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Innovation Union Competitiveness report 2011

4. Optimising research programmes and infrastructures

Highlights

The European research system is going through reforms in order to enhance excellence and efficiency. These reforms are made at national level but efficiency gains from using the European research system are increasingly exploited.

At the European level, reforms in the funding allocation for research and in research organisations capitalise on the expanding EU funds for research. In 2007–2008, the EU research Framework Programme (FP) represented about 7.5 % of civil R&D expenditures financed by governments in Europe. Total EU funding of R&D (FP and Structural Funds[66]) reached almost 16 % of total national civil R&D budgets in EU-27. National public funding of intergovernmental research infrastructures and intergovernmental Europe-wide research programmes and agencies represents about 3.5 % of civil R&D expenditures financed by governments in Europe. When examining national R&D budgets and adding national public funding to bi- and multi-lateral R&D programmes, about 4.5 % of EU Member States' R&D budget was directed to 'trans-nationally coordinated research'[67] in 2008.

The trans-national coordination of research funding is expected to rise in Europe. In particular, European countries are jointly deciding and funding the construction and major upgrade of 44 pan-European research infrastructures in all the main scientific fields for an estimated total construction cost of EUR 21–22 billion, and Joint Programming Initiatives are being launched to address major societal challenges through jointly programmed public research. FP instruments of coordination of R&D programmes (ERA-NET, ERA-NET+, JTIs, Art. 185) and other Europe-wide R&D programmes (EUREKA, COST, ESA, EFDA, EUROCORES) are equally major driving forces for trans-nationally coordinated research activities.

In absolute numbers, scientific cooperation through the EU FP mainly takes place between the four larger Member States. However, when corrected by the size of the country, researchers in smaller countries, including new Member States, have a higher integration propensity in the scientific cooperation funded by the FP. Also, relative to their R&D expenditure level, 'Convergence Objective regions' benefit more from FP7 funding than regions with higher R&D intensity.

The modalities and conditions for participation of non-resident research performers in national R&D programmes vary across countries and across different types of programme within a country. However, there is as yet no robust estimation of the degree of openness of national R&D programmes in Europe. Reforms should lead to the opening up of most national programmes to non-resident participation — which does not imply necessarily

[66] 2007–2008 FP spending (annual average), Structural Funds earmarked for Research, Technology, Development and Innovation (RTDI) activities over the period 2007–2013 (annual average).
[67] *Trans-nationally coordinated* research funding, also coined *intergovernmental* research funding, implies the *coordination* of national funding for research activities *bi- or multi-laterally*, through *Europe-wide research programmes and agencies,* or through *intergovernmental research infrastructures*. It is distinct from EU Framework Programme funding which comes directly from the EU budget, is managed by the European Commission, and does not imply the coordination of national funding.

funding — and to an increase in the number of national programmes that are fully open. Opening up national programmes also necessitates a greater alignment of participation and funding rules in Europe in order to facilitate the participation of non-residents, reduce red tape, abolish the tax on innovation due to unnecessary administrative costs and ease trans-border cooperation

4. Optimising research programmes and infrastructures

4.1. Are national and European research programmes becoming more closely integrated?

Public funding needs to be optimally distributed to research performers, and there are several ways to do this. National public funding can be allocated as recurrent funding to national research institutions, or competitively to selected research projects; it can be used domestically only, but it can also be opened to non-resident researchers, or used in coordination with public funding from other countries. Finally, in Europe, part of public funding of R&D comes from the EU budget. This chapter analyses the relative importance of the different allocation modes of public funding in Europe. The efficiency of research in Europe partly depends upon the balance between them.

4.1.1 The two main allocation modes of direct public research funding[68]

Institutional funding is dominant in most countries, but project-based funding represents more than half of total direct government funding in certain countries

Governments can use two main modes of direct R&D funding: institutional and project-based. Institutional funding can help ensure stable research funding in the long run, while project-based funding can be used to promote competition within the research system as well as targeting strategic areas. Project-based funding includes R&D national contracts from line ministries and contributions from the government to national funding agencies (*e.g.* research councils).

The balance between these two modes of funding varies across countries. In several countries since the 1970s, the volume of project-based funding has strongly increased both in real terms and as % of GDP. In Switzerland, Austria, Norway, France, Italy and the Netherlands, project-based funding has been multiplied by two to five in real terms between 1970 and 2002[69]. The long-term trend of public R&D funding mode favours project funding over institutional funding. Since 2000 however, there is a relative stability between the two modes of funding in Europe, except in Austria where the share of project funding has increased sharply[70].

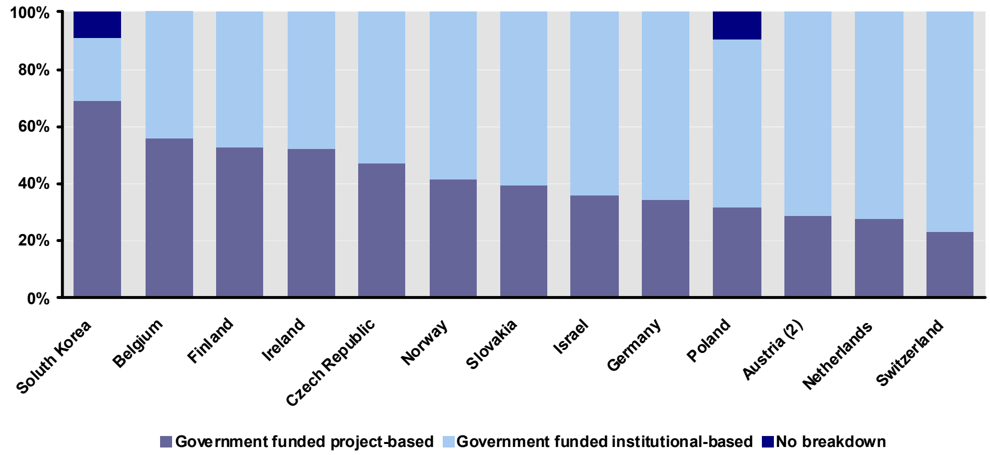
[68] The data presented in this section are based on preliminary data from the OECD Microdata project on public R&D funding of the Working Party of National Experts in Science and Technology (NESTI), 2009. These are new, experimental data to be treated with care.

[69] Lepori et al. 'Comparing the evolution of national research policies: what patterns of change?' *Science and Public Policy*, 34(6), July 2007, pages 372–388. This study covers six European countries: Switzerland, Austria, Norway, France, Italy and the Netherlands.

[70]OECD, based on preliminary data from the Microdata project on public R&D funding of the Working Party of National Experts in Science and Technology (NESTI), 2009. This observation is done on a limited number of countries which could provide the data back to 2000.

Despite this long-term trend, in most countries more than half of direct government funding is still institution-based (Figure II.4.1). Among European countries, Belgium, Finland and Ireland are three exceptions, with more than 50 % of project-based direct government funding. There is no strong relationship between the level of direct government funding (GBAORD as % of GDP) and the share of the latter that is project-based.

Figure II.4.1 Government funded R&D by type of funding[(1)], 2008 [(2)]



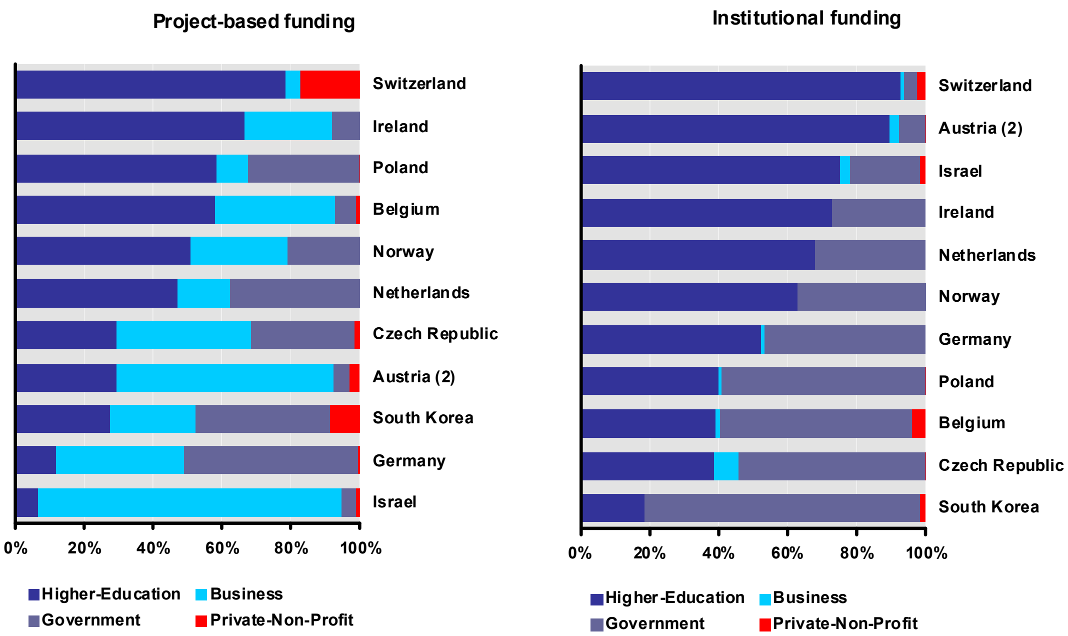
Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: OECD, based on preliminary data from the microdata project on public R&D funding of the Working Party of National Experts in Science and Technology (NESTI), 2009-2010.
Notes: (1) This is an experimental indicator. International comparability is currently limited.
(2) AT: 2009.

The public sector (higher education and government sectors) is the quasi-exclusive destination of institutional funding, while the business sector is the destination of a good share (20-40 %) of the project-based funding

The public sector (higher education and government sectors) is the quasi-exclusive destination of institutional funding, although in some countries (the Czech Republic, Austria, Poland, Belgium and Germany) the business sector also receives some (very small share) of it (Figure II.4.2)[71]. In contrast, in all countries the business sector is the destination of a good share (20–40 %) of the project-based funding — up to 60 % in Austria and 90 % in Israel. In some countries, the project-based funding is primarily managed by independent agencies (Belgium, Netherlands, Austria), while in others the research ministry and other ministries are the main, sometimes exclusive, managers of this type of funding (Czech Republic, Poland and Germany)[72].

[71] Ibid. Data to be treated with care as the destination of funds is not always clear in GBAORD data.
[72] Ibid.

Figure II.4.2 - National public funding by funding modes (1) and sector of performance, 2008 (2)



Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: OECD, based on preliminary data from the microdata project on public R&D funding of the Working Party of National Experts in Science and Technology (NESTI), 2009-2010.
Notes: (1) This is an experimental indicator. International comparability is currently limited.
(2) AT: 2009.

The development of trans-nationally coordinated (intergovernmental) public R&D activities and open public R&D programmes is growing

Public R&D funding in Europe is channelled through different funding modes at EU, inter-governmental, national and regional level. Although substantial between FP6 and FP7, the increase in the EU R&D budget is necessarily limited in comparison to what can be achieved with the *coordination and opening-up* of the national research programmes which remain the bulk of public research in EU-27. The development *of trans-nationally coordinated (intergovernmental) public R&D activities* and *open public R&D programmes* are therefore meant to be a key and growing element of the ERA in the future.

4.1.2. Trans-nationally coordinated (intergovernmental) research in Europe[73]

Together, the EU research Framework Programme (FP) and intergovernmental public funding represent about 11% of civil R&D expenditures financed by governments in Europe

In 2009, governments of EU Member States and EFTA countries contributed EUR 2.6 billion to intergovernmental research, a slight increase compared to 2008 (EUR 2.3 billion) and 2007 (EUR 2.4 billion) (Figure II.4.3)[74].

[73] In this chapter, 'intergovernmental' and 'trans-national' are used interchangeably and refer to coordination between countries.

In 2009, national public contributions to intergovernmental research were equal to 43 % of the amount of FP available that year (EUR 6.1 billion). In 2007 and 2008, they represented respectively 3.5 % and 3.2 % of all civil R&D expenditures financed by governments of EU Member States and EFTA countries. Although they underestimate the amount of national public funds for trans-nationally coordinated research (bi-lateral and multi-lateral research programmes are not included), these figures show that there is considerable room for increased cross-border programme collaboration and coordination.

