Science Europe Position Statement

On Priority One of the 2012 ERA Communication: 'More Effective National Research Systems'

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SCIENCE EUROPE
Shaping the future of research

Priority One of the 2012 ERA Communication

The 2012 Communication 'A Reinforced European Research Area Partnership for Excellence and Growth'[1] laid out the current approach for realising a European Research Area (ERA). As this approach is now being reviewed by the European institutions, Science Europe puts forward its analysis of Priority One of the Communication, in order to start a fruitful dialogue with the European institutions on the future of ERA policy. This analysis provides a practical example as to why the current ERA Communication approach needs to be thoroughly reviewed if ERA policy is to have a real impact.

Priority One of the ERA Communication: 'More Effective National Research Systems'

With regards to public sector research, the first Priority of the ERA Communication holds that competitive funding should be "at the core of research funding decisions in all Member States in order to overcome divergences in performance across the EU". The Impact Assessment[2] accompanying the Communication states that it is "problematic" that researchers and institutions across Europe are exposed to different levels of competition for accessing public funding.[3] The document quotes research according to which competition levels are positively correlated with research production per euro spent,[4] and it holds that competition for funding acts as a positive incentive for research institutions in terms of financial capacity, visibility and the attraction and retention of talent.

In terms of how to organise performance assessments that should be linked to the majority of funding decisions, the Communication advocates the large-scale use of peer review. The Communication encourages the adoption of international peer review standards, and of international panels, in order to foster the comparability of national evaluations across Member States and to ensure that performance is correctly assessed.

The ERA Progress Report 2013 states that: "Open national level-competition is crucial to deriving maximum value from public money in invested research".[5] The ERA Monitoring Mechanism developed by the European Commission chooses the following indicators to track the implementation of Priority One: "Share of national GBAORD allocated as project-based funding", "Share of project-based research and development budget allocated through peer-review", and "Share of institutional funding allocated based on institutional assessment and/or evaluation".[6]

Applying a Market Analogy to Research Funding Allocation Models

Priority One links funding models with the concept of effectiveness by means of a market analogy. According to mainstream economic models, competition increases market efficiency. ERA policy transfers this assumption into science policy, by asserting that competition in public funding for research increases the effectiveness of national research systems.

This framing of system effectiveness has its roots in calculations performed in the United Kingdom in the late 1990s.[7] Such calculations related public R&D spending (input) with publication patterns (output), and they were used to draw conclusions on the effectiveness of national R&D funding from a comparative perspective.

This approach is not evidence-based[8] for the following reasons:

- **Input definition.** Despite the fact that input indicators are widely standardised, significant differences in the organisation of national R&D spending contribute to 'inflating' or 'deflating' national spending when compared internationally. For example, office space and doctoral students form part of national spending in some countries, but less so, or not at all, in others.[9] This in itself sheds no light on the relationship between competition levels and productivity, but it should make policy makers wary of EU-level productivity comparisons.

- **Output definition.** Productivity calculations define scientific publications as the only output, due to the fact that publications are the only widely, internationally available and comparable data. However, the use of such output definition to draw policy conclusions is highly misleading. Firstly, the indicator disregards the knowledge – developed over decades of research – on the variety of the benefits of publicly-funded science[10] and on its role in national innovation systems[11]. Essentially, public funding of science plays a systemic role that goes far beyond immediate and tangible outputs such as scientific publications. Secondly, even if such a systemic role is not accepted, tangible outputs in many disciplines go far beyond what is captured by publication databases.[12]

- **Relationship between inputs and outputs.** The existence of a linear relationship between competition for funding and effectiveness is unlikely, even when a narrow input-output view is adopted. The empirical evidence is contradictory.[13] Moreover, scholars and analysts argue that competition for R&D funding can be associated with both positive and negative effects.[14] The relationship between inputs and outputs actually depends on the process in between: that is, on research conduct.[15] Such issues are addressed by other ERA priorities. The Science Europe Roadmap identifies a link with systemic effectiveness in the case of nine areas related to the conduct of research.[16] An independent study also proposes that even the effects of funding models are better explored by analysing research conduct.[17] Much of the current efforts of science policy scholars are directed at understanding this process and at creating micro-level datasets that can support such understanding.[18] At present, the level of knowledge of the issue is far from a level of maturity that can justify either prescriptive measures, or even policy monitoring solely based on narrowly-defined inputs and outputs or funding models. The only clear conclusion that is valid across the board regards the need for increased levels of R&D funding – at the very least in line with Europe 2020 targets – to ensure that Europe keeps up with the current global race for knowledge.

