

Chapter 1

Overview of models of performance-based research funding systems

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This chapter provides an overview of models of performance-based research funding systems. It discusses the rationales for such systems from a number of perspectives, including innovation studies and the higher education literature. It explores the variation in their design, the funding implications and the long-term future of these systems.

Introduction

The university research environment has been undergoing profound change. Performance-based research funding systems (PRFSs) are one of the many novelties introduced over the past few decades. This chapter explores the rationale and design of PRFSs and their relation to funding systems. It is based on a literature review conducted in early 2010 which sought to identify all known PRFSs and draw out as much detail on their operation as possible.

Understanding the literature on PRFSs requires acknowledging the dual identity of university research. On the one hand, university research is part of the larger enterprise of the university and is shaped by university governance and university-related policy making. On the other hand, university research is a substantial element of every national innovation system, and so is of concern to scholars of innovation and to governments seeking to enhance the innovativeness of their economies. These two perspectives on PRFSs differ somewhat. The higher education literature treats the research mission of universities in a somewhat sketchy fashion towards the end of documents that are mainly concerned with accreditation, completion rates, harmonisation, etc. The innovation literature tends to ignore the educational mission of universities and the changes under way in the allocation of the teaching component of university funding. This chapter draws from the higher education literature a framework for understanding the introduction of PRFS as part of new public management, a movement to reshape government. A detailed perspective on the methods used to assess research performance and their possible effects draws on the innovation literature.

The tension between autonomy and control recurs at several points in the discussion. Autonomy is a sensitive issue for scholars at both the institutional and individual levels. At least in the literature in English, critics often focus on the shifts of control over academic work that accompany the introduction of PRFS. Ultimately, the effects of PRFS on institutional autonomy seem ambiguous, and may become more so as extensive consultation with the academic community over PRFS design becomes routine. The effect of PRFSs on the perceived autonomy of individual scholars is a source of perennial dissatisfaction and of the accusation that PRFSs harm scholarship and the research enterprise.

This chapter is organised as follows. First the remit of the study is specified and a discussion of coverage lists the PRFSs. Then the rationales underpinning PRFSs are explored from several perspectives: the innovation and higher education literature and the stated rationales of governments. The

features of systems are explored as well as their funding implications. After examining the convergences between the systems, the future of PRFSs is considered.

Coverage

The scope of this study was specified by the OECD. These specifications were translated into the following list of criteria for systems to be included in the review:

- **Research** must be evaluated. Evaluations of the quality of degree programmes and teaching are excluded.
- Research evaluation must be *ex post*. Evaluations of research proposals for project or programme funding are *ex ante* evaluations and are excluded.
- Research **output** must be evaluated. Systems that allocate funding based only on PhD student numbers and external research funding are excluded.
- Government distribution of research **funding** must depend on the results of the evaluation. *Ex post* evaluation of university research performance used only to provide feedback to the institutions is excluded.
- It must be a **national** system. University evaluations of their own research standing, even if used to inform internal funding distribution, are excluded.

The first PRFS was introduced in 1986 in the United Kingdom, the Research Assessment Exercise (RAE). Use of PRFSs has expanded since, and 13 countries were found to be using them in early 2010. These systems are listed in Table 1.1 which reports the countries, the name of the system or agency responsible, and the year the system was introduced. The systems are not static. Most have undergone major redesign. In fact new versions of seven systems are under discussion or in the first stages of rollout. In the PRFS literature, it is important to be aware of the version of the system that is discussed.

Table 1.1. National performance-based research funding systems for universities

Country	System	Year implemented/ major revision
United Kingdom	RAE moving to REF – research excellence framework	1986/current
Spain	CNEAI – National Commission for the Evaluation – <i>sexenio</i>	1989
Slovak Republic		1992/2002
Hong Kong, China	RAE	1993
Australia	Composite Index, Research Quality Framework (RQF), Excellence in Research for Australia (ERA)	1995/current
Poland	Ministry of Science and Higher Education – parametric evaluation	1991/1998-99
Italy	<i>Valutazione triennale della ricerca</i> (VTR)	Evaluation 2001-03/ funded 2009
New Zealand	Performance-based research funding (PBRF)	2003/current
Belgium (Flemish Community)	BOF key	2003/2008
Norway	Norwegian model (new model for result-based university research funding)	2006
Sweden	New model for allocation of resources	2009
Denmark	Implementation of the Norwegian model	Current
Finland	Funding formula for allocation of university resources	1998/2010

A number of countries do not have systems that meet the criteria for inclusion:

- France: In response to the Bologna process the French government is reworking its university evaluation mechanisms. Although this is driven by accreditation concerns, the research side appears to be included and the results influence funding distribution in some way.
- Germany: Although the *Länder* may be different, the federal government seems to be pursuing some goals of performance-based funding, such as international excellence, by awarding large centres of excellence to universities based on assessment of proposals (CHEPS, 2007, pp. 37-38).
- Japan: Funding for Japanese universities seems to be distributed based on number of faculty. Government attempts to introduce performance-based funding have met with opposition and have not yet succeeded.
- Korea: No known performance evaluation component in university funding. However, Seoul National University is becoming autonomous, and this sort of change is often accompanied by performance-based funding.

- Netherlands: The Netherlands implements an evaluation system based on peer review which is not used to inform distribution of funding (Geuna and Martin, 2003).
- Portugal: All research money appears to be project-based, although proposal evaluation may include *ex post* evaluation of the research team's performance (Strehl, 2007).
- South Africa: The Foundation for Research and Development conducts evaluations of individuals' research record. Peer-reviewed grants of quite lengthy duration are awarded based both on this *ex post* evaluation and on peer review of proposals.

