

## Progress toward the ERA: the implementation of public R&D funding in transnational ERA-NET programs

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### Executive Summary

The development of the European Research Area is a key policy issue in public R&D policies, and coordination through joint programming appears as one of the most promising path to achieve the goal of aligning national research agendas and activities across Europe. The policy brief focuses on the different implementation of transnational research programs from research funding organizations (RFOs) in European countries. The analysis discusses the ERA-NET funding schemes; it is based on advancements of the **JoREP** database developed within the RISIS project, and deals with factors affecting the volume of funding mobilized by different countries over time, and the characteristics of networking between RFOs.



## 1 Introduction

From the 2000s the EU policies address the issue of the development of cooperation among national RFOs in specific R&D fields. The purpose was to mobilize a greater portion of national public research budgets, which had until then remained in the hands of national governments and had not been used within initiatives based on European funding. The main policy rationale for joint programming therefore was increasing the efficiency of public spending for research, improving the attractiveness of Europe for the production of knowledge, and the need for research to be efficient in aiding governments, firms, and institutions.

However, it is a well-known problem that the participation to the EU funding is strongly unbalanced within Europe. The FP7 interim evaluation report confirmed that the program attracts the top EU researchers from universities and research organizations (Annerberg, Begg, Acherson, et al. 2010), but the distribution of funding in the FP is rather skewed and concentrated on a relatively small number of organizations. These results were also confirmed by a study on the role and engagement of universities within EUEFPs (Ciffolilli et al., 2016) demonstrating that university participation and the corresponding funding is concentrated in some countries and organizations.

The mentioned evidence rises the interest toward deepening how RFOs implement national funding for transnational research programs in European countries, and which factors influence the level of funding mobilized. Also, factors driving coordination between funding agencies for participating in transnational research programs is an interesting issue to be addressed, in order to figure out possible phenomena of preferential attachment between RFOs.

The interest to answering these questions drove the efforts toward transforming and integrating JoREP database in the RISIS infrastructure, combining it with EUPRO and OrgReg, respectively by the way of the call for proposals and the funding agencies involved. In this policy brief we concentrate on the ERA-NET schemes as a central example of transnational collaborative effort, joining together research developed in different sectors within Europe, strengthening capacity building and quality and promoting dissemination and knowledge transfer (EC, 2016). In this respect, two items related to the way in which coordination of research occur are particularly interesting:

- a) investigating the policy decisions about participating (formal engagement) and determining the level funding (real engagement) to joint European research programs, because closeness or distance in some key dimensions are likely to influence the possibility of decision makers at national level to collaborate in the implementation of research programs;
- b) deepening the linkages between funding agencies of European countries in transnational EU research programs, and how the decisions of creating connections change over the years.

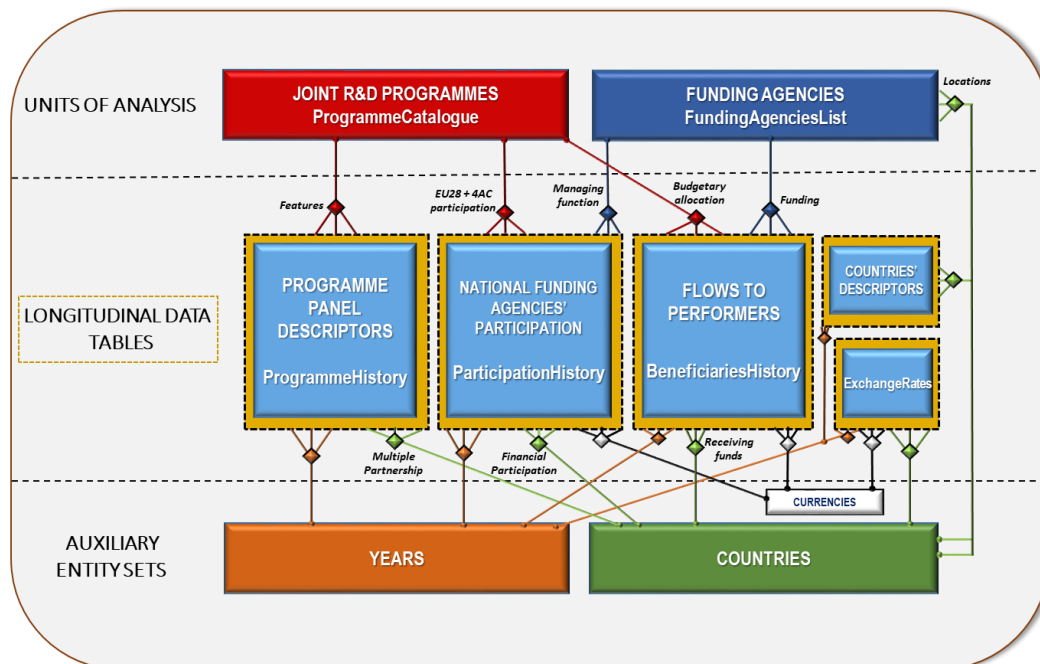
Both the items are relevant for the scholar community to understand policy formation and elements determining the funding decisions. On the policy maker side, the items are relevant to understand how policy implementation differs between policy actors in Europe.

