



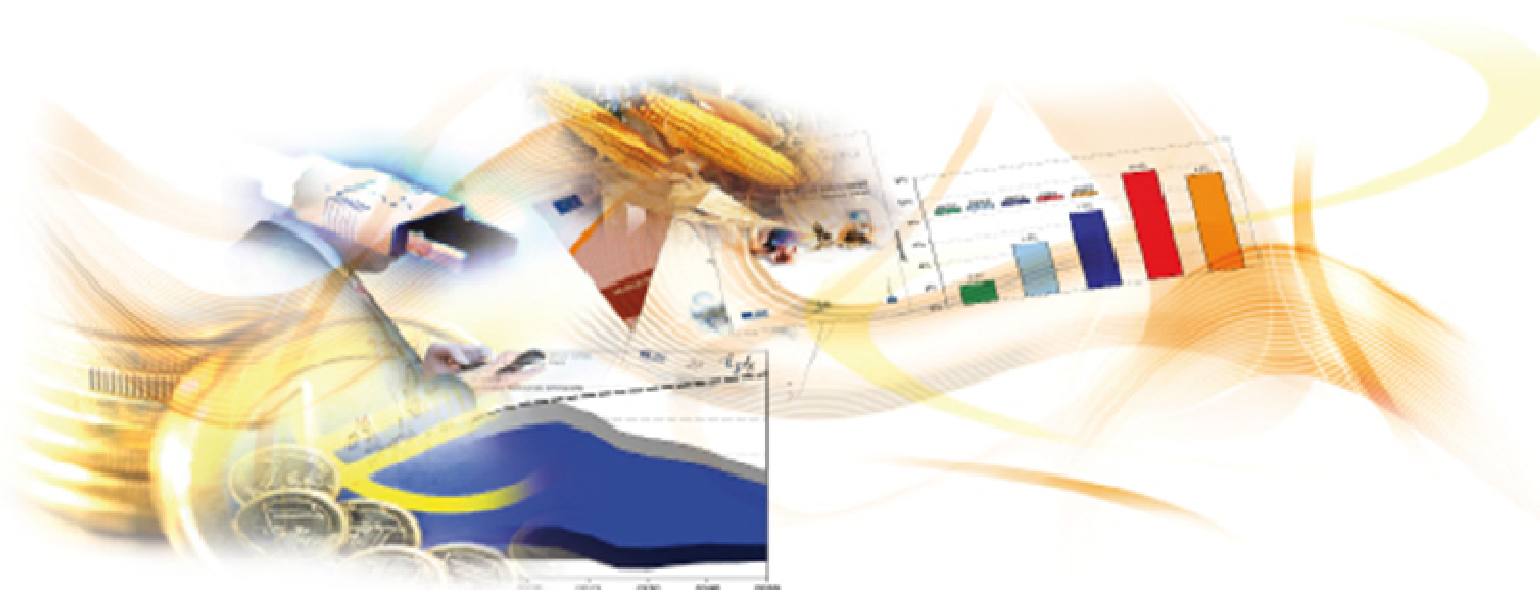
JRC SCIENCE AND POLICY REPORT

Measuring progress in transnational coordination of research programming in Europe

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Abstract

Cooperation in the EU between Member States and with Associated Countries on national public research programming has received a lot of attention in recent years, and will continue to do so under Europe 2020. This NETWATCH Policy Brief looks at the current policy context and rationales for transnational coordination of research programming, and aims to measure progress made so far in doing so. It looks both at coordination of public national research budgets and at cooperation between nations under the framework programmes, Horizon 2020 and Cohesion policy.

Measuring progress in transnational coordination of research programming in Europe

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■ Summary

Cooperation within Europe, among EU Member States and also with Countries Associated to the Framework Programmes, on national public research programming has received much attention in recent years, and continues to do so under Horizon 2020. This NETWATCH Policy Brief looks at the current policy context and rationales for transnational coordination of research programming, and aims to measure progress made so far in doing so. It looks at coordination of public national research budgets and at cooperation between nations under both the seventh framework programme and Cohesion Policy.

Keywords: transnational research programming, alignment, indicators, European Research Area, partnering instruments, Horizon 2020, Cohesion Policy.

■ 1. The role of programme cooperation in addressing societal challenges

1.1 *The European policy context for research addressing societal challenges*

The current policy context for programme cooperation largely depends on a number of decisions taken at European level and within Member States. These include the Europe 2020 strategy, the positions of the European Commission and the Council on the state and the future of the European Research Area, and the directions taken by Cohesion Policy.

Europe 2020

The Europe 2020 strategy (European Commission, 2010) assigns two key roles to research in Europe: solving societal challenges¹ and increasing competitiveness. As the European research landscape is still highly fragmented, coordination efforts continue to be made in order to create critical mass, identify gaps and avoid unnecessary duplication. These engage stakeholders from both the public and the private sectors in identifying and responding to societal challenges in transparent processes, which take into account the global dimension. In addition, Europe 2020 points at two other aspects relevant to this priority: the need to ‘reform national (and

¹ The need for European research to focus on the Grand Challenges of our time and moving beyond current rigid thematic approaches is also recognised by the 2009 Declaration of The Lund Conference, subscribed to by 350 researchers, funders, business representatives and politicians at the Swedish Presidency’s New Worlds New Solutions conference in July 2009 and acknowledged by the Council ftp://ftp.cordis.europa.eu/pub/sweden/presidency/docs/lund-declaration_en.pdf

regional) R&D and innovation systems to foster excellence and smart specialisation’.