Rationales

“The rationale of performance funding is that funds should flow to institutions where performance is manifest: ‘performing’ institutions should receive more income than lesser performing institutions, which would provide performers with a competitive edge and would stimulate less performing institutions to perform. Output should be rewarded, not input.” (Herbst, 2007, p. 90)

Straightforward as this seems, full understanding of the motivations behind PRFSs requires exploring some nuances. Broadly speaking, different parties evoke seemingly different types of rationales when explaining the introduction of national research evaluation systems. Those primarily concerned with understanding research and innovation tend to speak of globalisation, competitiveness, the knowledge economy, etc. Those who study higher education and who are mainly concerned with education, accreditation and the like tend to trace the introduction of these systems to the spread of the tenets of new public management. Discussions of the introduction and evolution of individual systems tend to take a historical turn, focusing on changes in government, ministerial actions and stated rationales of governments rather than on an interpretation of events in broader international contexts (Jiménez-Contreras *et al.*, 2003; Sanz-Menendez, 1995; Tapper and Salter, 2003). Rationales of national governments tend to include the word “excellence”. Of course, each approach addresses the same phenomenon from a different angle. For example, Kettl traces the widespread introduction of new public management reforms to a shared set of political, social, economic and institutional challenges faced by many governments. These include the shift from the industrial economy to the information economy and globalisation (Kettl, 2000).

An example of the global competitiveness argument can be found in the introduction to the recent European Commission report, *Assessing Europe's University-Based Research*:

“...research performance is widely regarded as being a major factor in economic performance. Because of their interlinked roles in education, research, and innovation, universities are considered key to the success of the Lisbon Strategy with its move towards a global and knowledge-based economy. Improving the capacity and quality of university-based research is thought to be vitally important for innovation, including social innovation...”

“The economic dimension of (university-based) research in terms of expected economic and societal benefit and increased expenditure goes a long way to explain the heightened concern for quality and excellence in research, for transparency, accountability, comparability and competition, and for performance indicators and assessment.” (European Commission, 2010, p. 9)

A very similar statement can be found on the UK government website introducing the new REF (Research Excellence Framework):

“Through the REF, the UK funding bodies aim to develop and sustain a dynamic and internationally competitive research sector that makes a major contribution to economic prosperity, national wellbeing and the expansion and dissemination of knowledge.” (HEFCE, 2010)

In contrast, higher education authors often view the changing relationship between universities and their government in the context of new public management reforms (for example, Herbst, 2007). Donald Kettl is a leading analyst of new public management, and in a nutshell his view is the following:

*“Over the past quarter century, governments around the world have launched ambitious efforts to reform the way they manage. Citizens have demanded smaller, cheaper, more effective governments while asking for more programs and better services. To resolve this paradox, governments are experimenting with many ideas to improve performance and production and to reduce costs... Reviewing the standard strategies and tactics behind these reforms, [Kettl's *The Global Public Management Revolution*] identifies six common core ideas* (Brookings Institution Press, 2005):

- *greater productivity*
- *more public reliance on private markets*
- *a stronger service orientation*
- *devolution to sub-national government*
- *increased capacity to formulate and evaluate policy*
- *enhanced accountability.”*

Performance-based funding systems for public research in universities can be interpreted in light of these six core ideas (Kettl, 2000):

- Increasing productivity: Output-based evaluation increases research output without adding research resources to the system, thus increasing productivity (see Chapter 4).
- Replacing traditional command-and-control systems with market-like incentives: In many nations, universities were not autonomous and were often little more than extensions of their ministry. In Whitley’s terms they were “administrative shells” (Whitley, 2008, p. 12), or as Herbst describes it “government agencies were practically distributing funds down to each individual faculty member... Until recently, we may claim in jest, a typical rector’s office just had a yearly budget to pay for various banquets” (Herbst, 2007, p. 87). Universities had no discretionary budget and did not control hiring, tuition, student numbers, etc. The shift to performance-based funding is part of a broader movement to make universities more autonomous and introduce more strategic university management. This also involves competition for funding - the market-like side of the reform.
- Stronger service orientation: This dimension refers to increased attention to the needs of citizens. In the research world this would be analogous to giving more weight to serving the needs of the high-technology economy and less to the self-governed programmes of work of the community of scholars subject only to peer validation (Marginson, 1997, p. 69).
- Devolution: The idea here is that programmes are more responsive and effective when managed closer to the provision of services. In the university world this means making universities autonomous, strategically managed entities rather than having all key decisions taken by ministries.

- Formulating policy: This refers to a shift from formulating policy and delivering the service to formulating policy and contracting for the service. The government as purchaser of “education services” was explicitly articulated in the Australian context (Marginson, 1997, p. 71).
- Enhanced accountability: This means focusing on outputs and outcomes rather than processes and structures. Measuring research output and distributing funding on the basis of results is clearly meant to enhance accountability.

Not everyone views the application of new public management to universities in a neutral or positive light. Critical commentators see these developments in the context of neo-liberal policies, understood pejoratively. Also, although implementation of a PRFS is related to new public management, it is not an exemplar. Important new public management characteristics such as efficiency gains and increased use of contracting play little or no role in PRFSs.

The rationales provided by individual governments for their PRFSs are worth examining briefly because they reveal national differences in priorities due to the pre-existing state of university research in each country. In the United Kingdom, greater selectivity in funding allocation was initially an explicit goal of the RAE. Selectivity was a government response to limited resources and the increasing costs of research. The goal was to maintain research excellence but at fewer places (Tapper and Salter, 2003). Sweden also looks to concentrate resources, believing that international competition requires concentration and priorities to maintain high scientific quality (European Commission, 2010). The goal of the Spanish *sexenio* as stated in law is to foster university professors’ research productivity and improve the diffusion of this research both nationally and internationally. Fostering international publication was an explicit goal of Spanish science and technology policy more generally, and overall the policies have been successful (Jiménez-Contreras *et al.*, 2003).

Excellence appears frequently as a goal. In Australia the stated goal of the new ERA system is to identify and promote excellence across the full spectrum of research activity, including discovery and applied research, in Australia’s higher education institutions (ARC, 2009, p. 11). In New Zealand, the primary purpose of the PBRF is to ensure that excellent research in the tertiary education sector is encouraged and rewarded (New Zealand, Tertiary Education Commission, 2010). In Norway the goal is to increase research activities and allocate resources to centres performing excellent research (European Commission, 2010, p. 120). Sivertsen reports the goal of the Norwegian publication indicator to be “to measure and

stimulate the research activity at the level of institutions and to enhance the focus and priority they give to research as organisations” (Sivertsen, 2009, p. 6). Government statements of PRFS rationale thus reveal several independent themes: resource concentration, encouraging international (*i.e.* English-language) publication and the general pursuit of excellence. While the resource concentration theme bears some similarity to the search for increased efficiency of new public management reforms, research excellence is more reminiscent of the newer “public values” movement (Stoker, 2006).

