

Chapter 3

Performance-based funding for public research in tertiary education institutions: Country experiences

by

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This chapter presents the results of a survey on funding models. It looks at rationales for the use of performance-based funding systems and outlines the key features of schemes and systems currently in use, including frequency of assessment and the allocation of funds. It discusses the effects of using performance-based funding as well as interactions with other funding mechanisms.

Introduction

This chapter draws on responses to a questionnaire distributed to OECD countries and select non-member economies to present a sample of country experiences in the use of performance-based funding for research in tertiary education institutions (TEIs). The survey was part of the project on performance-based funding for public research in TEIs of the OECD Working Party on Research Institutions and Human Resources (RIHR). Some governments use such funding to allocate a portion of research funds to TEIs at the institutional level, generally based on *ex post* evaluation of research outputs and outcomes. The questionnaire sought country-level information on the use of performance-based funding, its features and its perceived impacts. It also sought the views of countries not currently using performance-based funding but which had previously considered or were now considering using such systems. Thirteen responses were received: twelve from countries actively using performance-based funding in some form and one from a country considering its use.

This work can be seen in the context of governments' efforts to improve steering and governance within the research environment. Over recent decades, funding arrangements have evolved in several countries to include a larger share of project funding, and current efforts on performance-based funding may be regarded as a complementary policy tool aimed at improving the outcomes from institutional funding streams.

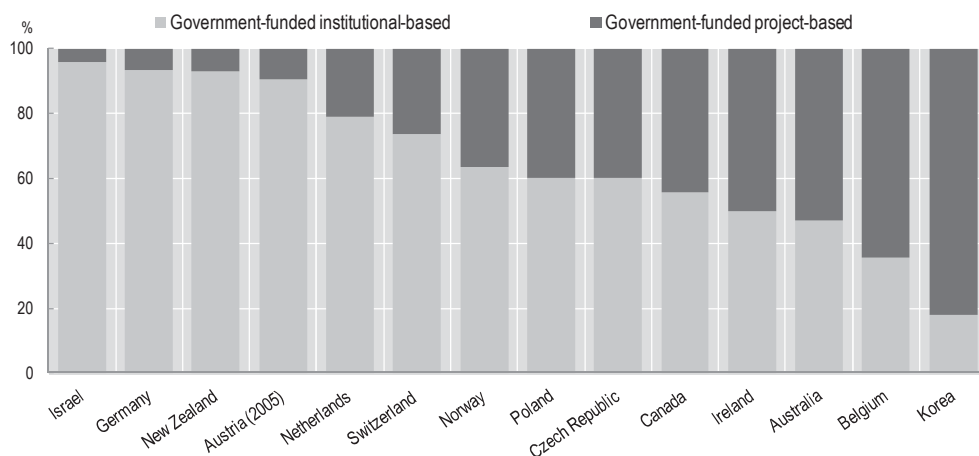
The chapter begins with a brief discussion of general trends in public funding systems for research. It then outlines the findings from the questionnaire, addressing the rationales, key features and effects of performance-based funding systems currently in use. Finally, it summarises key findings and presents a number of policy issues that emerged from the analysis.

Institutional and project funding – the backdrop

Institutional (or block) funding and project funding are the two main mechanisms used by governments for financing research in TEIs. Institutional funding can broadly be defined as funds attributed to universities and research organisations with no direct selection of projects or programmes to be performed, while project funding is attributed to a group or individual to perform an R&D activity that is limited in scope, budget and time and is normally allocated on the basis of a project proposal describing the research to be done (see Lepori *et al.*, 2007a; van Steen, 2010).¹

Project funding for public research in the aggregate (*i.e.* TEIs plus government research institutions) has grown over time in several countries. For instance, Lepori *et al.* (2007a) found that project funding had increased since 1970 in Austria, France, Italy, the Netherlands, Norway and Switzerland, both in real terms and as a percentage of GDP. They concluded that project funding had also increased as a share of total funding, since total public research funding did not strongly increase over the period. Preliminary analysis from the OECD’s National Experts on Science and Technology Indicators (NESTI), reported in van Steen (2010), found a rising share of project funding from 2000 to 2008 in Australia and Austria, although there was relative stability in the modes of public R&D funding in the other countries studied.

Figure 3.1. Government funded R&D in higher education, by type of funding, 2008



Note: This is an experimental indicator. International comparability is currently limited.

Note on Israel: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: OECD, Working Party of National Experts on Science and Technology Indicators (NESTI) project on public R&D funding, 2009.

Nevertheless, despite the general trend towards project funding, some countries still have a high share of institutional funding in their overall funding mix and arrangements vary widely across countries. Austria, Germany, the Netherlands and Switzerland had shares of institutional funding in total national public funding to national R&D performers of over 70%. Australia, Canada, the Czech Republic, Israel and Poland used institutional funding for 50-70% of total funding, while Belgium, Ireland, Korea and New Zealand instead used project funding to allocate more than

50% of funding (van Steen, 2010). These results suggest that the higher education sector is the main destination of institutional funding, although half the countries also provided substantial institutional funding to the government sector. Figure 3.1 shows the proportion of institutional and project funding in the higher education sector in a sample of countries; the share of institutional funding ranges from a high of almost 96% in Israel, to around 18% in Korea. Interestingly, project-based funding shares are much lower in the higher education sector than in public research overall in Israel and New Zealand.

Given the ongoing importance of institutional funding in many countries, coupled with the interest of governments in more effectively steering research activities, it is not surprising that mechanisms that allow some element of direction of institutional funding flows have emerged. Jongbloed (2010) noted that funding is part of the set of governance tools that enforce common goals for higher education, set incentives for certain behaviour and attempt to maximise the desired output with limited resources. Institutional funding generally provides institutions with more scope to shape their own research agenda, while project funding provides governments with more scope to steer research towards certain fields or issues. Project funding may also allow governments to target the best research groups or support structural change (Lepori *et al.*, 2007b). Over recent decades, competitive funding has increased in order to enhance efficiency and quality, and institutional budgets have become more tied to specific teaching and research outcomes via formula-based funding systems (Jongbloed, 2010). In contrast to the 1990s when only a few countries used output-related criteria in funding, almost 20 European countries now use elements of performance to drive budgets of HEIs.

Systems of performance-based funding

Responses to the OECD RIHR questionnaire on performance-based funding for public research in tertiary education institutions were received from Australia, Austria, Belgium, the Czech Republic, Denmark, Finland, Germany, New Zealand, Norway, Poland, Slovenia, Sweden and the United Kingdom. The Belgian response detailed the policies and systems in place in the Flemish Community of Belgium. All references to “Belgium” or “Belgian” thus relate to the Flemish Community. The German response was drawn up on the basis of submissions from nine German regional states (*Länder*): Baden-Württemberg, Bavaria, Berlin, Brandenburg, Hamburg, Hesse, Lower Saxony, North Rhine-Westphalia and Rhineland-Palatinate. In Germany, the *Länder* determine the design and implementation of procedures to fund public higher education, and this has led to a diversity of models for performance-based funding. Therefore, this chapter will refer to both general German conditions and state-specific procedures.