The European Research Area

According to the Commission Communication on ‘A Reinforced European Research Area Partnership for Excellence and Growth’ (European Commission, 2012), the optimisation of transnational (and international) programme cooperation has a threefold objective, at member state level, at stakeholders level and at EC level:

- Member states are invited to step up efforts to implement joint research agendas addressing grand challenges (including information sharing, strategic alignment of national funding at European level and common *ex post* evaluation), ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions, and removal of legal and other barriers to the cross-border interoperability of national programmes (including cooperation with non-EU countries where relevant).
- Stakeholder organisations are encouraged to agree on common funding principles, to further develop and deploy the Lead-Agency, Money-Follows-Cooperation Line, Money-Follows-Researcher and other models for cross-border cooperation and to pilot the use of synchronised calls with, where possible, single joint international

peer review evaluation of proposals as a basis for funding decision.

- Meanwhile, EC is engaged to pursue, stimulate and participate in Public-Public Partnerships to address grand challenges as set out in the Communication on Partnering in Research and innovation to leverage Member States' contributions and ensure close coordination with relevant activities under Horizon 2020, map activities in agreed priority areas, with a view to identifying strengths, weaknesses, gaps and duplications.

In essence, optimal transnational cooperation and competition relate not only to research programme coordination and research infrastructure cooperation, as described in the ERA Communication 2012, but also to other types of cooperation, both in research and in innovation. Examples include institutional cooperation and the creation of joint institutes (such as CERN²) or cooperation between innovation clusters and aligning cluster policies (e.g. Europe Innova focusing on joint policy learning with regard to innovation clusters), thus widening the priority area not only to include research but also innovation. Complementing the ERA Communication of the Commission, the Council of the European Union (2012) follows this line by stressing the 'need to enable transnational research *and innovation* by fostering and exploiting synergies between national programmes with *international* programmes'. Taking into account these aspects this priority can be understood in a broad sense as 'optimal transnational and international R&D cooperation and competition'. Transnational cooperation then refers to cooperation between EU MS, while international cooperation refers to cooperation with non-

EU countries (both Associated States and Third Countries).

Based on the need to address Grand Challenges, the 2012 ERA Communication urges Member States to act coherently to achieve the scale of effort and impact needed to address these grand challenges with the limited public research funds available. Synergies and reinforced interoperability between national research systems in terms of strategic agenda, research infrastructures but also processes are the backbone for "Optimal transnational co-operation and competition". A target scale of effort has not been set, but the Communication suggests clearly that the currently scale is not sufficient for achieving impact.

Cohesion Policy: Smart Specialisation as an ex-ante conditionality for ERDF funds

Following the Communication from the Commission on 'Regional Policy contributing to smart growth in Europe 2020' (European Commission, 2010a) Smart Specialisation (S3) has been introduced as a framework for research and innovation strategies. This, in synergy with other instruments, such as Horizon 2020, is designed to pull Europe out of its current economic problems. One of the actions pursued includes fostering interregional cooperation to promote research and innovation. This is an essential feature of the Smart Specialisation concept and complements prior cooperation initiatives (e.g. FP7 Regions of Knowledge, CIP cluster initiatives, INTERREG IVC, etc.) and is gaining importance under the new ERDF programme, where a larger part of the structural funds will be spent on research and innovation and cooperation with other regions in and outside Europe.

² European Organization for Nuclear Research

1.2 Setting Research and innovation priorities

In aiming to address grand challenges through research and innovation, two key questions arise: who decides on the priorities that should receive public funding? And which priorities get most funding? Obviously, both questions are connected as priorities in public R&D are normally set by those who spend the budget. As public R&D budgets in Europe are largely dispersed, the setting of priorities is also largely fragmented. When policies aim to include more societal challenges in priority setting, it is important to have a good understanding of this fragmentation. Figure 1 below shows the different levels at which societal challenges are (sometimes partially) being

used to set public priorities in research and innovation. Figure 1 gives an overview of societal challenges targeted at European, national and regional levels. The sum of all these priorities could be considered as the priorities for the EU as a whole, as set out in the far right hand column of Figure 1.

In practice, priorities for Europe may however differ from this list of summarised priorities for a number of reasons, including:

- Granularity: the summary does not take into account all the details of each priority at each level
- Weighting: the final resulting challenges depend on the relative weight (the budget allocated to it) for each priority at each level.

Figure 1. Research priorities targeting societal challenges at different levels, and estimation of resulting priority societal challenges for the EU as a whole

Research priorities targeting societal challenges at different levels							Resulting challenges for the EU as a whole
Europe 2020 (3)	European			National	Regional		
2020 (3)	Horizon 2020 (7)	KICs (3+6)	EIPs (3+2)	JPIs (10)	National strategies	Regional strategies	
Inclusive growth	Health, demographic change and wellbeing	Innovation for healthy living and active ageing ICT Labs	Active & healthy ageing	Neurodegenerative Diseases A Healthy Diet for a Healthy Life More Years, Better Lives Antimicrobial Resistance			Health & well-being
Sustainable growth	Food security, sustainable agriculture, marine and maritime research, and the bio-economy	Food4Future	Agricultural sustainability & productivity Water	Agriculture, Food Security & CC Water Challenges for a Changing World Healthy and Productive Seas and Oceans			Food, agriculture, water
Sustainable growth	Secure, clean and efficient energy	Inno-Energy ICT Labs					Energy
Sustainable growth	Smart, green and integrated transport	Urban Mobility ICT Labs	Smart cities & communities	Urban Europe			Transport & cities
Sustainable growth	Climate action, resource efficiency and raw materials	Climate		Connecting Climate Knowledge for Europe			Climate change
Inclusive growth	Inclusive, innovative and reflexive societies			Cultural Heritage and Global Change			Inclusiveness & learning from history
	Secure societies	Secure societies ICT Labs Raw materials	Raw Materials				Security
Smart growth		Added Value Manufacturing					Raw materials Manufacturing



- Scope: national and regional priorities that are not linked to Joint Programming Initiatives (JPI) are not specified in this overview. The majority of the budget is, however, decided on at these levels. The same goes for priorities set by other organisations such as universities and public research organisations (PROs).