The features of PRFSs

Performance-based research funding systems show variations in their design. Here their governance, unit of analysis, frequency, census period, cost, methods of measurement and use in funding allocation are examined.

There appear to be two basic models for running a PRFS; either it is run out of the Ministry of Education (or Ministry of Education and Research if there is no independent research ministry), sometimes based on a new law, or out of a new dedicated agency. The following is a list of economies and their PRFS administering agencies:

- Education ministries:
 - Hong Kong, China: University Grants Committee.
 - New Zealand: Tertiary Education Commission.
 - Slovak Republic: Act on Higher Education implemented by the Ministry of Education.
 - Sweden: Governmental Research Bill in 2008 established the new model for distribution of block grants system, handled by the Ministry of Education with some methodological support from the Swedish Research Council (European Commission, 2010).
 - United Kingdom: formerly Higher Education Funding Council for England (HEFCE), now Department of Business, Innovation and Skills.
- Mixed research/education ministries:
 - Australia: disputed between Department of Education, Employment and Workplace Relations and Department of Innovation, Science and Research.

- Finland: Ministry of Education.
- Norway: Ministry for Research and Education.
- Poland: Science Council – advisory body to the Minister of Science and Higher Education (established by a new Act of October 8, 2004 on the Principles of Financing Science).
- Dedicated agencies:
 - Belgium (Flemish Community): Steunpunt O&O Statistieken (SOOS) agency established to produce the bibliometric analysis for BOF key, which is administered by the Flemish government.
 - Italy: currently Agency for the Evaluation of University System and Research (ANVUR), whose predecessor (CIVR) had an advisory relationship with the Council of Ministers and the Ministry of Universities and Research.
 - Spain: National Commission for Evaluation of Research Activity (CNEAI) established by law simply to implement the *sexenio*.

The choice of administrative home for the PRFS would seem to have nothing to do with the characteristics of the PRFS. Most likely the choice of education ministry or dedicated agency is a political decision or is based on structural characteristics of the government.

The possible units of research evaluation in PRFSs include: individuals, research groups, departments and universities. All have played a role in PRFSs. Note that the unit evaluated may or may not correspond to the unit allocated funding on the basis of the results. The Spanish *sexenio* and the New Zealand PBRF both grade individual researchers on their research record. The *sexenio* results are used to increase the salaries of individuals achieving a high grade. The PBRF results are aggregated into a rating for universities to be used in allocating block funding.

Research groups are in fact the unit of evaluation with the best theoretical rationale because research is conducted by such groups, not by individuals or departments. Departmental level PRFSs are routinely criticised because of this (see for example Herbst, 2007, p. 91). The recent assessment of university research evaluation in Europe by an expert working group of the European Commission makes a best practice recommendation that groups, or “knowledge clusters”, be the preferred unit of analysis (European Commission, 2010, pp. 38-39). However, research group evaluation is probably impossible to implement on a national scale because there are so

many groups and their boundaries are fluid and indistinct. The Australian RQF proposed evaluation at the research group level. This elaborate exercise was the result of an extensive consultation and design exercise, but was abandoned by a new government before implementation in favour of the ERA, which emphasises simplicity. Because the ideal research group level evaluation is impractical, actual PRFSs will always be subject to criticism. However, departmental and university level PRFSs have proved their worth in practice and can be considered quite good and usable, even though imperfect.

The more practical and thus widely implemented unit of analysis is the department or the analogous field-in-university. The UK RAE evaluates university departments; the Australian ERA and Italian VTR evaluate fields in universities. In the RAE the results by department are published but are aggregated to the university level in order to award a single block grant to each university. The ERA is not yet used to allocate funding. In Poland faculties within universities are evaluated and money is awarded to faculties directly by the Ministry of Science and Higher Education. The Slovak Republic also appears to conduct its evaluation at the field-in-university level. Some systems produce evaluations at the university level. The Australian Composite Index, which is presently used to allocate the research quantum, is a formula that produces a result for each university. The same is true of the Norwegian and Danish PRFSs.

PRFSs also differ in the frequency with which evaluations are conducted. The Australian Composite Index and the Norwegian model require annual data submissions to calculate the following year's budget allocation. The Slovak Republic evaluates every three years (Geuna and Martin, 2003), Poland no less frequently than once every five years (in practice every four years), and Spain every six years (hence *sexenio*). The frequency of the Australian ERA has not yet been determined. Italy conducted an evaluation in 2006 using 2001-03 data and used the results to allocate funding in 2009 (European Commission, 2010, p. 116). Evaluations are not necessarily conducted on a regular schedule. The first two rounds of New Zealand's PBRF and Hong Kong, China's, RAE were conducted at three-year intervals. The next are scheduled at intervals of six and seven years, respectively. The interval between RAEs has increased from three to four, five and then seven years.

The census periods also differ among PRFSs. The Australian Composite Index and the Norwegian model base calculations on one year of data. The VTR was based on three years of data, Poland four years, Hong Kong, China, basically four years, the PBRF five years, the *sexenio* six years. ERA uses six years for bibliometric measures and three years for other indicators. RAE 2008 used publications from a seven-year period. The BOF key is

based on ten years for bibliometric measures and four years for non-bibliometric measures (see Poland, Ministry of Science and Higher Education, 2010; Hong Kong, China, UGC, 2006, p. 11; Hodder and Hodder, 2010; ARC, 2009, p. 13; Debackere and Glänzel, 2004, p. 268).

The costliness of the PRFS should be a concern for any government though cost is rarely discussed. PRFSs incur indirect costs for universities that compile submissions and direct costs for the evaluation of those submissions. The RAE and VTR incur heavy costs in faculty time because they are peer-review exercises. The RAE in 2001 involved 70 panels of 10 or more members convened to work on assessing 180 000 publications, which made the exercise expensive. Panels were expected to read papers, though given the impossibility of comprehensive reading, thoroughness varied (Harman, 2000, p. 115). One author noted that the exercise was conducted as if it was to appraise 50 000 individual researchers and their 180 000 pieces of work in order to make 160 funding decisions (Sastry and Bekhradnia, 2006), which seemed disproportionate. There were also indirect costs borne by departments whose efforts for preparing submissions increased with each round. A particularly clear cost statement was found for the Italian exercise which took place in 2006:

“The evaluation involved 20 disciplinary areas, 102 research structures, 18 500 research products and 6 661 peer reviewers (1 465 from abroad); it had a direct cost of EUR 3.55 million and a time length spanning over 18 months.” (Franceschet and Costantini, 2009, p. 1)

The VTR panels were expected to assess the quality of each of the 17 300 unique written works submitted, 2 900 of which were books. Two reviewers were assigned to assess each work independently. If every reviewer fully fulfilled their mandate, 5 800 reviewers read a book in addition to the four articles they were assigned. Is it any wonder that the intervals between the RAEs increased over time or that a second VTR has not been scheduled?