Box II.4.1 — Intergovernmental research

Intergovernmental research includes:

(i) research performed in *intergovernmental research infrastructures* (CERN, EMBL, ESO, ESRF, ILL, see below); future research infrastructures of the ESFRI Roadmap (see below) will belong to this category;

(ii) European-level *intergovernmental research programmes and agencies* (ESA, EMBO, ESF, EUREKA), as well as a number of *FP instruments of coordination* (ERA-NET, ERA-NET+, JTIs, Art. 185); the latter were introduced in FP6 and FP7 and they already represented 20 % of national funding directed to intergovernmental research in 2008–2009 (see zoom-in in Figure II.4.3); the Joint Programming Initiatives (see below) belong to this category;

(iii) *bi- or multi-lateral programmes* between European countries. In Figure II.4.3, however, these programmes are not included[75].

Intergovernmental research funding is also coined *trans-nationally coordinated research* funding. It implies the *coordination of national funding* for research activities. It is distinct from EU Framework Programme funding which comes directly from the EU budget, is managed by the European Commission, and does not imply the coordination of national funding. This does not prevent part of the EU FP funding from being used to trigger the coordination of national funding (FP instruments of coordination: ERA-NET, ERA-NET+, JTIs, Art. 185).

In 2007 and 2008, EU FP funds represented respectively 7.4 % and 7.7 % of all civil R&D expenditures financed by governments of EU Member States and EFTA countries (Figure II.4.3 below). FP funds are not the sole EU funds allocated to R&D. A significant share of Structural Funds is used for RTDI[76] projects in Member State: about 14.4 %, i.e. EUR 50 billion over 2007–2013, an amount comparable with that of the FP (see Chapter 3 in Part I for an analysis of total EU funds for R&D). However, the use of Structural Funds for trans-national coordination appears to be extremely limited, and therefore is not included in Figure II.4.3. There is considerable room for more coordination of regional R&D funding as expressed by regions participating in the ERA-NET scheme[77] and Joint Programming Initiatives.

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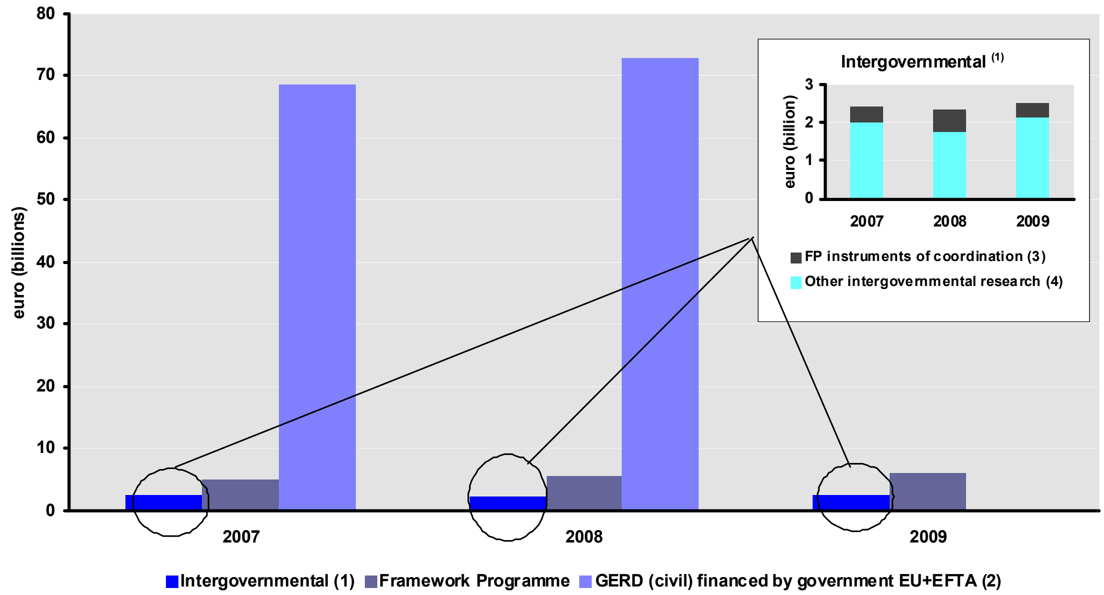
[74] For this 2010 report, figures provided by all intergovernmental programmes were checked with respect to 2008/2009 report, when they were used for the first time. Consistency was ensured by checking that:
- year of allocation was year of national budgetary commitment: this moved allocation of ERA-NET joint calls from scheduled to actual year, not altering the total;
- budget allocated was checked by independent sources for ERA-NET joint calls. (ftp://ftp.cordis.europa.eu/pub/fp7/docs/fp6-era-net-study-summary-web-version_en.pdf)
- Only budgets for R&D activities were included. This reduced by 75 % allocation of ESA funds from 2007 onwards. Most of what was mentioned in the 2008/2009 report (covering years until 2006) appearing to be industrialisation activities, not R&D.
- Only public research funding was counted. This reduced by 70 % allocation of Eureka funds from 2007 onwards. Most of what was mentioned in the 2008/2009 report (covering years until 2006) appeared to be private funding or industrialisation activities, not R&D. .

[75] These were estimated to account for less than 1 % of total national GBAORD in most countries by the first data collection of Eurostat (2010) on GBAORD to trans-nationally coordinated research.

[76] Research, Technology, Development and Innovation.

[77] ftp://ftp.cordis.europa.eu/pub/fp7/docs/fp6-era-net-study-summary-web-version_en.pdf.

Figure II.4.3 Public funding of R&D in Europe, 2007-2009



Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: DG Research and Innovation, Eurostat
Notes: (1) Intergovernmental includes the budget contributions from the EU Member States, EFTA countries, Israel, Candidate countries (Croatia, The former Yugoslav Republic of Macedonia, Turkey) to ERA-NET, ERA-NET+, JTIs (Artemis, ENIAC), Art 185 (EMRP, EUROSTARS, AAL, EDCTP), CERN, EMBL, EMBO, ESA, ESRF, ESO, ILL, ESF, COST and EUREKA.
(2) GERD (civil) financed by government was estimated by DG Research and Innovation.
(3) FP instruments of coordination: ERA-NET, ERA-NET+, JTIs, Art. 185.
(4) Other intergovernmental research: CERN, EMBL, EMBO, ESA, ESRF, ESO, ILL, ESF, COST and EUREKA.

Project-based funding is easier to coordinate trans-nationally than institutional funding

The comparison of FP funds and national funding of intergovernmental research with total civil R&D expenditures financed by governments is not entirely appropriate. National funding of civil research includes both institutional funding (of universities and other public research organisations) and competitive project-based funding (see Figure II.4.1), while the EU FP funding and intergovernmental research programmes are above all competitive project-based, the institutional part of the EU FP being limited to the budget dedicated to the Joint Research Centre. Institutional funding includes mainly salaries of researchers and other R&D personnel, capital expenditures and recurrent funding of laboratories. It constitutes over half (and up to 80 %) of total government funding of R&D in most European countries (see section 4.1.1), although the share of project-based funding has been increasing in most of them in recent years.

Compared to project-funding, only a small part of this institutional funding can easily be trans-nationally coordinated, i.e. mainly the national funding to large trans-national research infrastructures. Therefore a large share of (civil) R&D expenditure financed by government displayed in Figure II.4.3 cannot easily be subject to trans-national coordination. The project-based part of national funding can be more easily used for trans-national public R&D programmes. However, actions such as the European Metrology Research Programme (EMRP[78]) Art.185 initiative (which shared some EUR 60 million over 2008 and 2009), the

[78] http://www.emrponline.eu/.

European Research Infrastructure Consortia (ERIC) or the recently launched European Energy Research Alliances[79], suggest that such coordination of institutional funding is starting to follow the path pioneered by CERN in the 1950s.

When compared to project-based government funding alone, FP funds appear much more considerable: in certain Member States, the EU FP represents more than 20% of the project-based funding available[80]. In total, according to the first Europe-wide estimations, the EU FP represents some 20% to 25% of all project-based funding in Europe[81]. Therefore, if national governments ensure the basic recurrent funding of laboratories in terms of salaries and infrastructures, EU FP funds may be of significant importance for their actual functioning and the development of their research projects.

Joint Programming Initiatives are being launched to address major societal challenges through jointly programmed public research

A Joint Programming Initiative (JPI) is a partnership[82] between the Member States involved, facilitated by the support of the European Commission, and aimed at addressing major societal challenges through jointly programmed public research and related actions.

A pilot JPI on Neurodegenerative diseases (including Alzheimer's disease) was launched in December 2009. Three additional Joint Programming Initiatives have been launched in 2010: (1) Agriculture, Food Security and Climate Change, (2) Cultural Heritage and Global Change: a new challenge for Europe, (3) A Healthy Diet for a Healthy Life.

National funding to trans-nationally coordinated research is therefore expected to increase substantially in the coming years, probably more so than EU funding for research. The increase in EU funding for research, although important between FP6 and FP7, is necessarily limited in comparison to what can be achieved with the coordination (and opening up) of national research programmes which continue to provide the bulk of public research in EU-27 as shown in Figure II.4.3.

On average, about 4.5% of EU Member States' R&D budget was directed to 'trans-nationally coordinated research' in 2008

Figure II.4.4 below presents the experimental results of the first ever data collection[83] on 'national public funding to trans-nationally coordinated research', defined as the total of budget funded by the government (state, federal, provincial, as measured by GBAORD[84]) which is directed to the three categories of R&D performers and programmes spelled out above (Box II.4.1), namely:

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[79] http://www.eera-set.eu/.
[80] Lepori B., van den Besselaar P., Dinges M.,van der Meulen B., Poti B., Reale E., Slipersaeter S., Theves J., (2007), *Comparing the evolution of national research policies: what patterns of change?*, Science and Public Policy Vol. 34, No 6, pp. 372-388.) (see also http://www.enid-europe.org/funding/CEEC.html).
[81] European Commission's estimations.
[82] Joint Programming Initiatives are not an instrument.
[83] This data collection was conducted for the first time in 2010 by National Statistical Institutes under the guidance of Eurostat. As it is the first data collection of this kind, the figures have to be considered with the greatest caution and will be subject to revision in the coming years. Eighteen European countries (among them fifteen EU Member States) provided all the data on this indicator.
[84] Government Budget Appropriations or Outlays for R&D.

(i) trans-national public R&D performers[85] located in Europe;

(ii) Europe-wide trans-national public R&D programmes[86];

(iii) bi- or multi-lateral public R&D programmes established between Member States' governments[87].

While the first category often implies cross-border flows of funds (the trans-national R&D performer located in one country is located 'abroad' for all the other contributing countries), it is not the case of the second and third categories which may or may not imply cross-border flows of funds. In most trans-national R&D programmes, there is actually no cross-border flow of funds, and each country funds its own participants.

Figure II.4.4 does not include national contributions to the FP funding which comes from the overall national contributions to the total EC budget[88].

Trans-nationally coordinated research is not meant to be limited to European coordination only. Non-European countries participate in research activities performed in trans-national public R&D performers located in Europe. Multilateral public R&D programmes between European countries can (and often do) include non-European countries.

In 2008, for the 18 countries providing this data (except Belgium), the share of the total R&D budget (GBAORD) that was used to fund 'trans-nationally coordinated research' ranges from 1.03 % in Poland to 5.45 % in Germany (Figure II.4.4), with an EU aggregate of 4.49 %[89]. Belgium stands out as an exceptional case with 12.13 % of its R&D budget directed to trans-nationally coordinated research in 2008.

The share of countries' R&D budget directed to 'trans-nationally coordinated research' increased slightly in 2008 compared to 2007

The share of R&D budget directed to 'trans-nationally coordinated research' did not change much in most countries between 2007 and 2008, except in Cyprus (+56 %) and in Poland (-32 %). At EU aggregate level[90] it increased by 5.2 %, from 4.27 % in 2007 to 4.49 % in 2008. In nominal terms, national public funding to trans-nationally coordinated research increased in all countries except in Slovenia and Poland.

