

EU RESEARCH & INNOVATION FUNDING SCHEMES: USING PROJECT-LEVEL DATA FOR MONITORING & EVALUATION

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DOI: 10.22163/fteval.2020.486

ABSTRACT

This non-technical article promotes the use of project-level data for monitoring and the evaluation of EU research and innovation policy. First, a new dataset of R&I-related projects co-funded by the ERDF during the multi-annual financial framework 2014-2020 is introduced. Second, this data is used, together with Horizon 2020 project information, in order to explore interlinkages between the funding schemes in terms of thematic priorities as well as beneficiaries. On average, 15% of ERDF projects could be identified as being carried out by a beneficiary that also receives funds from the Horizon 2020 programme.

INTRODUCTION

The European Union (EU) provides substantial amounts of funding for research and innovation (R&I) activities in European Member States. Fostering R&I in order to strengthen the EU's global competitiveness has been a key priority of EU policies in the multi-annual financial framework (MFF) 2014-2020. As recently decided in a Special Meeting of the European Council (1720 July 2020), also in the MFF 2021-2027 "*particular priority shall be given to delivering a substantial and progressive enhancement of the EU's research and innovation effort*" (European Council, 2020, p. 17).

In the MFF 2014-2020, Horizon 2020 has been the financially most powerful programme fully dedicated to enhancing R&I. In addition, European Structural and Investment Funds (ESIF) as well as funds specifically targeted at the development of a global satellite navigation system (Galileo) or the improvement of earth observation (Copernicus) provide financing for projects and activities in the R&I sphere (Reillon, 2015). Apart from Horizon 2020 which distributes almost €80bn over the period from 2014 to 2020¹, the largest R&I funding volume is provided by the European Regional Development Fund (ERDF) which is part of ESIF and

thus the EU's cohesion and structural policy. The ERDF budget specifically R&I related for the MFF 2014-2020 amounts to €40.9bn².

These two major European R&I funding schemes differ considerably in terms of funding principles, regulation and eligibility criteria. On the one hand, the Horizon 2020 programme is based on the excellence of individual R&I projects and does not consider the location of tenderers. Very often, international consortia are awarded contracts in the tendering process. On the other hand, the objective of the ERDF is to foster smart, sustainable and inclusive growth in European regions. Beside other thematic objectives, strengthening research, technological development and innovation represents one (important) vehicle to achieve this goal. The choice of funded projects is mostly non-competitive and depends on strategic considerations considering the development and structural characteristics of the region. Moreover, ERDF allocation is place-based (see e.g. Barca et al. 2012, Foray et al. 2009). The design of regional or national smart specialisation strategies has become a central instrument to support EU Member States in identifying competitive niches and concentrating R&I resources co-financed by the ERDF on a few strategic priority areas.

In order to increase the impact of European R&I policies, Member States are encouraged to develop synergies between the main sources of R&I funding. Thus, the Stairway to Excellence pilot project (S2E) was initiated in 2014, funded by the European Parliament and implemented by the European Commission with the aim to support EU Member States and their regions in developing and exploiting synergies among EU programmes. Synergies can occur through the combined usage of ERDF (ESIF) and Horizon 2020 resources for the same project, consecutive or parallel projects or the co-financing of shortlisted Horizon 2020 proposals which were not funded because of a lack of financial resources through the ERDF (European Commission, 2014). In addition, to foster the achievement of synergies, improvements in coordination and communication between planning and implementing bodies, i.e. managing authorities of operational programmes and national contact points for

1 According to European Council (2020), p.18, the budget of the follow-up programme Horizon Europe for the MFF 2021-2027 will decrease to €75.9 bn.
2 Among ESIF, also the European Agricultural Fund for Rural Development commits €2.2 bn for funding R&I. Retrieved from <https://cohesiondata.ec.europa.eu/themes/1#> (accessed: 8 October 2020).

Horizon 2020, as well as an alignment of funding principles are required (Perez et al. 2014, Özbolat & Harrap 2018). The conclusions of the Special Meeting of the European Council in July 2020 also highlight the objective of coordinating “R&I activities funded through Horizon 2020 with those funded under other EU programmes, including through cohesion policy. [...] Important synergies will be needed between Horizon Europe and the structural funds for the purpose of ‘sharing excellence’, thereby enhancing regional R&I capacity and the ability of all regions to develop clusters of excellence.” (European Council, 2020, p. 18).