In brief, Figure 1 illustrates that there are many actors involved at many different levels in setting R&I priorities in Europe, and in deciding which societal challenges are to be tackled through R&I. Some part of the national/regional R&D budget is not assigned to any priority *per se*, and is allocated to research performers as block funding, especially universities and research and technology organisations (RTOs). As such, those organisations may have more autonomy in setting their own priorities, whether oriented to addressing societal challenges or not.

The role of universities in priority setting

In the European policy debate, universities are seen to have an important role in addressing societal challenges. From the results of a 2011 survey among rectors and vice-rectors of research-intensive universities in Europe, it can be noted that universities address a wide variety of challenges related to each of the seven flagship initiatives of Europe 2020. The flagship initiatives with the most related challenges are innovation and climate, energy and mobility. Also challenges related to education, competitiveness and employment and skills are mentioned quite often. Challenges related to fighting poverty and to the digital society

are less often mentioned. Societal challenges mentioned that do not directly relate to one of the flagships include health, ageing, and other challenges such as values and democracy, integration, and globalisation. Some respondents pointed explicitly at reasons for not addressing societal challenges with university research, such as: basic science does not need to solve societal problems; emphasis on societal problems is likely to harm basic research; the focus on societal challenges risks over-concentrating research in a limited number of areas.

The role of research alliances in the development of transnational collaborations on specific research areas

Public research and technology organisations also increasingly collaborate transnationally in research alliances. The European Energy Research Alliance (EERA), for instance, groups more than 250 energy research organisations representing in-kind contributions of roughly €600M. The EERA has created 15 Joint Programmes since its launch in 2008, with the potential to engage 3500 full time equivalents (Witzanyová, 2014). Other examples of European wide collaborations between public research organisations include: the European Climate Research Alliance (ECRA); the European Transport Research Alliance (ETRA); the Alliance for Biomedical Research in Europe (BioMed Alliance); and the European Research Alliance for liquid metals (LIMTECH). The JPI Urban Europe is in the process of creating an Urban Europe Research Alliance.

■ 2. Transnational coordination of programmes and funds

2.1 Volume and composition of programme cooperation in Europe

According to Eurostat (R&D budget statistics - transnationally coordinated research, 2013), transnational coordination of national research funding activities includes three categories:

- Transnational public R&D performers located in Europe. Examples are CERN, ESO and JRC³. The programming and performance of research are in these cases integrated.
- Europe-wide transnational public R&D programmes. These include ERA-NETs, ERA-NETs PLUS, EUREKA, COST, ESA, EFDA, EUROCORES, Article 185 Initiatives, and the public funding part of the Joint Technology Initiatives (ENIAC and ARTEMIS).
- Bilateral and multilateral public R&D programmes established between Member State governments (and with candidate countries and EFTA countries).

As shown in Figure 2, 2010 national public funding to transnationally coordinated research represents €3.5 bn for EU27 (or €4.2 bn for EU28+NO+CH). Three quarters (or €2.6 bn) of the total is represented by national contributions to the European Space Agency (ESA). Joint calls by ERA-NETs, ERA-NETs Plus and Art. 187 excluding the top-up funding of the EC represent €0.26 bn (10% of the total national contributions to the ESA, 7.3% of

³ The data presented here do not include the national contributions to the 7th Framework Programme which come from the overall national contributions to the total EU budget (Eurostat, 2013).

the total transnationally coordinated budget in 2010, and 0.28% of 2010 GBAORD). The remaining part of around €0.65 bn is divided over all the rest of the above mentioned categories.

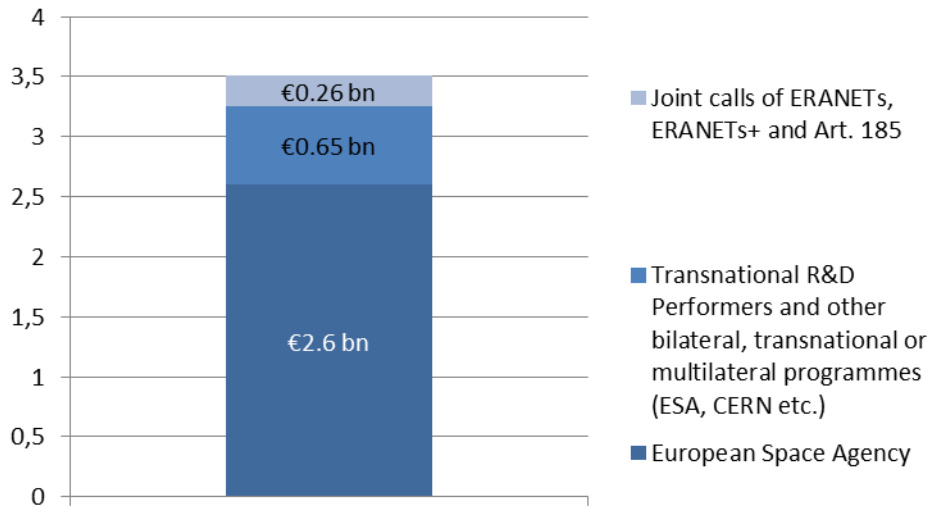
2.2 National breakdown of programme cooperation

Most Member States are involved in some form of research coordination at transnational and international level, but wide differences exist both in absolute and relative terms. The proportion of 2010 GBAORD (EU28, Norway and Switzerland) directed towards transnationally coordinated research is estimated to be of 4.27% on average (based on data from 21 Member States), ranging from 0.27% in Romania to 5.87% in France (8.95% for Belgium but drawing on partial data). This is a slight increase compared to the 2009 figure of 3.84%. The total transnationally coordinated research budget for 2010 represents €4.2 bn (out of which €2.7 bn is assigned to the European Space Agency).

