

RISIS



RESEARCH INFRASTRUCTURE FOR SCIENCE
AND INNOVATION POLICY STUDIES

NEW INSIGHTS INTO PROJECT-BASED R&D FUNDING FROM RISIS DATASETS: SOME EVIDENCE FROM EFIL AND NATPRO

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The exploration of project-based R&D activities supported by public research funding organisations (RFOs) has become a core research issue in **science and innovation policy studies**. RISIS has a strong focus in responding to this growing interest and related recently increased demand from the research community but also policy makers by maintaining and developing datasets on project-based R&D, both from a **performing perspective** (EUPRO) as well as from a perspective of **R&D funding programs** across European countries (EFIL). While EUPRO has been an established RISIS dataset comprising systematic information on European R&D projects and participations (mainly from the FP), it recently shifts – within the new NATPRO module – attention to the collection and integration of national R&D projects as an important complement to the existing European ones. To cover the funding perspective, EFIL has been set up as a completely new dataset currently under development collecting data on national R&D policy programs at the level of policy instruments. This policy brief discusses the broader conceptual background of the two datasets, the main methodological data collection procedures, but also comes up with some initial illustrative empirical examples underlining the relevance of **EFIL** and **EUPRO/NATPRO** both in a research and policy context. The two datasets are not only integrated with each other, but also inter-linked with other datasets of the RISIS data nexus, in particular via RISIS organisation registers enabling to connect with other R&D output oriented datasets on e.g. patents or publications.

1. INTRODUCTION

The investigation of publicly funded R&D projects has attracted significant interest in the recent past, both in research as well as in a policy context. Research on project-based R&D can usually be approached from two angles, that is, on the one hand, from the perspective of public research funding organisations (RFOs) and the characteristics and rationalities of the R&D programs and instruments implemented by them, or, on the other hand, from the performing perspective and the characteristics of the funded R&D projects, e.g., in terms of participation patterns and resulting **R&D collaboration networks**. From a policy perspective, both angles are highly relevant for getting a better understanding on the effects of publicly funded R&D, both in terms of the evaluation of policy programs but also their future design.

RISIS has a rather long-standing tradition in developing and providing access to data focusing on R&D projects by means of the EUPRO database. It's a unique information source providing systematic information on European R&D projects (FP, Eureka, Cost and selected Joint Technology initiatives), recently used in research activities investigating structure, dynamics and impacts of project-based R&D collaboration, in particular to grasp the development of the European Research Area (ERA) (see, e.g., Hoekman et al. 2013, Neuländtner and Scherngell 2020). However, it is central to enlarge EUPRO to national project-based funding to better position such dynamics and study complementarities between project-based funding mechanisms. The newly developed NATPRO module exactly speaks to this gap setting up a novel and systematic information basis on nationally funded R&D projects.

Moreover, RISIS has recently extended its focus to collect data R&D funding programs and instruments by means of the EFIL database. It aims at characterising the portfolios of public policy instruments of RFOs from selected European countries, and at producing evidence of the structural, procedural, and allocational aspects of funding instruments, as well as organizational profiles. In this respect, EFIL enables users to investigate public R&D funding in Europe at the level of RFOs and funding instruments in terms of a completely new information basis on the specific characteristics of these RFOs and funding instruments.

The remainder of this policy brief is organized as follows. Section 2 provides an overview of the main methodological aspects of the data collection of the two datasets and their inter-linking in the RISIS data nexus. Section 3 provides some

insights into simple empirical illustrations on the German Research Foundation (DFG), for which both EFIL and NATPRO have already collected substantial amounts of data. The brief concludes with a perspective on some potential future exploitations in research, as well as in the policy context, by the use of the two datasets.

2. METHODOLOGY AND DATA

EFIL collects data at the funding instrument level, with a focus on the policy design of project funding, while **NATPRO** provides a systematic information basis on nationally funded R&D on the project level, focusing on the R&D performing organisations.

EFIL data collection

EFIL data are gathered through a web-based search of publicly available information on the structural, allocational, procedural, and budgetary characteristics of R&D project funding instruments. EFIL's first release includes **data on project funding portfolios from 52 relevant RFOs in nine countries** (see Table 1). RISIS ORGREG was used to draw up the list of relevant RFOs.

For each RFO a re-composition of the funding instrument portfolios was carried out, assuming **2017** and **2018** as reference years. The major “funding rotues” (meso-level portfolio disaggregation) and single funding schemes (micro-level) are identified and listed. Official instrument calls, webpages, and RFO annual reports are used to obtain qualitative data (e.g., goals, aims, type of funding, decision-making procedures) and quantitative data (e.g., budget invested). Through analytical text mining procedures applied to official documentation hosted in an open repository linked to the dataset, funding instruments are also linked to the SGC, KET, and SDG standard classifications (for information on the complete methodology, see Reale et al., 2022).

