	EU15
STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	NL	EU15
ISTITUTO NAZIONALE PER LA FISICA DELLA MATERIA.	IT	EU15
ISTITUTO PER LE TECNOLOGIE APPLICATE AI BELLI CULTURALI (CNR-ITABC)	IT	EU15
UNIVERSITA DELLA CALABRIA	IT	EU15
CONSIGLIO NAZIONALE DELLE RICERCHE	IT	EU15
AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	ES	EU15
COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	FR	EU15
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	MA	OTH
FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	DE	EU15
JOZEF STEFAN INSTITUTE	SI	EU13
LEIBNIZ-ZENTRUM FUER AGRARLANDSCHAFTSFORSCHUNG (ZALF) e.V.	DE	EU15
BUNDESFORSCHUNGSANSTALT FUER LANDWIRTSCHAFT	DE	EU15
NATIONAL VETERINARY INSTITUTE - ETHIOPIA	ET	OTH
VETERINAERINSTITUTTET - NATIONAL VETERINARY INSTITUTE	NO	OTH
STATENS VETERINAERMEDICINSKA ANSTALT	SE	EU15
INSTITUTO NACIONAL DE TECNOLOGIA AGROPECUARIA	AR	OTH
NATURAL ENVIRONMENT RESEARCH COUNCIL	UK	EU15
VIB	BE	EU15

RPO Name	Country code	Area
JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION	BE	EU15
DANMARKS JORDBRUGSFORSKNING	DK	EU15
INTERNATIONALES INSTITUT FUER ANGEWANDTE SYSTEMANALYSE	AT	EU15
EIDGENOESSISCHE FORSCHUNGSANSTALT WSL	CH	OTH
Karlsruher Institut fuer Technologie	DE	EU15
IVL SVENSKA MILJOEINSTITUTET AB	SE	EU15
MET OFFICE	UK	EU15
SUOMEN YMPARISTOKESKUS	FI	EU15
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK - TNO	NL	EU15
PLANBUREAU VOOR DE LEEFOMGEVING	NL	EU15
ISTITUTO SUPERIORE DI SANITA	IT	EU15
NATIONAL INSTITUTE OF AGRICULTURAL BOTANY	UK	EU15
RIJKS-KWALITEITSINTITUUT VOOR LAND- EN TUINBOUWPRODUKTEN (RIKILT)	NL	EU15
FORSCHUNGSINSTITUT FUR BIOLOGISCHENLANDBAU STIFTUNG	CH	OTH
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	FR	EU15
NACIONALNI INSTITUT ZA BIOLOGIJO	SI	EU13
STICHTING ENERGIEONDERZOEK CENTRUM NEDERLAND	NL	EU15
CENTRE WALLON DE RECHERCHES AGRONOMIQUES	BE	EU15
JULIUS KUHN INSTITUT BUNDESFORSCHUNGSINSTITUT FUR KULTURPFLANZEN	DE	EU15
AGROBIOINSTITUTE	BG	EU13
THE SCOTTISH AGRICULTURAL COLLEGE	UK	EU15
CENTRO DE INVESTIGATION EN ECONOMIA Y DESAROLLO AGROALIMENTARIOS - UPC - IRTA	ES	EU15
EUROPAEISCHES ZENTRUM FUER SCHADENERSATZ- UND VERSICHERUNGSRECHT	DE	EU15
FOEDEVAREOEKONOMISK INSTITUT	DK	EU15
EPPENDORF ARRAY TECHNOLOGIES S.A.	BE	EU15
VEZ-INSTITUTO UNIBRASIL PARA O DESENVOLVIMENTO DA CIENCIA E CULTURA	BR	OTH
INSTITUTO TECNOLOGIA DO PARANA	BR	OTH
LUMORA LTD	UK	EU15
ARVALIS INSTITUT DU VEGETAL ASSOCIATION	FR	EU15
Centre Bioengineering of the Russian academy of sciences	RU	OTH
EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW EN VISSERIJONDERZOEK	BE	EU15
CENTRE TECHNIQUE INTERPROFESSIONNEL DES OLEAGINEUX METROPOLITAINS	FR	EU15
KMETIJSKI INSTITUT SLOVENIJE - AGRICULTURAL INSTITUTE OF SLOVENIA	SI	EU13
ETHNIKO IDRYMA EREVNON	EL	EU15
NOFIMA MAT AS	NO	OTH
CENTRO RICERCHE PRODUZIONI ANIMALI - C.R.P.A. S.P.A.	IT	EU15
CENTRO DI ECOLOGIA ALPINA	IT	EU15