To analyse existing interrelationships, synergies or non-intended overlaps between European R&I funding, case studies or interviews with institutional actors or beneficiaries seem to be appropriate research methods. However, these approaches are typically limited to a selection of programmes and calls, respectively, or a few regions or Member States given available resources. In order to study interlinkages and synergies between the funding schemes considering the full programmes in all EU Member States, one possibility is to explore and contrast characteristics of (co-)funded projects and beneficiaries.

First, in terms of thematic classification, a synergy between funding schemes may arise by aligning Horizon 2020 and ERDF among a set of technological or policy areas. In order to build on a common analytical framework, we consider as specialisation areas the Horizon 2020 key enabling technologies (KET) and societal grand challenges (SGC). While the relevant KET and SGC assignments are reported for Horizon 2020 projects in the CORDIS database³, detailed ERDF project-level information is required in order to be able to assign KET and SGC to ERDF projects. For the thematic classification, keywords associated to different KET and SGC provided by the ontological approach of the KNOWMAK project⁴ are used.⁵

Second, synergies of funding may occur if the same beneficiary, e.g. the research and development department of a company, an innovative SME or a university, successfully applied for funding from both funding schemes. In order to find out whether there are private or public entities which receive funding for R&I activities from both ERDF and Horizon 2020, it is necessary to investigate the micro-level distribution of both funding schemes.

Next to analysing linkages between funding schemes, project-level data enables further analyses of interest for policy evaluators, policy makers and the public. By linking the beneficiaries’ data with business information, such as balance sheet or patent data, policy impacts can be estimated at the individual or small-scale geographical level (see e.g. Fattorini et al. 2019, Bachtrögler et al. 2020b). Using data on INTERREG projects in MFF 2014-2020, Darvas et al. (2019) find that different types of projects contribute differently to successful policy implementation.

The aim of this practice-oriented article is to introduce a new dataset of R&I-related projects co-funded by the ERDF during the MFF 2014-2020 and to present possibilities to analyse interlinkages between R&I funding through the ERDF and Horizon 2020 using project-level data. As the data-

set includes project- and beneficiary-level information for all EU Member States and the United Kingdom, this approach does not only serve for national or case studies but allows a contribution to R&I policy monitoring and evaluation at the EU level. The dataset of ERDF projects as well as the link with Horizon 2020 data has been developed in the course of the S2E project.⁶

DATA ON PROJECTS CO-FUNDED BY ERDF AND HORIZON 2020

The Horizon 2020 programme is centrally implemented and managed by the European Commission which develops work programmes and issues calls for proposals, evaluates them and monitors the progress of funded projects (Perez et al. 2014). Thus, project data is also collected by the European Commission and published in the CORDIS database.

Conversely to Horizon 2020 and due to the principle of shared management which implies policy implementation at the level of Member States, a complete structured database of ERDF projects does not exist. In the current programming period, the distribution of ERDF funds in European Member States is based on smart specialisation strategies that are designed and implemented under shared management between the Commission and regional or national authorities. Accordingly, monitoring and evaluation also happens at different levels. At the European Commission level, monitoring of cohesion policy is carried out at operational programme (OP) level with limited accuracy in terms of geographical information (depending on the member state, there are not only regional but also national as well as multiregional OPs), or at the regional level. For the latter, allocations by fund and thematic categories are added up for each NUTS-2 region. Project-level data is provided only for a selection of representative projects on the ESIF open data platform.⁷

Reporting of EU cohesion and structural policy at the level of project and beneficiaries is carried out in national or regional databases. According to Article 115(2) of Regulation (EU) No 1303/2013 (common provisions regulation), managing authorities of OPs are required to provide a list of operations with certain minimum information such as project title, description, location, start and end date, total eligible expenditure and a category of intervention (see Annex XII of the Common Provisions Regulation (EU) No 1303/2013).

In the course of S2E, a project was initiated to design and set up a structured and comprehensive database of operations funded by the ERDF and corresponding beneficiaries for the MFF 2014-2020 (comprising projects initiated by June 2019), based on the systematic collection of all information available at national and regional levels. The resulting ERDF database contains more than 238,000 projects in 27 EU Member States and the United Kingdom, covering around half of ERDF commit-

3 CORDIS (EU research results): <https://cordis.europa.eu/en>.

4 The aim of the KNOWMAK project is to develop a web-based tool, which provides interactive visualisations and indicators on knowledge co-creation in the European research area. The tool is developed by the European Research Infrastructure for Science, technology and Innovation policy Studies (RISIS) (see <https://project.knowmak.eu/about/project-overview/> and <https://www.knowmak.eu/>).

