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Topics of social relevance in research project funding instruments: evidences from European countries¹

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Aim

This paper explores, using existing recent data collected at European level on government R&D funding, the portfolio of project funding instruments managed by the Research Funding Organisations (RFOs) in different European countries to understand how far they are targeted toward addressing problems of social relevance—those close to solving problems affecting citizens and society.

Following Nightingale and Scott (2007), we assume that the actual capability of project funding instruments to implement issues of social relevance is mainly related to the way in which the aims and objectives are put into actions by the managing RFOs through criteria used in the selection processes, and the composition of the selection panel.

We explore whether instruments with targeted objectives toward topics of social relevance may be implemented in a flexible way when the selection is driven by criteria that do not score high the capability of the proposals to address problems of social relevance and do not involve non-academic experts in the selection panels. Conversely, project funding instruments not oriented toward social relevant objectives can be implemented in a way that score high the presence of topics of social relevance in research proposals, by including also the participation of experts in the panels.

Theoretical background and conceptual framework

R&D funding was deeply transformed from the seventies onward, and the use of project-based funding mode of allocation was further improved in the eighties for two main reasons: on the one hand the stagnation of the volume of public research funding pushed toward more selective modes of allocation; on the other hand, the policy objective of an efficient use of public resources emphasised competitive allocation as a mean to increase efficiency and effectiveness

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of the research systems (Lepori et al., 2007). The rationale behind this tendency was that enhancing competitive allocation mechanisms would allow to better the research performance and a more efficient use of the funding resources, by selecting the best research groups, promoting some subjects or research themes, supporting structural changes in the modes of knowledge production, improving the cooperation and competition between research groups (Geuna, 2001; Braun, 2006).

Over the last decades, mechanisms for competitive allocation of public R&D funding have become more widespread, which has come with a reduction of resources in almost all European countries, creating issues related to equity of funding distribution based on performance (Hicks, 2012). Several attempts of scholars to control the assumptions about positive and negative effects produced by competitive funding on the performance of R&D systems have been developed over the years, but effects produced by competitive allocation remain uncertain and no definitive answer can be provided but evidence suggest to avoid simple explanations (Sandstrom and van den Besselaar, 2018).

At the same time, many countries have embarked on reforms in funding in response to new demands and opportunities, enhancing their strategic-planning capacity and paying more attention to the social and economic environment and to the evolving patterns of relationships between stakeholders.

Project funding is supposed to be used more for research oriented toward producing useful results than for research aimed at the general advancement of knowledge; resources distributed in a competitive way dealing with targeted research objectives should also increase the capability of the government to control the content of research activities developed by researchers, and to improve the likelihood of R&D investment to produce effects on society (Braun, 2017). Instruments show the actual characteristics of the policy design (Bleiklie, 2001), but although they are shaped by goals and priorities of policy makers, when implemented they are 'far from being fully controlled by policy makers' (Reale and Seeber, 2013, 142).

RFOs have an important role for both the instrument design and implementation and the institutional arrangements shaping the relationships between RFOs and research actors. Agencies are characterized by different missions, goals and internal governance, which also implies different levels of political influence and organisational autonomy (Lepori and Reale, 2018). A common trait however is how to manage the policy-maker quest for relevant research, and the need to put 'social relevance' in the objectives of the instruments and in the selection criteria, because of the resistance coming from the scientific community both in case of basic and applied research (Braun, 2017). It was also pointed out that the differentiation of RFOs in national context can drive either to a further broadening of objectives and strategies or to a narrowing of goals and priorities (Whitley et al., 2018), which might lead respectively to a greater flexibility of evaluation criteria or to a stronger standardization of evaluation approaches.

Methodology and data

We exploited a unique dataset derived from a large-scale study on public research funding supported by the Joint Research Centre of the European Commission (PREF). The project has developed a systematic methodological framework for analysis public research funding systems in EU-28 countries, associated and accession countries, by combining quantitative data and descriptors concerning allocation modes and criteria, as well as information on the stream of public funding and on the RFOs managing funding (Reale, 2017; Lepori, 2017). From a methodological point of view the capability to measure project funding allocation proved to be reliable enough to allow further investigations (Lepori et al., 2018).