RPO Name	Country code	Area
FONDAZIONE EDMUND MACH	IT	EU15
INSTITUTE OF PHYSICOCHEMICAL AND BIOLOGICAL PROBLEMS IN SOIL SCIENCE OF RUSSIAN ACADEMY OF SCIENCES	RU	OTH
CENTRO DE INVESTIGACION ECOLOGICA YAPLICACIONES FORESTALES	ES	EU15
EIDGENOESSISCHE FORSCHUNGSANSTALT FUER AGRAROEKOLOGIE UND LANDBAU	CH	OTH
Bundesforschungs-und Ausbildungszentrum für Wald, Naturgefahren und Landschaft	AT	EU15
INSTITUT PROBLEM EKOLOGII I EVOLYUCII IM A N SEVERTSOV ROSSIISKAYA AKADEMIYA NAUK*SIEE-RAS A.N.SEVERTSOVINSTITUTE OF ECOLOGY AND EVOLUTION	RU	OTH
JOHANN HEINRICH VON THUENEN-INSTITUT, BUNDESFORSCHUNGSINSTITUT FUER LANDLICHE RAUME, WALD UND FISCHEREI	DE	EU15
METEOROLOGISK INSTITUTT	NO	OTH
ERDESZETI TUDOMANYOS INTEZET	HU	EU13
ILMATIETEEN LAITOS	FI	EU15
NORSK INSTITUTT FOR LUFTFORSKNING	NO	OTH
FUNDACION CENTRO DE ESTUDIOS AMBIENTALES DEL MEDITERRANEO	ES	EU15

List of RPOs with the highest number of connections - FP7

RPO Name	Country code	Area
COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	FR	EU15
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	FR	EU15
DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DE	EU15
FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	DE	EU15
STIFTELSEN SINTEF	NO	OTH
FUNDACION TECNALIA RESEARCH & INNOVATION	ES	EU15
ASIAN INSTITUTE OF TECHNOLOGY	TH	OTH
AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	ES	EU15
CONSIGLIO NAZIONALE DELLE RICERCHE	IT	EU15
MAX PLANCK GESELLSCHAFT ZUR FOERDERUNG DER WISSENSCHAFTEN E.V.	DE	EU15
RIJKSINSTITUUT VOOR VOLKSGEZONDHEIDEN MILIEU*NATIONAL INSTITUTEFOR PUBLIC HEALTH AND THE ENVIRONMENTEN	NL	EU15
KONINKLIJKE NEDERLANDSE AKADEMIE VAN WETENSCHAPPEN - KNAW	NL	EU15
FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS	EL	EU15
ACONDICIONAMIENTO TARRASENSE ASSOCIACION	ES	EU15
NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK - TNO	NL	EU15
COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH	IN	OTH
INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT	FR	EU15
INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	FR	EU15
JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION	EU	OTH
DHI	DK	EU15

