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Data on joint programming in the European Research Area:  
An overview of JoREP 2.0 database

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# Data on joint programming in the European Research Area: An overview of JoREP 2.0 database\*

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## ABSTRACT

This technical report provides an insight into the main features and the analytical potential of JoREP 2.0 database, a resource that allows for multifaceted representations of the organisational and financial characteristics of transnational R&D programmes in the European Research Area. Target of the database includes the community of Science and Innovation studies, and all the researchers interested in the study of the Europeanisation of research activities and the dynamics related to transnational R&D funding.

KEYWORDS: Europeanisation of research, ERA, joint programming, JoREP, joint R&D programmes.

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CONTENTS

1	INTRODUCTION.....	3
2	DESIGN OF THE JOREP STUDY .....	4
2.1	Units of analysis.....	4
2.2	Data sources.....	5
2.3	Geographical and temporal coverage.....	6
3	DATABASE DESCRIPTION.....	7
3.1	Composition of the sample .....	7
3.2	Relational structure and variables.....	7
3.3	Data quality.....	10
4	ANALYTICAL POTENTIAL .....	10
5	DATA ACCESS.....	11
6	REFERENCES.....	11

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ANDREA ORAZIO SPINELLO

## 1 INTRODUCTION

Integration between scientific communities at the European and international level promises to enhance the potential for research pushing towards transnational collaborations enabling to tackle the societal grand challenges and to generate a growing social and economic impact (ES-FRI 2016).

The issue of integration of the national research systems, pursued through initiatives like the European Research Area (ERA), has been widely studied for a number of years (see e.g. Edler 2010). The three main functions on which the ERA is founded – orientation, programming and performance of research – can be carried out through different modes of relationships, namely either by simple juxtaposing national policies and programmes, by coordinating national policies and programmes across EU member states, or by integrating policies and programmes at European level, and the need to be constantly monitored (Barré et al. 2013; Lepori et al. 2014). Different combinations of functions and modes of relationship provide a framework that allows for a mapping of the evolution of the ERA in structural and organisational terms.

Analysing the integration of research activities at European level developed particularly through the establishment of transnational R&D programmes can shed light on what effect joint schemes of research funding would have on the Europeanisation of the research activities. In this respect, descriptive information on the organisational characteristics of these peculiar kind of research instruments and the relative financial data can be used on one side to understand modes of relationships between the actors involved, on the other to depict the levels of resource mobilization and concentration over the years.

The JoREP study responded to the need of collecting and maintaining sets of data on joint R&D programmes launched in order to foster transnational cooperation within the ERA. On the background of the lack or incompleteness of systematised data, one of the main goals addressed by the study was to put together dispersed information about when and how European-level initiatives and bilateral/multilateral transnational schemes are combined, integrating it with budget data on the funding channelled through them.

The first wave of the study was carried out within the JOREP EC contract<sup>1</sup> by a team composed of national experts coordinated by National Research Council of Italy (CNR); researchers collected data for the period 2000-2009 and produced an analytical report (Reale et al. 2013) and a handbook (Lepori & Reale 2013), both published by the European Commission. Data

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<sup>1</sup> JOREP – *Investments in joint and open R&D programmes and analysis of their economic impact* was a service contract commissioned by the European Commission [Contract. No. RTD/DirC/C3/2010/SI2.561034] under the Seventh Framework Programme of the European Union (EUF7).

were then integrated into RISIS, a distributed research infrastructure for Science and Innovation studies created by the EUFP7 RISIS project<sup>2</sup>. The inclusion in RISIS infrastructure addressed the expectation that data from isolated projects dealing with Science and Innovation studies could be increasingly made open, allowing to embrace a model of data sharing characterised by offering the same access to data, without restrictions, to each member of the scientific community. RISIS project financed the preparation for the opening of the database and the processes of harmonisation and integration with other resources belonging to the infrastructure and related to different aspects of the Europeanisation of research activities. Within the new framework, a second wave of the study was performed by the CNR, producing an update of the data for the period 2010-2014, in parallel with an enlargement of the geographical coverage from 11 to 32 countries.