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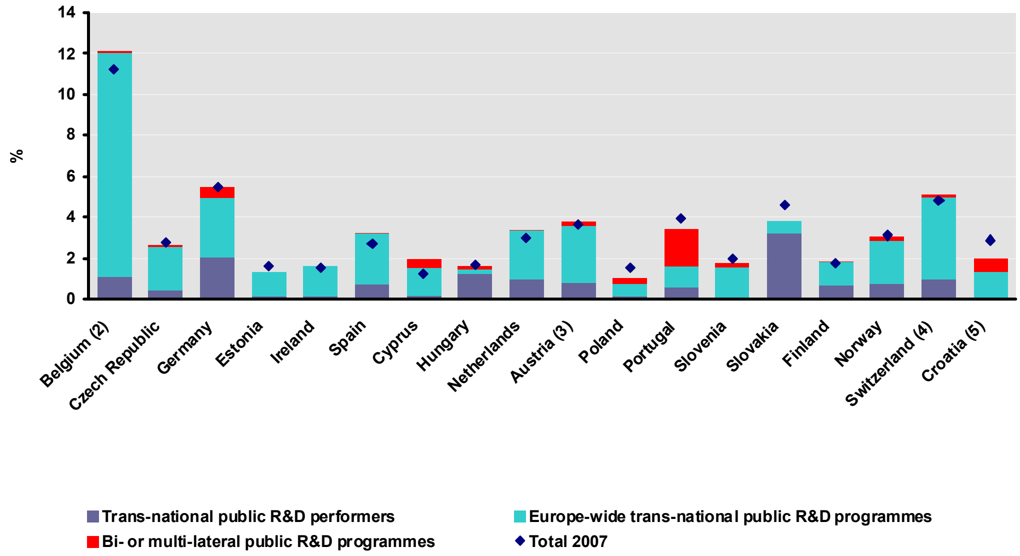
[85] 'Trans-national public R&D performers': CERN, EMBL, ESO, ESRF, ILL, JRC. See Methodological Annex.
[86] 'Europe-wide trans-national public R&D programmes': EUREKA, COST, ESA, ERA-NETs, ERA-NET+, EFDA, EUROCORES, Art 185 initiatives (Europe-Developing Countries Clinical Trials Platform, Eurostars and Ambient assisted living for the elderly), Joint Technology Initiatives (public funding part: ENIAC, ARTEMIS). See Methodological Annex.
[87] And with candidate countries and EFTA countries.
[88] See Part III, Chapter 2 for total EU funding for RTDI.
[89] This EU aggregate is based on the 15 Member States that provided all the data on this indicator for 2008.
[90] This EU aggregate is based on the 15 Member States that provided all the data on this indicator for 2007.

Figure II.4.4 National public funding of trans-nationally coordinated research by category (1), as a % of total national GBAORD, 2008



Source: DG Research and Innovation

Innovation Union Competitiveness Report 2011

Data: Eurostat

Notes: (1) Experimental data.
(2) BE: Data of some regional authorities in Belgium are probably not included.
(3) AT: federal or central government only.
(4) CH: 2007 value uses 2006 GBAORD as denominator.
(5) HR: 2007 value uses 2008 GBAORD as denominator.

FP instruments of coordination of national R&D programmes and other Europe-wide R&D programmes are a major driving force for trans-nationally coordinated research activities

In almost all countries that provided the data, the largest part (more than two thirds) of the national contributions to 'trans-nationally coordinated research' goes to the category 'Europe-wide trans-national public R&D programmes'. The dominant category in Hungary and Slovakia alone is the 'trans-national public R&D performers', and in Portugal, 'bi- or multilateral public R&D programmes'. In all countries except in Portugal, less than 1% of GBAORD is directed to 'bi- or multilateral public R&D programmes'.

Even if this first data collection underestimates the amount of national funding directed to the third category (bi- and multilateral R&D programmes), these observations show the great importance of Europe-wide programmes in steering the coordination of R&D programmes in European countries. The use of FP instruments of coordination in particular (participation in ERA-NETs, European Technology Platforms, Joint Technology Initiatives) and the coordination under the ESFRI Roadmap, are mentioned in all countries as major vehicles for implementing S&T and research coordination[91].

[91] *Monitoring progress towards the ERA*, European Commission, ERAWATCH Network, 2009. Available at: http://cordis.europa.eu/erawatch/index.cfm?fuseaction=reports.home.

4.2. Has there been progress in the development of pan-European research infrastructures?

Coordinated and joint R&D activities take place in existing large pan-European research infrastructures

Coordinated and joint R&D activities take place in a number of existing medium- to large-scale research infrastructures (RIs) in Europe, i.e. medium- or large-scale, single-sited, distributed or virtual facilities or joint resources that provide unique access and services to research communities in both academic and technological domains. These facilities typically have investment, operating or maintenance costs that are relatively high in relation to research costs in their particular field. RIs play a central role in the advancement of knowledge and have a structuring effect in their respective scientific fields. Each of them is by nature a focal point of intensive trans-national research cooperation, for both its construction and its regular operation. RIs allow the performance of major trans-national frontier research projects with the most advanced equipment and instruments. RIs therefore play a central role in the trans-national coordination of research activities.

Large pan-European research infrastructures foster international cooperation in science and achieve world-class scientific and technological excellence in interdisciplinary fields

EIROforum is a partnership of European Intergovernmental Research Organisations (EIROs). The EIROforum partners design, construct, operate and exploit large RIs on behalf of the user communities of their member countries and beyond, covering disciplines ranging from particle physics, space science and biology, to fusion research, astronomy, and neutron and photon sciences. The EIROforum currently comprises:

- CERN European Organisation for Nuclear Research
- EFDA-JET European Fusion Development Agreement-Joint European Torus
- EMBL European Molecular Biology Laboratory
- ESA European Space Agency
- ESO European Organisation for Astronomical Research in the
- Southern Hemisphere (European Southern Observatory)
- ESRF European Synchrotron Radiation Facility
- XFEL European X-Ray Free-Electron Laser Facility
- ILL Institut Laue-Langevin.

EIROforum RIs operate in a competitive global environment, attracting users from all over the world to the very best scientific and technological resources. They are centres of excellence for the development of some of the world's most advanced technologies, and interact with European industry. They therefore play a crucial role in the innovation process, whilst enabling Europe's researchers to maintain scientific leadership in their fields. National contributions from European countries[92] to EIROforum organisations amounted to about EUR 1.6 billion in 2009[93].

Europe's intergovernmental research infrastructures:

[92] EU-27 Member States, EFTA countries, Israel, Candidate Countries (Croatia, The former Yugoslav Republic of Macedonia, Turkey).
[93] Not including national contributions to XFEL which has joined EIROforum only recently.

- conduct and support world-leading research;
- pool resources to enable large-scale research endeavours;
- provide unique services and facilities to the scientific community;
- promote scientific expertise by training and investing in Europe's scientists;
- foster collaboration and networking with national and international partners;
- showcase European scientific excellence and competitiveness.

European countries are jointly deciding and funding the construction and major upgrade of 51 pan-European research infrastructures in all main scientific fields for an estimated total construction cost of about EUR 22 billion.

In October 2006, the European Strategy Forum on Research Infrastructures (ESFRI)[94] published the first ever European 'roadmap' for building new and upgraded pan-European research infrastructures. This roadmap provides an overview of the needs for research infrastructures of pan-European interest for the next 10 to 20 years. After its revision in 2008, it contained a description of 44 large-scale, world-class research infrastructures in 7 scientific domains. Participating countries pull funds together to cover the often large construction costs; they will also share the future annual operational costs. Six additional research infrastructures projects have been added to the ESFRI roadmap in 2010: three in the field of energy and three in the field of life sciences.

Table II.4.1[95] gives an overview of the main characteristics of the 10 research infrastructures which are already in their implementation phase.

[94] In 2002, the European Strategy Forum on Research Infrastructures (ESFRI) was established with the objective of agreeing on the common planning of new large-scale research infrastructures at European level.
[95] In this table, figures and dates are only indicative.

Table II.4.1 ESFRI projects in the implementation phase

	Projects (in alphabetical order per domain)	Full name or Short description	Estimated construction cost (million euro)(2)	Indicative operational cost per year (million euro)(2)
Social Sciences and Humanities	CESSDA	Facility to provide and facilitate access of reseachers to high quality data for social sciences	30	3
	ESS	Upgrade of the European Social survey, set up in 2001 to monitor long term changes in social values	2	2
	SHARE	Data Infrastructure for empiric economic and social science analysis of ongoing changes due to population ageing	23	13
Energy	JHR	High flux reactor for fission reactors material testing	750	35
Material Sciences	ESRF Upgrade	Upgrade of the European Synchroton Radiation Facility	238	83
	European XFEL	Hard X-Ray Free Electron Laser	1082	84
	ILL 20/20 Upgrade	Upgrade of the European Neutron Spectroscopy Facility	171	5
Astronomy, Astrophysics, Nuclear and Particle Physics	FAIR	Facility for Antioproton and Ion Research	1027	118
	SPIRAL2	Facility for the production and study of rare isotope radioactive beams	196	10-12
Computer and Data Treatment	PRACE	Partnership for Advanced Computing in Europe	200-400	50-100

Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: ESFRI Strategy report on research infrastructures, Roadmap 2010
Note: (1) Estimated construction cost and Indicative operational cost as known in February, 2011.

Table II.4.2 below gives a synthetic view of the 38 European research infrastructures on the ESFRI Roadmap update 2010. In addition to its contribution to the preparatory phases of these research infrastructures, the EU is funding part of the preparatory phases of three research infrastructures of the European Strategy for Particle Physics, as approved by the CERN Council:

- ILC-HiGrade – Preparatory phase for the International Linear Collider,
- SLHC – Preparatory phase for the Large Hadron Collider Upgrade,
- TIARA – Test infrastructure and accelerator research area

The estimated total construction cost of these 51[96] European research infrastructures is EUR 22 billion to be shared between participating countries.

[96] Ten under implementation, thirty-eight in the ESFRI Roadmap, three of the European Strategy for Particle Physics.

Table II.4.2 Research Infrastructure projects [1] listed in the ESFRI Roadmap 2010

	Projects	Construction costs (euro (millions))	Operation costs (euro (millions) per year)	First possible operations or upgrade	Description
Social Sciences and Humanities	CLARIN	104	7.6	2011	Research infrastructure to make language resources and technology available and useful to scholars of all disciplines.
	DARIAH	20	2.4	2016	Digital infrastructure to study source materials in cultural heritage institutions.
Environmental Sciences	COPAL (ex EUFAR)	50-60	3	to be defined	Long range aircraft for tropospheric research.
	EISCAT_3D Upgrade	60 (up to 250)	4-10	2016	Upgrade of the EISCAT facility for ionospheric and space weather research.
	EMSO	160	32	2014	Multidisciplinary Seafloor Observatory.
	EPOS	500	80	2020	Infrastructure for the study of tectonics and Earth surface dynamics.
	EURO-ARGO	3 [3]	8.4	2011	Ocean observing buoy system.
	IAGOS	15	5-10	2012	Climate change observation from commercial aircraft.
	ICOS	130	36	2013	Integrated carbon observation system.
	LIFEWATCH	255	35.5	2012	Infrastructure for research on the protection, management and sustainable use of biodiversity.
	SIOS	50	10	2013	Upgrade of the Svalbard Integrated Arctic Earth Observing System.
Energy	ECCSEL	81	6.3	2015	European Carbon Dioxide and Storage Laboratory infrastructure.
	EU-SOLARIS [2]	80	3	2015	The EUropean SOLAR research InfraStructure for Concentrating Solar Power.
	HiPER	under discussion		2028	High power long pulse laser for fast ignition fusion.
	IFMIF	1000	150	2020	International Fusion Materials Irradiation Facility.
	MYRRHA [2]	960	46.4	2020	Multipurpose hYbrid Research Reactor for High-technology Applications.
	Windscanner [2]	45-60	4	2013	The European Windscanner Facility.
Biological and Medical Sciences	ANAEE [2]	210	12	2015	Infrastructure for Analysis and Experimentation on Ecosystems.
	BBMRI	170	3	2012	Bio-banking and biomolecular resources research infrastructure.
	EATRIS	20-100	3-8	2016	European advanced translational research infrastructure in medicine.
	ECRIN	0 [4]	3,5	2011	Pan-European infrastructure for clinical trials and biotherapy.
	ELIXIR	470	100	2012	Upgrade of the European Life-science infrastructure for biological information.
	EMBRC	100	60	2014	European marine biological resource centre.
	Erinha	174	24	to be defined	Upgrade of the High Security Laboratories for the study of level 4 pathogens.
	EU-OPENSCREEN	40	~40	2015	European Infrastructure of Open Screening Platforms for chemical biology.
	EuroBioImaging	600	160	2013	Research infrastructure for imaging technologies in biological and biomedical sciences.
	Infrafrontier	180	80	2011	European infrastructure for phenotyping and archiving of model mammalian genomes.
	INSTRUCT	300	25	2012	Integrated Structural Biology Infrastructure.
	ISBE [2]	300	100	2017	Infrastructure for Systems Biology – Europe.
	MIRRI [2]	190	10,5	ongoing	Microbial Resource Research Infrastructure.
Materials and Analytical Facilities	EMFL	115	8 [5]	2014	European Magnetic Field Laboratory.
	ESS	1478	110	2019-2020	European Spallation Source.
	EUROFEL (ex-IRUV-FEL)	1200-1600	120-160	2007-2020	Complementary Free Electron Lasers in the Infrared to soft X-ray range.
Physical Sciences and Engineering	CTA	150	10	2019	Cherenkov Telescope Array for Gamma-ray astronomy.
	E-ELT	1000	30	2018	European Extremely Large Telescope for optical astronomy.
	ELI	~700 [6]	~70	2015	Extreme Light Intensity short pulse laser.
	KM3NeT	220	4-6	2016	Kilometre Cube Neutrino Telescope.
	SKA (GLOBAL)	1500	100-150	2017	Square Kilometre Array for radio-astronomy.