The questionnaire specified that the focus of the survey was the systems of *ex post* evaluation of research outputs and outcomes used to allocate a portion of institutional-level funding for research in TEIs. It noted that the study concerned government-level funding formulas for institutions, not systems for the allocation of project or programme funding to groups or individuals, or the internal allocation of funds within institutions. The following therefore describes funding schemes identified by the surveyed countries as meeting the criteria for inclusion in the study as performance-based funding schemes for public research in TEIs. The interpretation of these parameters by individual countries and the resulting list of schemes discussed in this chapter may not accord with other interpretations and lists (see Chapter 1, for example).

Dates of introduction

The use of performance-based funding systems is generally relatively recent. In the sample of countries responding to the OECD questionnaire, most funding policies have been introduced since 2000, although some schemes have been operating for longer. Of the schemes with longer histories, the “first vintage” of Belgium’s main performance-based system for allocating funds for basic research was created in 1985, although the performance-based mechanism with bibliometric indicators was introduced in 2003 and a second fund for strategic and applied research was introduced in 2005. The United Kingdom introduced quality-related (QR) research block funding to institutions in 1989. This system phased out a less structured algorithm based on quality and volume of research. The first Research Assessment Exercise (RAE), currently the United Kingdom’s main performance-based funding tool, took place in 1992. In Poland, the performance-based system was introduced in 1991, together with the foundation of the State Committee for Scientific Research, a key institution in the post-1989 arrangements for science and research. Norway began funding part of the total public general university fund on the basis of performance in 1992, and the current system took effect in the 2003 budget.

Some German states introduced forms of performance-based funding allocations for higher education institutions (HEIs) as early as 1994, with some subsequent modifications, while others introduced their schemes after 2000. The “oldest-serving” model, still in use today, is in Rhineland-Palatinate, which has used indicator-based funding for materials and capital expenditure for research and teaching since 1994 and for staff costs since 1998. North Rhine-Westphalia began distributing funding for student assistants, digital literature and equipment on the basis of indicators in 1994, though the current system dates from 2006. In other states, performance-based funding is more recent, dating from 1999 in Bavaria, 2000 in Baden-

Württemberg, 2003 in Hesse, 2004 in Brandenburg, 2004-05 in Hamburg (an earlier system was introduced in 2002-03), and 2006 in Lower Saxony (with an earlier system in place since 2000 for universities of applied science). Berlin is about to introduce a new system of performance-based funding, with grants allocated for the first time using the new criteria in 2012.

Of Australia's current set of schemes funded via performance-based formulas, one (related to research infrastructure) took effect in the 1995 budget, while the others have taken effect since 2002. Australia's new Excellence in Research for Australia (ERA) process for research evaluation, which will be used in funding allocation decisions, begins from June 2010. Finland began allocating part of university resources on the basis of performance in 1998; the current system dates from 2010. The Czech Republic implemented its first model (covering part of TEI research activity) in 2003; a second model was introduced in legislation in 2008 (with budget impacts in fiscal year 2010). New Zealand implemented its Performance-Based Research Fund (PBRF) in 2003, with funding phased in over three years. The first of the periodic quality evaluations took place in 2003, with another partial round in 2006 and a further round scheduled for 2012. Of the most recent schemes, Austria's performance-based system began in 2007, and Sweden's performance-based system took effect in 2009. Denmark's funding via a bibliometric indicator begins in 2010, following a political agreement in 2009. On average, it appeared to take countries two to three years to move from discussions of a particular performance-based funding scheme to the introduction of schemes in budgets.

Rationales for the introduction of performance-based funding systems

Among the rationales for the use of performance-based funding for research in TEIs, many of the questionnaire responses mentioned the search for research quality, the central rationale of several systems. For example, strengthening research quality was the main rationale behind the Danish system, with incentives for publishing in the most recognised journals and by the most recognised publishers. Quality was also the top factor behind the Finnish system, with an additional rationale of demonstrating to the public that research funding is spent optimally. In Norway, the main purpose of the performance-based allocation system is to enhance the quality of research by motivating institutions to increase their research activities and by distributing resources according to research results. This focus accords with the principles set out in the 2000/01 White Paper to the Norwegian Parliament (Storting) *Do Your Duty – Demand Your Rights: Quality Reform of Higher Education*, which was drafted in response to a Royal Commission report on HEIs. Sweden also cited improved quality in research as the main

purpose of the system. The main purpose of the United Kingdom's system is improved research quality, but accountability is also paramount, and making quality visible to the public is an important aspect of this. For the United Kingdom, concentration in research is regarded as a consequence of the system rather than a goal.

However, countries are also seeking to use performance-based funding to create incentives for other actions and behaviours related to research. For instance:

- As well as identifying excellence and improving research quality, Australia's new ERA initiative aims to compare research efforts against international benchmarks and identify emerging research areas for development. More broadly, the funding system is aligned with the principles for higher education research funding in the 1999 Knowledge and Innovation Framework. These principles focus on the achievement of world-class research and research training, encouragement of critical mass in areas of strength, the development of a diverse research base and the ability to respond to global market opportunities, university autonomy in setting research priorities and conducting research, increased collaboration, greater contestability and transparency in allocation processes, and openness to verification.
- Belgium established its performance-based funding mechanism to stimulate scientific performance and the quality of research, to make quality visible, to create an incentive for technology transfer and to distribute research funding on an equitable basis.
- At first, the purposes of the Czech system were to determine where to concentrate research funding, to achieve better organisation, uniformity and transparency in the management of public financial resources for research, and to have effective and optimal spending. Subsequently were added research quality, accentuation of the competitive advantage of Czech research results, and making quality visible to the national and international public.
- The main purpose of New Zealand's PBRF is to ensure that excellent research in the tertiary education sector is encouraged and rewarded, thus increasing quality. It is also designed to achieve other aims, such as improving the quality of public information on research and preventing undue concentration of funding. The design of the scheme also attempts to support Māori and Pacific research capability.

- Poland’s performance-based system aims to create incentives to improve research quality and to make this quality visible to the public. The system also seeks to concentrate research funding (or to avoid fragmentation). As part of Poland’s shift away from a centralised system of science and higher education, the performance-based funding scheme aims to move decisions on science towards the research community and away from politicians and officials.

Box 3.1. Funding research in Slovenia

In 2010, the Slovenian Ministry of Higher Education, Science and Technology is preparing new strategic plans for higher education and R&D – the National Plan for Higher Education 2011-15 and the National Research and Development Programme 2011-15. In this context, the issues of funding and introducing “novelties” into financial systems are of great relevance and interest.

Slovenia has five universities and 26 other HEIs, of which 20 are also registered as research organisations. Data show that 36% of all researchers work in higher education and more than one-third of research is carried out in HEIs. Currently, public money for R&D activities (basic and applied research) is distributed to public universities and public research institutes exclusively through public calls and tenders, which are based on competitive principles. The main evaluation criteria are quality of research outputs (publications), quality of research programmes proposed (peer review) and connections with industry (money from external sources).