RPO Name	Country code	Area
INSTITUTO ESPANOL DE OCEANOGRAFIA	ES	EU15
INSTITUTE OF OCEANOLOGY - BULGARIAN ACADEMY OF SCIENCES	BG	EU13
NATURAL ENVIRONMENT RESEARCH COUNCIL	UK	EU15
HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL	DE	EU15
HELLENIC CENTRE FOR MARINE RESEARCH	EL	EU15
VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V.	BE	EU15
DANMARKS METEOROLOGISKE INSTITUT	DK	EU15
STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	NL	EU15
INSTITUT JOZEF STEFAN	SI	EU13
CENTRO EURO-MEDITERRANEO SUI CAMBIAMENTI CLIMATICI SCARL	IT	EU15
FORSCHUNGSZENTRUM JUELICH GMBH	DE	EU15
ALFRED-WEGENER-INSTITUT HELMHOLTZ- ZENTRUM FUER POLAR- UND MEERESFORSCHUNG	DE	EU15
STICHTING KONINKLIJK NEDERLANDS INSTITUUT VOOR ZEEONDERZOEK (NIOZ)	NL	EU15
PLYMOUTH MARINE LABORATORY	UK	EU15
AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	IT	EU15
STICHTING DELTARES	NL	EU15
TEKNOLOGIAN TUTKIMUSKESKUS VTT	FI	EU15
STICHTING ENERGIEONDERZOEK CENTRUM NEDERLAND	NL	EU15
ECOLOGIC INSTITUT gemeinnützige GmbH	DE	EU15
FONDAZIONE ENI ENRICO MATTEI	IT	EU15
INTERNATIONALES INSTITUT FUER ANGEWANDTE SYSTEMANALYSE	AT	EU15
INSTITUT NATIONAL DE RECHERCHE EN SCIENCES ET TECHNOLOGIES POUR L'ENVIRONNEMENT ET L'AGRICULTURE	FR	EU15
INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE PENTRU GEOLOGIE SI GEOECOLOGIE MARINA-GEOECOMAR	RO	EU13
HAVFORSKNINGSINSTITUTTET	NO	OTH
ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS	EL	EU15
INSTITUT NATIONAL DE RECHERCHE HALIEUTIQUE	MA	OTH
JOHANN HEINRICH VON THUENEN-INSTITUT, BUNDESFORSCHUNGSINSTITUT FUER LAENDLICHE RAEUME, WALD UND FISCHEREI	DE	EU15
INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	FR	EU15
STIFTELSEN NANSEN SENTER FOR MILJOOG FJERNMALING	NO	OTH
INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE	BE	EU15
EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS	UK	EU15
KONINKLIJK NEDERLANDS METEOROLOGISCH INSTITUUT-KNMI	NL	EU15
THE SCOTTISH ASSOCIATION FOR MARINESCIENCE LBG	UK	EU15
IVL SVENSKA MILJOEINSTITUTET AB	SE	EU15
CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE SCIENZE DEL MARE	IT	EU15
HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	DE	EU15
SUOMEN YMPARISTOKESKUS	FI	EU15

RPO Name	Country code	Area
TURKIYE BILIMSEL VE TEKNOLOJIK ARASTIRMA KURUMU	TR	OTH
INSTITUTO PORTUGUES DO MAR E DA ATMOSFERA IP	PT	EU15
INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE MARINA GRIGORE ANTIPA	RO	EU13
ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	IL	OTH
Istituto Superiore per la Protezione e la Ricerca Ambientale	IT	EU15
NACIONALNI INSTITUT ZA BIOLOGIJO	SI	EU13
NORSK INSTITUTT FOR VANNFORSKNING	NO	OTH
ISTITUTO NAZIONALE DI OCEANOGRAFIA E DI GEOFISICA SPERIMENTALE	IT	EU15
LEIBNIZ-INSTITUT FUR OSTSEEFORSCHUNG WARNEMUNDE STIFTUNG	DE	EU15
A.O. KOVALEVSKIY INSTITUTE OF BIOLOGY OF SOUTHERN SEAS	UA	OTH
BC3 BASQUE CENTRE FOR CLIMATE CHANGE - KLIMA ALDAKETA IKERGAI	ES	EU15

Additional tables based on CORDA

Allocation of projects and funds across institutions with coordinator/participant break down

	Number of institutions		Number of participations		Amount of awarded funding ('000 EUR)		Share of awarded funding (%)	
	FP6	**FP7**	**FP6**	**FP7**	**FP6**	**FP7**	**FP6**	**FP7**
HES	1,449	1,396	23,257	42,806	5,629,264	17,002,711	37%	42.30%
Coordinator			3,832	12,280	1,481,548	8,374,990	9.70%	20.90%
Participant			19,425	30,526	4,147,716	8,627,721	27.30%	21.50%
OTH	5,876	1,811	11,224	3,591	1,910,984	925,982	12.60%	2.30%
Coordinator			1,105	361	563,163	433,097	3.70%	1.10%
Participant			10,119	3,230	1,347,821	492,885	8.90%	1.20%
PRC	7,585	17,085	13,031	36,926	2,673,315	10,121,707	17.60%	25.20%
Coordinator			824	2,860	499,483	1,908,727	3.30%	4.80%
Participant			12,207	34,066	2,173,832	8,212,980	14.30%	20.50%
RPO	2,690	2,703	17,452	29,078	4,672,393	11,081,190	30.70%	27.60%
Coordinator			3,009	6,558	1,355,792	4,656,675	8.90%	11.60%
Participant			14,443	22,520	3,316,602	6,424,514	21.80%	16.00%
PUB	-	1,477	-	4,866	-	1,025,784	-	2.60%
Coordinator			-	399	-	316,742	-	0.80%
Participant			-	4,467	-	709,042	-	1.80%
N/A	1,339	-	1,946	-	330,860	-	2.20%	-
Coordinator			135	-	60,550	-	0.40%	-
Participant			1,811	-	270,310	-	1.80%	-
Grand Total	**18,939**	**24,472**	**66,910**	**117,267**	**15,216,816**	**40,157,374**		