5 Note that the KET taxonomy of the KNOWMAK project does not completely mirror the one by the Horizon 2020 programme. First, the KET related to space is not considered and, second, the one related to ICT only considers hardware technologies (micro- and nanoelectronics and optics and photonics).

6 See Bachtrögler et al. (2020a) for the technical documentation of the dataset of R&I projects co-funded by the ERDF during the multi-annual financial framework 2014-2020. The data is available in the R&I Regional Viewer: <https://s3platform.jrc.ec.europa.eu/synergies-tool>.

7 For more information see <https://cohesiondata.ec.europa.eu/projects>.

ments for the complete MFF 2014-2020 (see Bachtrögler et al. 2020a). Based on the categories of intervention, it is defined whether a project is attributed to the R&I sphere.⁸

While the 86 categories of intervention allow a granular thematic classification of projects co-financed by the ERDF, the Horizon 2020 database provides a thematic categorisation of funded activities based on key enabling technologies (KET) and societal grand challenges (SGC). In order to link the datasets, KET and SGC are assigned to ERDF projects according to project names and descriptions based on the KNOWMAK⁹ ontology, which enables comparing the thematic priorities of R&I funding by ERDF and Horizon 2020 in European Member States and regions. Furthermore, beneficiaries profiting from both schemes are identified by name matching and additional manual checks.

R&I-RELATED ERDF FUNDING AND ITS INTERLINKAGES WITH HORIZON 2020

Among all projects co-funded by the ERDF, more than 84,500 projects are classified as R&I-related according to the definition stated above. This is around a third of all projects in the dataset based on lists of operations as reported by June 2019. Those R&I related projects correspond to around €35bn of ERDF funds, which is approximately a quarter of the total ERDF co-financing amount reported in the dataset. Thus, the dataset covers a considerable share of the ERDF budget for the thematic objective “Research & Innovation” (€40.9bn¹⁰).

However, the share of R&I projects among all funded ERDF projects varies significantly across Member States and regions. While more than half of ERDF funds reported in the dataset are dedicated to R&I activities in Denmark, Finland, Luxembourg, Latvia, the Netherlands and Sweden, more than a third of project expenditure is related to R&I in Austria, Germany, Estonia, Spain, Slovenia and the United Kingdom. The lowest shares of R&I-related projects lie below 10% and occur in Bulgaria, Greece, Croatia and Romania (Bachtrögler et al. 2020a, p. 6).

In large part, this pattern mirrors the level of economic development relative to the EU average which implies different funding priorities in less and more developed regions in order to increase GDP growth. In Bulgaria and Romania, the largest amounts of ERDF funding are invested in transport infrastructure projects (among others, railways, clean urban transport infrastructure and TEN-T motorways and roads). Likewise, the most important category of intervention in terms of the absolute sum of project amounts in Greece is “Clean urban transport infrastructure”, for Croatia the second most important one is “TEN-T motorways and roads”.

Figure 1 presents the share of R&I-related ERDF funding per NUTS-2 region and reveals significant within-country variation. Note that de-

tailed information for Hungary is only available for R&I projects and Irish data is provided for only one of two operational programmes.

Furthermore, project- and beneficiary-level data, respectively, allows to link funding data with business information such as the AMADEUS database. By applying name matching it was possible to enrich beneficiaries’ data for around 60% of R&I-related projects, and after further manual checks, a NACE main category could be assigned to more than three quarters of projects. However, it is essential to take into account that the coverage of AMADEUS data varies strongly between countries, i.e. from below 2% of R&I projects in Cyprus to 83% in Hungary (the average and median coverage per country amounts to approximately one third of projects).

Considering eleven Member States for which the coverage with AMADEUS data lies above 25%, almost 80% (more than 25,000) of individual beneficiaries can be assigned a NACE industry (main category). While the majority of those, i.e. more than a third, are manufacturing firms, almost a fifth of beneficiaries are carrying out professional, scientific and technical activities or operate in the education sector. Therefore, there appears to be a considerable number of ERDF beneficiaries such as research institutes, universities or innovation-oriented manufacturing firms that could potentially also profit from Horizon 2020 funds.

Linking ERDF beneficiaries with the CORDIS database allows to investigate this in more detail. A comparison of ERDF and Horizon 2020 beneficiaries reveals that there is indeed a significant number of firms, universities and research institutions involved in and profiting from both programmes. Around 15% of R&I projects co-funded by the ERDF are carried out by beneficiaries that also receive Horizon 2020 funds. Considering individual beneficiaries, this corresponds to 5% of ERDF beneficiaries.