Indicator-based systems also incur substantial direct costs. The direct costs of indicator-based exercises include establishing and maintaining a national research documentation system, buying supplemental information from database providers, data cleaning and validation, and indicator calculation. As these data systems are intricate and large, the costs are considerable. Auditing of submissions is also necessary because fraudulent submissions could be used to increase funding allocations. Audits of Composite Index submissions were conducted by KPMG and found a high error rate (34% in the second audit in 1997); 97% of errors affected final scores and thus funding allocations (Harman, 2000, pp. 118-119). If costs are articulated, some consideration could be given to cost/benefit ratios.

The methods used in assessment correlate with the unit of analysis. Peer review is used for individual evaluations in Spain and New Zealand. Peer review is also used for departmental evaluations: the RAE, VTR and ERA. The RAE reviews are informed by narratives submitted by departments. In ERA, the reviewing committees are informed by indicators produced by an agency using university submissions. Although peer review seems to give control of the evaluation to the community of scholars, the criteria for reviewers vary. In Spain the criteria are set down in the regulations and are quite specific, reducing the degrees of freedom for reviewers and enhancing government control. In other countries less specific criteria provide scholars with more autonomy in their judgments (Jiménez-Contreras *et al.*, 2003). When the RAE began, disciplinary committees had complete freedom to determine criteria; later the government introduced a standardised statement of criteria to ensure fairness across fields (Tapper and Salter, 2003).

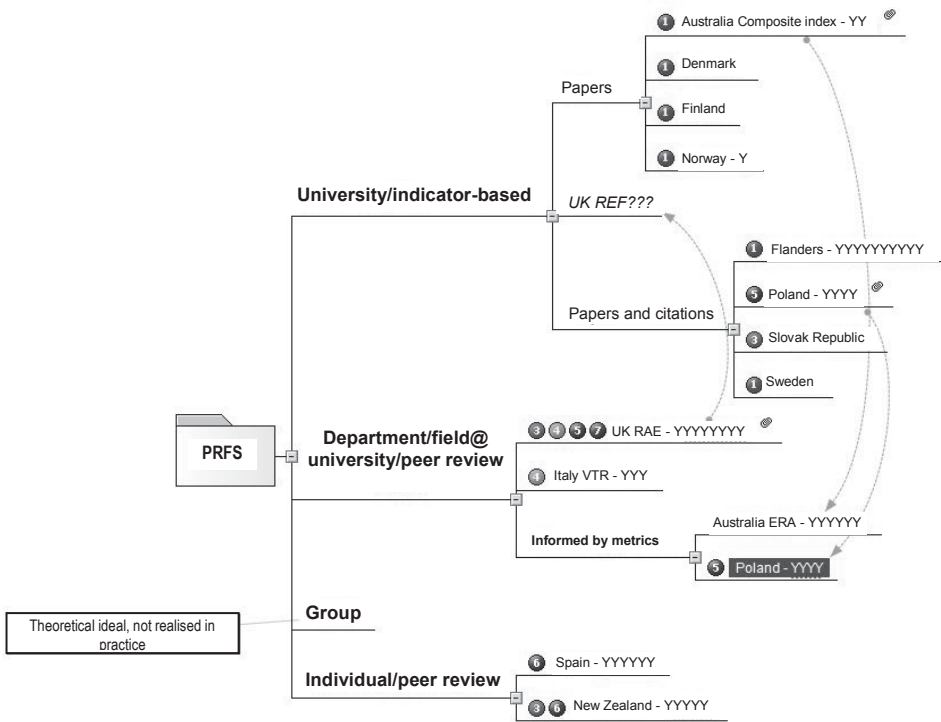
University-level evaluations rely on quantitative formulas. Such formulas use bibliometric output information but differ as to whether papers alone are counted or whether citation information is also included. The Australian Composite Index and the Norwegian and Danish systems employ paper counts only. However, Butler identified a weakness in simply counting papers, in that it encourages a move to lower quality journals to increase publication frequency (Butler, 2003). Therefore the Norwegian and Danish systems use an enhanced method in which 10% or more of journals are assigned to a higher quality category and given extra weight in the formula. Spain incorporates the Thomson-Reuters impact factor in their deliberations. Systems that include citation information, which must be purchased, include ERA, the Slovak Republic, Sweden and Belgium (Flemish Community). Spain's *sexenio* includes self-reported impact information such as citations or journal impact factor. The formulas include a range of other measures in addition to publication output including:

- employment of graduates,
- external research funding,
- faculty characteristics and qualifications,
- faculty size,
- graduate students graduated,
- implementation/application of research,
- international memberships,
- student load.

Figure 1.1 summarises this information in a broad typology of systems based on the unit evaluated/method used: individual/peer review, research group (theoretical, not realised), department or field in university/peer review, university/indicator based. A further subdivision based on type of bibliometrics used is included. The typology is simplified because non-bibliometric metrics are not considered, nor is the unit to which funding is allocated. However, if every dimension were included, every system would probably be in a different category since each would be unique.

Figure 1.1. PRFSs classified based on use of bibliometrics

Frequency, country and census period indicated



PRFSs are challenged by diversity. In the main this does not seem to concern the diversity of mission of universities (though Hong Kong, China, is concerned with this; French *et al.*, 2001). PRFSs simply concern a segment of tertiary institutions, some of which obtain far more research money in the block grant than others. Since the goals of PRFSs revolve around encouraging excellence and sometimes international publishing or concentration of resources, they are not designed to help weak research institutions improve and may in fact serve to remove resources from teaching-oriented institutions. The national innovation systems literature is largely silent on this issue, presumably because the authors reside in research-intensive universities and are not particularly concerned with colleagues in teaching-oriented institutions who wish to compete for scarce research resources.