## JoREP database as empirical base to study the policy implementation of transnational research programs

JoREP is a unique database on European trans-national joint R&D programs. The facility provides a quantitative basis for the monitoring of investments in joint R&D programs in EU-28 countries plus Israel, Norway, Switzerland and Turkey, pointing out the policy rationales behind them and their impact. Each program is described by a set of attributes (organizational, financial, etc.). The main focus is on national funding allocated to the programs. The set of data aims also at describing when, how and serving what purposes European-level initiatives and bilateral/multilateral joint R&D programs are combined.

JoREP stores raw panel data on joint R&D programs and a basic set of descriptors of funding agencies participating to the programs. The actual list of variables was subject to utility and feasibility controls. Data redundancy were limited to the necessary for the integration of tables within the new formed relational database (e.g. repetition of information in multiple fields were treated clustering information in unique fields).

Figure 1: Structure and content of JoREP database



The current version 2.0, opened in June 2016, covers data for the period 2000-2014, with a specific focus on 2013 and 2014 - assumed as reference years. The design of the database has been planned to store data on the amount spent for joint R&D programs and on their organizational characteristics, according to the analyses of the modes of the ERA dynamics. The conceptual scheme considers joint R&D programs as the main unit of analysis, characterized by both internal and contextual features. Secondary units of analysis in JoREP are the national funding agencies.

Compared to the 1.0 version of the database, the new release presents a set of enhancements, among which an enlargement of geographical coverage (from 11 to 32 countries) for European-level programs for the period 2010-2014 and the creation of a new table of indicators at the country level and RFO level to allow further analysis.

## 2 Activities, Approaches and Results

In this section we present the activities developed to transform the architecture of the JoREP database, updating and controlling information on the base of public available data, and integrating data from international statistics to address the questions of interest. Then we discuss the main results on how funding for transnational research programs is mobilized within European countries and what influence networking between funding agencies for participating in transnational research programs.