Interestingly, Table 1 shows that the number of beneficiaries of both programmes differs strongly across countries. Countries with a relatively small share of R&I-related ERDF projects such as Bulgaria, Greece and Croatia correspondingly appear at the bottom of the ranking in terms of the share of beneficiary overlap. By contrast, e.g. also in Estonia, which dedicates more than a third of ERDF amounts to R&I projects, only 3% of ERDF beneficiaries also receive Horizon 2020 funds.

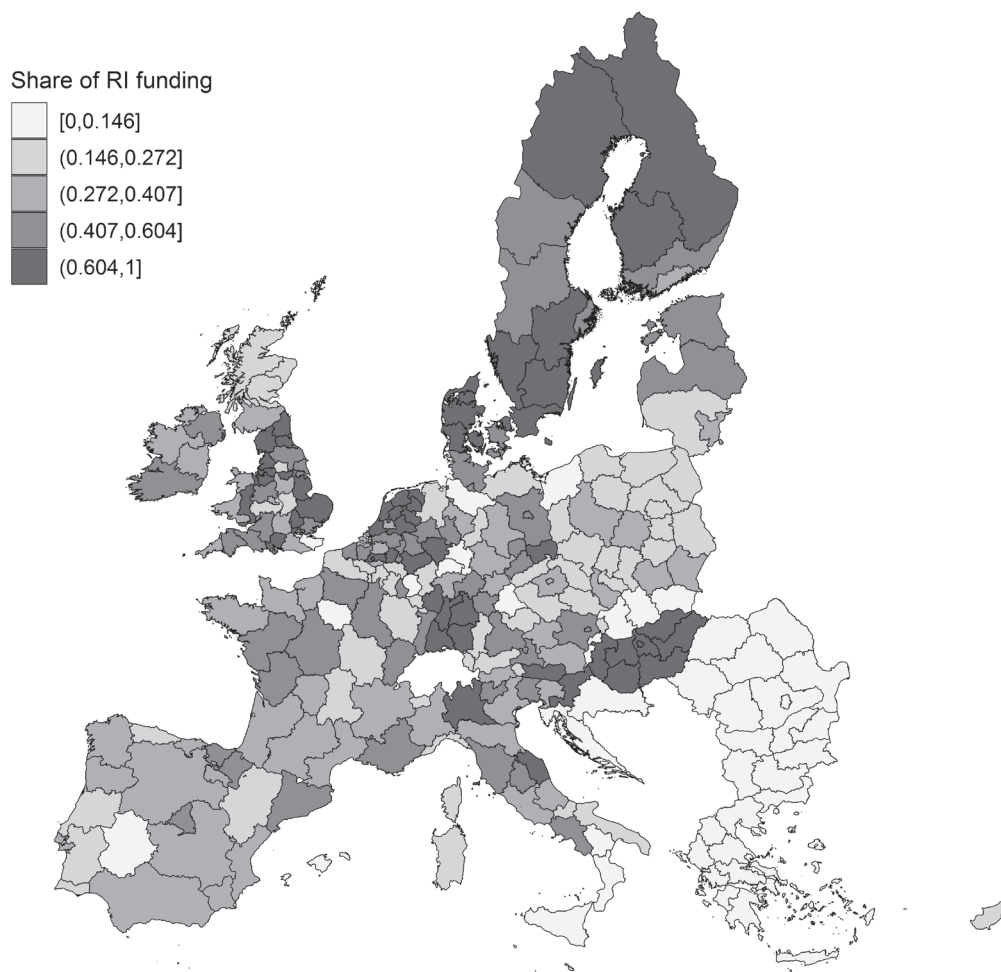
8 R&I related categories of intervention include R & I processes in large enterprises and SMEs, Investment in infrastructure, capacities and equipment in SMEs and large enterprises directly linked to R&I activities, Public and private R&I infrastructure, R&I activities in research centres, Technology transfer and university-enterprise cooperation as well as cluster support and business networks primarily benefiting SMEs, Cluster support and business networks (Bachtrögler et al. 2020a, pp. 7 f.).

9 www.knowmak.eu

10 Retrieved from <https://cohesiondata.ec.europa.eu/themes/1#> (accessed: 8 October 2020).

Figure 1: Share of ERDF co-funding amounts for R&I-related projects per NUTS2 region

Interval of shares in percentage points/100



Source: ERDF beneficiaries' database (<https://s3platform.jrc.ec.europa.eu/synergies-tool>) as described in Bachtrögler et al. (2020a), own analysis. Note that in Hungary detailed project data is only available for R&I-related projects. Five bins correspond to quantiles. Projects that could not be assigned to a (single) NUTS2 region are not considered.