JoREP (Joint REsearch Programmes) database, managed by CNR-IRCrES – Research Institute on Sustainable Economic Growth<sup>3</sup>, unit of Rome, represents a unique resource based on a sample of joint R&D programmes, describing their organisational features and participation and allocation dynamics. Version 1.0 was publicly released in December 2015, based on the data collection from the first wave of the study; the current version – 2.0 – was released in mid-2016, and stores data from both the waves of the study.

The following sections describe the main features of the JoREP study, the design and the contents of the database, the analytical potential and the data access conditions.

## 2 DESIGN OF THE JOREP STUDY

### 2.1 Units of analysis

JoREP study collected information on two major units of analysis: publicly funded joint R&D programmes and national funding agencies participating in the programmes. In addition, countries included in the geographical coverage of JoREP study (see Section 2.3) represent a third unit of analysis, since a set of indicators related to the national research systems was integrated into the database.

According to the handbook of the JoREP study (Lepori & Reale 2013), R&D programmes are defined as organizational settings able to allocate project funding to research groups for a limited time on the basis of a project proposal. They are characterised by the existence of open and competitive calls for proposals indicating explicit objectives to be reached, scientific priorities, an expression of the type and mode of research expected, a set of rules for submitting proposals as well as for their evaluation and selection, and a dedicated budget. Spot research contracts for specific purposes and grants attributed without an open call for proposal are not included in the definition. The basic feature for a research programme to be qualified as “joint” is that it must be configured as a research funding instrument for which at least one of its functions is shared between funding agencies from more than one country or regions belonging to more than one country. Funding agencies are defined as formal organizations which participate in a joint R&D programme collaborating in the definition of goals and mission, preparation and diffusion of the call; management of the submission process, evaluation and selection process, decision on which projects to fund; management of contract and payments.

Two major categories of publicly funded joint R&D programmes are identified by the JoREP study for the inclusion in the perimeter of the data collection: European-level joint research initiatives and programmes established by a group of countries through a bilateral/multilateral agreement.

The first category corresponds to research programmes in principle open to all countries belonging to the ERA either because they are established within a European Union Framework or

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<sup>2</sup> RISIS – *Research Infrastructure for Research and Innovation Policy Studies* (<http://risis.eu>) is a EUFP7 project (grant agreement no. 313082) aimed at integrating databases on Science and Innovation studies into accessible forms, building a harmonized infrastructure, stabilising these resources and making them freely available to European researchers.

<sup>3</sup> Official website in English: <http://www.ircres.cnr.it/index.php/en>

through the creation of a European cooperation platform, or because they are based on international treaties (see Table 1). For this category, the JoREP study collected descriptive information and funding data on programmes which launched at least one call in 2008 or 2009 (first wave of the study) or in 2013 or 2014 (second wave).

**Table 1.** Types of European-level joint R&D programmes

Type of programme	Short description
ERA-Net/ERA-Net+/ ERA-Net cofund actions	Starting from EUFP6, promoted coordination platforms, which strengthen the synergy between funding agencies' networking of national and regional research programmes on a wide range of topics. Different types of ERA-Net are related to different funding models.
Joint Programming Initiative (JPIs)	Based on the identification of common societal challenges, JPIs aim to transform the results of joint research in the ERA into tangible benefits for society and to enhance the competitiveness of its economy.
Joint Technology Initiatives (JTIs)	Through the establishment of joint undertakings, JTIs support large-scale multinational research activities in areas of major interest to European industrial competitiveness and issues of high societal relevance.
Programmes created under article 185 of the EC Treaty	Programmes to enhance the complementarity and synergy between the FP and activities carried out under intergovernmental structures, covering subjects not directly linked to the themes of the FP.
European Social Foundation schemes	Schemes addressing researcher-led scientific questions requiring international cooperation and supporting interdisciplinary research.
EUREKA	Platform for international cooperation that provides for the establishment of research clusters for market oriented R&D and individual projects.
COST	Intergovernmental framework for European cooperation in Science and Technology, which aims at strengthening Europe's research and innovation capacities connecting communities and researchers.
ESA	Promotes cooperation among European States in space research and technology applications and for operational space applications systems.

Note: Programmes managed entirely by the European Union (Framework Programmes) or by the European Union together with a single member state as well as all programmes supporting research infrastructures and careers were excluded from the data collection. European programmes whose R&D activities are supported by only an EU contribution and private partners were also excluded.