### 2.1 Addressing the problem of different participation of European countries in transnational research

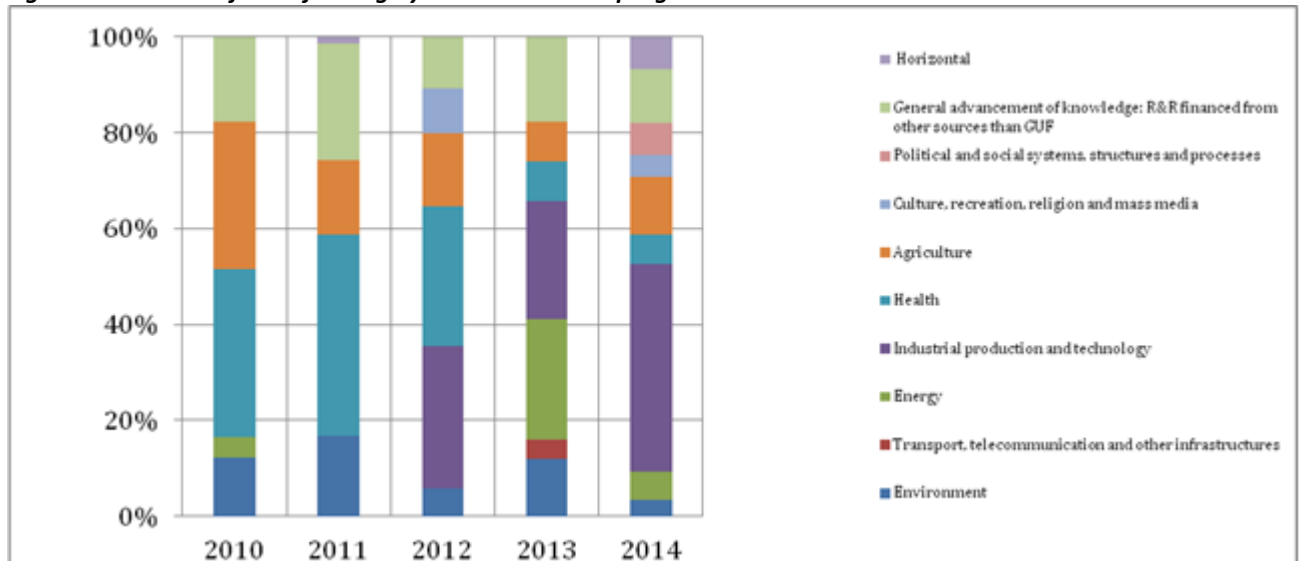
The JoREP database was used to explore factors affecting the different levels of funding policy makers at national level mobilize for transnational joint research activities. One possible explanation is proximity linked to institutional and organizational dimensions, which might affect the policy decisions about participating (formal engagement) and funding (real engagement) joint European research programs, because closeness or distance in some key dimensions generates similarities that are likely to influence the possibility of decision makers to collaborate in the implementation of research programs. ERA-NETs programs were selected for this explorative approach because of their relevance in fostering mutual collaboration in the process for overcoming the fragmentation of research within the ERA. Table 1 shows some descriptive statistics about the amount of funding in the ERA-NET programs from 2010 to 2014. The results illustrate that the values of mean are close and quite steady over the years; this is not true for 2010 and 2012 where the mean is respectively lower and higher. The difference over the years is observed in term of standard deviation.

**Tab. 1: ERA-NET funding over the years (KEuros)**

	Amount-ERA-NET				
	2010	2011	2012	2013	2014
Mean	656.473	843.234	853.893	919.956	838.053
Std. Dev.	717.819	863.135	1,013.077	969.127	888.334
Min	20.000	21.000	38.000	10.000	20.000
Max	4,000.000	5,000.000	7,300.000	8,383.430	7,200.000