Source: authors' calculations based on the CORDA database

Comparative perspective of RPOs participation in specific programmes with respect to other institutions

	RPO	HES	PRC	PUB	OTH	EC contribution ('000 EUR)	Share of EC contribution (%)
CAPACITIES	32%	23%	35%	3%	7%	3,334,021	8%
COOPERATION	27%	35%	33%	3%	2%	25,673,477	64%
IDEAS	29%	70%	1%	0%	0%	6,568,405	16%
PEOPLE	22%	62%	11%	4%	1%	4,255,646	11%
Euratom	52%	26%	18%	2%	2%	325,825	1%
Total						40,157,374	

Source: authors' calculations based on the CORDA database

Comparative perspective of participation in FP7 specific programmes for EU15 and EU13 MS

	EU15				EU13			
	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)
Capacities	775	3,584	912,404	8.6%	238	565	138,232	27.3%
Cooperation	1,797	17,289	6,732,196	63.7%	502	1,597	271,489	53.7%
Ideas	208	1,257	1,874,448	17.7%	26	37	41,057	8.1%
People	531	3,663	895,956	8.5%	153	361	45,526	9.0%
Euratom	75	594	160,314	1.5%	36	131	9,566	1.9%
Total		26,387	10,575,318			2,691	505,870	

Source: authors' calculations based on the CORDA database

Allocation of RPOs participations and funding by theme

Theme	Number of RPO participants		Number of RPO participations		Amount of funding awarded to RPOs ('000 EUR)		Amount of awarded funding (%)	
	FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7
Activities of International Cooperation	214	94	438	350	59,716	61,226	1.3%	0.6%
Research potential of convergence regions		80	-	110	-	142,415	-	1.3%
Coherent development of research policies	23	18	24	18	2,174	1,444	0.1%	0.01%
Coordination of research activities	137		268	-	64,925	-	1.4%	-
General Activities (Annex IV)		40	-	45	-	30,503	-	0.3%
Joint Technology Initiatives (Annex IV-SP1)		278	-	1,016	-	430,393	-	3.9%
Regions of Knowledge		114	-	137	-	18,815	-	0.2%
Energy	711	238	2,643	900	645,723	365,542	13.8%	3.3%
Environment (including Climate Change)		505	-	2,029	-	601,267	-	5.4%
European Research Council		234	-	1,294	-	1,915,505	-	17.3%
Food, Agriculture, and Biotechnology	361	493	976	2,012	273,006	550,945	5.8%	5.0%
Fusion Energy	106	21	501	25	103,339	1,798	2.2%	0.02%
Nuclear Fission and Radiation Protection		101	-	700	-	168,083	-	1.5%
Health	461	606	1,964	2,401	746,380	1,023,188	16.0%	9.2%
Information and Communication Technologies	338	708	2,331	4,341	762,981	1,844,202	16.3%	16.6%
Marie-Curie Actions	508	684	2,078	4,024	459,482	941,482	9.8%	8.5%
Nanosciences, Nanotechnologies, Materials and new Production Technologies	429	482	1,404	2,207	458,440	875,554	9.8%	7.9%
New and emerging science and technologies			0	-	0	0	-	0
Policy support and anticipating scientific and technological needs	603		1,604	-	213,218	-	4. 6%	-
Research and innovation	160		271	-	32,336	-	0.7%	-