Table 1: Share of ERDF beneficiaries carrying out R&I-related projects that also receive Horizon 2020 funds

Country	ERDF+H2020	Country	ERDF+H2020	Country	ERDF+H2020
IE	27%	LU	9%	HR	3%
AT	26%	ES	8%	CZ	3%
UK	23%	SI	7%	EE	3%
BE	19%	CY	7%	PL	2%
MT	17%	DE	7%	BG	2%
DK	15%	FI	7%	HU	2%
RO	12%	SK	6%	EL	2%
NL	11%	LV	6%	LT	1%
FR	11%	IT	6%		
SE	11%	PT	4%	Average:	5%

Source: ERDF beneficiaries' database (<https://s3platform.jrc.ec.europa.eu/synergies-tool>) as described in Bachtrögler et al. (2020a), own analysis.

The interlinkage between ERDF and Horizon 2020 funding data in terms of (the same) beneficiaries is one way to explore potential synergies among the funding schemes. Digging deeper into details on funded projects will allow to draw further conclusions on whether the funds are used for different types of projects, e.g. whether the ERDF supports investments in R&I infrastructure used for preparing Horizon 2020 projects. The latter is one way of exploiting synergies recommended by the S2E project (see Perez et al. 2014).

Another way to analyse the interaction between ERDF and Horizon 2020 beneficiaries is according to thematic priorities. For this kind of analysis, KET were assigned to more than 42,000 and SGC to almost 70,000 R&I-related ERDF projects based on project descriptions and the KNOWMAK taxonomy (multiple KET and SGC, respectively, can be assigned to one single project).

As Table 2 shows, the most frequent KET assigned to ERDF projects is biotechnology, followed by advanced materials, and nanoscience and technology. Regarding societal grand challenges, “inclusive, innovative and reflective societies” is the one that was assigned most often to ERDF projects. In addition, challenges corresponding to climate change and sustainability appear to be important issues for programmers of EU structural and cohesion policies. In comparison with other societal grand challenges, and in line with the priorities set in operational programmes, “Health, demographic change and wellbeing” is attributed to a relatively low number of ERDF projects, which – in the context of the current COVID-19 crisis – may gain importance in the future.

Table 2: Number of projects being assigned a specific KET or SGC

Key enabling technologies (KET)	Number
Biotechnology	28,800
Advanced materials	13,900
Nanoscience and technology	12,300
Micro- and nanoelectronics	9,000
Optics and photonics	7,900
Advanced manufacturing technology	6,400
Total number KETs assigned to 42,700 R&I projects	78,300
Societal grand challenges (SGC) ¹¹	Number
Europe in a changing world - inclusive, innovative and reflective societies	46,700
Smart, green and integrated transport	27,400
Secure, clean and efficient energy	24,500
Climate action, environment, resource efficiency and raw materials	24,100
Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy	21,400
Health, demographic change and wellbeing	18,500
Secure societies – protecting freedom and security of Europe and its citizens	16,100
Total number SGCs assigned to 69,800 R&I projects	178,700

Source: ERDF beneficiaries’ database described in Bachtrögler et al. (2020a), own analysis.

CONCLUSION

This article promotes the use of project-level data for the monitoring and evaluation of EU (R&I) policies. In particular, it points to the analysis of the characteristics of R&I projects co-funded by different EU funding schemes (ERDF as part of ESIF and Horizon 2020) for exploring potential synergies or overlaps between those schemes. One limitation of analysing data at a high level of granularity is that more general intra- or interregional or nation-wide developments might be shaded. Therefore, combining data at different aggregation levels will be fruitful in many analyses.

While Horizon 2020 and R&I funding under the ERDF target different objectives and operate under different funding principles, this analysis has shown that 15% of R&I-related ERDF projects are carried out by beneficiaries that also receive funding from Horizon 2020. Furthermore, based on Horizon 2020 funding principles, several key enabling technologies, such as biotechnology, and societal grand challenges, such as inclusive, innovative and reflective societies or sustainable transport, also appear to be priorities in the distribution of ERDF funding within European regions.

In line with the plans of the European Council for the next MFF 2021-2027, the detailed analysis of project- and beneficiary-level data could help to improve the alignment of funding procedures and strategies in order to generate synergies. Thereby, patterns of concentration of funding in different EU regions can be investigated as well as the research question whether these patterns matter for the overall effectiveness of EU R&I policies.

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KEYWORDS

ERDF, Horizon 2020, EU Research and Innovation Policy, Evaluation, Funding Interlinkages

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