Source: DG Research and Innovation

Innovation Union Competitiveness Report 2011

Data: DG Research and Innovation

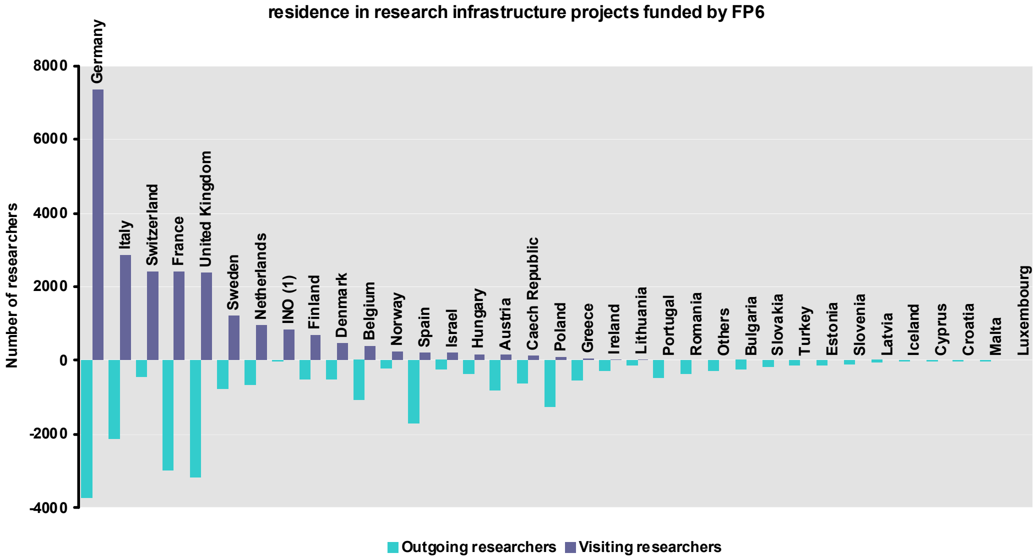
Notes: (1) Projects with a green background are facilities likely to be implemented before the end of 2012.
(2) New facility added in 2010.
(3) Preparation costs.
(4) Actual construction costs absorbed by the update and certification of national IT components.
(5) Additional to current operation costs.
(6) Includes costs of three Regional Partner Facilities.

Ongoing FP activities give more than 6 500 researchers each year direct access to existing research infrastructure not located in their own countries.

FP6 and FP7 projects allow trans-national access to research infrastructures in Europe, i.e. access of a researcher to a research infrastructure that is not located in his/her country of residence. The funding support covers the travel costs of the researcher from the country of his/her host institution to the country hosting the research infrastructure, as well as the user fees of the research infrastructures, i.e. the scientific, technical and logistic supports that are related to the use of the research infrastructures.

Germany is by far the first country of destination for the use of research infrastructures under FP6[128] (7 334 incoming researchers, almost one third of the total number of visiting researchers in all countries, purple bar in Figure II.4.5). Italy comes second, followed by Switzerland, which has been hosting more incoming researchers than France and the United Kingdom, despite its small size relative to these two countries. Together, these five countries have been hosting three quarters of the visiting researchers under FP6. This shows that these countries host most of the research infrastructures of pan-European interest.

Figure II.4.5 Visiting researchers by operator country versus outgoing researchers by country of residence in research infrastructure projects funded by FP6



Source: DG Research and Innovation
Data: DG Research and Innovation, Eurostat
Note: (1) INO: International organizations and research infrastructures not based in a single country.

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The researchers benefiting from this FP trans-national access to research infrastructures are based on a permanent basis in all Member States (blue bars in Figure I.4.5). Researchers based in Germany, the United Kingdom and France are the most numerous in benefiting from this trans-national access, in accord with the size of the researcher population of these countries. Germany, Italy, Switzerland, Sweden, the Netherlands, Finland and Norway are net receivers of researchers through this FP6 scheme: more researchers are coming to these countries to use their research facilities than leaving them to use research facilities located in other countries. All other countries are net providers of researchers.

[128] Data relating to the trans-national access funded under FP7 are not yet available.

In absolute terms, the circulation of researchers is highly concentrated in flows between France, Germany, Italy, the United Kingdom and Switzerland

Table II.4.3 shows that flows of researchers converge on Germany, Italy and Switzerland for the use of research infrastructures. Most of these researchers come from France, Germany, Italy and the United Kingdom, indicating that, in absolute terms, the circulation of researchers within these four countries and Switzerland accounts for much of the trans-national use of research infrastructures in Europe.

This is of course linked to a large extent to the size of these countries, apart from Switzerland, whose equipment in research infrastructures of pan-European interest is exceptional given the size of the country. If we normalise the figures with the total number of national researchers, it appears that Central and Eastern European countries and other smaller countries benefit most from trans-national access to research infrastructures. Even in absolute terms, the flows from Poland, Belgium and Spain to Germany are among the ten highest flows of FP research infrastructure users.

Table II.4.3 The ten biggest tans-national flows of research infrastructure (RI) users in FP6

ORIGIN	DESTINATION	Number of RI users
Country of home institution	RI operator country	
Germany	Switzerland	1265
United Kingdom	Germany	977
France	Germany	905
Italy	Germany	846
Germany	Italy	684
Poland	Germany	671
France	Italy	671
France	Switzerland	654
Belgium	Germany	620
Spain	Germany	542

Source: DG Research and Innovation
Data: DG Research and Innovation

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4.3. Are the EU Framework Programme and Structural Funds contributing to the building of a European Research Area?

In this section the role of Framework Programme and Structural Funds in building a European Research Area is looked at from the perspective of funding and integration (universities' participation and cooperation, collaborative links between countries, access to research infrastructures and international cooperation)[129].

[129] The role of the EC Framework Programme on researcher mobility in Part II, Chapter 5.

4.3.1. Size and focus of the European Commission funding instruments for research and innovation

In 2008–2009, national funding directed to FP instruments of coordination (ERA-NET, ERA-NET+, JTIs, Art. 185) represented 20 % of national funding directed to intergovernmental research

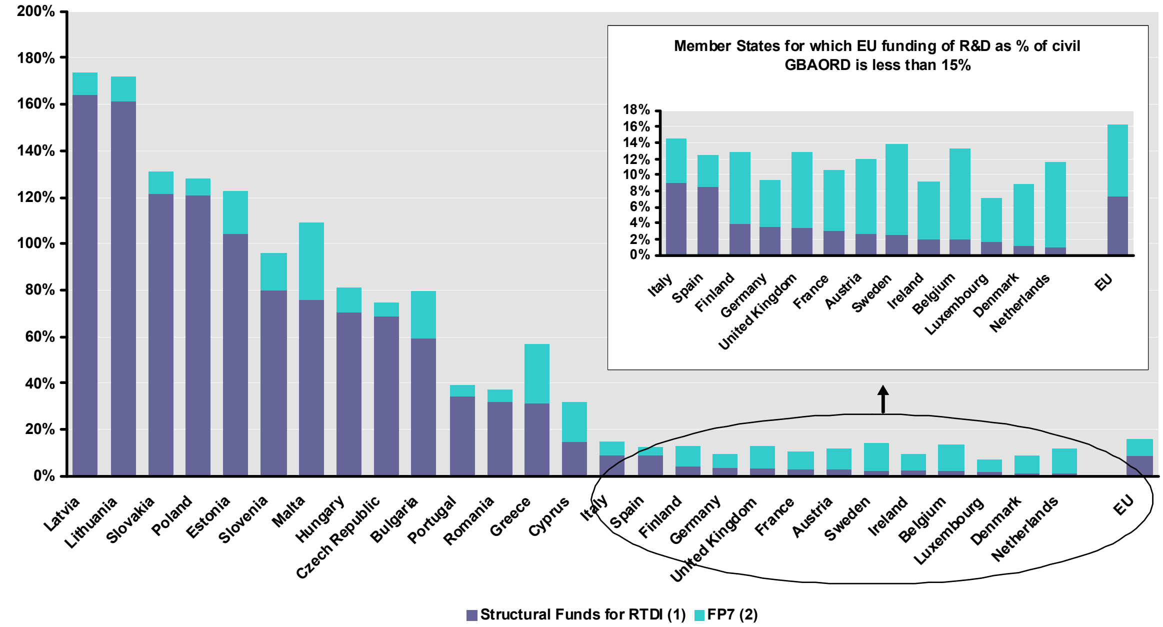
The first FP instruments of coordination of national funds for R&D were created with FP6. Figure II.4.3 shows that in a short number of years, these instruments have become an important vector of coordination of national public funding of R&D, since they account for about one fifth of intergovernmental public R&D funding.

EU funding of R&D reaches 16 % of total national civil R&D budgets in EU-27

EU funding of R&D has considerably increased over the last 25 years (see Chapter 3 in Part I). In 2007–2013, Structural Funds are a major source of funds for R&D in EU-12 Member States where they often represent more than 100 % of their own national civil R&D budgets, up to 165 % in Latvia (Figure II.4.6).[130] In EU-15 Member States (except Italy and Spain), the Framework Programme remains the first source of funds for R&D from the European Commission. Together with Structural Funds, they represent around 8 %–10 % of their national civil R&D budgets.

[130] In these countries, although "abroad" is an important source of funds for R&D, it may not appear as large as these Structural Funds figure would indicate. This is due to three main reasons. First, all Member States do not record EU Structural Funds for RTDI in the "abroad" source of funds. For better data comparability across Member States, Eurostat recently instructed Member States to do so in the future. In practice, in some cases, this may turn out to be difficult as R&D performers may not be able to identify the ultimate source of funds when they receive the funds from the government. Second, the RTDI category in Structural Funds taxonomy is broader than R&D: it covers many innovation activities which are not covered in official data on R&D expenditure by source of funds. Third, these figures concern Structural Funds earmarked for RTDI at the beginning of the period 2007-2013 (annual average). The amount of Structural Funds for RTDI actually spent in 2007-2008 (2008 is the latest year for which we have data on the "abroad" source of funds) in these countries may be much smaller than this.

Figure II.4.6 EU funding of R&D as % of civil GBAORD, 2007-2009 (annual average)



Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: DG Research and Innovation, DG REGIO
Notes: (1) Initial allocation of 2007-2013 Structural Funds to RTDI activities, annual average.
(2) Received FP7 funding up to 2009, annual average.

Box II.4.2 — Re-allocation of Structural Funds to R&D in Slovenia

In 2010, Slovenia is proceeding to the transfer of EUR 88.7 million in favour of R&D within the Operational Programme for Strengthening Regional Development Potentials 2007–2013 (OP SRDP within the EU structural funds). Of these EUR 88.7 million for the period 2011–15, EUR 19.9 million are planned to be used in 2011 and the rest in the following years until the close of the actual financial perspective. This increase will trigger, in the five-year period, an additional EUR 35.5 million for R&D from enterprises (40% of co-funding according to state aid rules). Another increase of EUR 5.3 million is planned in the 2011 government budget for the development of human resources from the Operational Programme for the Development of Human Resources 2007–2013. In total therefore, this re-allocation of structural funds gives an increase of EUR 25.2 million (or 0.07% of GDP) in the 2011 government R&D budget.