Theme	Number of RPO participants		Number of RPO participations		Amount of funding awarded to RPOs ('000 EUR)		Amount of awarded funding (%)	
	FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7
Research for the benefit of SMEs	380	374	901	1,206	112,994	47,358	2.4%	0.4%
Research Infrastructures	265	479	685	1,997	431,330	727,537	9.2%	6.6%
Science in Society	114	181	165	331	12,793	51,841	0.3%	0.5%
Security		255	-	800	-	314,935	-	2.8%
Socio-economic sciences and Humanities	239	271	433	583	56,626	135,061	1.2%	1.2%
Space	202	209	766	842	236,932	301,166	5.1%	2.7%
Transport (including Aeronautics)		320	-	1,710	-	530,929	-	4.8%
Grand Total			**17,452**	**29,078**	**4,672,395**	**11,081,189**		

Source: authors' calculations based on the CORDA database

Allocation of financial resources and participations by funding scheme

Funding scheme		Number of RPO participants		Number of RPO participations		Amount of funding awarded to RPOs ('000 EUR)		Amount of awarded funding (%)	
FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7
Coordination Actions	Coordination and support action	740	1,160	1,630	4,682	158,478	753,628	3%	7%
Specific Support Actions		682		1,586		141,418	-	3%	0%
Integrated Projects	Collaborative project	1,124	2,085	3,919	14,994	1,742,386	6,079,578	37%	55%
Specific Targeted Research Projects		1,306		5,138		1,135,874	-	24%	
	Combination of CP & CSA		506		1,893	-	815,292		7%
Marie Curie Actions	Support for training and career development of researchers (Marie Curie)	478	638	2,015	3,754	454,145	932,790	10%	8%
Networks of Excellence	Network of Excellence	575	187	1,370	323	430,885	115,043	9%	1%

Funding scheme		Number of RPO participants		Number of RPO participations		Amount of funding awarded to RPOs ('000 EUR)		Amount of awarded funding (%)	
FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7	FP6	FP7
Collective Research Projects	Research for the benefit of specific groups	166	383	265	1,169	38,667	45,099	1%	0%
Co-operative Research Projects		265	n/a	620	n/a	72,415		2%	n/a
	Article 171 of the Treaty-Joint technology initiatives	n/a	278	n/a	1,016		430,393		4%
	Support for frontier research (ERC)	n/a	226	n/a	1,247		1,909,367		17%
Specific Actions to Promote Research Infrastructures	n/a		n/a	656	n/a	438,067		9%	
Not classified	n/a	n/a	n/a	253	n/a	60,060		1%	
Total				17,452	29,078	4,672,395	11,081,190		

Source: authors' calculations based on the CORDA database

Allocation of FP funds to RPOs across MS

	FP6				FP7			
MS	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)
AT	112	502	117,359	2.5%	121	800	256,418	2.3%
BE	85	548	161,742	3.5%	132	1,165	435,878	3.9%
BG	66	150	15,300	0.3%	65	203	30,825	0.3%
CY	15	32	2,688	0.1%	11	23	5,802	0.1%
CZ	81	349	44,835	1.0%	77	360	68,462	0.6%
DE	382	3,221	1,112,500	23.8%	344	5,127	2,379,361	21.5%
DK	73	256	60,480	1.3%	41	343	105,754	1.0%

	FP6				FP7			
MS	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)
EE	22	61	6,376	0.1%	16	57	9,349	0.1%
EL	55	776	186,642	4.0%	57	1,331	423,838	3.8%
ES	210	1,535	307,964	6.6%	340	3,844	1,313,264	11.9%
FI	37	369	89,506	1.9%	39	817	294,964	2.7%
FR	258	3,070	976,376	20.9%	196	4,979	2,558,269	23.1%
HR	14	42	5,591	0.1%	30	89	19,173	0.2%
HU	83	360	48,677	1.0%	87	418	72,187	0.7%
IE	22	76	12,512	0.3%	22	130	30,461	0.3%
IT	302	1,823	479,955	10.3%	319	3,152	1,046,991	9.5%
LT	39	86	7,147	0.2%	21	70	8,363	0.1%
LU	8	24	3,624	0.1%	10	34	7,382	0.1%
LV	20	50	4,910	0.1%	24	109	20,393	0.2%
MT	1	4	433	0.01%	5	9	1,411	0.01%
NL	133	1,033	308,465	6.6%	138	1,787	761,440	6.9%
PL	160	599	75,272	1.6%	131	668	144,496	1.3%
PT	75	347	64,578	1.4%	72	731	196,494	1.8%
RO	79	197	20,036	0.4%	78	289	41,127	0.4%
SE	98	409	93,654	2.0%	61	559	190,824	1.7%
SI	32	175	24,518	0.5%	44	292	66,227	0.6%
SK	52	138	13,911	0.3%	41	104	18,057	0.2%
UK	176	1,220	427,341	9.2%	181	1,588	573,980	5.2%