Refocusing ERA Policy

ERA policy is relatively young, having its origins in the early 2000s. There is much that this policy can achieve by fostering dialogue and collaboration between national science policy makers. However, to make the most of such opportunity, debates need to be built on more solid ground. ERA Priority One is a clear example of this pressing need.

In the case of Priority One, a simple market analogy was turned into a benchmarking exercise, which unfortunately does not address the real terms of the debate. Competition is an important element in a science policy mix, and it has a key role in fostering excellence. Competitive funding is at the core of many European systems, as well as European programming. In fact, organising the competitive allocation of funding based on scientific excellence is the core activity of a large number of Science Europe Member Organisations; these play a specific and essential role within their national systems. However, structuring the debate on the effectiveness of national research systems around funding models alone does not seem the best way to improve the quality of public research policy across the continent.

Funding models, such as performance-based research funding, are not ends in themselves. Depending on their features, funding models will be more or less suitable to support different goals, for example: capacity building in terms of institutions or human resources, geographical distribution, long-term sustainability of research systems, specialisation, innovativeness, and scientific excellence.[19] There are trade-offs between the different goals (for example between capacity building and excellence) and each goal can be pursued in different ways (for example territories can aim at very different levels of specialisation). There is no reason to assume that different countries need similar policy mixes in terms of funding allocation modes. Rather, the contrary is probably true: optimal policy mixes will depend on national contexts and objectives, as also remarked by ERAC.[20] Even the same system may be in need of different policy mixes over time, as the local context changes. For example, a country whose resources are excessively concentrated in a few world-class, elite universities may wish to decrease competition levels to foster capacity building elsewhere, to then raise competition levels again, once more universities are able to compete.

In its own Roadmap, Science Europe states that “effective, efficient and high-quality peer review is at the heart of the scientific system, and is a prerequisite for the funding and performance of excellent research”. Recognising the fundamental role of peer review is, however, different from prescribing peer review-based competitive funding as the main research funding allocation mode. Competitive funding should not be sold as a ‘silver bullet’ that will make all national research systems more efficient. By giving such advice, ERA policy may inadvertently encourage national administrations to disregard local needs and contexts in favour of a simple formula. This is a disservice: it can be counterproductive locally, because individual countries may be tempted to apply policy mixes that are not suitable in their case; it can also be counterproductive globally, because the experimentation that is needed to improve the current formula or to find new formulas is discouraged. Two examples of this are given in the boxes below.

Example 1: The first ERA priority advocates the use of peer review for the majority of funding decisions. Peer review is widely used, and alternative means of project selection are not readily available. The consensus in the research funding community is that, at present, peer review is the most suitable evaluation mechanism for a specific type of funding that targets scientific excellence. Research funding agencies are highly specialised organisations that have extensive experience in using peer review as a highly specialised tool for the purposes it serves best. However, when formulating policy recommendations at the EU level, the limitations of peer review should not be overlooked.[21] Peer review may not be the appropriate mechanism for all types of funding allocation in a research system, not even for all competitive funding. Peer review can result in biases, for instance against early-career researchers, women, interdisciplinary and breakthrough science and innovation. Moreover, on a large scale, peer review is costly and it can be difficult to find truly independent researchers, with no stake in the specific project or in the research direction proposed, or with no familiarity with proposers. Finally, while peer review can clearly identify excellent proposals and poor proposals, panels often struggle with ranking average quality proposals, in order to justify funding decisions regarding those. For these reasons, many organisations around the world try to experiment with different systems or to find novel ways of using peer review evaluations.[22] Past experimentations have, for example, included lottery distributions and career trajectory assessments in place of project proposal assessments. Looking into the future, a group of researchers of the Indiana University recently proposed a peer-to-peer funding distribution system, whereby each researcher would be allocated an equal annual amount of funding, part of which they would be required to reallocate to other researchers.[23] Experimentations and innovation on these lines can also be regarded as good practice.