The Slovenian Research Agency (SRA) is responsible for the execution of public research financing and it provides independent decision making on the selection of programmes and projects financed from the state budget and other financial sources. The SRA also evaluates project proposals and the results of science policies. Its evaluation system collects a large amount of information, including data on publications (using the national bibliographic system COBISS and the Web of Science), data on results (using the Slovenian current research information system SICRIS), data on the connection of researchers with the business sector, participation in EU projects, and connection of researchers in the education process. Transparency of criteria, procedures and results is one of the top priorities of the SRA to ensure greater legitimacy of the system and better access to information.

With respect to teaching, the traditional method of funding according to numbers of teachers, workloads and hours per week is gradually being replaced by a funding formula based on numbers of students and graduates by field of study. In 2010, 40% of funding is flexible, with a lump sum being allocated according to the funding formula, while 60% remains fixed. HEIs have full freedom to manage these funds.

Source: Slovenian government response to the OECD RIHR questionnaire on performance-based funding for public research in tertiary education institutions (February 2010).

In contrast to these examples, Austria's indicator-based budget for TEIs does not have a research-specific rationale, as it is used for the institution as a whole and encompasses education, graduates, mobility and gender mainstreaming as well as research. Similarly in Germany, institutional funding does not distinguish between research and teaching and, as such, the objective of performance-based allocations is broader. The general aim is to strengthen the autonomy and institutional responsibility of HEIs, especially in relation to budget management (the implementation of performance-linked models is occurring in the general context of governance reforms with a view to less state intervention, more TEI autonomy and more market activity). The *Länder* also cited the introduction of competition between institutions to encourage optimal use of state grants, clear incentives for improvements in performance and quality, transparency and predictability of budget allocations, and stronger incentives for third-party funding and doctoral graduates.

Given its potential impacts on incentives for quality research and other behaviours, performance-based funding is attracting attention in other countries as a tool for governing and steering research. Slovenia is currently considering the issue of performance-based funding for public research in TEIs in the context of setting broader higher education and R&D development plans (Box 3.1). With experience in providing formula-based lump sum funding for teaching in HEIs, and a wealth of research-related information already gathered by the Slovenian Research Agency, Slovenia would appear to have a good base for introducing performance-based funding for research in TEIs if it chooses to do so.

Key features of systems

More than half of the countries responding to the questionnaire make no distinction between private and public institutions for the purposes of performance-based funding. In Australia, for example, payments are made to eligible higher education providers (HEPs); these are listed in the *Higher Education Support Act 2003*. Eligibility for this list relies on factors related to tuition assurance, accreditation, and quality and accountability; both public and private institutions may be eligible. The Belgian and Finnish systems cover both private and public institutions.² Following a legislative amendment in 2008, the Czech system covers all types of research organisations (not just TEIs) if their primary purpose is to carry out and disseminate research, reinvest profits, improve research capacity or results and foster co-operation between the academic and private sector. New Zealand's scheme is open to all New Zealand-based degree-granting tertiary education providers (and their wholly owned subsidiaries) and thus encompasses universities, institutes of technology, polytechnics, *wānanga*³ and private training establishments.

Norway's funding system covers both private and public institutions, as does that of Poland and Sweden.

In contrast, the performance-based funding systems in Austria, Denmark, Germany and the United Kingdom focus on public institutions. In particular, Austria's system covers its 21 public universities, and Denmark's its eight universities. Germany's performance-based grant allocation procedures encompass public universities and universities of applied science (*Fachhochschulen*) in all *Länder*, as well as public colleges of art (*Kunsthochschulen*) in Berlin, Brandenburg, Hamburg and Hesse, and university clinics in Bavaria, Hamburg and North Rhine-Westphalia. In addition, Baden-Württemberg includes teacher training colleges (*Pädagogische Hochschulen*) in its system, and Bavaria also includes university libraries. All HEIs in the United Kingdom are eligible to submit their research to the Research Assessment Exercise, if they choose to do so, with HEIs defined within relevant higher education legislation. However, private institutions are not eligible.

Table 3.1 provides an overview of the schemes and systems of performance-based funding in the responding countries. The functional detail of the assessment systems can be complex and more details, where available, can be found on the project website.⁴ In all countries, the schemes cover all types of research and all fields. Most of the schemes use annual assessment processes, although Austria has a three-year cycle in accordance with its budget, and New Zealand, Poland and the United Kingdom have aspects of assessments taking place every five to seven years. To put performance-based funding into practice, most countries use a “master” performance assessment system that affects a tranche of block funding. However, Australia and Belgium use various performance-based schemes at the level of individual funding programmes. The indicators used by countries are generally quite similar, drawing mainly on information about publications, research income and students. However, Australia's ERA scheme intends to look also at indicators of application/commercialisation and recognition, Belgium uses information on patents and spin-offs, Finland accounts for teacher and researcher mobility, and Poland looks at the creation of new technologies and patents. In contrast to indicator-led models, the United Kingdom's RAE uses peer review techniques, whereby panels of experts assess the research submitted by institutions, while New Zealand's PBRF uses a mixture of periodic peer review and annual quantitative indicator assessments. Poland's system also incorporates some aspects of peer review and subjective decision making. In Germany, peer review and bibliometrics play almost no role in the *Länders'* performance-based systems.

Table 3.1. Key features of performance-based funding schemes in operation

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Australia	Grants provided on annual basis Indicators often look at performance in the two most recent years	Research block grants to eligible higher education providers, including: * Joint Research Engagement (JRE) initiative (formerly the Institutional Grants Scheme – IGS) * Research Infrastructure Block Grants (RIBG) * Sustainable Research Excellence in Universities (SRE)	Indicators include: 1. Research income received by HEIs (averaged over two most recent years of data) 2. Institutions' capacity to disseminate research results in (mainly) peer-reviewed research publications (averaged over two most recent years of data); the four categories are books (weighted by factor of 5), book chapters, journal articles and conference papers 3. Institutions' Commonwealth funded higher degree by research (HDR) student load ¹ (weighted by course cost) Another indicator, used as a performance moderator, is number of research active staff (averaged over two most recent years of data); research active staff are defined as research only and teaching and research staff. The new Excellence in Research for Australia (ERA) system will use indicators of: a) Research quality: ranked outlets, citation analysis, ERA peer review, and peer-reviewed Australian and international research income b) Research volume and activity: total research outputs, research income and other research items within the context of the profile of eligible researchers c) Research application: research commercialisation income and other applied measures d) Recognition: a range of esteem measures	Funding pools are fixed and annual grants are based on each university's performance relative to others In 2010, AUD 1.42 billion will be provided as block grants to support research and research training in Australian higher education providers through performance-based schemes The JRE incorporates a "safety net" feature that ensures institutions' grants do not fall below 95% of the previous year