MS	FP6				FP7			
	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)	Number of RPOs	Number of participations	Amount of awarded funding ('000 EUR)	Share of awarded funding (%)
Grand Total	2,690	17,452	4,672,392		2,703	29,078	11,081,190	

Source: authors' calculations based on the CORDA database

Most funded RPO in FP7, relative ranking and comparison with FP6 performance (EU-15)

#	RPO	Country	Projects	Awarded funding (EUR)	Awarded funding (%)	FP6 Rank	FP6 Projects	FP6 funding (EUR)	FP6 funding (%)
1	Centre National De La Recherche Scientifique (CNRS)	FR	1524	793,225,130	7.16%	**1**	845	282,991,384	6.06%
2	Fraunhofer-Gesellschaft	DE	1228	581,811,910	5.25%	**2**	560	219,419,972	4.70%
3	Commissariat A L Energie Atomique Et Aux Energies Alternatives (CEA)	FR	745	422,915,212	3.82%	**4**	338	149,461,645	3.20%
4	Max Planck Gesellschaft	DE	665	412,347,026	3.72%	**3**	401	151,300,272	3.24%
5	Institut National De La Sante Et De La Recherche Medicale (Inserm)	FR	423	299,026,799	2.70%	**9**	226	77,651,687	1.66%
6	Agencia Estatal Consejo Superior De Investigaciones Cientificas (CSIC)	ES	701	259,532,907	2.34%	**6**	398	96,504,913	2.07%
7	Consiglio Nazionale Delle Ricerche (CNR)	IT	696	231,028,795	2.08%	**5**	389	105,044,186	2.25%
8	VTT Technical Research Centre of Finland Ltd	FI	471	194,828,078	1.76%	**13**	206	63,196,378	1.35%
9	German Aerospace Center (DLR)	DE	430	191,188,192	1.73%	**7**	202	78,317,373	1.68%
10	Netherlands Organisation for Applied Scientific Research (TNO)	NL	429	187,829,232	1.70%	**11**	230	66,966,612	1.43%

#	RPO	Country	Projects	Awarded funding (EUR)	Awarded funding (%)	FP6 Rank	FP6 Projects	FP6 funding (EUR)	FP6 funding (%)
11	Institut National De La Recherche Agronomique (INRA)	FR	278	127,758,500	1.15%	**10**	163	68,635,278	1.47%
12	European Molecular Biology Laboratory (EMBL)	DE	176	123,181,408	1.11%	**12**	121	63,966,346	1.37%
13	Institut National De Recherche En Informatique Et En Automatique (INRIA)	FR	229	117,380,019	1.06%	**20**	120	40,189,933	0.86%
14	Fundacion Tecnalia Research & Innovation	ES	374	113,290,734	1.02%	**nr**	-	-	-
15	Stichting Dienst Landbouwkundig Onderzoek (DLO)	NL	310	112,320,987	1.01%	**16**	193	53,568,940	1.15%
16	Interuniversitair Micro-Electronica Centrum Vzw (Imec)	BE	182	107,401,977	0.97%	**14**	105	59,948,424	1.28%
17	Foundation For Research And Technology Hellas (FORTH)	EL	268	93,818,844	0.85%	**18**	155	45,722,409	0.98%
18	Institut Pasteur	FR	130	93,492,695	0.84%	**23**	95	34,938,836	0.75%
19	Forschungszentrum Jülich GmbH	DE	184	81,470,469	0.74%	**21**	105	38,395,712	0.82%
20	Ethniko Kentro Erevnas Kai Technologikis Anaptyxis (CERTH/ISFTA)	EL	257	74,712,987	0.67%	**nr**	-	-	-

Source: authors' calculations based on the CORDA database

Most funded RPO in FP7, relative ranking and comparison with FP6 performance (EU-13)