Table 1. Overview of the EFIL perimeter

Country	RFOs	Instruments
Austria	4	87
Czech Republic	10	35
Denmark	6	79
Estonia	4	11
Germany	6	73
Italy	2	5
Norway	2	93
Switzerland	4	41
United Kingdom	14	104
Total	52	528

NATPRO data collection

As in EUPRO as a whole, the main approach of the NATPRO extension is to collect data from publicly available heterogeneous sources. These may be data sets on the level of single RFOs or national research information systems covering multiple or all RFOs of the respective country. The data collection therefore requires identifying national RFOs, to screen the public availability of project data, and to evaluate potential alternatives for data collection. The identification of the relevant RFOs for inclusion in NATPRO is done in close co-operation with EFIL. A specific effort has been done to cover new Member States from Central and Eastern European countries.

Focus of the NATPRO data collection is to collect data on the participations in **R&D projects** (e.g. to trace organisation-by-organisation networks). Additional information, if available in the source dataset, includes title, objective and topics of the project, and – where applicable – project costs, funding instruments and funding calls. Different structures of data and access conditions imply the need to first transform raw data into the **NATPRO** database structure and variables, followed by a process of **data cleaning** (e.g., organisation names) and **semi-automated name matching** to RISIS OrgReg and RISIS FirmReg (requiring immense efforts and resources). The inclusion of information on funding instruments allows a direct linking between NATPRO and EFIL not just on the RFO level but also directly on the instrument level (for information on the complete methodology, see Zahradnik et al., 2021).

Table 2. Overview NATPRO perimeter

Country	Projects	Participations
Austria	17,331	24,581
Czech Republic	37,848	62,214
Estonia	3,583	4,156
Germany	124,590	151,521
Ireland	6,007	6,007
Italy	9,977	42,111
Poland	21,781	25,864
Sweden	52,570	52,570
Switzerland	76,961	143,408
United Kingdom	121,045	317,629
Total	454,362	746,903

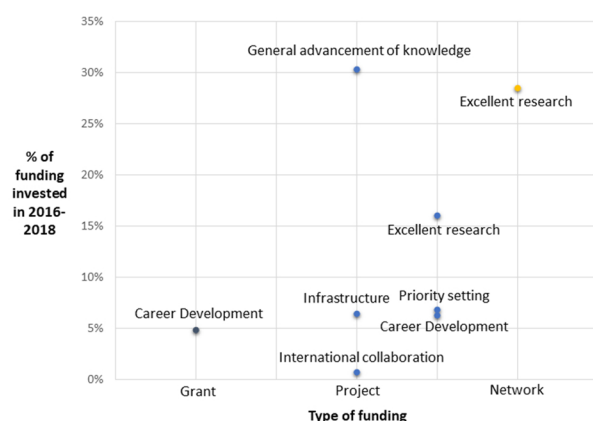
3. FINDINGS

In this section, we present some **exemplary empirical illustrations** of the two datasets, mobilizing their inter-linking in a rough analysis of the funding patterns observed for the **German Research Foundation (DFG)** as one main example of newly collected data in both datasets.

DFG funding opportunities largely pursue a bottom-up approach, being clearly aimed at curiosity-driven research, with a low orientation to economic innovation or specific policy goals. The "Individual Research Grants," a large generalistic program aimed at funding projects limited in time and scope in all disciplinary fields, account for roughly **30% of the agency investment in 2018**. A small set of programs targeted to individuals shapes a distinct funding route dedicated to career advancement, accounting for around 4.5% of the total 2018 budget, e.g., Emmy Noether Programme and Heisenberg Programme.

The presence of funding schemes devoted to scientific excellence and the fulfillment of relevant thematic priorities distinguishes the agency the most in the European context. In this regard, "Priority Programmes" are aimed at fostering emerging fields of research (pursuing a top-down approach) and the **Excellence Initiative** (17% of the 2018 budget) promotes cutting-edge research contributing to German universities' international competitiveness. Furthermore, a double set of other coordinated programs targeted to individuals and institutions, among which "Collaborative Research Centres", is by far the richest one (around 22% of 2018 budget), promoting cooperation and excellence. These programs stand out for pursuing internationalization of research and the peculiar type of transfer of the funding. Indeed, they enable the formation of **long-term networks of researchers** (e.g., Research Units, Clinical Research Units) or **institutional networks** (see Braun, 2003) - e.g., Collaborative Research Centers; DFG Research Centers.

Figure 1. DFG funding by instrument aim and type of funding 2016-2018



As to the instruments' aim, Figure 1 shows that a consistent part of the DFG budget was targeted to **cooperative excellence research** between different organizations forming a network and for the establishment of long-term research units (28%). The investment according to the typical project funding model (transferred for a specific research activity limited in time and scope) accounts for the 16% and 30% of the total budget for other excellence research and research aimed to the general advancement of knowledge, respectively.