For the comparative purpose of the paper, we select eleven western European countries - Austria, Denmark, France, Germany, Italy, Norway, Portugal, Sweden, Switzerland, The

Netherlands and United Kingdom, and consider the period 2007-2014, where data are more complete and reliable. The sample reflects the diversity of countries in Western Europe.

A set of descriptors was needed to signal the different ways in which social relevance can be implemented; in this respect it is necessary to refer to the policy objective of the instruments and to other elements such as: the presence of social relevance in the evaluation criteria of instruments knowledge-oriented, the presence of agencies with the specific mission to sustain social relevant research, the preference for selection panels dominated by experts.

Thus, data from the PREF dataset refer to descriptors of funding instruments in each RFO, which are explained in Table 1, and amounts of funding allocated for each project funding instruments across the years analysed.

Table 1. Funding instruments descriptors used for the analysis.

Descriptor	Characterisation
Orientation of the project funding instruments	The descriptor observes the policy goal inherent to the schemes and does not refer to the actual type of research carried out by the performers. We distinguish three broad groups: (i) instruments oriented towards economic innovation and the creation of market value labelled 'Economic Innovation'; (ii) instruments devoted to the 'General advancement of knowledge', which are sometimes referred in the text as non-oriented instruments; (iii) policy-oriented instruments covering multiple domains (labelled 'Policy'), where issues of public interest can be addressed by research activities.
Allocation criteria for the projects assessment	Each instrument received three different scores (from 1 to 5) scaling the importance of the evaluation criteria taken into account for the assignment of project funding, specifically "Academic quality", "Topicality to instruments subject", and "Potential for economic innovation and public/private cooperation".
Composition of the decision-making bodies	The decision-making body entitled to implement the selection process can be mostly composed of (i) academics (university professors/other public-sector researchers); (ii) experts from policy, society and economy, public administrators/actors at political level. Furthermore, (iii) it could present a mixed composition.
RFO classification	Classification is based on RFO mission, domain and position in respect of the State. We distinguish RFOs which are functionally part of the public administration (research/science ministry; sectoral ministries); those characterised by a large degree of independence in managing their activities (innovation agencies; research councils; sectoral RFOs; higher education agencies); public research organizations whose main mission is to perform R&D activities, but also can carry out some funding agencies activities.

The analysis adopts exploratory approaches to characterise project funding instruments and their importance in term of funding volume with respect to the RFOs in the countries analysed:

- a) Descriptive analysis on the distribution of funding between agencies in different countries and on the characteristics of the instruments using the descriptors;
- b) Multiple Correspondence Analysis (MCA) to explore the pattern of relationships of several categorical variables and type of RFOs. MCA allows extrapolating patterns across a set of variables described by single components;
- c) Text analysis, which is the procedure of extracting meaningful information from unstructured corpus of text (paper, call, web page etc...), to control the reliability of MCA. A function is the frequency of words that allows extrapolating the most frequently used keywords in a text.

We select homogeneous project funding instruments related to national research activities (146), excluding the instruments labelled as 'transnational research' since they cover schemes with different orientation and evaluation criteria. The instruments received - by national experts - three different scores scaling the importance of the evaluation criteria taken into account for the assignment of project funding. Scores assigned are likely to be contestable measures, as

different experts might disagree on single assignments (Aksnes et al., 2017), thus we developed an original approach to check whether the global level of orientation in terms of assessment criteria would be compliant with the features emerging from a text analysis performed on 46 calls for proposal from five countries selected for our study.

Results

Descriptive statistics

Table 2 presents the thematic orientation of the project funding instruments in different countries implemented by the national RFOs. Data show that different types of RFO show different ‘specialization’ as to the instruments managed: Innovation Agencies with instruments oriented toward economic innovation, Research councils with non-oriented instruments, Sectoral RFOs with policy-oriented instruments.

Table 2. Orientation of funding instrument by RFO classification.

RFO Classification	Economic innovation	General advancement of knowledge	Policy
Research/science ministry	1	1	5
Sectoral ministry	0	1	0
Innovation agency	14	0	3
Research council	1	83	4
Sectoral RFO	2	16	13
Higher education agency	1	0	0
Public research organization	0	0	1
Total	19	101	26

Table 3 reports the percentage of instruments by thematic orientation, whose importance of allocation criteria scored higher than 3 and lower than 3. Instruments oriented toward policy issues show the more heterogeneous situation when the higher values are concerned, since the percentage of instruments scoring high criteria referring to academic quality is close to the percentage of the instruments scoring high criteria on topicality.