The second category concerns publicly funded research programmes established by a group of countries through a bilateral/multilateral agreement. For this category, JoREP study collected – within the first wave of the study – descriptive information and funding data on programmes which launched at least one call in 2008 or 2009 for a subset of countries selected between Mediterranean, Central and Eastern European states in order to represent peculiar situations within the ERA (the list of countries is presented in Section 2.3).

## 2.2 Data sources

With the nature of joint R&D programmes being public, basic information on these kind of schemes is widely available, but very often dispersed into several online sources.

ERA LEARN 2020 (formerly NETWATCH) website<sup>4</sup> represented the primary source for the selection of the European-level joint R&D programmes. Although it represents the better systematized source on this kind of programmes, data and information on the volume of investment

<sup>4</sup> <http://www.era-learn.eu>

by each country and each funding agency are not available. The volume of R&D investments was extracted only from the specific programmes' websites, particularly downloading the single calls for proposal launched by each programme, or programmes' activity or evaluation reports. Recovering single calls with their attached application guidelines, especially the oldest ones, implied several search sessions, because the documents are often removed after a period of time from the programmes' website, but are still available on other sources on the web, e.g. the websites of the funding agencies participating in the programmes. When funding data were not totally available, estimation of missing data was processed. In some cases, direct contact with the personnel of the agencies funding the programmes enabled the integration of contextual data on programmes, beyond the collection of information about the agencies themselves not available in the official websites.

As for country data, sources included EUROSTAT, OECD, World Bank, SCOPUS, and SCIMAGO.

All the sources used for the data collection are listed in Table 2.

**Table 2.** Lists of data sources used for the JoREP study

Unit of analysis	Sources
Joint R&D programmes	ERA-LEARN 2020 (formerly NETWATCH) website; calls for proposal publicly available; joint R&D programmes' websites; joint R&D programmes' activity reports; joint R&D programmes' evaluation reports; funding agencies websites; direct contacts with personnel from agencies participating in the programme.
Funding agencies	Funding agency websites; direct contacts with agency personnel.
Countries	EUROSTAT (statistics on Research and Development), OECD (statistics on Science, Technology and Patents), World Bank (worldwide governance indicators); SCOPUS (information on H-Index), Scimago Journal & Country Rank (Country rankings).

### 2.3 Geographical and temporal coverage

The geographical coverage of the JoREP study includes 32 countries: EU-28 countries plus four associate countries – Israel, Norway, Switzerland and Turkey.

Although longitudinal data on the programmes cover the period 2000-2014, different timespans are provided for those included in the European-level category and those included in the bilateral/multilateral one, according to the two waves of the JoREP study (see Section 2.1).

Data on funding and features of European-level joint R&D programmes for EU-28 countries and Israel, Norway, Switzerland and Turkey are provided for a five-year period covering 2010-2014; the same kind of data for selected 11 countries – Czech Republic, Denmark, France, Germany, Italy, Netherlands, Norway, Poland, Spain, Switzerland and the United Kingdom – are also provided for the period 2000-2009. For the same 11 countries, data on flows to performers, deriving from the first wave of the study, are integrated into the database and available for the period 2000-2009.

Data on funding and features of bilateral/multilateral programmes and relative flows to performers cover the same selection of 11 countries mentioned above and are provided for the period 2000-2009.



### 3 DATABASE DESCRIPTION

#### 3.1 Composition of the sample

The first version of JoREP stored 97 joint R&D programmes, selected for having launched a call for proposal in 2008 or 2009<sup>5</sup>. The second version of the database have expanded by more than one third the set of joint R&D programmes (+55 programmes having launched a call in 2013 or 2014, see Tab. 3). JoREP 2.0 stores data on 99 European-level joint R&D programmes and 53 bilateral/multilateral joint R&D programmes.

**Table 3.** Sample of joint R&D programmes and comparison between the two waves of the study

JoREP 1.0 (first wave)	JoREP 2.0 (first + second wave)
<i>97 programmes</i>	<i>152 programmes</i>
33 ERA-Net/ERA-Net+ actions;	74 ERA-Net/ERA-Net+/Era-Net cofund actions;
2 Joint Technology Initiatives (JTIs);	3 Joint Technology Initiatives (JTIs);
4 Article 185 of the EC Treaty;	4 Article 185 of the EC Treaty;
2 European Social Foundation (ESF);	2 European Social Foundation (ESF);
COST; EUREKA; ESA;	COST; EUREKA (subdivided); ESA;
53 Bilateral/Multilateral Programmes	53 Bilateral/Multilateral Programmes;
	9 Joint Programming Initiatives (JPIs)

Note: Total counting refers to the unique ID codes assigned to the programmes. In JoREP 2.0, EUREKA was unpacked into its 3 funding instruments, and one large JPI into 3 actions.