Example 2: For Priority One, the ERA Monitoring Mechanism analyses competition levels by providing breakdowns of national R&D spending by three allocation modes: project-based funding, institutional funding, institutional funding based on institutional assessment[24]. Project funding has been defined by the OECD as funding "attributed on the basis of a project submission to a group or individuals for an R&D activity that is limited in scope, budget and time, normally on the basis of a project proposal"[25]. By contrast, institutional funding was defined as funding "attributed to an institution, with no direct selection of R&D projects or research programmes"[26]. The 2014 ERA Progress Report reveals the reason for the interest in project-based funding, stating that "project-based funding is the most important way to induce competition in research"[27]. An excessive focus on project-based funding may prove counter-productive in specific contexts. For example, project-based funding on very large scales may: (1) cause researchers to spend a significant amount of their time writing or reviewing research proposals instead of doing research; (2) push publicly-funded research to mimic privately-funded research in terms of short-termism and risk tolerance; and (3) amplify the risks associated with peer review.[28] For these reasons, choosing an allocation model like project-based funding over alternative models is not as straightforward as implied by ERA policy.

When discussing funding models, what then are the real terms of the debate?

1) The effects of funding models on fundamental systemic features:[29]

- Degree of prioritisation and specialisation: some countries may wish to prioritise between fields, to gear capacities towards specific economic sectors, or, on the contrary, to develop human resources and infrastructures that can be redeployed across sectors.

- Degree of concentration of resources in the best performers versus capacity building: smaller countries with a small number of research performers may be less interested in internal competition and more in a sufficiently diverse, but not over-diversified, research base, linked to national economic sectors. Larger countries with a large research base can take critical mass as a given, and may be more interested in high competition levels to foster world-class excellence in a variety of sectors.

- Long-term sustainability in terms of replenishment of human and physical capital: the concentration of resources in the best performers can undermine the possibility for challengers to emerge over time. In turn, this can endanger the very possibility of having competition. As a result, excellence policies need to be part of a mix that also includes capacity-building ones.

Different funding models can foster or hinder the pursuit of different strategies adapted to regional and national contexts. If ERA policy is to help national administrations, then it should foster a real understanding of the interplay between funding models and fundamental systemic features. A policy structured around the simple dichotomy of 'competitive versus non-competitive' will not lead to increasing the effectiveness of national research systems. The knowledge is not currently available to formulate advice on, and assess, national funding allocation models.

2) The respective roles of the European Union (EU) and national policies:

EU funding has played, and continues to play, the role of creating collaborations at European level and of giving visibility, connections and resources to the best performers in Europe. EU funding is complementary to national science policies. It relies fully on the availability of excellence and capacities built at national level, in science systems that are holistic, and that cannot be reduced to funding models alone. A debate exploring the respective roles played by the different levels would be more conducive to effective EU and national policies than advice merely targeting a specific allocation model.

Given the limited knowledge available on the drivers behind the effectiveness of national research systems, the EU Member States, the European Commission and ERA stakeholders could consider different options for Priority One. For instance, the following alternative options could be discussed:

a) Creating a learning platform devoted to the evaluation of national policy mixes in relation to national strategic needs;

b) Refocusing the priority on the conduct of research, towards considerations that have so far been missing, such as research integrity (good research practice) or reproducibility (including journal review practices and funding for reproducibility);

c) Making Priority One exclusively about funding levels (spending targets in relation to national Gross Domestic Product);

d) Discarding this priority, and devoting more energy and resources to better defining objectives for more focused priorities, such as gender equality or the availability of Research Infrastructures. This option could also lend more credibility to the use of the word 'priority' within the ERA Communication.