Treatment of field diversity is far more involved and all systems are sensitive to differences in the patterns of fields' output. Evaluating the social sciences and humanities presents particular challenges because traditional bibliometric evaluation using Web of Science data does not work well (Hicks, 2004; Hicks and Wang, 2009). Peer review systems convene field-based committees that generally have latitude for developing appropriate standards of judgment for their field (Poland, ERA, RAE, VTR). The ERA suite of quantitative indicators differs by field. The Swedish formula contains an intricate field-weighting system. Spain's *sexenio* permits submissions to include a broader range of publication types in social sciences and humanities, though there are indications that this does not work very well. The applications of social scientists are less likely to be approved than those of scientists, and success rates have not increased over time (Jiménez-Contreras *et al.*, 2003, p. 138).

Transparency is highly valued in the design, execution and distribution of the results of PRFSs. Most systems emphasise transparency of methods and data. Thus the systems are designed in highly consultative processes in which the government gathers input from universities using comment periods, and evaluation processes are designed by expert panels made up of representatives of university or field-based associations. Instructions to universities concerning their submissions are easily available over the Internet as are the formulas used to convert measures into final rankings, grades or weights. The final grades are publicly available as well, again often posted on government websites. In Norway and the RAE 2008, all university submissions are public. The public nature of the results means that they are often used by others, picked up by the media and used in other funding decisions such as internal university allocation of funds or as one factor considered in awarding research grants. Individual grades are used in tenure decisions in Spain and South Africa.

Funding and the PRFS

PRFSs are used in decision making concerning the distribution of block grants to universities. Older methods of deciding the distribution of block grants include using a historical basis, *i.e.* the previous year, or formulas based on faculty or student numbers. The introduction of research performance likely entails splitting the traditional block grant into teaching and research components. The percentage of funding that depends on the research evaluation is a key feature of the PRFS, but it is difficult to define and to obtain the necessary information in most cases. It can be defined in many ways, and there is no consistency among authors in this respect. Reported figures include shares of:

- total university resources (government plus other funding),
- government funding for universities (block grant plus research grants and contracts),
- block grant or “general university funds” (GUF),
- research resources (total or government).

The share allocated according to the performance formula might be of interest and might include research performance assessment as well as graduate student numbers and amount of outside funding raised, for example. A smaller share depending just on assessment of research output might be relevant. One might wish to know the average across all universities, the share only in the most research-intensive universities, or the highest and lowest shares in the system. In addition, static snapshots may be less interesting than trends over time. Finally, the amount that moves between universities in any two years might be most illuminating. Moreover, to fully understand the effects of PRFSs they must be compared with non-PRFS funding systems.

Ideally, each of these figures would be available for every university system for current and past allocations. The following limited information was found:

- In Australia, the Composite Index informs the distribution of DIISR research grants. In 2008 these grants comprised 10.5% of Australian government financial assistance to universities and 6% of total revenues from continuing operations at Australian universities (Australian Government Department of Education, Employment and Workplace Relations, 2009, Table 1).

- In Italy, 2% of block funding is allocated based on assessment of research output. This is calculated as follows: 7% of the block funding to universities (FFO, Fondo di Finanziamento Ordinario) is allocated according to a performance formula of which research comprises two-thirds of the total (and teaching one-third). Of this, 50% is in proportion to the grade received by the university from VTR in 2006 (European Commission, 2010, p. 115).
- In New Zealand, the research output evaluation comprises 60% of the PBRF, which is one of six Tertiary Education Organisation Component (TEOC) funding elements (Tertiary Education Commission, 2010). Thus the research output evaluation likely drives 10% of block grant funding in New Zealand.
- In Norway, the publication indicator only affects 2% of the total expenses of the higher education sector, and a publication point represents no more than EUR 5 000 (Sivertsen, 2009, p. 6).
- In the Slovak Republic in 2006, formula-based subsidies for research represented approximately 15% of the total budget (Strehl, 2007, p. 41).
- In the United Kingdom, the RAE informs the distribution of a block grant which comprised 36% of support for science and engineering R&D in UK universities in 2004-05 (Department of Trade and Industry [DTI], and Office of Science and Innovation, 2007). General support for university research is allocated largely, but not entirely, on the basis of RAE ratings. Other criteria such as supporting new subjects or making allowance for the higher cost of living in London also play a role. In 2006-07, HEFCE allocated 70% of its general support using RAE-linked criteria (HEFCE, 2006). Just prior to 2008 approximately 25% of all research support in UK universities appears to have been allocated to universities based on the RAE ratings of their departments. RAE-based allocations are quite stable. By 2001 the marginal impact of the RAE on university finances was small. Sastry and Bekhradnia (2006) calculated that as a result of the 2001 RAE, only one institution saw its total revenues affected by more than 3.7% and the median impact was less than 0.6%.

Some information on time trends is also available:

- In Belgium (Flemish Community), the block grant for universities is divided into three parts: general, basic research (BOF) and applied research (IOF), and 45% of general and BOF are allocated according to a formula called the BOF key. The weighting given to the evaluation

of research outputs in the calculation of the BOF key rose from 0.10 in 2003 to 0.30 in 2006 (Debackere and Glänzel, 2004, p. 268; Luwel, 2010).

- In Poland the proportion of research funding distributed in block grants is likely to decline as the government promises to increase the share dedicated to competitive awards (Pain, 2010).
- In the Slovak Republic, government funding for research in universities more than doubled between 2002 and 2005. At the same time, the share of block funding allocated according to evaluated research performance as well as the “quality of development projects” increased from 9.7% to 23.1% at the expense of historical allocation and allocation according to evaluated teaching performance (Strehl, 2007, p. 113).
- In the United Kingdom, the share of university resources from RAE-governed processes declined from 58% in 1984 to 35% in 1997 because the share of research funding from all other sources increased, including the share from competitive grants.