Within the two waves, once the programmes were selected, data were collected from the reference years of the wave backwards over time. In the second release of the database, large programmes underwent a fine-grained disaggregation in order to collect specific information. As an example, EUREKA was unpacked into its three funding instruments: Individual Projects (short-term, market-oriented international development projects); Clusters (long-term thematic initiatives by to strengthen European competitiveness); Eurostars (an art. 185 of the Treaty on the Functioning of the European Union initiative, addressed primarily to small and medium-sized enterprises).

As for the national actors involved in the programmes, JoREP 2.0 stores descriptors concerning a set of 348 national funding agencies participating at least in one joint R&D programme included in the sample.

#### 3.2 Relational structure and variables

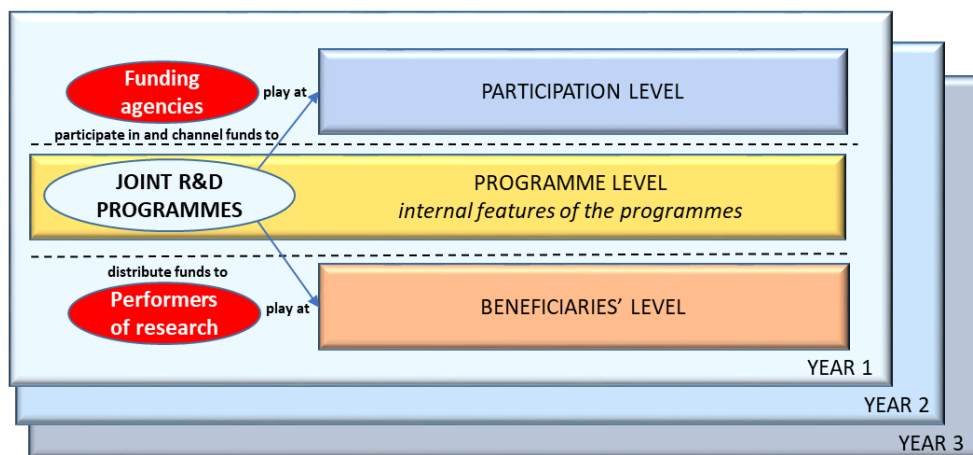
JoREP 2.0 is designed as a relational database, which combines different sets of data dealing with the complex structure of joint R&D programmes.

A joint R&D programme is a multilevel entity, characterized by diversified attributes; programme descriptors refer to three different levels of analysis. One level concerns the internal features of the programme and includes its basic descriptive characteristics; another is the level of participation that refers to the financial participation of the countries and the relative funding agencies; the third one is the level of beneficiaries and concerns the allocations to the research performers. Furthermore, programmes can change over time, undergoing specific transformations, potentially each year. Along the years, internal changes related to the characteristics of the programme can occur and participation and allocation dynamics might change at the same time.

<sup>5</sup> The launch of at least a call for proposal in the reference year reveals that a R&D programme is existing and “active” (Lepori & Reale, 2013).

Levels of analysis related to joint R&D programmes and type of actors involved are showed in Figure 1.

**Figure 1.** Levels of analysis of joint R&D programmes and actors involved changing over time



Data have been stored into distinct tables within a relational structure allowing the user to browse specific information referring to all levels, accounting for the storage and visualization of longitudinal data and assuring maximum possibility of querying.

Joint R&D programmes are listed in a parent table, which includes demographic information, with the indication of original and successor programmes (if applicable). Three child-tables are provided storing longitudinal information on different dimensions related to the programmes: (i) programme internal attributes, (ii) dynamics of participation by countries and relative national funding agencies and (iii) flow of funds to performers.

The table called *ProgrammeHistory* keeps track of the basic features of the transnational instruments – like duration, research topics, selection criteria, funding model, partnership of countries establishing the programme – in their evolution over time.