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Australia (<i>cont'd</i>)		Performance-based block funding to support training for students undertaking doctorate and masters degrees by research, including: <ul style="list-style-type: none"> * Research Training Scheme * Commercialisation Training Scheme * Australian Postgraduate Awards * International Postgraduate Research Scholarships 	1. Successful completions of HDR degrees by students in HEIs (weighted by level of course and course cost; data averaged over two most recent years)	
Austria	Every three years (in line with the tri-annual budget system for public universities)	Direct public funding of universities (GUF)	The major R&D indicators are: <ol style="list-style-type: none"> 1. Number of PhD graduates grouped by field of study 2. Level of external funding for requesting research (e.g. local research funds, EU) 3. Level of contract research The indicator-based budget for public universities in Austria is used for the institution as a whole, and thus also includes weighted indicators for the areas of education and social objectives	20% of the direct public funding of universities (GUF)

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Belgium – Flemish Community	Annual	Funding to universities via: * BOF (Special Research Funds) * OF (Industrial Research Funds) * Research component of operational remittance	Indicators are calculated for individual institutions as the proportion of the total achieved by all institutions and include: 1. Bachelor and initial masters diplomas 2. Doctorates 3. Annual operational remittance/number of scientific personnel 4. Publications and citations 5. Industrial contract income 6. Income from the European Framework Programme 7. Patents 8. Spin-offs A mobility and diversity parameter is also used	In 2008, 75% of the research funding paid at the institutional level by the Flemish government was subject to performance-based funding via the BOF, IOF or operational remittance for a total of around EUR 312 million
Czech Republic	Annual	Performance-based targeted support for specific university research; and performance-based institutional support	For specific university research funding (student research) (Model 1): 1. Bibliometric indicators 2. Number of PhD students in accredited study programmes 3. Number of magister (master) degrees awarded in last academic year 4. Number of PhD degrees awarded in last academic year For institutional funding (Model 2): 1. Bibliometric indicators	In 2009, CZK 1 047 million was allocated for performance-based university research (this equated to around 4% of total government R&D expenditure and 7% of public general institutional university funds). In 2010, CZK 937 million is allocated for specific university research (almost 4% of total government R&D expenditure). One-third of total government R&D expenditure will be spent on performance-based funding for public research in research organisations including TEIs.

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Denmark	Annual	Restructuring fund (a fund additional to the general university fund)	Indicators include: 1. Share of educational resources 2. External research funding obtained by universities 3. Number of PhD graduates 4. The Danish Bibliometric Research Indicator	In 2010, 10% of the restructuring fund was allocated according to bibliometric performance. This tranche equated to DKK 30 million (approximately EUR 4 million). Institutions received a share equivalent to their share of publication output.
Finland	Annual (based on three-year averages in most of the indicators)	Core funding	Indicators include: 1. Teaching and research person-years 2. Number of doctoral degrees determined in the agreement between the Ministry and the institution 3. Number of doctoral degrees completed 4. Nationally competed research funding (Academy of Finland funding, funding via decisions on Centres of Excellence, Tekes funding) 5. Scientific publications (refereed international publications and other scientific publications) 6. Internationalisation of research (amount of internationally competitive research funding and extent of teacher and researcher mobility)	Universities receive a share of criteria-based funding. Around 34% of core funded is performance based.

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Germany	Once every financial term (either each year, or in some states for two years)	State-level allocations of institutional funding	Indicators vary by state and by type of institution. Most frequently used are indicators of third-party funding and number of completed doctorates. Some states also use collaboration-related indicators, while Bavaria and Berlin make use of publications data.	Varies by state, with Berlin having the highest share (30%) of performance-based funding for research (from 2012). Approximate shares in other states: North Rhine-Westphalia 11%; Baden-Württemberg and Hesse 10%; Brandenburg 8%. Most states limit the maximum possible budget loss of HEIs through application of a tolerance band based on the previous year's budget
New Zealand	Annual funding allocation but mixture of periodic and annual assessment of performance	Performance-Based Research Fund (PBRF)	Three indicators are used to determine funding allocations: 1. Results of periodic quality evaluation (a peer review process) 2. Number of research degree completions (annual) 3. External research income (annual)	Institutions receive allocations based on relative performance, with yearly changes based on movement in research degree completions and external research income. In 2008, PBRF funding accounted for NZD 231 million (11.8%) of government funding to tertiary education institutions. The budget is set annually by the government.

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
Norway	Annual (based on results two years earlier)	Performance-Based Reallocation (PBR) of total funding	Four indicators determine the PBR: <ol style="list-style-type: none"> 1. Publication points 2. Funds from the EU Framework Programme for research 3. Funds from the Research Council of Norway 4. Number of doctoral degrees awarded 	Each year, 30% of total funding to the tertiary education sector is distributed among institutions on the basis of relative performance in education and research. In 2010, approximately 6% of total funding to tertiary education institutions was distributed through the PBR for research.
Poland	Five-year assessment of performance	Institutional funding	Indicators include: <ol style="list-style-type: none"> 1. Reviewed publications 2. Scientific monographs 3. International research projects 4. Authorisation for granting research degrees 5. New technologies, materials, products, systems, services, methods and software 6. Patents and utility models granted, copyrights 	In 2008, 60% of GBAORD was allocated through institutional funding, which is partially performance-based
Sweden	Annual	Direct funding	Indicators used are external funding (50%) and bibliometric indicators (50%)	All new direct funding since 2009, plus 10% of every institution's direct funding from the previous year is allocated according to the performance system

Table 3.1. Key features of performance-based funding schemes in operation (*continued*)

Country	Frequency of assessment	Funding tool	Indicators used	Budget affected
United Kingdom	RAE conducted every 5-7 years; annual activity metrics	Non-capital research block funding	The principle indicator is the peer review conducted under the Research Assessment Exercise (RAE). Other indicators include: 1. Charity income 2. Volume of business research (income) 3. Volume of postgraduate research supervision	The RAE plus metrics drive an allocation of funding for each institution that currently accounts for around one-third of non-capital public spend in science and research allocated through the dual support system (block funding plus project funding)

1. Student load refers to the equivalent full-time student load (EFTSL), which is a measure of the study load, for a year, of a student undertaking a course of study on a full-time basis.

Source: Country responses to OECD RIHR questionnaire on performance-based funding for public research in tertiary education institutions (February 2010).

Most countries appear to have fixed funding pools, with funds allocated according to relative performance. The majority make payments under their performance-based funding arrangements at the highest institutional level, even if the assessment is made at more disaggregated levels; payments are not made at the level of research centres within universities, individual researchers, research groups or networks. In Poland, however, assessment and decision on financing are made at the faculty level; funding goes to the tertiary institution, but the ministerial decisions on allocations to faculty cannot be altered by the university administration. In a few cases, caps and floors are used to limit the extent of budget gains or losses due to performance-based allocations – this issue is discussed below.