This information is difficult to summarise. The share of funding allocated using PRFSs ranges from almost trivial at 2% of total funding in Norway to quite substantial at perhaps 25% in the United Kingdom. Neither is the trend clear. In the United Kingdom the importance of RAE-based funding has decreased, while in Belgium (Flemish Community) and the Slovak Republic it seems to be increasing. However, analysts consistently emphasise the small amounts of money involved or the small amount that moves in any one year as a result of evaluation (Jiménez-Contreras *et al.*, 2003; Sanz-Menendez, 1995; Sivertsen, 2010; Sastry and Bekhradnia, 2006; Rodríguez-Navarro, 2009). Universities have high fixed costs and require stable funding streams, and no government would benefit from a university becoming bankrupt. Therefore, governments would not want a highly unstable funding system that would swiftly reallocate large amounts of funding and might bankrupt some institutions, though the Polish government is currently threatening to remove research funding from underperforming universities (Pain, 2010). The short-term financial consequences of PRFS are likely to be less than is often feared, although small, consistent movements can accumulate over time. Only the UK system has been operating long enough to assess the possible financial effects of PRFS over the long term. Since the UK government had an explicit goal of selectivity, or concentrating resources in fewer universities, the appearance of this effect should not have been unexpected.

PRFSs can create pressure to increase funding. Grade increases in the RAE between rounds were used to argue for more government money for research to reward improved performance (Tapper and Salter, 2003). Hong Kong, China, faces the same phenomenon (French *et al.*, 2001). If the success rate in Spain's *sexenio* increases, the government is automatically obliged to increase faculty salaries. It seems likely that pressures to increase university funding will spread with the spread of PRFSs. Universities that can demonstrate increased excellence, particularly in highly publicised, internationally comparable, measurable ways, will have strong arguments when budgets are discussed.

It is possible that a PRFS will entrain other parts of the research funding system, with the result that the effect of the PRFS will go beyond the amount of money directly allocated. This will happen if grant review is not double-blind and the probability of a successful grant application is increased if the applicant is located in a higher-ranking department. In Spain a minimum number of *sexenios* are required for securing tenure or for becoming a member of the commission that grants tenure, thereby aligning the formation of an elite with the PRFS. Also, *sexenios* help with applications for competitive research funding by aligning the two major research funding mechanisms (Jiménez-Contreras *et al.*, 2003, p. 135).

Analysts who point to the small direct financial consequences attached to PRFSs do not therefore believe that they lack influence. On the contrary, they argue that the systems have strong effects on universities, less through the incentives funding provides than through public judgments about relative prestige. Comprehensive assessment of universities and their departments creates intense interest among universities. Experience has shown that universities are extremely responsive to hierarchical ranking. One effect of the RAE was to create what McNay termed assured, aspiring and anxious universities (HEFCE, 1997, p. 47). Attention devoted to RAE submissions did not decrease, even though, as mentioned above, Sastry and Bekhradnia calculated that the median impact on total university revenue of the 2001 exercise was 0.6%. Marginson noted in relation to the introduction of a university assessment in Australia in 1993:

“Nothing less than the positional status of every institution was at stake; the process of competitive ranking had a compelling effect, leading to the rapid spread of a reflective culture of continuous improvement.” (Marginson, 1997, p. 74)

Harman related that in Australia allocation of funding based on the Composite Index had become “an important vehicle for developing status hierarchies” as data are published in newspapers and widely used (Harman, 2000, p. 116).

The attention paid to research output assessments that are not linked directly to funding confirms this. In the United States, the annual ranking of university departments by *US News & World Report* is extremely influential. Similarly in Australia, ERA has been conducted but is not yet in use to determine funding allocation, yet it is the focus of intense interest. The Shanghai Jiao Tong University Academic Ranking of World Universities and the THE World University Rankings have been so influential that President Sarkozy has ordered France's science and higher education ministry to set "the objective of having two French establishments in the top 20, and 10 in the top 100" (Anonymous, 2010). That universities pay close attention to rankings and their attendant prestige is entirely rational since prospective students use rankings to decide on their destinations, especially at the graduate level, and money follows students. In addition, the more productive, grant-raising faculty seek to work at more highly ranked institutions.

Perhaps most tellingly, many UK universities may now be choosing high ranking over more money. RAE 2008 allowed selective inclusion of faculty members, and "research-intensive institutions indicated that they would seek the best ratings rather than the financial rewards that could be won by entering more staff" (Lipsett, 2007).

The emphasis in the literature on prestige rather than financial incentives as the main mechanism through which PRFSs work is consistent with conclusions of the new public management literature. Kettl (2000, p. 38), summarising conclusions of a report from the OECD's Public Management Committee, explains that "public managers around the world have indeed been strongly motivated by incentives, but the incentives have had more to do with their jobs than with the often sporadic performance driven pay systems". Although PRFSs may not be sporadic in that the formulas are applied to every funding allocation, authors seem to agree that prestige is a more important motivating factor, and the influence of independent rankings supports this. In public management, contestability, that is, the prospect of competition (Kettl, 2000, p. 40), is seen as central to the benefits derived from new public management reforms. Universities compete for prestige.

Convergence and challenges

Developing international consensus on PRFS best practice is proceeding slowly because international discussion has been limited. Most in-depth analyses of PRFSs are specific to a nation or even a discipline within a nation. Most cross-national material is not analytical and provides short, static, country-based summaries of complex and evolving systems. The RAE is well known and has been highly influential. All cross-national short

summaries include the RAE, and one suspects all PRFS designers look to the RAE first. Hong Kong, China, copied the RAE. The reverse may not be true. There is no evidence that the UK discussion about revising the RAE is building on lessons learned elsewhere, for example the high level of bibliometric sophistication in Australian or Norwegian efforts. Norway did learn from prior efforts, specifically the RAE and the Composite Index. Denmark is copying Norway. However a host of others are unknown to each other and to the main players. The leadership of international bodies, such as the commissioning of this study and recent reports by the European Union and Hera (Dolan, 2007; European Commission, 2010), is therefore to be welcomed. Consensus and state of the art is much more likely to develop around international rankings of universities. The *Times Higher Education* (or *THE*), Shanghai Jiao Tong, and emerging corporate products are discussed internationally, are analysed and compared, and are politically influential (Butler, 2010; European Commission, 2010; anonymous, 2010).

Although consensus is slow to develop, the systems exhibit similarities in design because they face similar challenges. Peer review is held in high esteem because it is well accepted by the academic community in every country. However, as it is expensive and time consuming, it is conducted irregularly. As a result, funding decisions may be based on out-of-date information. Departmental level PRFS using peer judgment based on indicators seems to be the state of the art and is being implemented in ERA.