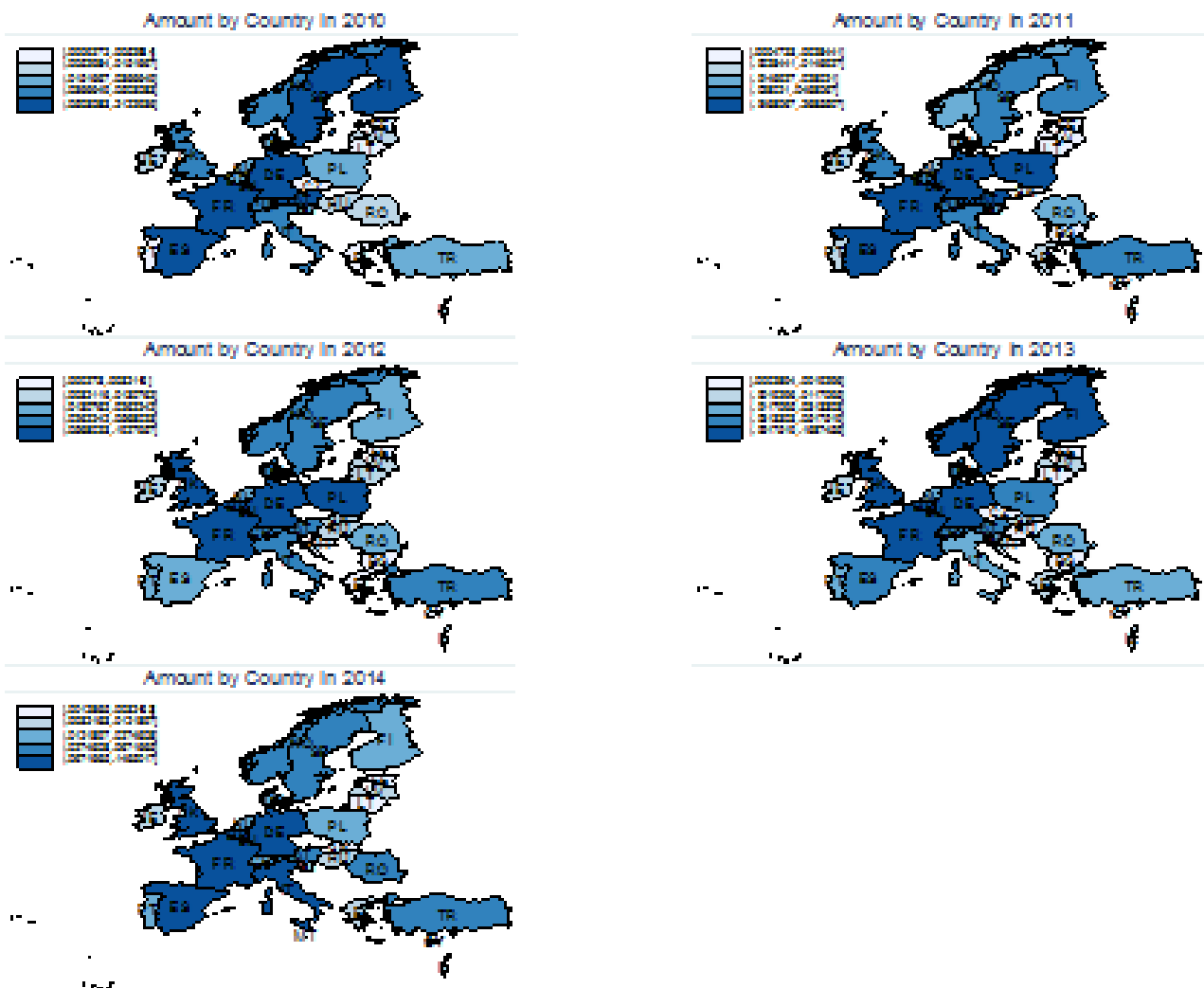
Figure 2 shows the distribution of total funding for each year by NABS (Nomenclature for the analysis and comparison of scientific programs and budgets) in the ERA-NET programs. Health emerges as the NABS where the highest volume of amount is concentrated between 2010 and 2012, followed by Agriculture and Energy. In 2013 and 2014, countries invested more in Industrial production and technology.

**Fig. 2: Distribution of total funding by NABS – ERA-NET programmes**



In Figure 3 we can observe the investment quota and its geographical distribution. In general, the countries with the highest share of investment in each considered year are Germany and France. The Figure shows "core-periphery" countries: there is a block of countries belonging at the central Europe that invest much more in ERA-NET programs compared to periphery countries that need to rely on dynamic interactions to promote their development and their ability to achieve a more consistent investment in transnational programs.