Making results public

Most countries have very open disclosure of processes and results of performance-based funding systems. In Australia, grant amounts for each programme and the methodologies for the calculation of funding are publicly available on the Department of Innovation, Industry, Science and Research (DIISR) website. Danish statistics on performance are released on the website of the Danish Agency for Science, Technology and Innovation. They include results at the level of institutions (universities), main research areas (arts, political and social science, natural and technical science, and medical science), and main research areas within each university. The results of New Zealand's PBRF are publicly released via a number of channels, such as reports on the quality evaluation exercises (including overall results, trends, processes and panel reports) and PBRF annual reports (with data on each institution). Results are published at the level of the institution, not the individual; however, individuals can know the quality category assigned to their portfolio of work, and institutions were given a confidential report following the 2006 quality evaluation that outlined the grades assigned to individual staff by the peer review panels. The provision of information is also subject to New Zealand's Official Information Act 1982 and the Privacy Act 1993.

Open processes are also found in Norway, where institutions receive an information booklet each year outlining the main changes in the budget, accompanied by the underlying documentation (performance on each indicator per institution). The results are also made public on the government's website and accessible on the website of the Database for Statistics on Higher Education (DBH). Finland's system is similar to Norway's – an information booklet on funding models and indicators is published and sent to universities and is made public on the Ministry of Education's website. Poland's performance assessment processes and results are available to the public on the website of the Ministry of Science and

Higher Education. Results of the United Kingdom's RAE are made public by unit of assessment within each higher education institution but are not disclosed for individual researchers in the exercise.

Austria noted that it publishes the results of the performance-based assessment to universities after the tri-annual university budgets have been established. Sweden noted that the assessment processes are generally known. Results of the performance-based allocations by German *Länder* are provided to HEIs and the regional parliament. In some states (Baden-Württemberg, Lower Saxony) they can also be requested by the public. In the Czech Republic, assessment processes and results are made public.

Internal allocation of performance-based funds

With respect to the allocation of performance-based funds within institutions, the results of the questionnaire indicate a scale of government control, ranging from decisions that are purely internal to the TEI, to government expectations of certain behaviour, to formal requirements on allocations:

- In Germany and Norway, institutions may internally allocate the grants as they wish, and are free to decide whether and to what extent the regional or national-level incentives (or any other incentives) are employed in their internal budget distributions. The situation is similar in New Zealand, where institutions are free to determine the allocation of the PBRF funds. In Australia, higher education providers are expected to use their own allocation mechanisms to distribute their research block grants internally. In Austria, some institutions also use indicators (on different levels) to allocate funds internally. In Denmark, universities are free to use their revenues according to their own institutional priorities and there are no government stipulations on how performance-based funds are distributed internally. It is assumed, however, that the government incentive structure influences internal incentive structures at the universities.
- In Finland, performance-based funds are allocated internally at the discretion of the university according to its strategic choices, although with reference to target outcomes agreed with the Ministry of Education. In Poland, institutions have freedom to allocate funds internally, within the framework of their annual applications for statutory funding, which set out planned research directions and which are implicitly an agreement between research units and the ministry on spending directions. In Sweden, institutions are expected to change their internal allocation of funding to create incentives to seek external funding and to publish good quality papers, although

this expectation is not explicitly set out in any regulations. In the United Kingdom, HEIs are autonomous in deciding the uses of funding, but they are expected to take strategic decisions on research funding based on their strengths and with a strong focus on research excellence.

- In Belgium, there is some government direction for spending performance-based funds. The BOF funding is allocated internally by the university board, on advice from the research board and according to selection criteria and allocation rules set out in the Ministerial Order on BOF. However, the IOF is allocated internally by the association board on the advice of the industrial research board. In the Czech Republic, the internal allocation of institutional performance-based funds must follow the general rules set out in the legislation (Act No. 130/2002 Coll. on the support of research and development) and the European Union document on state aid for research, development and innovation (2006/C 323/01). The targeted funding for specific university research is administered by TEIs, following the general rule that the major part of the funds must go to student research.

Governance and the role of institutions in designing and administering systems

In most countries, TEIs have played some role in designing the performance-based funding system and a number continue to be involved in its administration via data collection and ongoing consultation. Levels of TEI involvement range from high to low, generally as follows:

- In Denmark, the new system of allocating the basic grant according to performance is based on a proposal from the association of Danish universities, which was developed through negotiations between universities and the ministry. In addition, representatives from the universities are involved in the Steering Committee, around 300 researchers are represented in the expert groups responsible for selecting the data (journals and publishers) to be included in the bibliometric indicator, and the association “Universities Denmark” is responsible for appointing Danish researchers to the expert groups. The Danish Agency for Science, Technology and Innovation is responsible for oversight of the system and its administration and the Danish University and Property Agency is responsible for the allocation and distribution of funds to the institutions.

- In Belgium, the BOF allocation key introduced in 2003 was proposed by the Flemish interuniversity council (VLIR) which also has a role in data collection and processing for indicators on scientific personnel. The Centre for R&D Monitoring (ECOOM), an interuniversity consortium in which all Flemish universities participate, collects and processes data on publications, citations, patents and spin-offs. The Flemish ministers competent for education and innovation are responsible for the oversight of the performance-based system and the distribution of funds.
- In Poland, the system was designed by scholars elected to the State Committee for Scientific Research (until 2003) or nominated to the Council of Science. Other bodies, such as rectors' conferences, have an impact on the form of the evaluation system in the context of "social consultations". The Ministry of Science and Higher Education is responsible for oversight of the system, funds allocation and distribution.
- In Norway, representatives from the higher education sector, the ministry and the Norwegian Association of Higher Education Institutions (UHR) collaborated on the design and implementation of the funding system. UHR also played an important role in the design of the publication indicator in 2004 and has since had responsibility for the maintenance and further development of the indicator and its database. This responsibility is carried out by a National Publishing Board with representatives at the level of deans from all types of institutions and major research areas. Tertiary institutions themselves do not have a formal role in the administration of the system, except to report their results to the Database for Statistics on Higher Education (DBH). The Ministry of Education and Research is responsible for calculations, funding allocation decisions and distribution of funds.
- In Austria, the public universities took part in the final phase of development of the indicator-based budget and are partly responsible for the collection of the base data for the indicators. The indicator-based budget is administered by the Austrian Ministry of Science and Research.
- In Finland, the implementation of performance-based funding systems was jointly developed by the Ministry of Education and the universities. The Ministry of Education is responsible for granting the formula-based core funding to universities for the execution of their statutory public duties, according to the extent, quality and impact of the activities and to education and science policy objectives.