*ParticipationHistory* table hosts data on the national participation of the countries in the joint R&D programmes for each reference year; for each participating country, national funding agency and amount invested are identified.

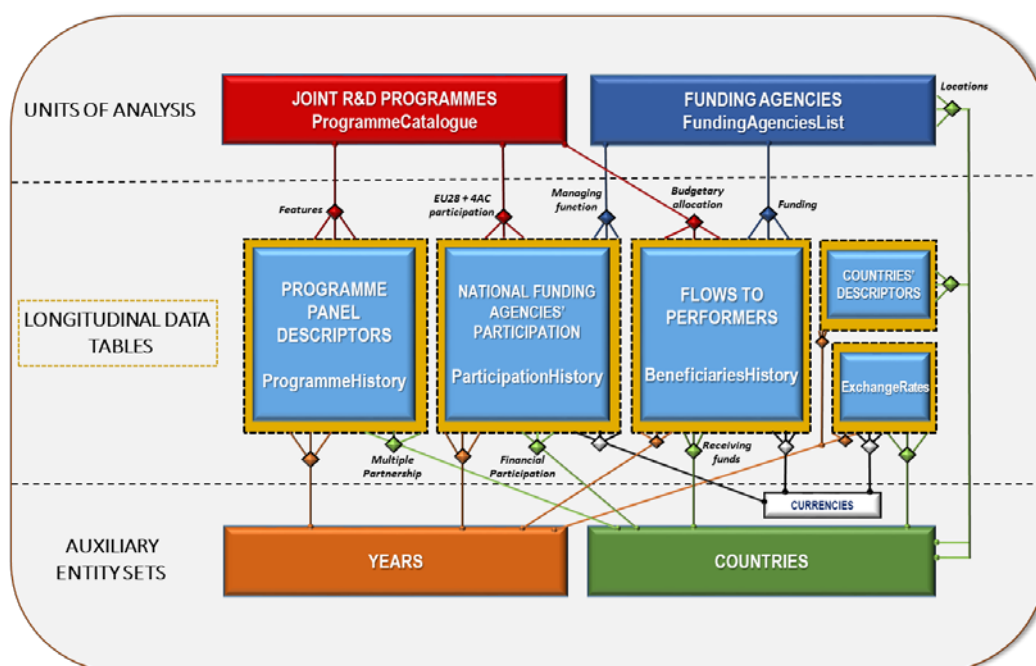
The table named *BeneficiariesHistory* stores information on countries of the performers receiving funds within a joint R&D programmes and relative amounts transferred.

Funding agencies and countries are listed in two distinct parent tables. Agency descriptors, including classification in terms of position with respect to the State and domain of activity, can be matched e.g. with the information on the features of the programme or the amount of funding channelled.

Basic information related to the country, including latitude and longitude of the capital city and population have been integrated with a longitudinal table on country descriptors. It includes relevant indicators such as General Expenditures on R&D on Gross Domestic Product (GERD on GDP), patents on population, and number of researchers on population extracted from official sources (see Section 2.2).

Figure 2 shows the web of one-to-many relationships creating links between parent and child tables through unique identifiers; Table 4 summarizes the sets of descriptors stored in JoREP 2.0 database<sup>6</sup>.

<sup>6</sup> For further detailed information on the technical structure of JoREP 2.0 database, see Reale and Spinello 2016.

**Figure 2.** Model of the relational structure of JoREP 2.0 database**Table 4.** Descriptors included in JoREP 2.0 database

Dimension	Descriptors
Joint R&D programme (programme level)	start year; end year; original programme (if existing); successor programme (if existing); demographic transformation (if occurred); establishing authority; name of the programme; type of instrument; duration; research topic; submission procedure; selection criteria; funding model; EU contribution; coordinator country; partner countries; integration mode; ERA category; programme type.
Joint R&D programme (participation level)	For each participating country: national role; national funding agency; national funding agency functions; origin of funding; budgeting; amount earmarked/channelled by the agency; beneficiary sectors.
Joint R&D programme (beneficiary level)	For each beneficiary country: national funding agency; amount received by the performers disaggregated into public and private.
Funding agency	agency country; agency acronym; agency name in the national language; agency name in English language; agency website; agency geographical level; agency classification; agency domain.
Country	latitude; longitude; population; language; GERD on GDP; graduated on population; researchers on population; patents on population; H-Index by country; citations by country; national administrative tradition; government effectiveness.