The most intensive use of Structural Funds for RTDI and enterprise environment occurs in less research intensive regions of old Member States

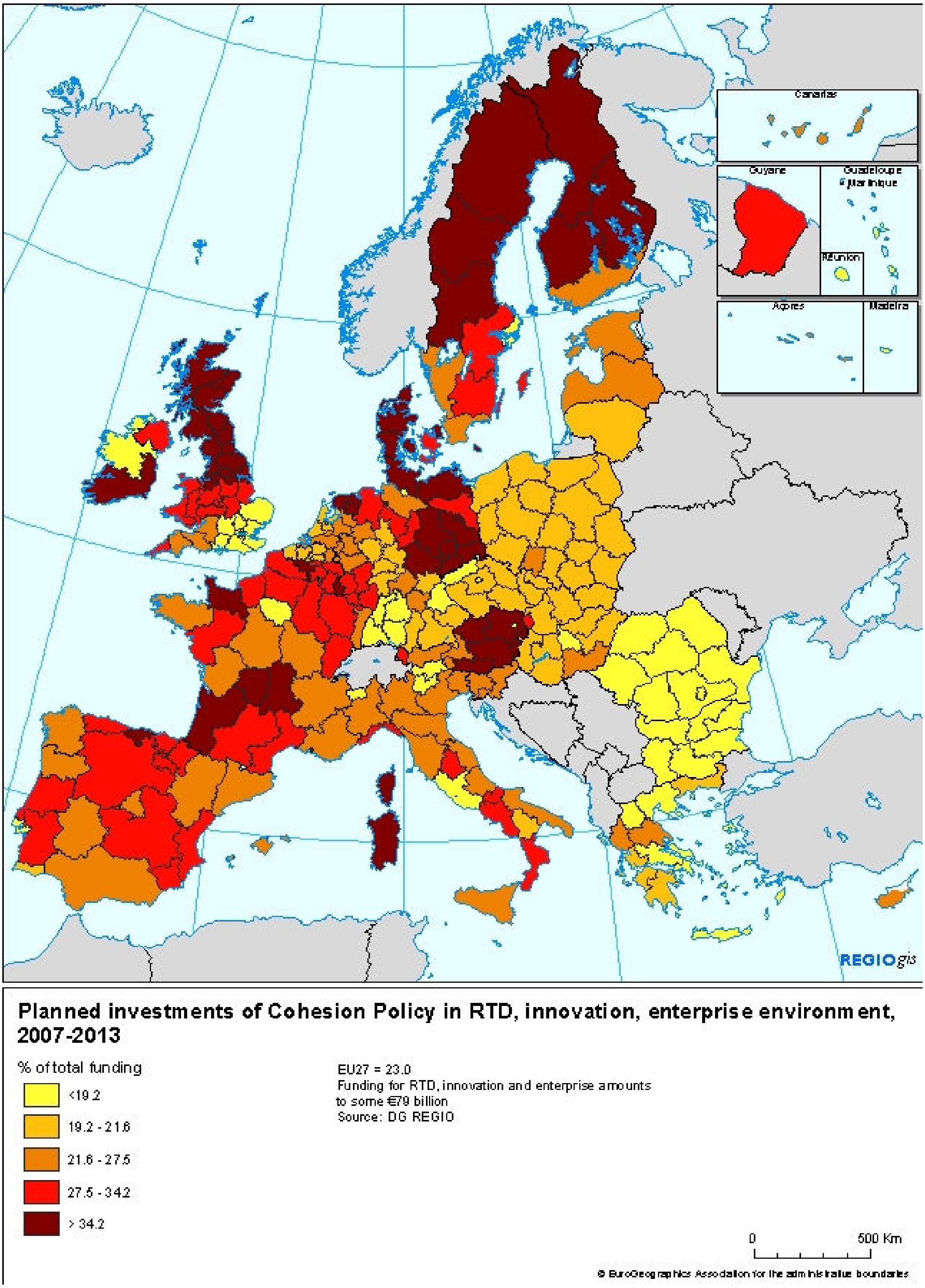
Relative to the size of the national R&D budget (GBAORD), the amount of Structural Funds for RTDI in EU-12 Member States is considerable (Figure II.4.6 above). In several of them, Structural Funds for RTDI are doubling, in some cases (Latvia and Lithuania) almost tripling, the national budget for R&D. Structural Funds therefore appear as a determining funding instrument for research and innovation capacity building in these countries.

These considerable amounts of RTDI Structural Funds with respect to the national R&D budgets of these countries represent only 20% or less of the total Structural Funds they receive (Figure II.4.7 below[131]).

In EU-15 Member States, a higher share of Structural Funds can be devoted to RTDI and enterprise environment (Figure II.4.7 below). Interestingly in these countries, although there are some exceptions, regions that are less research-intensive have higher shares of Structural Funds devoted to RTDI and enterprise environment. In contrast, research intensive regions use in general less than 20% of their Structural Funds for RTDI and enterprise environment. As far as the Western part is concerned therefore, the map below is to some extent the negative image of the regional research intensity map in Figure I.1.8.in Part I, Chapter 1. This highlights the important role of Structural Funds in developing further the research and innovation capacity of less research intensive regions.

[131] In Figure II.4.7, the map includes Structural Funds for RTDI *and* for enterprise environment, i.e. about EUR 79 billion. For the whole EU as indicated in the legend of the map. Structural Funds for RTDI only represent EUR 48.5 billion for the whole EU.

Figure II.4.7: Regional structural funds: Planned investments in research and innovation

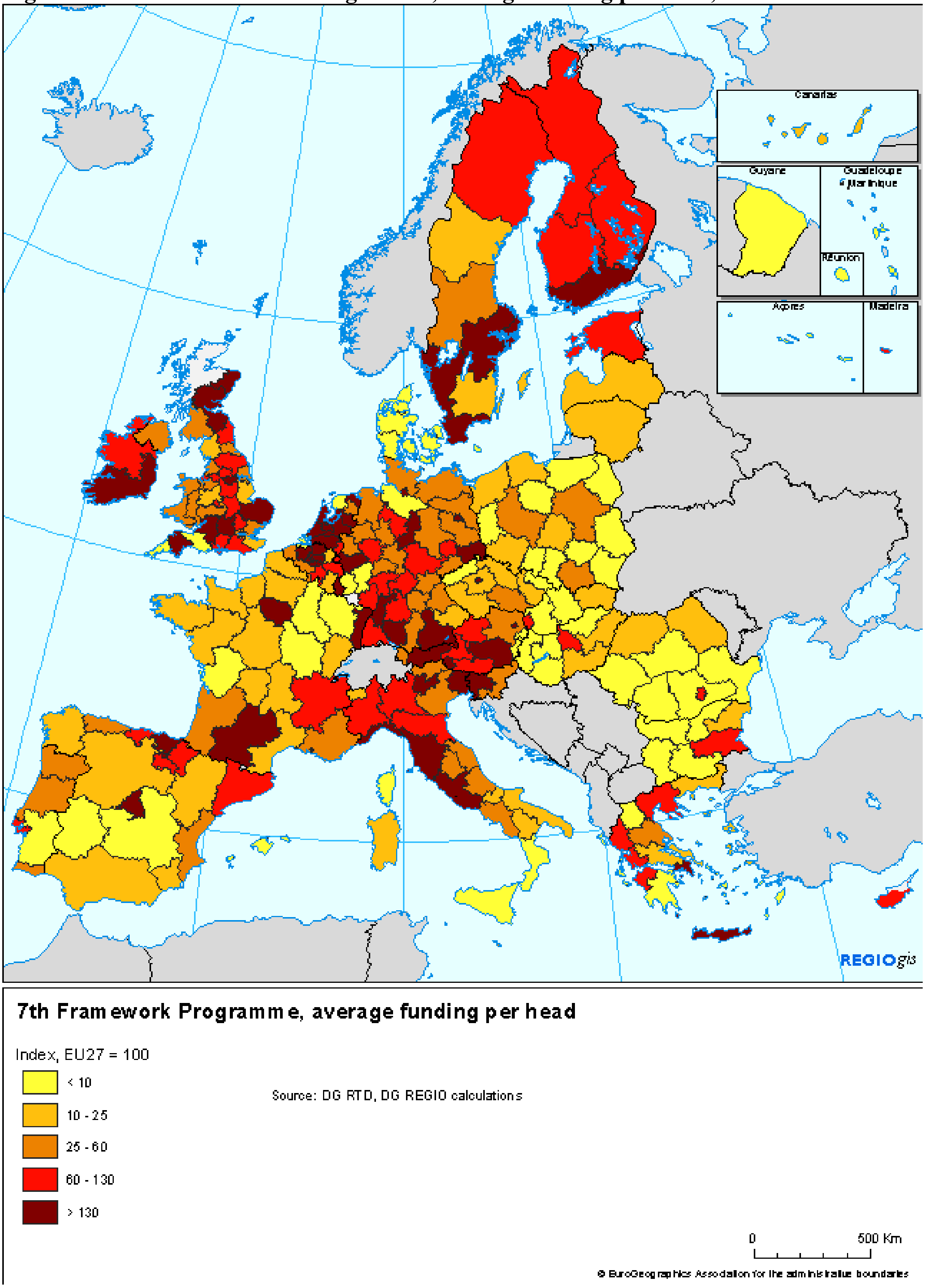


4.3.2. European integration through the European Commission funding instruments

The average FP funding per head in regions is well correlated with the regional R&D intensity

Comparing Figure II.4.8 below with Figure I.5.3. in Part I, Chapter 5 (representing regional business R&D intensity, which is highly correlated with regional total R&D intensity) shows that overall the regions which receive on average more FP7 funding per capita are regions with high R&D intensity. The same observation can be done with FP6 funds whose regional map looks very similar (not shown). This is to be expected as regions with more R&D resources and a larger R&D capacity necessarily have many more opportunities and actors to apply for funds from R&D programmes, including the FP. In addition, it is likely that the success rate of applicants will be higher in high R&D intensity regions, although this cannot be concluded from this map. Altogether this observation shows that larger volumes of FP funds go to regions with larger volumes of R&D activities.

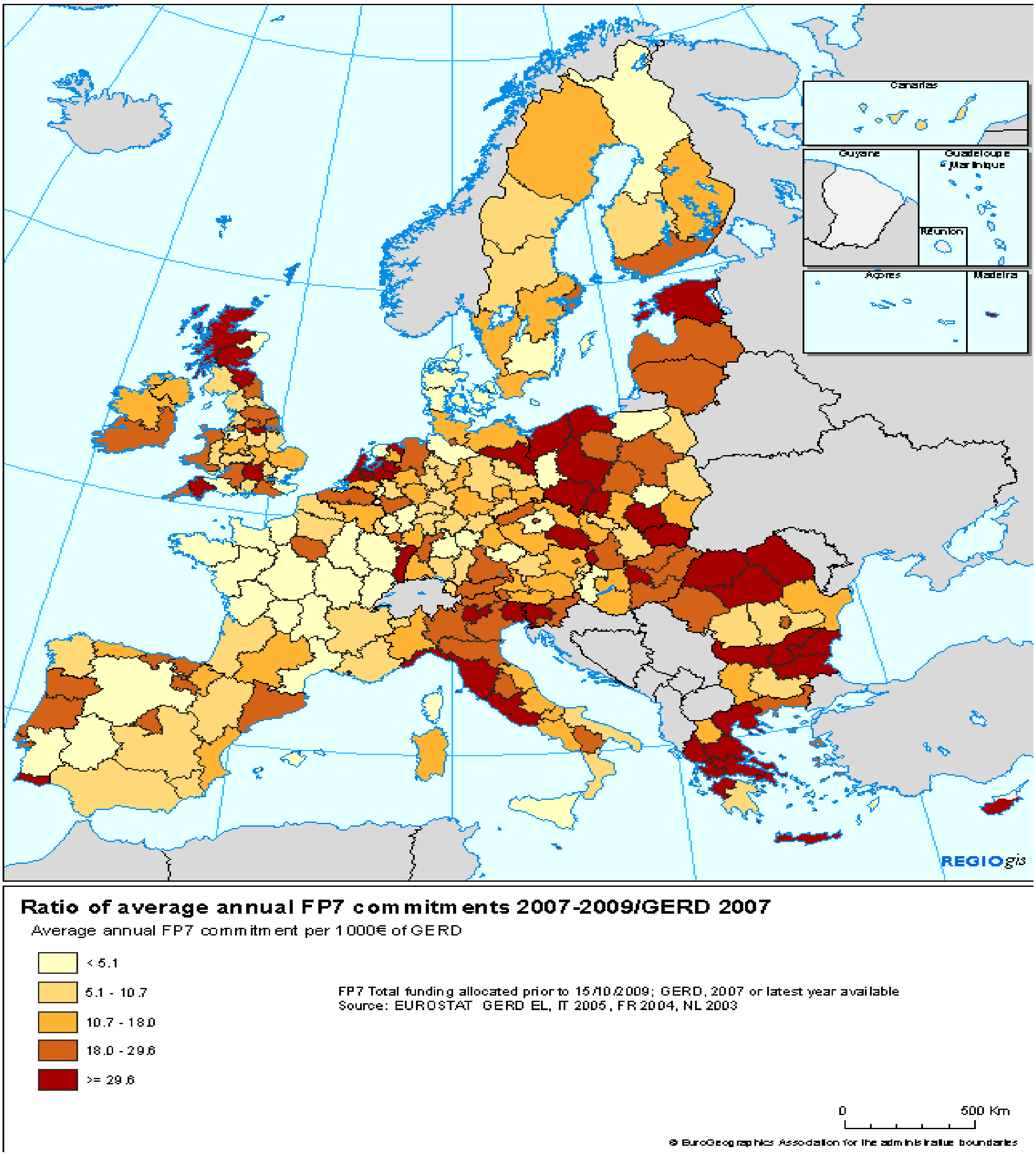
Figure II.4.8. 7th Framework Programme, average funding per head, 2007-2009