University-level evaluation is metric-based and conducted annually using bibliometric methods. As these are not much liked by the academic community, governments that propose them may face heavy criticism. In smaller nations, the ability to handle very large datasets has made possible departmental-level bibliometrics that are national in scope. However, the departmental affiliation of authors, as indicated on papers, is often ambiguous and cleaning the data is onerous (Debackere and Glänzel, 2004). When funding is allocated on the basis of such data, they must be absolutely clean, because universities would invest much time in challenging their allocations if errors were found. A key advance in the PRFS bibliometric method is the introduction of weighted categories of journals. PRFS frameworks now assign higher weights to the top 10-20% of journals.

The current challenge is to represent adequately the scholarly output of social science and humanities fields. Counting journal articles indexed in databases such as Web of Science or Scopus works for scientific fields but is inadequate for social sciences and humanities, both because the indexing of social science and humanities journals is inadequate and because scholars in these fields produce more than English-language journal articles (Hicks, 2004). For these reasons the Norwegian model, though metrics-based, does not simply count indexed publications but is based on a national research

information system of university submissions of outputs. The Swedish model includes a sophisticated field-based weighting scheme. The ERA suite of indicators varies by field, with scholars in each field choosing the most appropriate metrics for their field. In the Spanish system, researchers are evaluated within one of 11 fields and the criteria used vary somewhat among fields (European Commission, 2010, p. 122; Jiménez-Contreras *et al.*, 2003).

A challenge still unmet in any PRFS is to recognise the broader impact of research, that is, its application and commercialisation. The United Kingdom is currently discussing this. The RQF included measures of broader impact, but was dropped because of its complexity. ERA does not include broader impact measures. The *sexenio* has been criticised for excluding consideration of broader impact (Sanz-Menendez, 1995).

The state-of-the-art in PRFS design incorporates extensive consultation with the academic community. This was not the case initially; the first UK RAE and the Australian Composite Index were imposed. However, in the United Kingdom an extensive public discussion of the RAE ensued, much of it in the pages of the *THE*. Studies of effects were commissioned and the current design process for the RAE's replacement includes extensive formal consultation. Similarly in Australia the design of both the RQF and the ERA involved "exhaustive consultation with researchers and the 39 universities in the Australian system. There is a strong requirement of procedural fairness and transparency and acceptance by key stakeholders." (European Commission, 2010, p. 86) In Denmark years of discussion did not lead to a consensus, thereby preventing the introduction of a PRFS. Lately the discussion has moved forward and the introduction of the Norwegian system is being designed in collaboration with the research community (Fosse Hansen, 2009). In Poland the regulations governing the PRFS are being revised and comments have been solicited from the heads of academic units. The Norwegian model was designed by the ministry in consultation with the university sector, represented by the Norwegian Association of Higher Education Institutions (*i.e.* Rectors' Conference), and this body has ongoing responsibility for the publication indicator (Sivertsen, 2010, p. 2). The increased consultation in PRFS design may signal a shift from the new public management origins of the RAE and the Composite Index to the newer public values/networked governance model in which extensive consultation with stakeholders is preferred (Stoker, 2006).

Notable in PRFSs is a tension between complexity and practicality. The RQF goal of assessing at the level of the research group was too complex to be practical. The complexity of submissions required by the RAE increased over the years, and departments elaborated their submissions over time in an effort to become more competitive. This raised questions about the

cost/benefit ratio of the exercise, and the UK government proposes a metrics-only future in the REF. Complexity emerges in these systems as a response to consultation which produces pressures for fairness across heterogeneous academic disciplines. In Hong Kong, China, extensive consultation prior to the 1999 RAE resulted in a broadening of the activities assessed from research only to include research-related scholarly activities: discovery, integration, application and teaching (French *et al.*, 2001, p. 37). Presumably, complexity increases easily in the absence of any accounting of the full cost.

PRFS design and implementation also creates tensions between autonomy and control. This theme is prominent in the English-language commentary accessible to the author. British and Australian commentators on PRFSs are sensitive to the subtleties of rhetoric and reality in relation to university autonomy (Marginson, 1997). Tapper and Salter argue that: “Ironically, such a model of governance may constrain higher education institutions more severely whilst giving the impression, or at least creating the illusion, that university autonomy has been retained” (Tapper and Salter, 2003, p. 11). For example, the Australian Composite Index is used to allocate a block grant; it would seem universities have autonomy in deciding how to spend the block of money they receive. However, this block grant is divided into seven parts, each of which is subject to a separate set of “broad” guidelines by the funding agency which thereby retains a large degree of government control over expenditure. Herbst, an American, observes: “The move of European higher education systems toward managerial autonomy has strings attached: institutional autonomy appears to be offered with one hand – and taken back with the other.” (Herbst, 2007, p. 79) In addition, the influence of a PRFS will depend on how universities allocate funding internally; conceivably university management could negate or enhance PRFS incentives (see Chapter 4; also Frölich, 2008). Autonomy, self-governance and competition are sensitive issues for the academic community and each of these is implicated in the introduction of a PRFS.

At the individual level, a great deal of commentary related to autonomy implicitly assumes a prior state in which collegial relations governed the academic community through informal peer review. Others argue that this is an idealised view which neglects professional hierarchies and intellectual authority relations (Harley and Lee, 1997). Whitley develops this argument in expressing his concern about the possible deleterious effects of PRFSs on the vibrancy of the scholarly community and the knowledge it creates. In essence, he argues that strong evaluation systems will reinforce the influence of conservative scientific elders, thereby suppressing novelty, new fields, diversity and pluralism. This problem will be exacerbated if a country’s scientific elite is cohesive and if they also control project-based

funding through peer review. The problem will be mitigated if the country has diverse funding agencies with diverse goals, especially public policy and use-oriented goals. University autonomy will also reduce this effect. However, if a system is segmented, that is, applied research is in one place and basic in another, and if career paths are locked into one or the other place, varied funders will not matter because the same elites will control peer review for both the PRFS and the grants associated with universities (Whitley, 2008, pp. 14-16). The problems generated by a cohesive intellectual elite in control of a PRFS may be particularly visible in economics, with its striking division between neoclassical scholars and everybody else (European Commission, 2010, p. 116; Harley and Lee, 1997). This point is connected to the magnified effect of PRFSs through their effects on other parts of the funding system mentioned above. In essence, a PRFS will have contradictory and ambiguous effects on university autonomy, but under the right circumstances a PRFS will certainly enhance control by professional elites.