Note: Country descriptors cover the period 2005-2014, except “patents on population”, “citations by country”, “H-Index by country” and “government effectiveness”, which cover the period 2010-2014.

### 3.3 Data quality

Descriptors of joint R&D programmes at programme level and descriptors of funding agencies, which participate in the programmes, revealed a very good coverage. Some few issues related to the quality of participation data emerged during the first wave of collection, due to the limited availability of financial data (Reale et al. 2013). As for the second wave of the study, budget data on European-level initiatives for the period 2010-2014 are very complete especially for the last two reference years.

In terms of data comparability, the centralisation of the data management and processing during the second wave of the study allowed to solve any issues related to possible slight differences in the application of JoREP study guidelines for the data collection across countries.

## 4 ANALYTICAL POTENTIAL

JoREP 2.0 database allows for multifaceted representations of the organisational and financial characteristics of joint R&D programmes and can be exploited for analyses dealing with the ERA. Longitudinal data on participation allow figuring out the strategies adopted by the actors involved in the establishment of the programmes in terms of the underlying logic that frame their behaviour.

Reale et al. (2013) produced the first research output from the JoREP study describing the landscape related to the creation and implementation of joint R&D programmes, focusing also on the dynamics of participation of the national actors. Following the results of this preliminary study, Lepori et al. (2014) identified ideal types related to the organisational features and the role of funding agencies in the developing of transnational R&D programmes, which produce the emergence of different logics of integration in the Europeanisation of research activities.

The database allowed for the investigation of the geometries emerging in the creation of the partnerships establishing joint R&D programmes in order to verify whether funding is almost mostly aimed at supporting research collaborations between excellent actors or if the integration of research peripheries is becoming a fact. Reale et al. (2016) investigated the determinants of different levels of funding engagement in joint R&D programmes, focusing on the possibility to use non-spatial proximity and geographical proximity to understand how being close or distant in different dimensions affects the decision makers at national level to engage in participation and mobilise funding of transnational joint research programmes.

Participation in transnational initiatives implies the creation of peculiar networks of collaboration, whose study is relevant to understand the evolution of the European R&D system. In this respect, data from JoREP 2.0 inspired an interesting network analysis application performed by Reale and Zinilli (2017). The study shows how the different partners are related among them in transnational research programmes, how these relationships are made, who are the main actors and their role in the system, and how the networks operate.

JoREP data, dealing with one specific function carried out by the ERA – programming – can be combined with data on other dimensions, such as the one linked to the research performers; in this regard, data on funding schemes can be matched with information on the projects financed, providing i.e. insights into what research performing organisations actually engage in the framework of the instruments. For this reason, data on particular types of programmes, like JTIs (see Table 1), have been integrated – via unique identifiers – with data from another database belonging to RISIS distributed infrastructure – EUPRO – managed by Austrian Institute of Technology, dealing with European R&D projects<sup>7</sup>.

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<sup>7</sup> For detailed information on EUPRO database, see Report on the content and technical structure of EUPRO by Heller-Schuh et al. 2016.

## 5 DATA ACCESS

JoREP 2.0 database is accessible under RISIS rules for visits (see <http://risis.eu/risis-registration>). Target of the database includes the community of scholars in Science and Innovation studies, and all the researchers interested in the study of the Europeanisation of research activities and the dynamics related to transnational R&D funding. Data can be exploited for the sole purpose of scientific research and publishing.

Access to the database is conducted on site at CNR-IRCrES – Research Institute on Sustainable Economic Growth, unit of Rome. Interested researchers can apply for an on-site visit via the RISIS webpage <http://datasets.risis.eu>. In order to request access, they should register and agree on the conditions of use and then submit a project based on the use of the database, specifying also the time and duration of the visit. Projects are assessed by the managing structure of the database and the RISIS project review board.

In order to offer visibility to the resource and allow an informed approach to the data, CNR-IRCrES periodically organises training courses introducing to the potential of JoREP for the studies on the Europeanisation of research activities, addressing also concepts on advanced statistical methods applied to the data.

RISIS project website contains a complete documentation on the JoREP data, including metadata at <http://datasets.risis.eu/metadata/jorep>, full technical report at <http://risis.eu/documentation>, and course materials at <http://risis.eu/training>.

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