- In the Czech Republic, both performance-based funding systems were drafted under the partnership and oversight of all stakeholders. Responsibility for ongoing oversight of the system, funding allocation decisions and the distribution of funds lies with the Council for Research, Development and Innovation, the Ministry of Education, Youth and Sport, and some other ministries.
- In the United Kingdom, HEIs are consulted in each round of assessment and when the system is changing. They also contribute experts to the assessment panels. The performance-based system is managed on behalf of the Department of Business Innovation and Skills, the Welsh Assembly, the Scottish Government and the Northern Ireland Assembly by each region's respective funding body. The level of funding is the responsibility of the respective administrations and the allocation of funding is the responsibility of the respective funding council or equivalent body.
- In the German states, HEIs are involved to varying degrees in the conception, administration and implementation of the systems, while the regional science ministries are responsible for the administration of the system. For example, in Baden-Württemberg, the system was developed and modified in co-operation between the Ministry of Science, Research and Arts and the universities and other HEIs. In Bavaria, the university associations co-operated with the Ministry of Science, Research and Arts on development and adaptation of the system, while in Lower Saxony the state conference of HEIs played a similar role. In Berlin, the state senate and TEIs developed the indicators, with some indicators based on the universities' suggestions. Brandenburg has a working group formed of members of TEIs and the Ministry of Science, Research and Culture, which monitors and develops the allocation system.
- In New Zealand, tertiary education organisations are responsible for providing complete and accurate data for the calculation of performance-based indicators. They have also been involved in the ongoing review of the PBRF system through consultation processes. The Tertiary Education Commission (TEC) is responsible for payment of PBRF funds and shares responsibility with the Ministry of Education for validating and verifying data. Monitoring and reporting within the system is based on high trust, high accountability and low compliance costs.
- In Australia, research block grant guidelines, conditions of grants and funding amounts are determined by the government Minister for Innovation, Industry, Science and Research (or delegate), but any

programme or policy change is usually subject to consultation with the university sector. The government consults with the higher education sector in determining how the allocation of other research block grants may be linked to ERA results.

- In contrast, in Sweden, tertiary institutions have no role in the design, administration or implementation of the performance-based funding system. The Ministry of Education is responsible for system oversight, fund allocation decisions and distribution of funds.

Effects of using performance-based funding

Most countries have not yet undertaken formal evaluations of their performance-based funding schemes, in part because a number of systems are still too new to identify specific impacts. For example, Austria noted that its indicator budget has been used only twice so far and that impacts and the effects on the performance of Austrian public universities are still being evaluated. Sweden is in a similar position, with its system only in place since 2009. However, the Swedish government will appoint an Inquiry Chair to review the current system to see if peer review and co-operation with the surrounding community should be components of the system. Any changes would likely appear in the next Research Bill, due in 2012. Belgium's IOF policy was introduced in 2005, but with a two-year time-lag on the formula's parameters, it is too early to see effects. With changes to systems in 2008/09, the Czech Republic plans to monitor results continuously from 2010 and evaluate impacts at a later date. Denmark plans to undertake small evaluations each year from 2010, with a larger evaluation due in 2013. Poland has not yet formally evaluated its instrument for institutional funding, but noted that scholars send their opinions to the ministry and assess the system in the press (notably in the *Forum Akademickie* journal). Furthermore, in late 2009, the Department of Strategy undertook a consultation concerning the value of the institutional funding system, and a report drawing on the 135 responses is being prepared.

However, some countries have undertaken more formal evaluations of their performance-based funding systems. In Australia, the 2004 evaluation of the 1999 policy framework, *Knowledge and Innovation: A Policy Statement on Research and Research Training*, touched on the performance-based IGS and RIBG policies. New Zealand established a three-phase evaluation strategy for its PBRF, with phase one covering implementation, phase two giving a sense of emerging trends (Adams, 2008), and phase three (to be undertaken after the 2012 evaluation round) providing a longer-term assessment of outcomes. The Ministry of Education has also published two studies on the influence of the PBRF on research quality. Norway's Ministry of Education and Research evaluated the Norwegian funding model in 2009;

the report was presented in the Annual Budget Report to the Norwegian Parliament. The evaluation aimed to establish a knowledge base on the effects of the funding system and to identify adjustments that would contribute to achieving the sector's goals. In the United Kingdom, several analyses of the impacts and consequences of the performance-based system have been undertaken in recent years. In Germany, Brandenburg's allocation model has been reviewed by external evaluators. In Finland, the university funding model was evaluated as part of the international evaluation of the Finnish national innovation system.

Evaluations and anecdotal evidence have pointed to a number of positive impacts arising from the use of performance-based funding, particularly in regard to research outputs but also research management. For instance, the Australian evaluation suggested that subjecting research block funding to performance formulas improved universities' strategic focus on research and their research performance. In Belgium, ECOOM, the body responsible for calculating the bibliometric indicators for the BOF scheme, found a stimulating effect on universities stemming from the bibliometric criteria for funding. The Czech Republic suggested that there were more research results, an improvement in publishing activity by students and young researchers, and integration of more research activities in tertiary education. It also noted more targeted investment in research equipment installed in TEIs, and an overall improvement in quality in tertiary education. Finland pointed to an increase in the number of new PhD graduates (doubling from 1993 to 2008) and growth in the number of researchers and international scientific publications.

In New Zealand, a comparison of PBRF indicators from the 2003 and 2006 quality evaluations suggested there had been an improvement in the average quality of research at participating institutions, and that the percentage of New Zealand researchers undertaking world-class research had also risen. In the formal evaluation of the PBRF in 2008, Adams (2008) concluded that there had been positive effects on the behaviour of individual staff and on the processes and mechanisms used to support research within institutions. He also considered that the introduction of the PBRF had the beneficial effect of reducing the emphasis on teaching and student numbers that had characterised the New Zealand tertiary system in the 1990s and that had placed research as an adjunct rather than core activity. Recent studies by the Ministry of Education have found an increase in the impact of research (as measured by citations) since the introduction of the PBRF. It is suggested that poor performance in the 2003 quality evaluation was a key factor in improved research quality in the 2006 round.

Norway's evaluation suggested that research incentives have made a significant contribution to the increase in the volume of Norwegian scientific publications, even though the performance-based publication indicator has a reasonably modest impact on funding (less than 2% of total TEI funding). The Ministry of Education and Research suggested that this may be partly explained by intra-institutional use of the publications indicator for the purposes of management, which may lift the visibility and impact of this indicator. (At this time, there is no available analysis on the impact of internal funding distribution models at national level.) The number of PhD degrees has also increased in Norway, although this is partly due to an increase in funded positions.

The United Kingdom noted that the introduction of the current performance-based system coincided with an inflexion point in the performance trend of the research base, with its share of citations growing faster than its share of world publications (Evidence Ltd, 2005). There was also an improvement in the performance and the concentration of resources in more research-intensive institutions. The introduction of overt science management systems within HEIs was believed to be linked to greater institutional autonomy in the use of funds and the drive towards excellence. One positive but unintended effect was the engagement of "higher quality academic staff" due to recruitment strategies targeting excellence. The survey response also noted qualitative evidence from vice-chancellors of HEIs that a highly selective system of allocating public funds attracts private research funding.

In Germany, the types of positive impact noted by HEIs and responsible ministries were slightly different, in line with the objectives of the schemes. The funding models were viewed as having positive effects on governance, particularly by stimulating debates on performance components, strategic steering and prioritisation, and institutional leadership within administrations, HEIs, faculties and departments. The transparency and rationality of grant allocations improved and budget negotiations were sped up through use of performance-based systems. States also identified increases in third-party funding and doctorate degrees awarded, and noted that HEIs had become more competitive.