Table 3. Importance of assessment criteria by orientation of the instrument (% of instruments).

Thematic orientation	Allocation Criterion: Academic quality		Allocation Criterion: Topicality		Allocation Criterion: Economic Innovation	
	> 3	< 3	> 3	< 3	> 3	< 3
Economic innovation	31,6%	21,1%	52,6%	10,5%	94,7%	0,0%
General advancement of knowledge	98,0%	1,0%	63,4%	20,8%	43,6%	21,8%
Policy	73,1%	7,7%	80,8%	3,8%	57,7%	23,1%

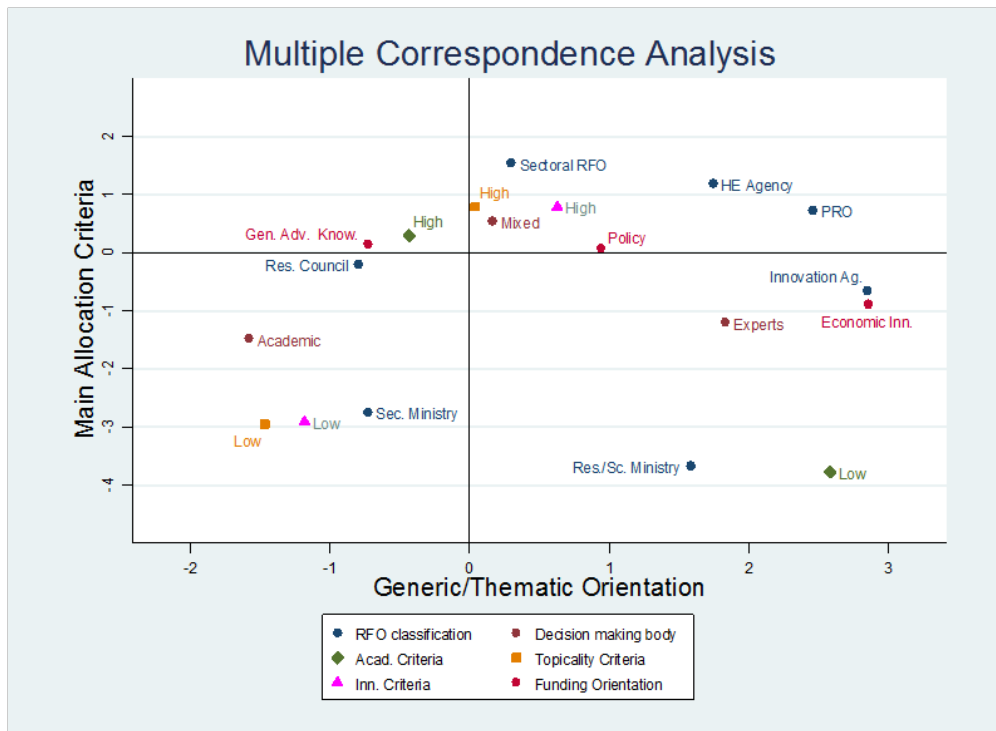
Multiple Correspondence Analysis

In the first factor (47% of inertia) produced by MCA (Fig. 1) we have on the one side the instruments non-oriented toward specific objectives (managed by Research Councils, first and foremost, and characterized by panels whose composition is dominated by academics); on the other side instruments with thematic orientation that characterized the other types of agencies, with a special relevance of Innovation Agency and panels composed by non-academic experts.

Policy Funding orientation is positioned on the horizontal line, indicating it is little discriminating. It is evident that Policy Funding orientation and Mixed Decision-making body have not an important contribution to the two dimensions. The second factor (20% of inertia) refers to the rating of the allocation criteria used for the instruments assessment, discriminating instruments with high scores of ratings on one side, and instruments with low values of the ratings on the other side. Low values of innovation and topicality criteria are correlated with National Sector Ministry, while low values of academic criteria are associated with oriented instruments. High scores of academic criteria are close to instruments with a generic orientation; policy funding orientation and mixed composition of the panels have not an important contribution to the two dimensions.

The mentioned results indicate that policy-oriented instruments are those that need more in-depth analysis to deepen the implementation using the evaluation criteria as evidence, checking whether there are biases affecting the scoring of evaluation criteria produced in the data used for the analysis.