**Fig. 3: Geographical distribution of amount by year**



## 2.2 Factors affecting RFOs networking in transnational coordinate programs

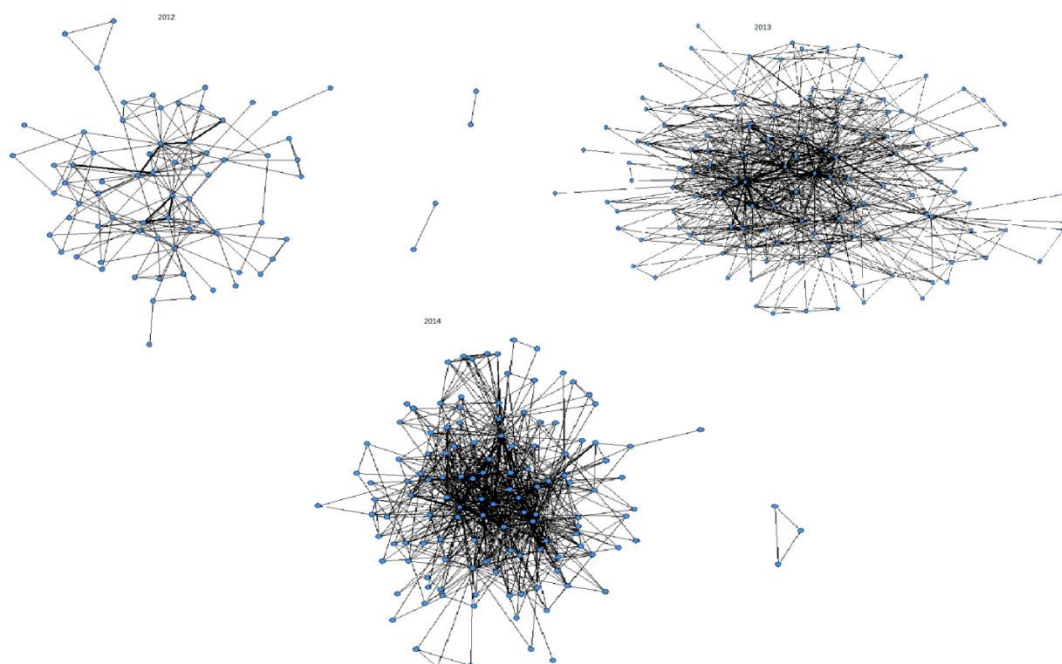
A second avenue of exploration developed using JoREP is the linkages between RFOs of European countries in transnational EU research programs, and how the decisions of creating the mentioned linkages change over the years. The ERA-NET network in the year 2014 is composed of 130 agencies, in the year 2013 is composed of 134 agencies in the year 2012 is composed of 82 agencies. Each agency can be joint to another agency more times; indeed, an agency can participate in more ERA-NET programs in the same year. Table 2 shows some network measures namely, the nodes and edges by year, the density, the degree and the distance between nodes. The density of a network is defined as the proportion of possible lines that are actually present in a graph, and takes values ranging from 0 to 1 (Wasserman & Faust, 1994). In this case, the “Weighted Density” (Table 1) is the total of all values divided by the number of possible ties. The “Average degree” indicates the normalized values for valued data take  $(n-1)*max$ , where max represents the maximum value and hence assume that larger values represent stronger ties. The “average distance” is the average shortest path of a graph.

**Tab.2: Network descriptive analysis**

Year	Nodes	Edges	Weighted Density	Avg. Degree	Avg. Distance
2012	82	396	0.06	4.8	2.922
2013	134	1622	0.09	12.1	2.335
2014	130	1738	0.10	13.4	2.264

The results indicate that the density is increasing over time, given that more programs join the network and new links are created within each program. The average degree increases over the years, and a huge difference between 2012 and 2013 is visible. The participation in term of funding in ERA-NET programs increases. Finally, the average distance between nodes decreases over the considered period. Figure 4 shows how the networks change between 2012 and 2014: the density increases over the years, instead the average distance between nodes decreases.

**Fig.4 Network visualizations of ERA-NET programs**



### 3 Conclusions

The results achieved shows the importance of the integration made in the JoREP database under the RISIS development, which allow to develop new approaches to figure out factors related to European integration.

Evidences of institutional and organizational distance affecting the mobilization of R&D funding for transnational research indicate problems for the different countries to participate to the process of European integration. Also networking of funding organizations shows highly connected and peripheral countries that try to establish connections with the most central one; thus, the preferential attachments between research funding agencies are difficult to overcome.

The analyses confirm the existence of structural constraints that produce effects for the country participation to ERA-NET, which should be considered for improving the programs design.

### 4 Implications

The policy issues are still relevant and need further efforts to be addressed properly. JoREP integrated in the RISIS infrastructure shows its capability to support research efforts; the combination of JoREP with EUPRO would require more efforts to understand how far it can be used for analyses assessing the effects produced by funding instruments devoted to support transnational research. Main points that would deserve attention are:

- Factors affecting the policy design of transnational European programs should be enlarged to include other important programs such as JPIs;
- In order to capture the different determinants, it is necessary to obtain data to characterize the national institutional features, which co-determine participation. While this is a huge task, it could be focused on specific areas of research and on selected countries;
- JoREP provides data on some specific funding instruments related to European integration. The enlargement to other instruments based on national funding would be extremely important to understand factors behind participation and funding mobilization at national level toward European integration. This objective needs a more complete information of R&D funding instruments designed and implemented at national level.

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