However, in identifying the positive impacts of these systems, several countries noted the difficulty of isolating the effects of performance-based funding from those of the general funding environment. Belgium noted that it is difficult to attribute impacts explicitly to specific funds, as they form part of the broader university funding system. New Zealand suggested it would be an oversimplification to attribute improvements in quality, and increases in degree completions and external income, entirely to the performance-based system, and Germany expressed a similar view with respect to observed

increases in third-party funding and graduations. Norway noted that funding from the Research Council and the EU to the TEI sector has increased but that this cannot be unequivocally attributed to the incentive structure. The United Kingdom also noted the difficulty of concluding that changes in performance are due to a single factor.

The RIHR survey responses received from countries also highlighted some potentially negative and/or unintended effects of their performance-based funding systems, with one broad issue being a narrowing of research focus. In New Zealand, for example, private R&D-intensive firms have asserted that the PBRF acts as a disincentive for tertiary institutions to partner with, and transfer knowledge to, the private sector. They suggest that the system's focus on academic excellence deters tertiary-sector staff from working on more commercially focused, applied areas of research, and that the drive towards publication is a barrier to conducting commercial in-confidence research. The 2008 evaluation by Adams also raised questions about the way in which research in institutes of technology and polytechnics, which tends to be more practice-based, is dealt with under the PBRF and whether alternative processes are required to support their complementary (but different) missions. More generally, the system may encourage researchers to focus on a narrower range of outputs (*e.g.* preferring journal articles and publication in a narrower range of journals). The United Kingdom suggested there may be higher risk aversion in the choice of research areas (*e.g.* if the potential for citation is limited) and lower levels of multidisciplinary as a result of its research assessment exercise. Germany's HEIs also expressed concerns that a dominance of quantitative indicators might lead to incentives that are detrimental to quality.

In New Zealand, another unintended effect of the PBRF has been increased incentive for tertiary institutions to compete with other research organisations, including New Zealand's eight Crown Research Institutes, for publicly funded research grants from the research, science and technology budget allocation (as these are counted as external research income). There may also now be an undue focus on staff with established track records, at the expense of creating a sustainable profile of staff age and experience across a department, because the quality assessment is conducted at the level of the individual. In the United Kingdom, there is a broader question, as yet unanswered, as to whether further concentration of resources is a desirable outcome and will support a world-class national research system (Adams and Gurney, 2010). The new weightings that drive funding from 2010-11 will concentrate resources in favour of the five top-performing institutions, contrary to the wishes of those who argue for more diversity. For their part, Adams and Gurney argue that the present level of concentration has supported

research that gains global recognition and disturbing this arrangement could be detrimental.

The German response to the RIHR questionnaire highlighted the importance of implementing indicator-based allocation mechanisms consistently. It noted that where systems had been supplemented by additional, non-transparent and discretionary measures (particularly in order to recognise qualitative efforts, *e.g.* on regional planning), the allocation system became less transparent and less predictable, which contradicted the aims of the schemes.

Indicators and incentives

The effects of performance-based systems rely to a great extent on the indicators used and the incentives they generate. Over time, most countries have “fine-tuned” their indicators so as to better target the desired goals. In Australia, for example, so as to reward universities that diversify their sources of income beyond Australian competitive grants, the JRE (replacing the IGS) will no longer include this variable in the calculations. In a slightly larger change, Australia also removed capping of payments under the IGS and replaced this with a safety net. Previously, the formula for funding the IGS had capped payments so that institutions could not gain more than a 5% increase in IGS funding above their previous year’s allocation. Increases larger than 5% were redistributed to institutions that had suffered declines in funding. The 2004 evaluation criticised this, noting that capping of funding disadvantaged successful institutions and worked against the intent of policies. The new safety net mechanism means that now no grant can fall below 95% of the previous year’s grant (indexed to current prices). In Germany, most of the models implemented by the *Länder* limit both the maximum possible budget loss and gain of a HEI by using a tolerance band linked to the total volume of the previous year’s budget. In Berlin this band is 5%, while in other states it is between 1% and 2%. At the same time, the share of the budget determined by indicators has risen in several *Länder*. The 2008 evaluation of New Zealand’s system touched on the issue of caps and funding impacts; Adams (2008) suggested that the overall funding envelope for research may need to be increased, if improvements in quality are to be rewarded (via salaries or other resources for research) and thereby drive the outcomes targeted by the policy.

Some countries have added indicators; for example, in Belgium, a mobility and diversity parameter was added to the indicator mix in 2004, with the weight gradually rising to 4% of the total, in order to encourage universities to hire women and externally trained researchers. In Berlin, the set of research-related indicators was expanded to reward participation in clusters of excellence or research centres. In Australia, a new performance-

based funding tool, the SRE, aims not only to assist with research costs but also to encourage the use of best practice financial management, performance and reporting frameworks. Countries also made improvements to their underlying data sources. For instance, in 2008 Belgium began to supplement Web of Science bibliographic information with other international bibliographic files. It also created a Flemish academic bibliographic file for social sciences and the humanities, which will be put into operation in 2011. In some cases, there has been an evolution from input measures to more output-based measures. For instance, Finland noted that the proportion of criteria directly or indirectly describing the quality of operations has increased to about one-third of the funding. In other changes, Norway unified in 2006 the indicators to cover all institutions, rather than differentiating between universities, specialised university institutions and university colleges.

Despite ongoing changes to indicators over time, there have been some notable criticisms of performance-based systems, particularly concerning the structure of incentives. In Norway, for example, some feedback has suggested that financial incentives to institutions to seek funds from the Research Council of Norway and the EU Framework Programme may be unnecessary. The low success rate in gaining such external funding means there are already substantial kudos for successful institutions so that encouraging applications may not be useful. Nevertheless, the Ministry of Education and Research considered that incentives for institutions to seek this type of external funding are important for motivating institutions and enhancing quality. Norway also stated that it was not evident that performance-based funding has prevented fragmentation of research funding. In Belgium, analysis of unwanted effects stemming from the BOF allocation key has raised issues about the appropriate influence of publications with lower impact factors, the lack of an international focus, and the domain-independence of the key (discussions on this analysis are ongoing).

Feedback received in Poland on its performance-based system for institutional funding highlighted a number of concerns about the operation of the system's indicators. Many research-related activities were considered to be under-rewarded or not rewarded appropriately (see Box 3.2). For instance, comments suggested that the system encouraged competition instead of co-operation, since participation in domestic or international research networks or consortia is not acknowledged.

