Identifying and facilitating high quality research

Policies attempting to promote high quality research are widespread. But what does it mean to promote high quality research? And do the policies work? This policy brief summarises what we know and do not know about these issues.

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1. The politics of research quality

One of the most prominent research policy features of the latest decade has been the ambition to promote high quality research – often under headings such as frontier, outstanding, excellent, ground-breaking and transformative research. Policies promoting high quality research are seen as (and justified as) a means for solving grand challenges based on the assumption that you need world leading research groups and ground-breaking research to solve the challenges our society confronts. They are also the result of the obligation to ensure that public money on R&D are spent wisely: When allocating research funds, the most obvious choice – if you want value for money – is to prioritise the most successful scientists and the most promising projects. Finally, such policies may also reflect a political wish to maintain or improve national scientific standing and status - much in the same way as success in international sports competitions is emphasised. **In sum, whatever the aim of research policy is, high quality research can be presented as the solution.**

This is however too simplistic: You cannot support only the best, you also need to build up competences in new fields to solve societal challenges. Thus, there is a need to provide good general conditions for research to secure a broad base of rank and file scientists to do research across a variety of fields and topics. We cannot predict (all) what we need in the future. More generally, diversity and excellence can be seen as complementary rather than contradictory considerations when allocating research resources (Lamont and da Silva 2009).

Still, in general, **the public can best be convinced that a research policy is successful if the funding agencies and the authorities can document that they help to foster and attract world leading research groups.** The concept of high quality research is appealing – and persuading – in terms of solving the grand challenges of our planet; in terms of ensuring value for public resources spent on research; and in terms of contributing to national competitiveness and pride (e.g. winning Noble prizes, having highest-ranking universities, and in brain gain questions in general).

2. Different aspects and perceptions of research quality

Summarising scholarly and empirical studies of research quality we find three basic aspects of the concept (Polanyi 1962; Gulbrandsen 2000; Lamont 2009; Langfeldt and Scordato 2016):

(1) Plausibility/solidity, methodological soundness (and feasibility)
(2) Originality/novelty
(3) (a) Scientific and
(b) societal value/significance

Each of these aspects may be specified and emphasised in different ways: both in different fields of research and in different evaluation contexts (reviewing grant proposals is different from assessing candidates for professorships or reviewing manuscripts for publishing). On a more general level, they derive from the definition of research: to qualify as scholarly[1] research, the work should be (1) well-founded in scientific methods, (2) give new knowledge and (3a) be relevant to the research community and/or (3b) the society. Some of the common concepts of research quality combine two or more of these aspects, such as 'frontier research' which is a combination of 2 and 3a in terms of generating valuable new knowledge at the frontier of science. And then of course, it also needs to be solid (1) to be valuable.

Even if clear and comprehensible at this basic conceptual level, 'research quality' is contested and elusive. While there is general consensus that good research is solid, original and significant, there is less consensus about what this means or how to identify good research. What is perceived as the

[1] In non-professional research, e.g. private genealogy, demands for relevance to the research community or the society do not apply.

most solid and significant contributions to a specific research field may vary between peers. Furthermore, numerous studies have pointed out biases in peer review, for instance that interdisciplinary and unconventional research is disfavoured (Luukkonen 2012; Lamont 2009; Langfeldt 2006; Laudel 2006; Chubin & Hackett 1990). The outcome of peer review may even depend on the way the review is organised (Langfeldt 2001).

3. Identifying high quality

Then, what do public authorities do to identify and facilitate high quality research? And how can they document that they succeed with this? **Even with its many limitations and potential biases, peer review is often the best – and only – option when it comes to identifying high quality research.** Peer review is thus widely used for allocating project grants and for performance based funding, as well as for evaluating the outcome of programmes and policy initiatives.

In later years, peer review has increasingly been supplemented – and in some cases replaced – by bibliometrics and other quantitative indicators. These indicators are essentially based on (aggregated) peer assessments – on the outcome of peer review of papers submitted for publication, on the number of citations to published work, and/or on the outcome of review of grant applications. They form the foundation of performance-based funding, [2] and are seen as indicators of policy success (e.g. comparing countries or institutions, or the outcome of funding schemes). However, being based on the aggregated outcome of peer review, science indicators also risk reproducing the biases in peer review (e.g. discriminating interdisciplinary and original research). Moreover, indicators based on citations primarily reflect *scientific impact*, which is only one of several aspects of research quality.

In addition, **quantitative indicators come with the risk of producing dysfunctional incentives.** If your future funding is based on your quantifiable output you may easily give priority to quantity over quality in your research. As stated in the Leiden Manifesto for research metrics: with metrics 'We risk damaging the system with the very tools designed to improve it' when used by 'organisations without

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knowledge of, or advice on, good practice and interpretation' (Hicks et al. 2015). The first principle of the Leiden Manifesto is thus that quantitative evaluations should support, not substitute, expert assessments.

In sum, metrics can seldom overcome the limitations, biases and indecisiveness of peer review, and there are additional limitations and biases attached to them. In combination with expert advice/direct peer review, they may however still contribute to the identification of high quality research. Metrics have important benefits as they demand far less resources than peer review, may challenge and inform peer review and trigger thorough expert panel discussions. On the other hand, there is also the risk that metrics misguide peer review or lead to less thorough panel discussions. Moreover, it should be kept in mind that the concept of research quality is multidimensional, its operationalisation often contested, and that scholarly research is dynamic by nature. This implies that a fixed 'agreement' on what is the most solid and significant research may be counter-productive in the long run – even if policy makers may perceive such a need. In the research community, diversity and open discussions are more important than agreement.