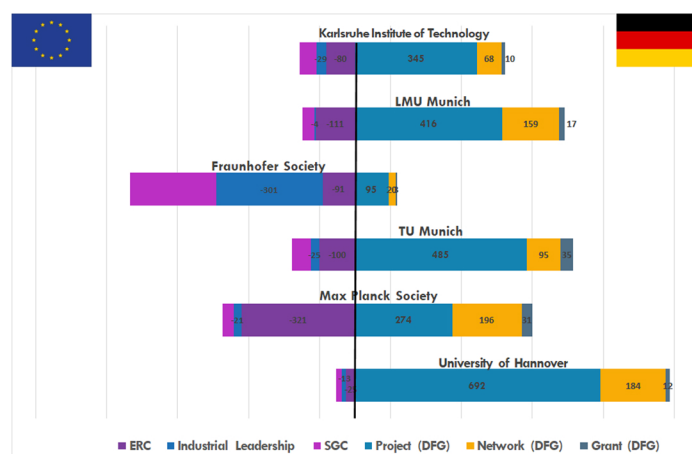
From 2016 to 2018 there has been an **increase of the total DFG funding** (12%). The various types of funding (project, grant, network) have not shown significant proportional differences, with the smaller percentage of funding allocated to personal grants for career development (see also Janger et al., 2019). The investment in this aim is however compensated by the project funding transferred to institutions under the "Research Training Groups" scheme.

As regard SDGs integrated into DFG funding instruments, "Partnership for the goals", "Decent work and economic growth" and "Industry, innovation and infrastructure" are the main goals pursued by the agency. "**Society**" is the primary political priority for the DFG in terms of the SGCs.

Shifting attention to the performing side, i.e., to the level of projects and participations (by connecting EFIL to EUPRO as described in the previous section), figure 2 illustrates the number of participations in DFG funded from **2016-2018** for selected major German universities and public research organizations, disaggregated by type of funding. It complements the information on DFG projects by the participation intensity of these organizations at the European level in FP projects running over the same period, available from EUPRO (this is only possible due to the cleaning and linking of NATPRO collected data with RISIS OrgReg, see Section 2).

We consider the top three universities and public research organisations in the analysis. The pattern we observe shows that **public research organisations** account for a large part of **EU funding**, while for all universities, DFG is much more important than for public research organisations. The three universities displayed (Hannover, TU Munich and LMU Munich) are the organisations with the overall **highest number of participations in DFG projects**. However, while TU Munich and LMU Munich also participate in a significant number of EU funded projects, in particular ERC grants, the University of Hannover does not and relies mostly on national third-party funding.

Figure 2. Top participants in DFG funded and EU funded projects by funding type 2016-2018



While for the two public research organisations (Max Planck Society, Fraunhofer Society) EU funding is clearly more important in relation to universities, they participate in both. It seems that some kind of complementarity effect is in stake here, given that high EU participation (e.g., Fraunhofer) goes together with relatively lower DFG participation, and vice versa. In the case of Fraunhofer as applied research institute, participations in EU projects, in particular more innovation-oriented programs like Industrial Leadership, outnumber the participation in the more basic oriented DFG funding instruments by far. In contrast, EU participations and national participations are of similar importance for the Max Planck society as a more basic research oriented institute.

4. POLICY IMPLICATIONS

While the development of EFIL and NATPRO per se opens new ways for addressing currently debated research and policy questions, the integration between the two datasets in particular provides an even wider potential for relevant policy studies. The combined use of the two datasets may help in shedding light on the characteristics of national R&D funding systems, as well as national R&D projects and participations. From a conceptual standpoint, **the link between programs and projects** allows for providing information on the mechanisms of how government goals for science policy are translated into concrete research activities by beneficiaries of

projects. Further, through the two datasets we are able to identify a long-term pattern of decisions regarding the policy orientation in terms of enabling technologies and social challenges. This double perspective, program and project levels, has a specific value in identifying problems that may arise at the decision-making level, which may affect **the way policy goals are shaped**, as well as **the relationships with research policy beneficiaries**. The joint information from the two datasets may reveal the mismatch between the policy orientation and research practices of scholars' communities. We expect to know whether governance instruments achieve their stated effects, what other effects they produce, and how governance could be perceived by performers.

Our case study's findings reveal that the DFG provides a **wide range of funding instruments** for individuals, research groups, and institutions. Funding opportunities are available for a variety of purposes, with a peculiar focus on excellent research. The funded research is generally not geared following a top-down approach (except for the Priority Programmes), so the project proposers can retain control over the research topics. Funding to person aimed at career development constitutes the smallest percentage of a project funding portfolio that dedicates a substantial percentage on the promotion of long-term institutional cooperation. Turning to the results **on the performance side**, the DFG funding opportunities show a higher relevance for universities than for public research organisations (PROs), in particular when compared to European funding channels (FP). Moreover, the analysis of the top-three universities and PROs shows that the intensity in participation in DFG projects is, in any case, usually higher than in FP project (with the exception of Fraunhofer that has a strong focus on the FP).

Summing up, using EFIL and NATPRO, the program-project link can be addressed in its full complexity. At the program level, this requires taking into account a **multitude of processes** in order to understand how the policies are designed and government goals are pursued. At the project level, governance can be studied as embedded in contexts of concrete research activities to which the beneficiaries respond. The integration allows us to understand the **changes in the effects of research policy** to the beneficiaries and how they respond to the policy strategies.

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RISIS community is dealing with sensitive issues as social innovation, non-technological innovation, the role of PhDs in society, and portfolios of public funding instruments, studying both universities and firms.



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