Conclusion

This initial analysis of Priority One indicates that the current ERA approach is not necessarily helping policy makers and stakeholders to identify the issues that matter in research policy. With its own Roadmap, Science Europe proposed a sensible, realistic and concrete approach to supporting the effectiveness of national research systems, by focusing on policy measures with a direct impact on research conduct. The Roadmap fosters gradual improvements based on sound evidence, expert knowledge and sharing of good practices, while respecting and leveraging the diversity and richness of the different European research systems. The example of Priority One, and the experience with the implementation of the Science Europe Roadmap, leads Science Europe to draw the following conclusions in view of the revision of ERA policy:

1. **Allowing for policy learning.** ERA priorities should better reflect the nature of ERA as a creative, flexible, trust-based, dynamic and evolving space. Pressures for ERA 'completion' by 2014 have led to the adoption of a 'tick box' exercise that in some cases, such as with Priority One, closes down dialogue and prevents Europe from learning how to leverage its true strengths: its diversity and the interplay between national and European policy. ERA should help decision makers analyse the challenges they face, not give them the illusion that 'quick and dirty' fixes exist. An effective ERA policy should foster mutual and collective learning about effective policies.

2. **Reassessing the ERA Communication approach and priorities.** A failure to assess the 2012 ERA Communication priorities with an open mind poses a clear and present danger to the effectiveness of the European research system: Science Europe invites policy makers to use the opportunity of the ongoing review of ERA policy to address the question of the fitness for purpose of the current approach. The current approach could for instance be improved by: (1) using the ERA Progress Reports to shed light on the nature of the problems faced by national research systems and on the drivers behind them; (2) using the ERA Stakeholder Platform to support ERAC in analysing such issues, and to identify appropriate objectives and progress indicators with research stakeholders; and (3) avoiding spreading the policy too thinly over too many 'priorities', while better defining the priorities that are retained.