Relative to their R&D expenditure level, 'Convergence Objective' regions benefit more from FP7 funding than regions with higher R&D intensity

The ratio between average annual FP7 funding in 2007-2009 received and total annual R&D expenditure (2007) is often higher in regions of Bulgaria, Greece, Romania, Poland and the Baltic States (Figure II.4.9). This shows that these regions can benefit from FP7 funding to a relatively satisfactory level given their level of R&D expenditure. In relative terms, FP7 funding is therefore more important in those regions than in more research intensive regions.

Figure II.4.9. Ratio of average annual FPR commitments 2007-2009 per 1000 GERD 2007



The scale of participation in the FP relative to the size of the country is larger in smaller countries

Figure II.4.10 shows the number of participations in FP6 and FP7 per thousand researchers for each country.[132] This gives an indication of the propensity and ability of research institutions from a given country to utilise the European funding instruments.

Unsurprisingly, the propensity to participate in FP6 and FP7 is highest in the smaller countries[133], although not in all of them. Lower shares of the German, French and UK

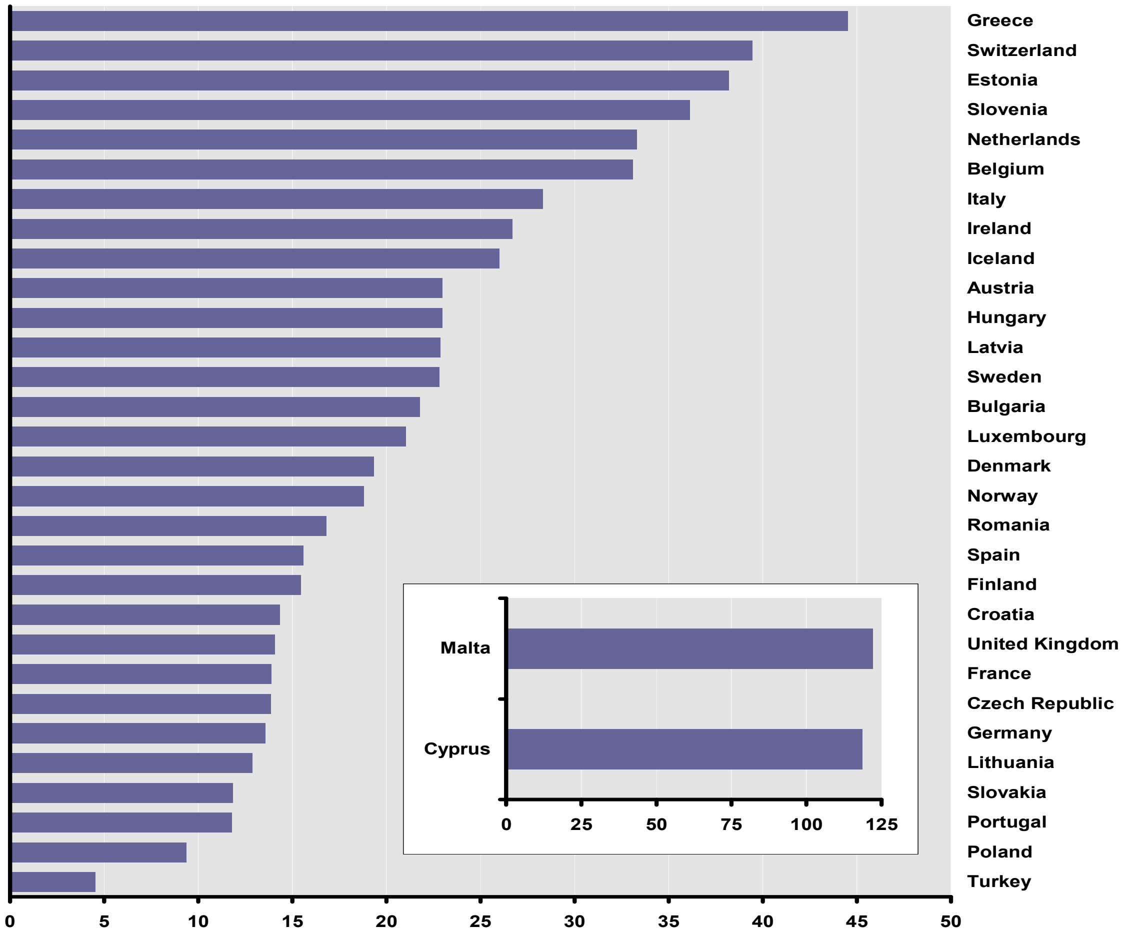
[132] The whole is multiplied by one thousand. It is to be noted that only the FP7 figures cover only 2007–09, with very few contracts signed in the first year of FP7 (2007), while the FP6 figures cover the whole of FP6, hence the higher values of FP6 figures.

research systems participate in the FP, while Greece, Switzerland, Estonia, Slovenia, the Netherlands and Belgium show a high participation of their research institutions when normalised by the population of its researchers. This implies that a larger part of the population of researchers in these countries is involved in FP-funded projects. FP funding plays therefore a bigger role in these countries. This is also reflected in the fact that received FP funding represents a higher share of the national civil GBAORD in these countries (Figure II.4.6 above).

If the size of the country is an important determinant of the number of FP participations per researcher, it is not the sole factor explaining the differences observed across countries. There are important differences among small countries of similar size as well, which can be explained by several factors, in particular the amount of national public funding available, the degree of internationalisation of the research system and the quality (success rate) of the proposals of the country's research institutions.

[133] Given the very small number of researchers in Malta and Cyprus, the number of participations in FP from these countries represents a very large share of the total number of researchers in each of these two countries.

FIGURE II.4.10 Number of participations (1) in FP7 (2) per thousand researchers (FTE)



Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: DG Research and Innovation
Notes: (1) A participating institution or firm is counted as many times as it is funded in different projects.
(2) FP7 covers only the years 2007-2009.

As a consequence of their higher number of participations per domestic researcher, small countries also have a higher number of FP collaborative links[134] per domestic researcher with other countries (see Figure II.4.13).

FP6 networks are characterised by a core–periphery structure dominated by a small number of close-knit organisations

The European Commission launched a project conducted between 2007 and 2009[135] to study the impact of EU funding on research and technological development networks in Europe. More specifically, one of the objectives was to conduct in-depth quantitative and qualitative network analyses of the RTD collaborations resulting from EU FP6 funded projects in five

[134] In an FP project, for a given participant, there are as many collaborative links as there are other participants in the project.
[135] 'Structuring Effects of Community Research — The Impact of the Framework Programme on Research and Technological Development (RTD) on Network Formation (NetPact)', Final Report, April 2009.

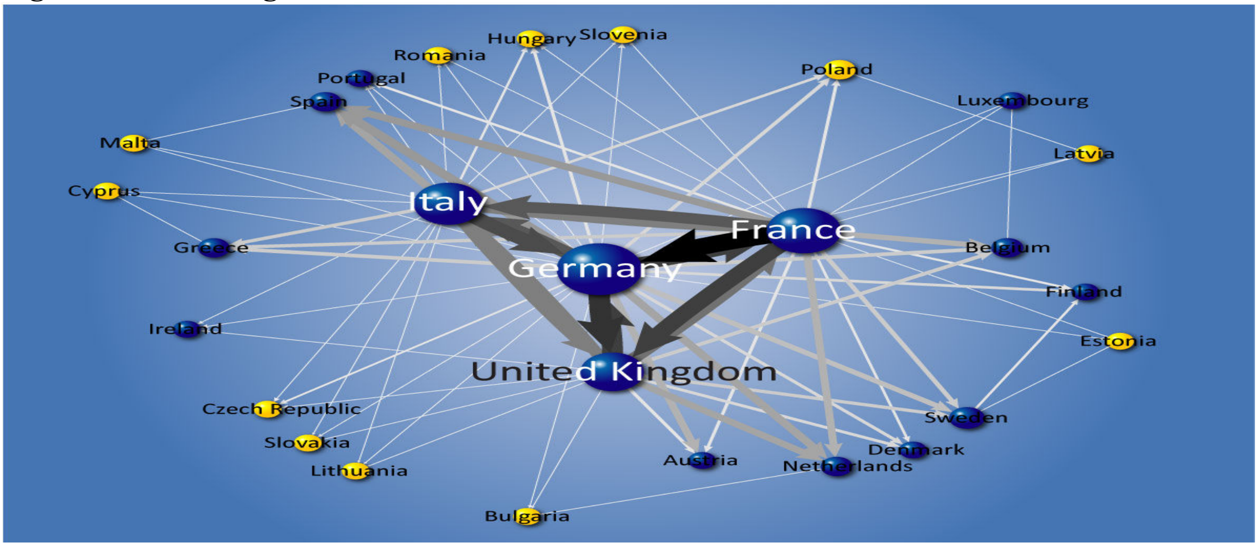
identified fields, with a focus on investigating the relationships between structural network characteristics and performance.

The FP6 networks are highly connected to one another through several projects, while the remaining organisations are on the network periphery and are only connected to the core and not connected to one another. The central actors which coordinate the projects are primarily large national research associations (e.g., Fraunhofer Gesellschaft, CNRS, INSERM) and universities in all thematic areas, except in Information Society Technologies (IST) where industry also plays central roles.