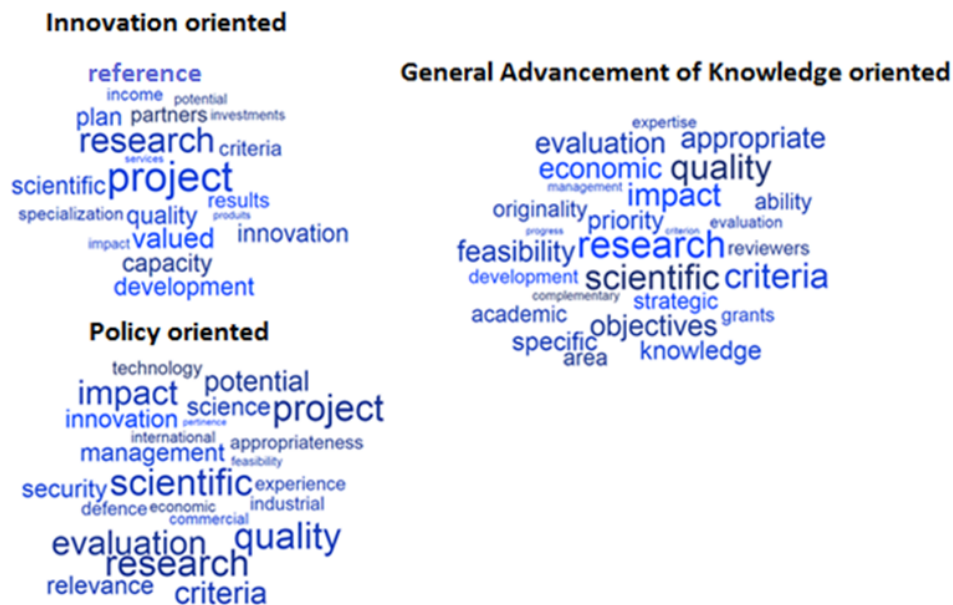
Figure 1: MCA coordinate plot.



Text analysis

Using word clouds (only the words above the 95th percentile are showed), we can observe the most frequent words within the calls we analysed (Fig. 2). In agencies with an innovation orientation the most frequent words are *research*, *project*, *reference*, *innovation*, *capacity* and *development*. For General advancement of knowledge, among the most frequent words there are *research*, *scientific*, *quality*, and *impact*. Finally, for Policy oriented instruments among the most frequent words are *quality*, *scientific* and *research*, *evaluation*, *impact*, which appear in large font size, meaning a higher frequency. In both the latter two cases, we observe a higher heterogeneity of words than in the former, and it is possible to notice a high recurrence of the word such as *quality*, *impact* and *evaluation*. The results do not contradict the evidence of MCA: whereas the differences between instruments are very clear when we look at the orientation, the differences are not really clear when we consider the evaluation criteria, except for the case of innovation-oriented schemes.

Fig. 2: Word Clouds of funding instruments by orientation



Concluding remarks

Funding instruments targeted to issues of social relevance are not widespread. Project funding orientation toward the general advancement of knowledge maintains a strong importance although it is not excluded in principle that the instruments with some generic orientation address research activities considering topics of social relevance as well, this effect depending from the design of the evaluation criteria and the panel composition.

Research Councils' portfolio includes mainly instruments without a thematic orientation toward social relevant issues, but the evaluation criteria are flexible enough to allow an implementation that might even score high the capability of the proposals to address objectives dealing with relevant policy problems. Portfolio of Sectoral RFOs on the contrary show that non-academic selection criteria are more important but the calls are characterized by a high heterogeneity of wording as well. Innovation agencies in this respect are those where the implementation is generally in line with the formal orientation of the funding instruments.

A provisional explanation could be that RFOs with general mission – Research Councils first, implement project funding instruments according to 'their core business' (Braun, 2017, 11), trying to maintain their autonomy with respect to government steering. Instead, agencies with targeted mission -such as Innovation Agencies, are characterised by instruments where research is supposed to address problems specifically devoted to create added value and impact on economy and society, and the evaluation procedures are more targeted toward selecting project oriented toward that objectives. One important consequence is that the differences of project funding portfolio between countries are related to the creation of specialized agencies for managing instruments addressing topics of social relevance or to entrusting Research Councils with the task of managing this type of schemes.

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