In Figure 3, countries are mapped according to the following dimensions:

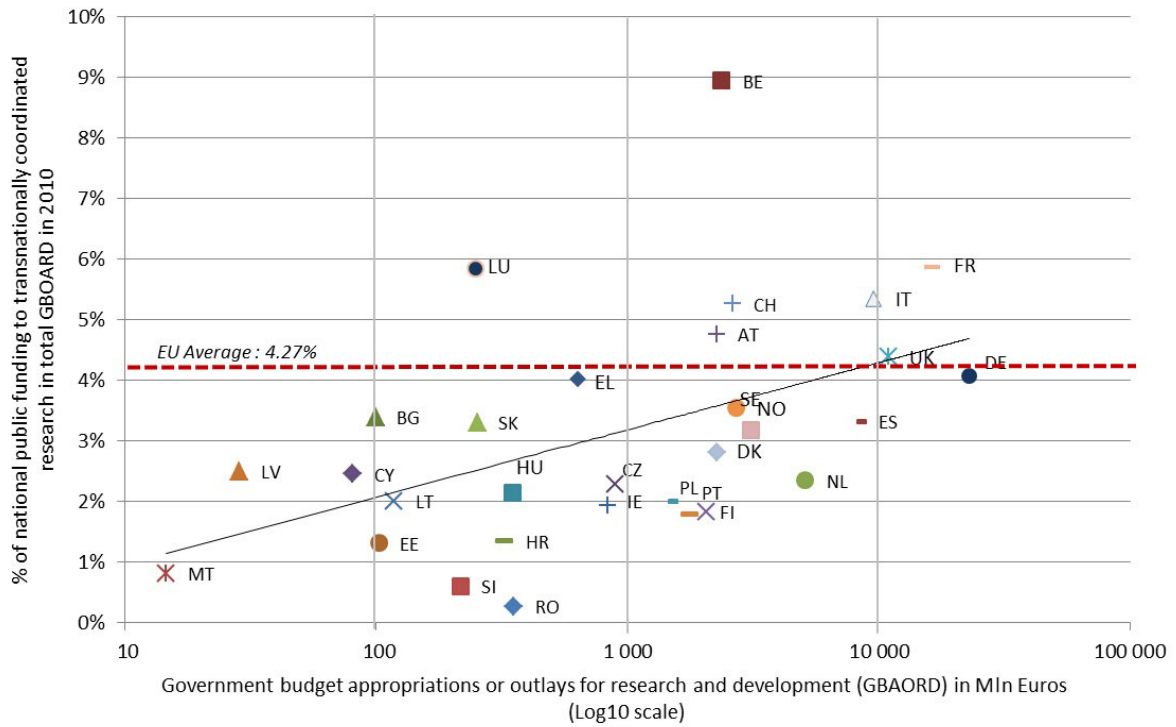
- GBAORD (divided into 4 categories: from €10 mln to €100 mln, from €100 mln to €1 bn, from €1 bn to €10 bn and greater than €10 bn).
- The share of public funding dedicated to transnationally coordinated research in GBAORD compared to the EU average (4.27% of GBAORD with ESA contributions and 1.5% of GBAORD without ESA contributions).

■ Figure 2. National public funding to transnationally coordinated research for EU27 in 2010



Source: Eurostat

■ Figure 3. Share of national public funding to transnationally coordinated research in total GBAORD in 2010 (including ESA contributions)



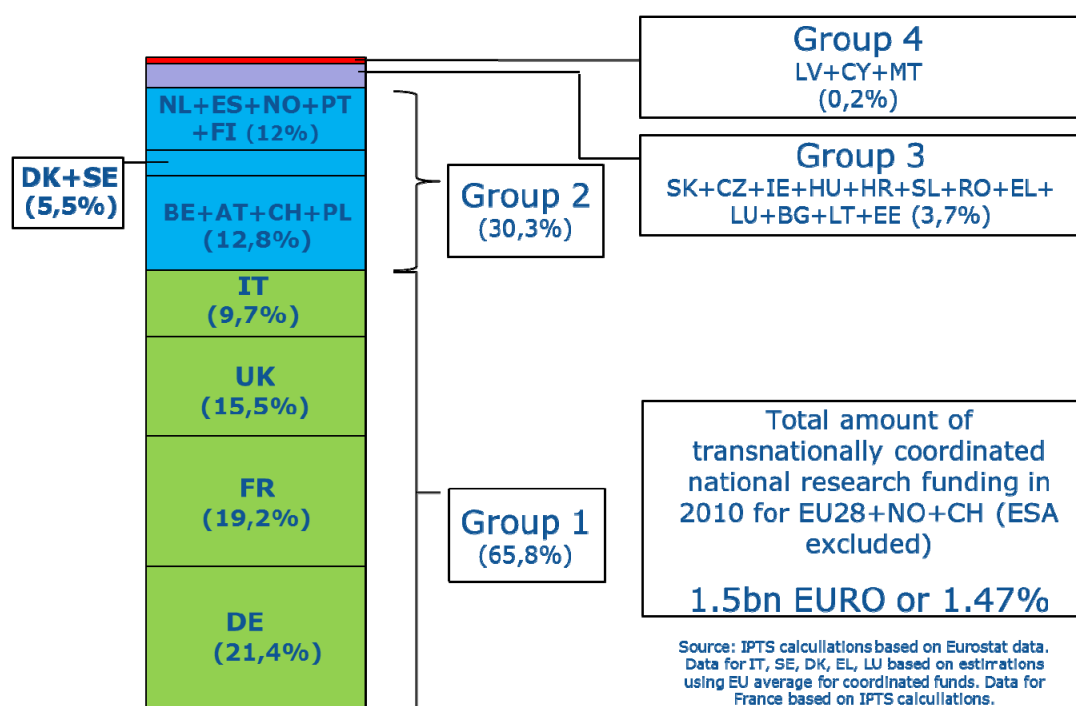
The figure shows that the countries with the highest share of transnationally coordinated national public funding (as a percentage of GBAORD) also represent the largest joint national public funding in absolute terms. This means that the largest spenders are also the ones with the highest degree of coordination.