In absolute numbers, scientific cooperation mainly takes place between four larger member states, with stronger integration of Spain, Sweden, Belgium and the Netherlands

One of the major outcomes of the study was that the FP6 marked the beginning of long-term collaborations in which partners continued to collaborate in projects. In addition, improved reputation creates attraction, i.e. high impact organisations and researchers within their field attract highly skilled researchers from around the world, clearly increasing the competitiveness of the EU through both skills as well as connections to other areas of the world through these researchers' networks. Both the study on FP6 and an analysis made by the Commission services on FP7 data (see map below) show that the integration of EU-12 Member States is still weak. Poland, Hungary and to a lesser extent the Czech Republic are the most integrated countries in the European cooperation. In absolute terms, cooperation still takes place mainly between the EU-15 Member States, with the big four countries — Germany, France, Italy and the United Kingdom — playing the role of central links, while Germany takes a strong gatekeeper position. However, comparison of this networking analysis with those of Webometrics or co-publications, indicates that countries in Eastern and Southern Europe are closer integrated through the cooperation funded by the EU FP.[136]

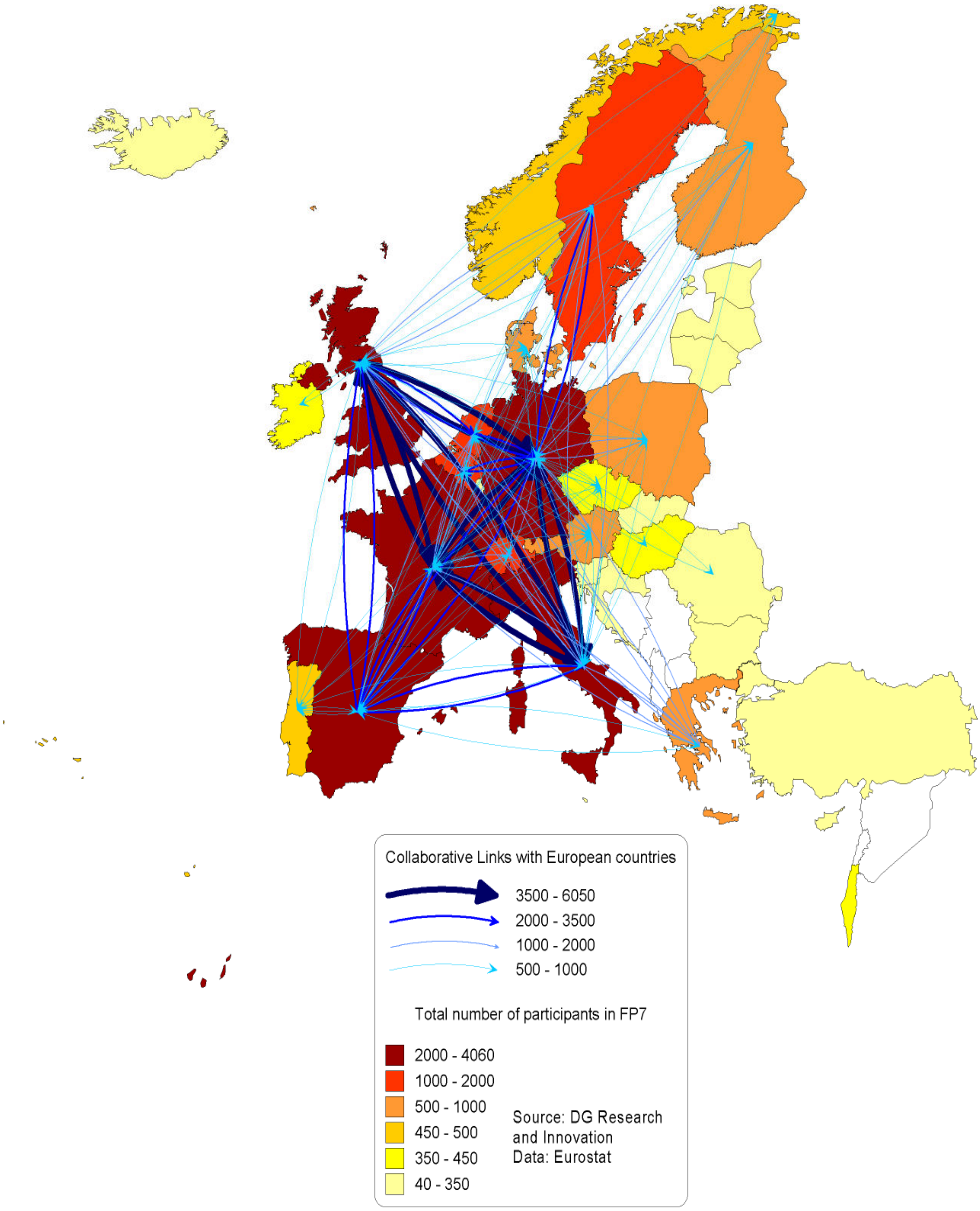
Figure II.4.11: Integration of EU Member States in FP6 research networks



Source: DG Research and Innovation
Data: NetPact final report, 2009

[136] See also data and analysis on European scientific cooperation in Part II, chapter 6.2 in this report. Additional information on structural network features of FP1-FP6 are in the forthcoming JRC scientific and technical report. Heller, B., Barber,M., Henriques,L., Paier, M., Pontikakis, D., Scherngell, T., Veltri, G.and Weber, M.: "Analysis of networks in European Framework Programmes (1984-2006), February 2011, Seville.

Figure II.4.12: FP7 collaborative links between European countries



Note: A collaborative link between two countries is counted each time participants from two countries are participating in a FP7 collaborative project.

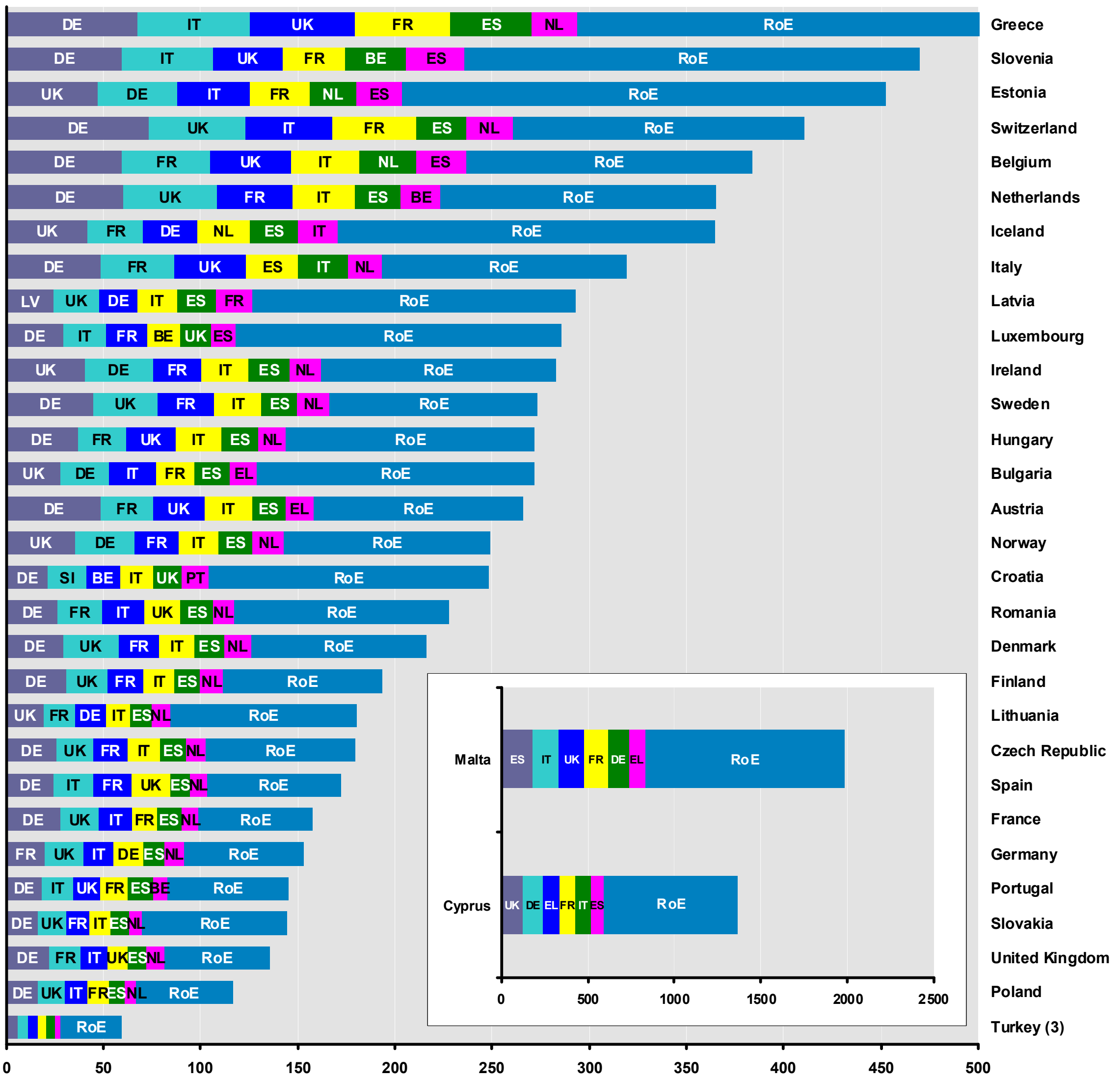
Researchers in smaller European countries, including new Member States, have a higher integration propensity in the scientific cooperation funded by the Framework Programme

As a consequence of their higher number of participations per domestic researcher, small countries also have a higher number of FP collaborative links[137] per domestic researcher with other countries (Figure II.4.13). Figure II.4.13 also shows that for most countries the first partner country in FP7 projects is Germany followed by the United Kingdom and France, then by Italy, Spain and the Netherlands. In all cases, these six partner countries together represent more than half of the collaborative links a country has in FP7 projects[138]. This order of partner countries in FP7 is to a large extent a reflection of the size of the research systems of these countries. However, for several countries, one observes a different order of partner countries which reflects particular geographical, cultural and/or linguistic ties between certain countries (e.g. Croatia–Slovenia, Luxembourg–Belgium, Slovenia–Italy).

Finally, it is interesting to see that due to the cross-border nature of collaboration in FP7, the number of *domestic* FP7 collaborative links ranks first for no country, except Latvia. Domestic partners are among the first six partners in FP7 only in the case of Germany, France, the United Kingdom, Italy and Spain — once again a reflection of the size of these countries.

[137] In an FP project, for a given participant, there are as many collaborative links as there are other participants in the project.
[138] On Figure X, RoE stands for 'Rest of Europe'.

Figure II.4.13 FP7 (1) collaborative links with European countries per 1000 researchers (FTE) (2)



Source: DG Research and Innovation
Data: DG Research and Innovation, Eurostat
Notes: (1) Signed grant agreements as of 15 October, 2009.
(2) Researchers refer to 2008 with the exceptions of CH: 2004; EL, FR: 2007.
(3) TR: IT, DE, UK, FR, ES, EL (from left to right).

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Knowledge flows through the FP enhance skills and technological knowledge relevant for SMEs

Results of impact assessment reports[139] have demonstrated that SMEs were the largest community of participants in both FP5 (35.9%) and FP6 (37.8%), and that the most visible effects of their involvement in the projects is an increase in S&T knowledge and R&D capability, besides the previously discussed aspects of intensification of networking and international collaboration. Economic and commercial benefits are less tangible but, on the

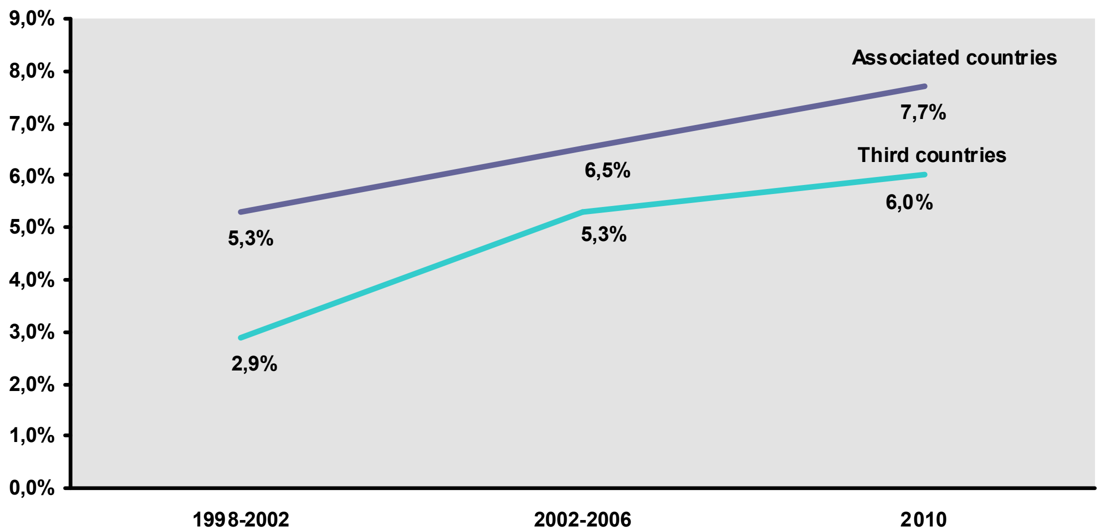
[139] Impact Assessment of SME-specific measures of the Fifth and Sixth Framework Programmes for Research on their SME target groups and Impact Assessment of the participation of SMEs in the Thematic Programmes of the Fifth and Sixth Framework Programmes for Research (DG RTD 2010).

other hand, an upgrade in in-house skills is noticeable. From the perspective of SMEs, the FPs are perceived as good opportunities to incorporate knowledge and improve skills' capabilities but not as an instrument to innovate. Nevertheless, their contribution to the research projects they are involved in is considered complementary, with specific and unique assets and technical know-how. Considering the typology profile of the SMEs participating in the FPs, two different groups can be defined: the Technology Developers, which are SMEs that enter the FP projects with the purpose of developing a specific technology, and Technology Networkers, who consist of SMEs that use FP projects to fulfil secondary strategic objectives and extend their networks. When it comes to the R&D intensity of the SMEs participating in the thematic programmes of the FPs, the picture is broader: approximately half of the SMEs spend less than 10% of their turnover on R&D while the other half is more R&D intensive. Among this second group, 25% represent high R&D intensity, spending more than 30% of the annual turnover on R&D.