Conclusion

To conclude, the elements discussed above are drawn together in a consideration of possible futures for PRFSs.

Many countries with PRFSs are embarking on stringent austerity programmes which will prevent increases in funding or lead to decreased funding. In terms of the possible consequences of running a PRFS in an austerity environment, a PRFS generates pressure for increased funding, on the one hand, while on the other, contestability rather than the available funding is the crucial element. Austerity programmes will inevitably lead to dissatisfaction and alienation, which will likely find their way into anti-PRFS rhetoric, but presumably universities can compete as effectively to minimise cuts as they can to maximise funding increases. Thus cuts across the board may not be a good idea in a PRFS system; maintaining consistency and allocating cuts using the PRFS will probably be important.

There is some concern that while the introduction of a PRFS initially brings performance gains, after a few iterations, improvements without funding increases are no longer possible and the costly exercises then return little to no benefit (Geuna and Martin, 2003; Hicks, 2008). The idea is that the PRFS harnesses latent capacity in the system without adding more research resources, but eventually that capacity is exhausted and further gains require more research resources. It would be rash to use this reasoning to remove a PRFS, however, because this analysis neglects the demonstrable benefits of introducing contestability and incentives into a system. The gains in performance are clear when contestability is introduced for the first time,

but eventually improvements slow as a new steady state is reached at a higher performance level. If contestability, which produced the higher-level steady state, were removed, one suspects the higher steady state would not be maintained. Strictly speaking, a government should maintain a PRFS if the difference in research excellence between the before and after steady states is achieved more cost effectively with a PRFS than by adding research resources. Any such calculation should build in the inexorably increasing cost of a PRFS over time as complexity increases as a result of stakeholder consultation. Although possible in theory, in practice it is impossible to make this calculation since the costs of PRFSs are not articulated and the benefits have not been quantified.

Any consideration of the future of PRFSs should take into account relevant non-PRFS mechanisms. Since contestability seems to be at the heart of the benefits of a PRFS, it may be possible to encourage research excellence simply by relying on independent rankings. International rankings are proliferating and their influence is likely to increase greatly over the next few years. Funding could be linked to the results of an international ranking or not. A government could simply rely on media attention and student and faculty pressure to create incentives from rankings. This is in fact a notable element of the highly successful US university system, for which *US News & World Report* annual departmental rankings and National Academy decadal departmental rankings are highly influential. Substituting an international ranking for a PRFS would have the benefit of eliminating costs and shifting divisive and resource-consuming methodological arguments to the international scholarly community. However, universities can only compete effectively for prestige if they have institutional autonomy and discretionary resources (again this is the case in the US system). This recalls the new public management origins of PRFSs. The introduction of a PRFS tends to be just one part of larger changes and although independent rankings may substitute for the research evaluation component, without the larger changes universities cannot respond to incentives to increase their prestige. This suggests that the focus should not be the PRFS *per se*, but rather increasing contestability and institutional autonomy in a university system.

The future of PRFSs also depends on how successful they prove to be in comparison to the alternative centre-of-excellence approach in which governments award a limited number of very large, long-term block grants to universities based on competitive proposals. Germany, Japan and Poland use this approach. China has also taken this approach with its Project 985, though without the competitive proposal aspect. This is clearly a mechanism meant to concentrate funding and encourage international levels of excellence – the same goals that motivate PRFSs. A long-term comparison of the

relative merits of centre-of-excellence and PRFS approaches might help governments understand and explore their options for increasing university research excellence.

The long-term future of a PRFS will depend on how well it meets the government's goals. Many governments have articulated a clear goal for their PRFS: the enhancement of research excellence. A competition for prestige among universities based on research performance will likely achieve that goal. Problems may arise however if governments realise that their goals, or values, are broader. First, a PRFS will not be a good way to encourage interaction with industry and application of research, activities with more demonstrable economic benefits than general research excellence. Enhancing universities' contributions to the economy is a common policy goal that is not well addressed in current PRFSs. Equity and diversity are also important public values in relation to universities. Excellence and equity have always been in tension in research policy. PRFSs encourage excellence at the expense of equity. A more subtle conflict may arise in a PRFS because of the strong reliance on the academic elite in its design and implementation and the possibly enhanced effect if the rest of the funding system is entrained by the PRFS. Whitley suggests that novelty, innovation and intellectual diversity may be suppressed because elites tend to judge academic quality in part on how well work advances paradigms they have themselves established. In addition, the contribution of universities to national and cultural identity may lessen because these are devalued in systems that focus on research excellence at the international level (*i.e.* published in English). There may be circumstances in which any of these value conflicts becomes politically unacceptable. Two choices will present themselves, either further increasing the complexity of the PRFS to broaden the definition of performance (and so increase cost), or reducing the influence of the PRFS and adding another programme to distribute research support based on consideration of other values. The vision of an ever more burdensome PRFS, forced to serve goals for which it is less than ideal seems to hold less appeal than a suite of programmes, each optimally designed to serve a different goal. The second option would increase diversity in the funding system and facilitate differentiation among autonomous universities managed strategically. This should enhance the ability of the system as a whole to serve a complex suite of public values.

As PRFSs are but one element in a complex university governance system, it is likely impossible to devise a single optimal, universal, perpetual best practice. Instability is evident today in the many systems being redesigned. Introducing international discussion in this context will be extremely valuable for comparing options and helping governments choose the best way forward.

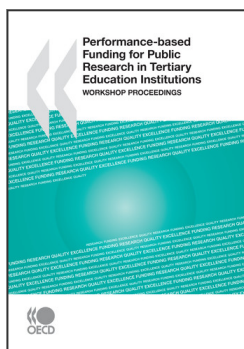
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From:
**Performance-based Funding for Public Research in
Tertiary Education Institutions**
Workshop Proceedings

Access the complete publication at:
<https://doi.org/10.1787/9789264094611-en>

Please cite this chapter as:

Hicks, Diana (2010), "Overview of models of performance-based research funding systems", in OECD, *Performance-based Funding for Public Research in Tertiary Education Institutions: Workshop Proceedings*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264094611-4-en>

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