The highest spenders also have a clear orientation towards grand challenges, albeit in different ways. Among the EU-13 there seems to be a gap between Poland, the Czech Republic and Estonia that have a clear orientation towards grand challenges, and the rest of EU-13 where joint

programmes seem more weakly connected to grand challenges (Doussineau et al, 2013).

Looking at the volume of coordinated spending excluding ESA contributions (EU28+NO+CH, 2010 figures), Figure 4 shows that two thirds of the total is represented by only four countries: Germany, France, the UK and Italy (Group 1). A second group of eleven countries (Group 2) represent another 30% of the total coordinated spending volume. The remaining countries account for less than 4% (Groups 3 and 4).

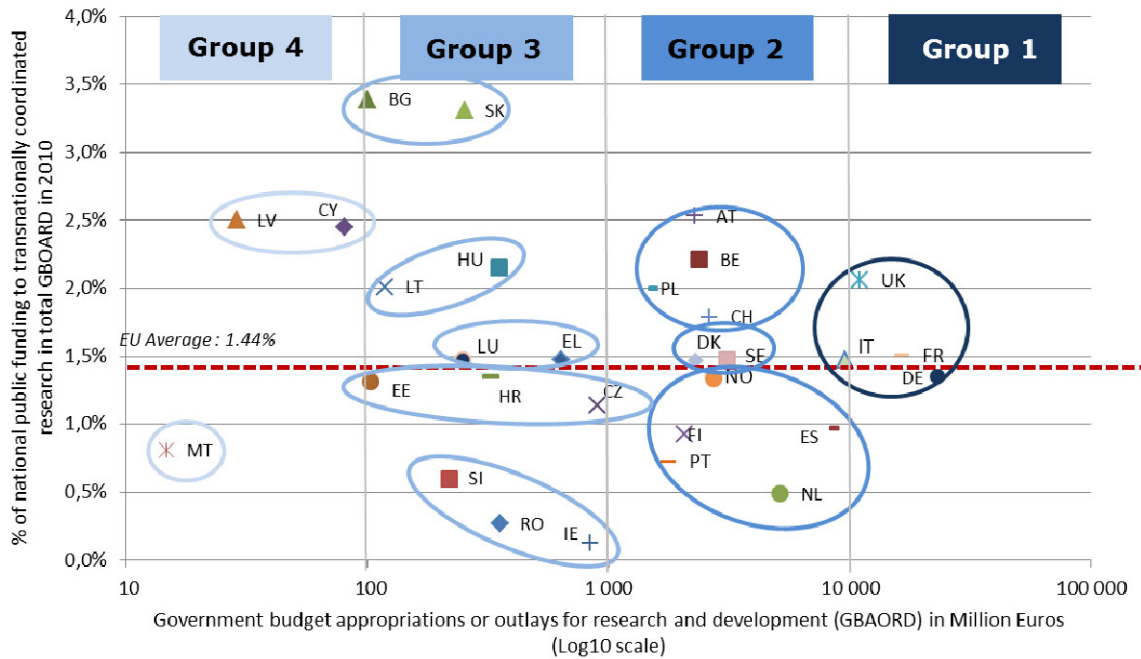
■ **Figure 4. Relative contributions of EU Member States, Norway and Switzerland to the total annual transnationally coordinated public national research funding for 2010 (excluding ESA contributions)**



In relative terms, the degrees of coordination, excluding ESA contributions, give a more diverse picture than when including them. Figure 5 below presents the same four country groups of Figure 4 above in relation to their absolute and relative

coordinated spending. As indicated in Figure 5, which excludes the ESA contributions, four main country groups can be identified according to the amount of their public spending for research and development.

■ **Figure 5. Share of national public funding to transnationally coordinated research in total GBAORD in 2010 (excluding ESA contributions)**