4.3.3. Opening up of the EC Framework Programme to international cooperation

The international dimension in FP7 has been growing in volume and focus in relation to previous FPs. Third countries' participations in FP7 represent 6% of all participations, compared to 2.9% and 5.3% in FP5 and FP6, while Associated Countries increased their participation from 5.3% in FP5 to 7.7% in FP7 (Figure II.4.14).

Figure II.4.14 Associated and Third country participations as % of total participations in EU Framework Programmes, 1998-2010



Source: DG Research and Innovation
Data: DG Research and Innovation

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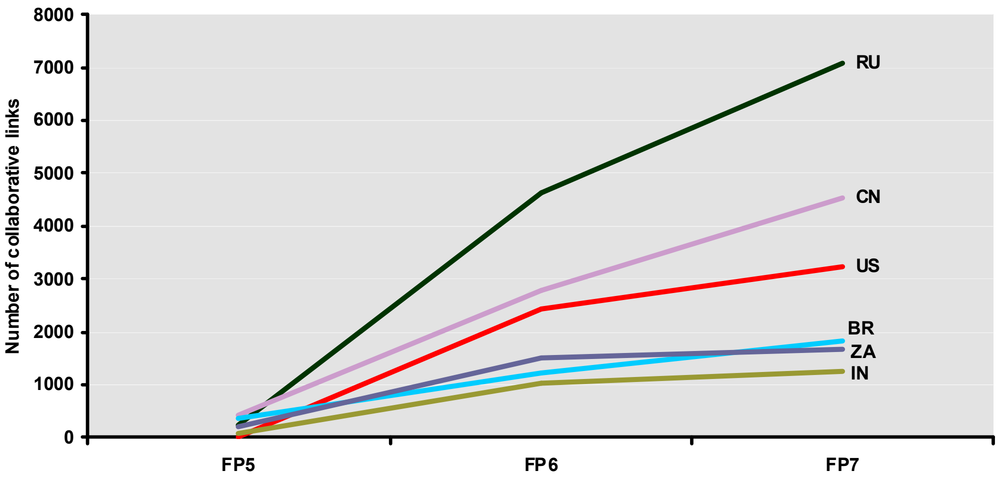
The main cooperation links with countries outside Europe are made with Russia and China, followed by the United States

As illustrated in Figure II.4.15 below, the EU framework programme offers cooperation with several partners outside Europe. It is noticeable that it is Russia and China which have the highest number of participants in FP projects, followed by the United States. The evolution from FP5 to FP7 illustrates a large relative increase in the number of participants from the most research-intensive emerging and industrialised countries.

Figure II.4.15 Number of collaborative links (1) between research teams from major third countries particpating in FP activities and EU research teams

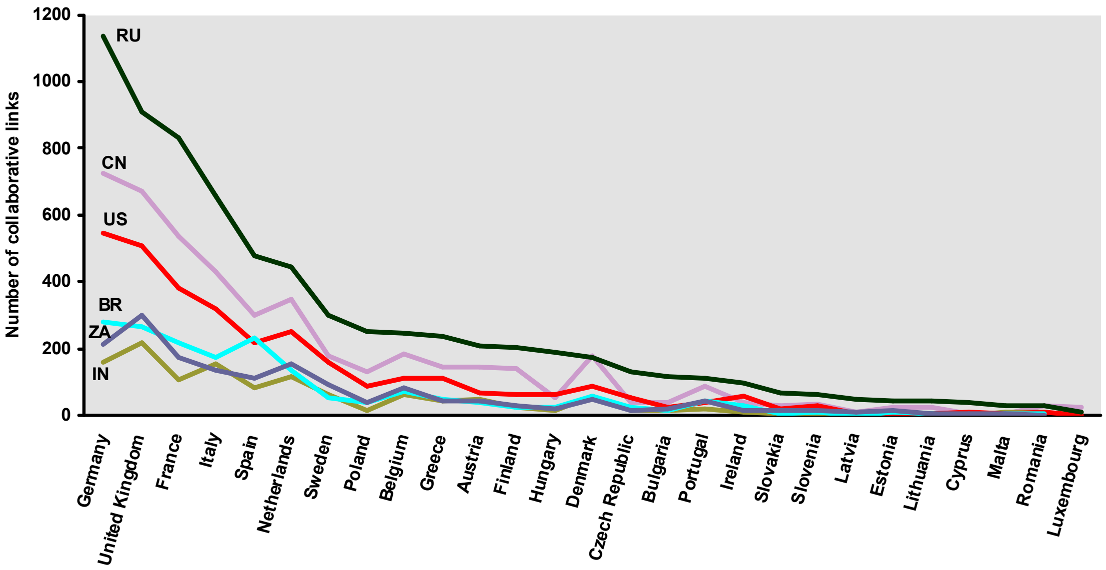


Source: DG Research and Innovation — Innovation Union Competitiveness Report 2011
Data: DG Research and Innovation
Note: (1) Every time two countries participate in the same FP project an FP collaborative link is established between the two countries.

Note: (1) Every time two countries participate in the same FP project, an FP collaborative link between the two countries is given.

In FP7, in absolute terms, the largest EU member states also have the largest number of collaborative links with countries outside Europe — Russia, China and the United States (Figure II.4.16). The Netherlands, Spain, Denmark and Belgium also have relatively high collaboration with China through the FP7.

Figure II.4.16 Number of FP7 collaborative links (1) between EU Member States and BRIC (2) countries, the United States and South Africa



Source: DG Research and Innovation
Data: DG Research and Innovation
Notes: (1) Every time two countries participate in the same FP project an FP collaborative link is established between the two countries.
(2) BRICs: Brazil, Russia, India, China.

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4.4. Are national research programmes opening up to non-resident research teams?

Broadly speaking, the opening-up of a national R&D programme **refers to the possibility for non-resident** (or foreign-based)[140] **research performers to participate in domestic R&D programmes, be they funded or not by these programmes. The rationale for opening up national R&D programmes is the necessity to reach higher degrees of excellence in domestic research activities and complement domestic expertise with other complementary expertise from abroad. Directing national funds to the best research performers, be they located within or outside the national borders, is meant to guarantee a more efficient use of public research funds. It also extends the competition space, hence raises the competition level, which ultimately raises the quality of research in Europe.**

The modalities and conditions for participation of non-resident research performers in national R&D programmes vary across countries and across different types of programme within a country

[140] Non-resident research performers are research performers located outside the country preparing and funding the R&D programme. The criteria here is the location of the research performer (domestic or not), not its nationality or country of ownership. That is why the term ‘non-resident’ or ‘foreign-based’ is preferred to the term ‘foreign’ alone: from the point of view of programme openness, the participation of a foreign research performer located in the country preparing and funding the R&D programme (e.g. an affiliate of a foreign-owned company, foreign researcher in the country) is in most cases not different from a participation of a national research performer.

These modalities can range from mere acceptance of non-resident partners in research projects, without any explicit selection criterion nor funding associated, to the establishment of compulsory participation of foreign research performers and the allocation of a substantial share of the funds to the latter.

There are several degrees of openness which are determined as eligibility rules for participations of the programmes[141]. One can usefully distinguish between six broad categories of openness of R&D programmes:

(1) *not open*: programmes that do not allow non-residents to participate;

(2) *open for sub-contractors*: programmes that allow funding for non-resident research performers as sub-contractors to a national partner;

(3) *open without funding*: programmes that allow participation of non-resident research performers as partners or leaders without funding;

(4) *open for national priorities*: programmes that allow funding for non-resident research performers when their activity is proved to strengthen national research;

(5) *open with budget ceiling*: programmes where non-resident research performers are eligible for funding as a partners but below a financial ceiling;

(6) *fully open*: programmes where non-resident research performers are eligible for funding as a partner and with no financial ceiling.

There is currently no robust estimation of the share of open programmes among national R&D programmes in Europe

To capture quantitatively the level of openness of national public R&D programmes in countries, it is useful to distinguish between: i) the number of programmes in the above categories among all R&D national public R&D programmes; ii) the share of national funding directed to these programmes; iii) the actual use of this funding by non-resident researcher performers. None of these three quantities has been so far properly estimated[142].

A recent review of R&D programmes in seven European countries[143] found that linking national research programmes to EU priorities under the FP, or planning large infrastructures according to EU directions, and using EU-level instruments such as ERA-NETs, are various ways to encourage international collaboration in R&D. The prevailing national approaches to ERA are to use EU-level instruments (for trans-national coordination of research activities) rather than opening up national funding sources to foreign-based research actors.

The most common situation across the seven countries reviewed is that of R&D programmes which are increasingly open to non-resident participants, but with funding restricted to actors

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[141] See *Science, Technology and Competitiveness Key Figures Report 2008/2009*, European Commission, p 159, available at http://ec.europa.eu/research/era/publication_en.cfm and *Monitoring progress towards the ERA*, European Commission, ERAWATCH Network, 2009. Available at: http://cordis.europa.eu/erawatch/index.cfm?fuseaction=reports.home.

[142] Work is being undertaken by the European Commission to provide first robust measures on the openness of national R&D programmes in Europe, based on ERAWATCH's Inventory of Research and Innovation Policy and on the ongoing project *Joint and Open REsearch Programmes* (JOREP).

[143] *Monitoring progress towards the ERA*, European Commission, ERAWATCH Network, 2009, available at: http://cordis.europa.eu/erawatch/index.cfm?fuseaction=reports.home.

based in the country. The principle 'each agency funds those residing in the country' is the most widespread rule.

Whatever its degree, international openness is in general not limited to European countries (there are some exceptions). The rationale for favouring openness is to enhance research quality, therefore there is no reason to limit the list of eligible countries to European ones.

Box II.4.3: A 2009 survey of European research funding bodies

The Danish Business Research Academy surveyed research funders in European countries on their international orientation and trans-national coordination and published the results in 2009. The survey was conducted among 71 research funding bodies in 27 European countries, with a total yearly budget of approximately EUR 20 billion. A total of 33 research funding bodies, representing 48 % of the total funds of the 71 research funders contacted, took part in the survey. According to the survey:
- 90 % of the respondents participate in bilateral research agreements with funding bodies in other countries;
- 87 % participate in multi-lateral initiatives with the EU;
- 60 % provide grants for non-resident research participants;
- 64 % devote 0 or less than 5 % of their budget to non-resident participants[144];
- 23 % wish to increase funding for non-residents;
- 37 % do not or cannot fund non-resident participants[145];
- 39 % cannot participate in common pots[146];

Almost all respondents 'somewhat' or 'strongly' agree that trans-national research coordination allows for joint policy responses to common challenges such as climate change, exploitation of complementary research strengths, increased mobility of researchers and sharing of knowledge and best practices in research funding. The conclusion of the survey is that, although European research funders show some degree of trans-national orientation, there is a significant proportion of research funders whose funds are not, or only limitedly, used for trans-national research projects, contributions to common pots and non-resident research participants. Therefore there is scope for augmenting the amount of funds in national funding bodies which is used to support trans-national research, i.e. (i) trans-nationally coordinated research programmes with cross-border flows of funds and (ii) national research programmes open to non-residents.

[144] 17 % do not know, hence 19 % devote more than 5 % of their budget to non-residents research participants.
[145] 13 % do not know.
[146] 10 % do not know, hence 51 % can participate in common pots.