#	RTO	Country	Projects	Awarded funding (EUR)	Awarded funding (%)	FP6 Rank	FP6 Projects	FP6 funding (EUR)	FP6 funding (%)
41	Jožef Stefan Institute	SI	155	42,264,919	0.38%	**44**	92	15,304,181	0.33%
91	Institute of Bioorganic Chemistry - Polish Academy of Sciences (IBCH PAS)	PL	54	18,314,223	0.17%	**83**	24	8,055,047	0.17%
143	Institute for Computer Science and Control – Hungarian Academy of Sciences (MTA SZTAKI)	HU	39	12,149,886	0.11%	**109**	35	6,292,454	0.13%
151	Latvian Institute of Organic Synthesis	LV	10	11,856,269	0.11%	**837**	1	576,056	
157	Ruder Boskovic Institute	HR	31	11,301,159	0.10%	**247**	19	2,825,581	0.06%
184	International Institute Of Molecular And Cell Biology	PL	12	9,544,855	0.09%	**nr**	-	-	-
211	Institute Of Experimental Medicine - Hungarian Academy Of Sciences	HU	8	8,226,576	0.07%	**376**	6	1,676,500	0.01%
219	Alfred Renyi Institute Of Mathematics - Hungarian Academy Of Sciences	HU	13	7,777,561	0.07%	**385**	8	1,623,229	0.03%
227	Institute of Physics - Polish Academy of Sciences	PL	9	7,564,270	0.07%	**562**	5	1,027,500	0.02%
237	Biology Centre of the Czech Academy of Sciences	CZ	15	7,349,926	0.07%	**1,052**	2	404,213	0.01%
266	Nencki Institute of Experimental Biology	PL	17	6,434,694	0.06%	**576**	7	980,912	0.02%
270	PIAP Industrial Research Institute For Automation And Measurements	PL	17	6,292,087	0.06%	**889**	4	524,865	0.01%

277	Aerospace Research And Test Establishment (VZLU)	CZ	18	6,056,600	0.05%	**241**	17	2,856,185	0.06%
280	Biological Research Center	HU	14	6,008,290	0.05%	**265**	20	2,575,145	0.06%
308	Institute Of Organic Chemistry And Biochemistry - Czech Academy of Sciences	CZ	11	5,463,708	0.05%	**685**	6	768,863	0.02%
312	Wigner Research Centre for Physics – Hungarian Academy of Sciences	HU	34	5,398,806	0.05%	**nr**	-	-	-
319	Institut Of Fundamental Technological Research-Polish Academy Of Sciences	PL	54	5,146,691	0.05%	**4**	52	4,234,382	0.09%
341	CESNET, Zajmove Sdruzeni Pravnickych Osob	CZ	13	4,654,508	0.04%	**289**	11	2,257,911	0.05%
344	Center for Physical Sciences and Technology	LT	13	4,611,711	0.04%	**nr**	-	-	-
348	The Cyprus Foundation For Muscular Dystrophy Research	CY	9	4,581,202	0.04%	**1,141**	3	355,928	0.01%
	Grand Total		**546**	**190,997,941**	**1.73%**		**312**	**52,338,952**	**1.08%**

Source: authors' calculations based on the CORDA database

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This study is conducted in the context of the evaluation of the European Union Framework Programmes for Research, Technological developments and Demonstration Activities (FPs). It is one of the preparatory studies being undertaken for the overall ex post evaluation of the FP7 (2007-2013). It aims at assessing the participation of Research Performing Organisations (RPOs) in FPs, the impact of FPs on the different dynamics and functioning of RPOs in the EU and the role of RPOs in the development of the FPs and EU research and innovation policy.

The scope of the study covers FP6 and FP7 funded research projects that involve the participation of RPOs based in the EU28 Member States and some RPOs based in Associated and Third Countries (e.g. the US).

The current report presents the results of the evaluation based on information collected through primary and secondary sources of information. Primary data collection has been conducted through in-depth interviews with representatives of selected RPOs across 16 MS, Norway, and the US, as well as with European associations of RPOs and representatives of the European Commission. Secondary sources have been used to collect both qualitative information from literature reviews and quantitative information from various databases (e.g. CORDA and Scopus).

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