Notes and References

1. European Commission (2012), *A Reinforced European Research Area Partnership for Excellence and Growth*, COM(2012) 392 final, 17 July 2012. Henceforth referred to as "ERA Communication".
2. European Commission (2012), *Impact Assessment Accompanying the document 'A European Research Area Partnership for Excellence and Growth'*, SWD(2012) 212 final.
3. See p. 8 of the document quoted in note 2.
4. Auranen O. and Nieminen, M. (2010), *University research funding and publication performance – An international comparison*, Research Policy 39 pp. 822-834.
5. European Commission (2013), *European Research Area Progress Report 2013*, COM(2013) 637 Final, 20 September 2013, p. 9.
6. ERA Monitoring Indicators for 2014: information released by the European Commission to ERA stakeholder organisations. The information replaces the indicators published in Annex 7 to the Impact Assessment referenced in note 2.
7. May, R. M. (1997), *The scientific wealth of nations*, Science 275, pp. 793-796 and May, R.M. (1997) Response 278, pp. 879-880.
8. For similar arguments see Barré, R. (2001), *Sense and nonsense of S&T productivity indicators*, Science and Public Policy, 28 (4) pp. 1-8.
9. Granberg, A. and Jacobsson, S. (2006), *Myths or reality – A scrutiny of dominant beliefs in the Swedish science policy debate*, Science and Public Policy 33, pp. 321-340.
10. Hughes, A. and Martin, Ben R. (2012), *Enhancing Impact – The Value of Public Sector R&D, Council for Industry and Higher Education (CIHE) and UK Innovation Research Centre*, available at: http://www.cbr.cam.ac.uk/pdf/Impact%20Report%20-%20webversion.pdf.
11. Allas, T. (2014), *Insights from international benchmarking of the UK science and innovation system*, BIS Analysis Paper Number 03, Department for Business, Innovation and Skills; Arnold, E. (2001), *Can We Measure the Socio-economic Effects of Basic Science? Contribution to an Academy of Finland Seminar* (12 November 2001), available at: http://www.aka.fi/Tiedostot/Tiedostot/Julkaisut/Socio-economic_Effects_%20of_%20Basic_%20Science_Erik_Arnold%5B1%5D.pdf.pdf.
12. For example, software and prototypes in the engineering sciences, or digital artefacts and archaeological excavations in the humanities. Researchfish in the UK is an example of database, developed by a Science Europe Member Organisation, that tries to capture output variety (see www.researchfish.com).
13. A recent study reviewed literature on the relationship between funding and research output, noting: "It was concluded that there was no clear pattern between funding and research output". See p. 17 of Dialogic/Empirica (2014): *The effectiveness of national research funding systems. Final Policy brief.* Principal authors: Leonique Korlaar, Pim den Hertog, Jessica Steur, Robbin te Velde (Dialogic) and Stefan Lilischkis (Empirica), Utrecht/Bonn, available at: http://ri-policy-analysis.eu/fileadmin/RIPolicies/documents/NRF-sYSTEMS/Policy_Briefs/Dialogic_empirica_2014_.Effectiveness-of-national-research-funding-systems.pdf (pp.14-17 address several relevant aspects of the issue). Also: Sandstrom, U., Heyman, U. and Peter van den Besselaar (2014), *The Complex Relationship between Competitive Funding and Performance,* Proceedings of the science and technology indicators conference 2014 Leiden, available at: http://sti2014.cwts.nl/download/f-y2w2.pdf.
14. Georghiou, L. (2013), *Effectiveness of National Research Systems*, Discussion paper for the 2013 ERAC mutual learning seminar on research and innovation policies – Brussels, 21 March 2013, p. 7. Problems with the way competitive funding is applied are raised in: Ioannides, J.P.A. (2011), *More time for research: Fund people not projects*, Nature 477, pp. 529-531. See also the overall conclusions of the study quoted in note 12, pp. 29-30. Finally, a short summary of the terms of past debates is found on p.1 of: OECD (2011), *Issue Brief: Public Sector Research Funding*, OECD Innovation Policy Platform, available at: http://www.oecd.org/innovation/policyplatform/48136600.pdf.
15. See study quoted in note 13, pp. 19-27.
16. Within the Science Europe Roadmap, the objective of systemic effectiveness is called 'Facilitating science', and for each Priority Action Area the expected link between work in such area and the overall objective is made explicit in a box under the area title. The Roadmap is available here: http://www.scienceeurope.org/uploads/PublicDocumentsAndSpeeches/ScienceEurope_Roadmap.pdf.
17. See study quoted in note 13, p.19.
18. For example the STAR METRICS project in the United States (https://www.starmetrics.nih.gov/Star/Participate#about). In Europe, the Researchfish service (www.researchfish.com) was developed to link up individual research outcomes with funding contributions.
19. Adapted from Georghiou (2013) and OECD (2011), referred to in note 14.
20. Conclusion 7 on Priority One, p. 16 of ERAC (2014), *ERAC Opinion on European Research Area Progress Report 2013*, ERAC Secretariat document 1201/14.
21. For example, see Georghiou (2013), pp. 9-10.
22. Ioannides (2011), referred to in note 14.
23. Bollen J., Crandall D., Junk D., Ding Y. and Katy Borner (2014), *From funding agencies to scientific agency,* EMBO Reports.
24. Note that this indicator is not well-suited to analyse competition levels, as project-based funding can be linked to very different competition levels, depending for example on the success rates or the funding rules. The study referenced in note 13 notes: "The ratio between institutional block funding and project funding is often used in existing studies as a proxy for the degree of competition within a national research funding system. However when the various subtypes are being considered, the simple dichotomy between 'non-competitive' and 'competitive' funding renders into a continuum" (p. 10).
25. OECD (2010), *Measuring Innovation: A New Perspective*, Paris, p. 82.
26. *Idem*.
27. European Commission (2014), *European Research Area Facts and Figures 2014*, Commission Staff Working Document, COM(2014) 575 Final, 15 September 2014.
28. Ioannides (2011) and p. 1 of OECD (2011), both referred to in note 14.
29. Adapted from Georghiou (2013, see note 14). Also, on framing the question of funding arrangements in terms of specific policy mixes, see OECD (2011), pp. 8-9, referred to in note 14.
30. On the lines of what has been done for regional policy, with the Smart Specialisation Platform.

Science Europe is a non-profit organisation based in Brussels representing 52 Research Funding and Research Performing Organisations across Europe. More information on its mission and activities is provided at: http://www.scienceeurope.org.

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