2.3 The volume of joint calls

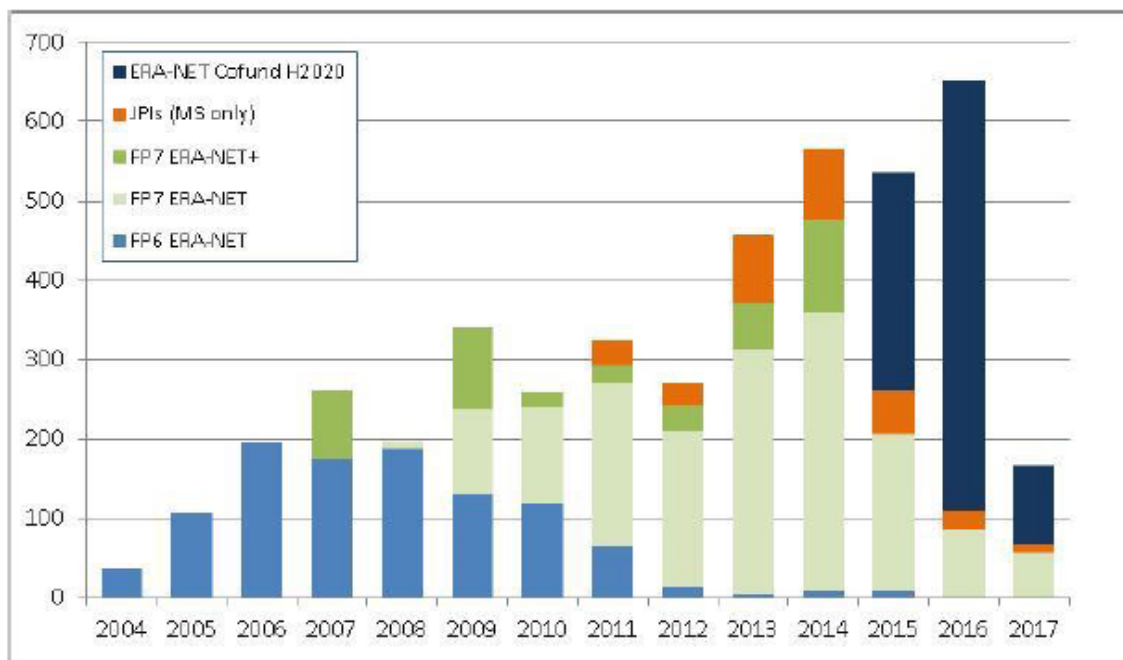
Looking at programme coordination over time, Niehoff (2014) estimates that the total public funding of research implemented by FP6 and FP7 ERA-NET/ERA-NET Plus Actions is expected to reach €3.1 bn between 2004 and 2017, through 396 joint calls (finished, ongoing and planned calls). The annual amount represented by joint calls of ERA-NET and ERA-NET Plus actions has been growing since 2004.

Figure 6 shows the total public funding per year for calls implemented by ERA-NET, ERA-NET Plus, and, ERA-NET Cofund (H2020), as well as calls from JPis (calls implemented by MS only) for the period 2004-2017. Data on both past and currently planned calls are included. The figure shows that the total public funding for calls will be over €0.6 bn in 2016. In spite of this increase

in the total amount spent through joint calls, in relative terms the amounts stay very low compared to total GBAORD. In 2012 the ERA Communication (European Commission, 2012) stated that the level of alignment was too low to have a serious impact on big and complex challenges, however without giving a clear target for the share of GBAORD transnationally coordinated that would be required.

An interesting side effect however from the joint calls is the leverage effect (the amount of public funding of transnational projects generated per €1 of Framework Programme funding), which increased from 6 under FP6 to 10 under FP7. The effect is also a lot bigger for those FP7 ERA-NETs that continued from FP6 (leverage effect of 16) compared to the new ERA-NETs under FP7, with a leverage effect of 7 (Niehoff, 2014).

■ Figure 6. Total public funding per year for calls implemented by ERA-NET , ERA-NET Plus, JPIs (calls implemented by MS only) and ERA-NET Cofund under Horizon 2020 actions over the period 2004-2017 including currently planned calls [in mln Euro] (Niehoff, 2014)



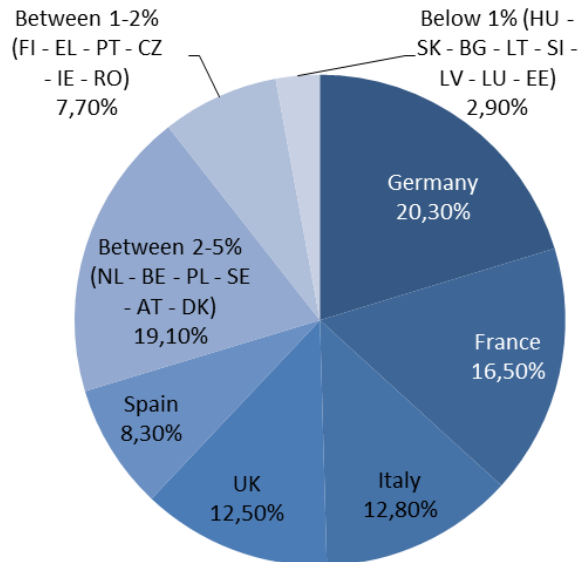
■ 3. Programme coordination under the Framework Programmes, Horizon2020 and Cohesion Policy

Public R&D cooperation between EU Member States is obviously not limited to transnational coordination of existing public national research budget spending. This section looks at cooperation between Member States in the framework of EU research and innovation and Cohesion Policy. To better understand the investments made by country we first look at the contributions by Member State to the total EU budget.

3.1 National contributions to the total EU budget

When considering country contributions to both the Framework Programmes and the Cohesion Policy funds we need to look at the relative contributions of MS to the European Union in general. Figure 7 shows the relative annual contribution for 2012. It shows a picture that is rather similar to Figure 4, with four countries accounting for 60% of the total budget.

■ Figure 7. National contribution per Member State and traditional own resources collected on behalf of the EU in 2012