4. What facilitates high quality?

When there is limited consensus on how to define and identify high quality research, how do we know how to promote it and whether our policies for doing this are successful? The answer is that our knowledge is limited and that **key success factors may vary between fields of research** (Laudel and Gläser 2014). **Moreover, there may be different success factors behind the different aspects of quality**; solidity originality, scientific and societal

[2] Key indicators for performance based funding may be number of peer review publications and success in grant competitions based on peer review (this may or may not be supplemented by direct peer review of the units competing for funding).

significance may be facilitated by different contexts and by different policy measures (Gulbrandsen 2000). There is still a large body of literature trying to establish a connection between policy and research performance/quality in general. Some studies are based on differences between countries' performance on bibliometric indicators, and try to link these differences to differences in research policy. Others build on researchers' perceptions of what promotes high quality.

In sum, the studies point to a high degree of complexity in the relation between research policy and research performance. The factors influencing performance are connected in multi-level systems with complex paths from changes in input-factors at a macro-level to changes in individual and group level behaviour which eventually constitutes the basis of the developments in national publication performance. In addition, relations may often be non-linear, meaning that both too much and too little of a certain factor may have negative effects on research performance. Moreover, **the high performing part of a research system can be rather independent of changes in general frame-conditions** due to better access to external funding, a higher degree of autonomy, focus on beneficial publication behaviours and benefits from existing cumulative advantages (Aagaard and Schneider 2015).

Studies that attempt to identify the factors which explain why certain countries regularly outperform their comparators in terms of publications and citations, have put much emphasis on the effects of changes in funding, as funding is one of the main channels by which authority is exercised over research (Edquist 2003; Whitley et al. 2010). National level **studies find no straightforward connection between financial incentives and the efficiency of university systems in terms of publication performance** (Auranen and Nieminen 2010). Moreover, turning to the impacts of specific instruments, studies indicate that research funding instruments have limited impact on research performance as measured in citation impact, but may impact productivity in terms of number of publications (Sandström 2009; Jacob and Lefgren 2011; Langfeldt et al. 2015) and increased career success (Bloch et al. 2014).

On the other hand, several studies appear to **agree on the importance of relative funding stability over longer time periods** (Hollingsworth 2008; Heinze 2008; Öquist and Benner 2012). Some argue that the combination of widespread autonomy and a competitive environment creates good performance (Aghion et al. 2010) and stimulates to scientific innovation (Whitley 2003).

Another strand of studies has investigated organisational conditions for academic performance and creativity. The majority of these concern research groups and emphasize factors such as: autonomy and flexibility in the interaction with colleagues; scholarly diversity; a balance between basic and applied research; small/moderate research group size; access to extramural skills and resources; facilitating leadership and good collaboration with department and university management (Pelz and Andrews, 1966; Gulbrandsen 2000; Carayol and Matt, 2006, Heinze et al. 2009; Salter and Martin, 2001; Hollingsworth, 2008). We have, however, limited knowledge on the role of the research organisations (universities, university hospitals, public research institutes) and how they may contribute to high quality research. In sum, studies at researcher level indicate that **policy has an impact on the organisation of research and researchers' practices, but not necessarily their performance.** In national level studies, research policy is seen as a main foundation for research performance, but **it has not been possible to establish a causal link between research policy and research performance.** We know and understand much about policy, research organisations and scientific practices, but very little about the dependencies between these.

Policy implications

- **Targeted policy:** As basis for policy-making, there is a need for insight into the vital conditions for the various aspects of research quality (solidity, originality, scientific and societal significance) and how they vary between research contexts. Vital conditions for solid laboratory science may be quite different from the conditions for solid research in the humanities, and very different from the conditions for originality or societal significance in these fields. Hence, policy instruments aimed at facilitating high quality research needs to be targeted, which implies:
  - defining the aspects of research quality to be facilitated (e.g. originality/ground-breaking science).

- identifying the conditions for high performance on these aspects of research quality in the relevant research fields.

In developing such targeted policies, there is a need for close collaboration with the research community and in-depth expertise.

- **Open policy:** There are significant limitations when it comes to identifying future scientific success. Whereas scholarly diversity is seen as important for high quality in research, both peer review and science metrics tend to be conservative and may disfavour e.g. interdisciplinary and less conventional research. To ensure a fertile and diverse research landscape, there is a need for policy measures providing general good conditions for research and to monitor adverse effects. Metrics (in particular different forms of maps and visualizations) may contribute to establish a general overview of research activities and can thus support policy discussions aiming to better align societal needs and research investments.

Further reading

Guides and advice

European peer review guide. European Science Foundation, 2011. http://www.esf.org/coordinating-research/mo-fora/peer-review.html

San Francisco Declaration on Research Assessment. http://www.ascb.org/dora/

The Leiden Manifesto for research metrics. *Nature* 22 April 2015. http://www.nature.com/news/bibliometrics-the-leiden-manifesto-for-research-metrics-1.17351

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