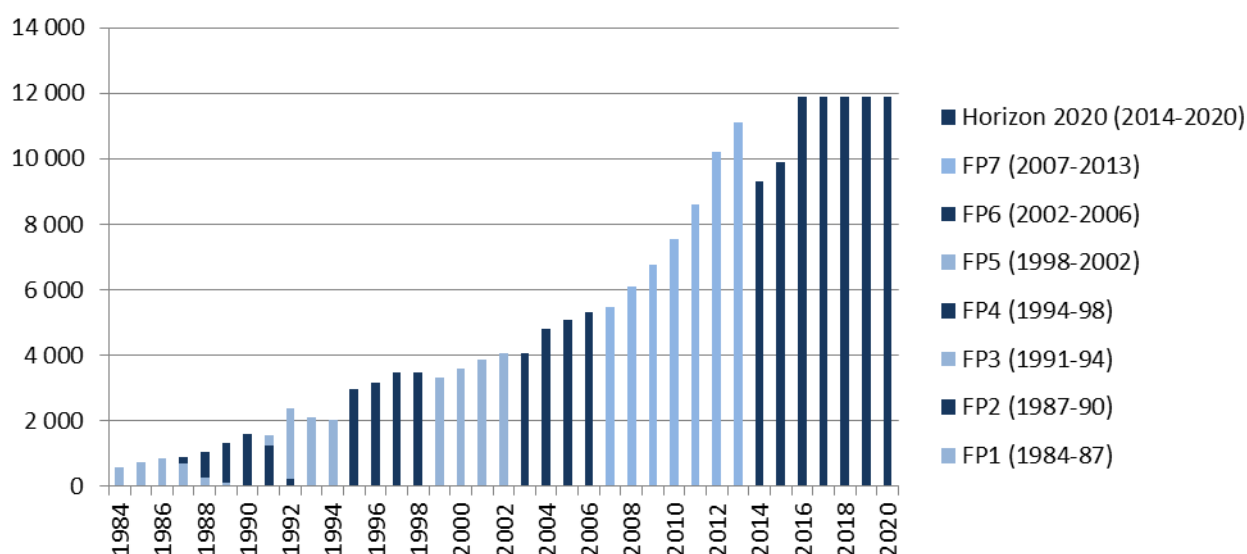
Source: Eurostat (2013) processed by JRC-IPTS.

3.2 European Framework Programmes and Horizon 2020

The biggest public R&D cooperation in the EU is represented by the Framework Programme, and subsequently Horizon 2020. Figure 8 below shows the history of annual budgets assigned to the European Framework Programme for research since its start in 1984 until 2020 (expenditure up until

2011, planned expenditure for 2012-2013 and estimated expenditure as of 2014). Data from 2014 onwards also include the innovation part of the European programme, i.e. the former Competitiveness and Innovation Framework Programme (CIP) (representing €3.621 bn over 2007-2013) and the European Institute for Innovation and Technology (EIT) (representing €0.31 bn over 2008-2013).

■ Figure 8. Annual budget for the Framework Programmes and for Horizon 2020



Please note that for FP7, actual expenditure for 2007-2011 is given, while for 2012-2013 planned expenditure is used. For Horizon 2020, 2014 data are based on the 2014 Work Programme. 2015 data may change at the moment of approval of the 2015 Work Programme. Data for 2016 and onwards based on pro rata division of total H2020 budget (€78,6 bn) minus 2014-2015 provisions. Prices 2013. (Source: European Commission – DG Research and Innovation and IPTS adaptations)

Whereas under FP7 (2007-2013) €55.8bn was planned to be spent over the lifetime of the programme (excluding the budgets for CIP and EIT), for Horizon 2020 (2014-2020) this amount rises to €78.6 bn (including the budgets for competitiveness and innovation and for the EIT). This is the largest amount so far that Europe has dedicated to joint public research and innovation spending. Figure 8 shows that there has been this rising trend since the beginning. In the transition years between programmes there

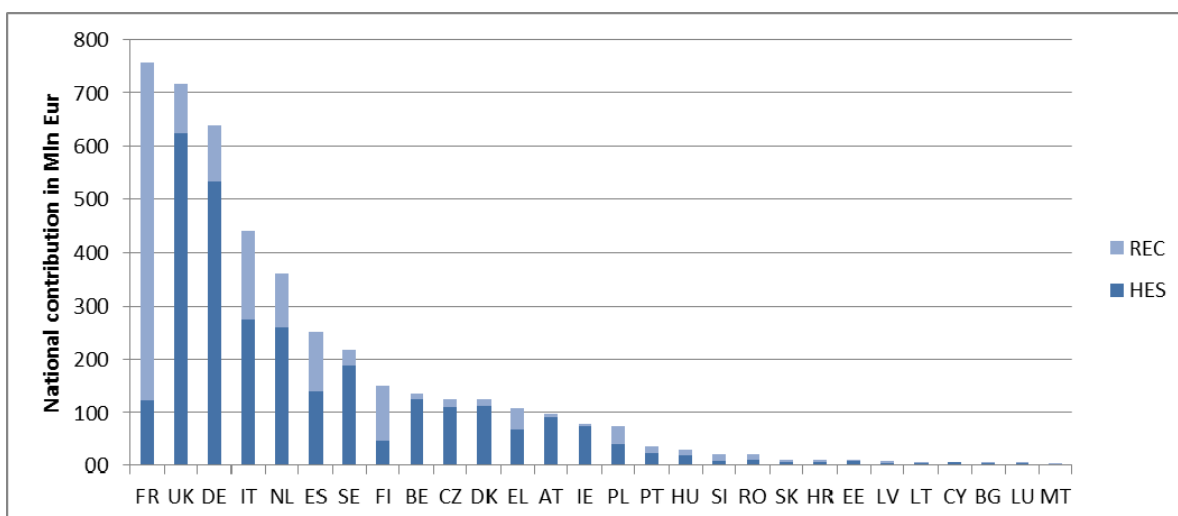
are small drops in budgets, reflecting the time typically needed to get the next programme fully operational. In 2014 this drop is particularly marked, reflecting the fact that FP7 was heavily backloaded and Horizon 2020 is not frontloaded. Horizon 2020 also has a larger share of its budget dedicated to innovation. For example, the EIT is envisaged to spend about ten times the budget it has spent since 2008, with a dedicated budget of €2.7 bn over 2014-2020.

3.3 Public national contributions complementing the EC contribution under FP7

The two most common types of public research organisations participating in FP7 are public research centres and public universities. On average, in FP7, public universities have been funded at a rate of 82.4% and public research centres at 75.2% of their eligible costs, with some disparities between countries depending of the type of activities (and funding instruments) the public organisations are involved in. Analysis of the FP7 contracts database reveals the national contributions that complement the

EC contributions. For the total programming FP7 period (up until the first half of 2013) national contributions can be estimated at around €4.4bn (or over €0.6bn annually under the hypothesis of a linear annual distribution), out of which €2.9bn from public universities and €1.5 bn from public research centres. A ranking by country (see Figure 9) of national contributions dedicated to public participants (public research centres and public universities) reveals that France has the highest national contribution for its research entities, followed by the UK, Germany, Italy, the Netherlands, Spain, Sweden and Finland.

■ Figure 9. National contribution dedicated to public research centres (REC) and public universities (HES) complementing the EC contribution in the FP7



Source: IPTS calculations based on FP7 contract database (November 2013)

Looking at the relative importance of public research centres versus public universities, for most countries the participation of public universities represents the highest share (Figure 9) in FP7 collaborations. Only for France and Finland does the relative participation of

public research centres (REC) appear more significant than for public universities. For France it should be noted that participation of research and technology organisations are in most cases twinned with universities through the so called "unités mixtes de recherche".

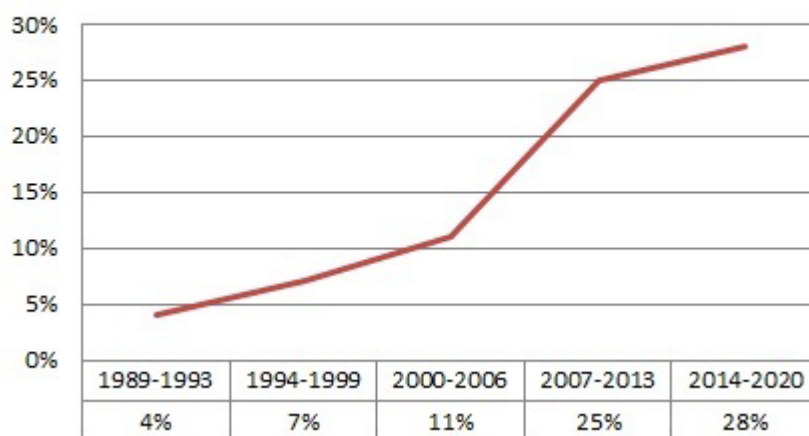
3.4 Cohesion Policy

Another important source of public research funding at EU level is represented by Cohesion Policy. In the period 2007-2013, €86 bn (€65 bn from the ERDF alone) or around 25% of total Cohesion Policy budget have been allocated to innovation (Research and Innovation including infrastructures,

Entrepreneurship, ICT development and human capital actions). For the period 2014-2020, Cohesion Policy will make available up to €351.8 bn, out of which €100 bn, or 28%, are expected to be assigned to research and innovation. Figure 10 puts this in a historical perspective, illustrating the constantly rising relative importance of research and innovation in Cohesion Policy over time.

■ Figure 10. Relative share of Cohesion Policy funding assigned to R&D and innovation over time

Relative importance of R&D and innovation in cohesion policy funds



Source: European Commission: DG Research and Innovation and JRC-IPTS

Under Europe 2020, synergies between Horizon 2020 and Cohesion Policy are being reinforced. Horizon 2020 focuses on supporting excellence through direct competitive calls to final beneficiaries and Cohesion Policy applies a place-based approach through non-competitive attribution with shared management between the European Commission and the

national and regional authorities. The rising importance of research and innovation in Cohesion Policy is also reflected by the introduction of an *ex-ante* conditionality for regions to have a regional smart specialisation strategy (RIS3-strategy) for objective no 1 of the Cohesion Policy funds: strengthening research, technological development and innovation.

■ 4. Policy implications

Examination of these different data sets indicates that the volume of research funds allocated in a coordinated way has overall gradually been increasing quite steadily over time. In light of the increasingly pervasive policy focus on addressing Grand Challenges, how to determine a sufficient level of coordination remains unclear. However, a more important question may be the relative importance of each challenge, as reflected by the amount of research funds (coordinated or otherwise) allocated to each of them. This will be the result of the decisions of a wide set of stakeholders within the European research landscape. As such decisions are not being taken simultaneously by these various stakeholders, this priority setting exercise can be seen as a constantly evolving process. To better understand and respond to this evolution, a valuable tool for policy makers is a dynamic map of the public research landscape in Europe, including all stakeholders, the challenges they address and the coordination patterns that exist. Stakeholders and coordination initiatives mapped should include public research organisations and European research alliances, regional authorities and interregional collaboration initiatives, universities, joint programming initiatives, ERA chairs, research infrastructure initiatives, etc.

If research in Europe is also to contribute to growth and increased

competitiveness (See Europe 2020), then the coordination of innovation funding in Europe is clearly on the radar. Here again, the relative importance of each challenge in innovation is determined by a wide set of stakeholders and coordination initiatives. A dynamic mapping tool should therefore also include (public and private) stakeholders that fund innovation, the challenges they address and the evolution of the coordination patterns emerging. Relevant stakeholders and coordination initiatives include Knowledge and innovation communities, European Technology Platforms, European Innovation Partnerships, Future & Emerging Technologies ("FET") Flagships, etc.

The NETWATCH platform has only gone part of the way to providing such a dynamic map, and there are a variety of future directions for development. The networks hitherto covered by the platform represent around 10% of the totally annually transnationally coordinated national research budget (see Figure 2). A potential future evolution of the platform could progressively cover a higher percentage of transnationally coordinated national research budgets. Alternatively, a web-based platform could evolve towards addressing the endeavour suggested above, covering and engaging additional stakeholders from the European research landscape or the European innovation landscape.

■ 5. Acknowledgements

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