There were also concerns about how well the Polish system dealt with field specificity. It was suggested that the evaluation regime should differ across units (*e.g.* condensed matter physics and particle physics should have slightly different regimes) and across disciplines (*e.g.* criteria should be different for disciplines closer to technological application). It was also suggested that there was not enough consideration of subject-based differences in the number

of publications, the rate and longevity of citations, and the importance of the peer-reviewed journals included in the Web of Science or Scopus list. In general, countries appeared to have a mix of levels of field specificity; for instance, the Danish bibliometric research indicator is applied equally to all disciplines and a key issue in its design was that it could fit all main areas of research equally. In Sweden, however, there is a weighting system to compensate the humanities for their lesser ability to attract external funding and for differences in publishing traditions compared, for example, to medicine and technology. The systems used by some German *Länder* (including Baden-Württemberg, Bavaria, Hesse, Lower Saxony and Rhineland-Palatinate) also apply subject- or discipline-specific weighting.

Box 3.2. Rewarding research activities: Polish feedback

Feedback on the Polish system for institutional funding has highlighted a number of areas in which the rewards for research activities may be under-rewarded or inappropriately rewarded given their level of merit. Examples of under-rewarded areas included:

- Small scale experimental production.
- Spin-offs and spin-outs.
- Success in grant and contract acquisition (including small contracts, since in many technological areas, co-operation with small and medium-sized enterprises (SMEs) consists of many small agreements).
- Science education for schools and the general public, organisation of public debates, and other scientific communication activities (*e.g.* maintenance of portals).
- Education of new researchers and support for mobility.
- Science and technology activities, such as measurement, monitoring, stocktaking and maintenance of data.
- Preparation of governmental regulations, instructions and standards.
- Translation of important handbooks or monographs of foreign authors; and
- Maintenance of accredited laboratories.

Examples of potentially inappropriate rewards included the favouring of English-language publications, rewarding publication quantity, not valuing certain accomplishments (such as participation in governing boards of international research organisations) according to merit, and greater rewards for some activities than for others (*e.g.* awarding 700 points for employing the laureate of the “Ideas” contest of the European Research Council, compared to three points for a chapter in a scientific monograph or academic handbook in languages other than English).

Source: Polish response to the OECD RIHR Questionnaire on Performance-Based Funding for Public Research in Tertiary Education Institutions (February 2010).

Future changes and developments

Several countries highlighted intended or desired changes to the system of indicators used in their performance-based funding systems, with some countries seeking to simplify their systems while others intended to add elements. In Austria, there have been calls to sharpen the indicators and simplify the mathematical model behind the system in order to make it easier to predict the impact on institutions. Belgium also noted scope to improve the transparency of its allocation key for the BOF, as the formula has become complicated. In Denmark, citations may be used to a greater extent in the future. Currently, journal impact factors are used voluntarily as a tool to rank journals. In Finland, the indicators will be further developed to describe education, research, research education and artistic activities. This will require consideration of the appropriate classification of publication data, promotion of the four-step researcher career⁶ and research co-operation. Publication-based funding is likely to be given more weight as the classification of publication activity advances. In Norway, the 2009 evaluation foresaw no need for extensive changes to the funding system, but some minor adjustments will be made, with effect from 2012. These include incorporating regional research funds into the allocation formula and reducing the weighting of EU funding in the formula. In Poland, changes were planned in the project of the law on science financing that was recently accepted by the relevant commission of the Policy Parliament. It is expected that the system will move towards more differentiation of criteria (while maintaining common core rules) and more visits *in situ*.

At the level of whole systems, changes have been more limited, although redesign is in the pipeline in several countries. In the Czech Republic, the model for funding specific university research (student research) was made more targeted in 2008, but no further changes are envisaged. In New Zealand, two new quality categories were introduced for the 2006 evaluation round, so as to better recognise new and emerging researchers. Changes ahead of the 2012 evaluation are likely to involve the treatment of commercial research, and may also address concerns about the provision of individual scores to institutions (considered as potentially undermining staff development processes in some institutions). Of note, the quality scores yielded by the peer review quality evaluation process in New Zealand are considered to have been fairly low (an average score of 2.96 out of 10 for the 31 tertiary institutions participating in the 2006 evaluation round; see TEC, 2006). This raises the question of whether it is the actual level of quality or rather the design of the scoring process or the breadth of tertiary institutions included in the system that is driving results, and whether changes to the system are needed. In the United Kingdom, the grading system was changed in 2008 to provide each unit of assessment with a “research profile” that recorded the

percentages of research submitted that fell into each of four grades, ranging from world-leading to nationally recognised. This had the effect of better indicating quality and has led to broader distribution of funding. A consultation in 2006 about moving towards a system largely based on citations was rejected by the academic community. In future, however, there will be more recognition of the contribution of science and research to society, by including an explicit element on the impact of excellent research within the new Research Excellence Framework (REF) that is currently being developed. Poland also plans to put more stress on the measurement of social and economic impacts of research.

In other changes, the Australian evaluation found a need to strengthen the drivers for excellence in research and for linkages and collaboration between universities and the national innovation system. The SRE scheme, which will receive AUD 510 million from 2009/10 to 2012/13, primarily aims to help universities address shortfalls in funding for indirect costs associated with competitive grants, but is allocated according to performance (in particular, using the results of the new ERA system). The introduction of the performance-driven JRE scheme in 2010 is aimed at encouraging greater collaboration between universities and the business and non-government research sectors by rewarding higher education providers that diversify their sources of income. Finland suggested that the level of internationalisation could be improved via changes to the performance system.

The German response to the RIHR questionnaire noted that care must be taken when changing funding models, as this can create confusion and gaps in ongoing governance arrangements. Higher education commissions have been set up in many German *Länder* to help develop allocation models, and have made recommendations for changes and improvements. Most of these have maintained continuity with state governance strategies, but in Lower Saxony and Berlin it was considered necessary to replace the funding systems. The German response noted that large changes can potentially cause “fissures in the steering logic”, and as universities and other HEIs often link their internal funding systems to state-level systems, frequent changes are not recommended.

Interactions with the performance-based funding system

Performance-based funding systems for public research in TEIs do not operate in isolation. The OECD RIHR questionnaire sought information on the interactions of these systems with funding systems for teaching, other evaluation systems and activities, and other funding mechanisms. The information provided also highlighted the role of these funding mechanisms within the broader governance structures for TEIs.

Funding of teaching

A number of countries have incorporated performance-based aspects into their funding of teaching at TEIs but these were not regarded as problematic for the operation of the research funding system. For instance, Austria's performance-based system encompasses both research and teaching components, and Finland's core funding for universities incorporates a performance-based allocation for education, which takes into account the extent of activities and their quality and effectiveness. The Czech system for funding teaching comprises several components, one of which is performance-based and uses indicators such as number of students, financial assessment of accredited programmes and results achieved in activities undertaken. Germany's institutional funding system makes no distinction between research and teaching, and the performance-based allocation systems used by the *Länder* thus encompass both aspects, with no identified frictions. In Norway, part of the total funding for tertiary institutions (around 24%) is distributed on the basis of performance in education, and in particular, results in the areas of education quality and internationalisation. The grant is distributed according to the performance two years earlier in the number of study points obtained by students and the number of incoming and outgoing exchange students. The education incentives have fixed rates for each indicator, meaning that improved results for one institution will lead to increased allocations regardless of the performance in the rest of the sector (*i.e.* the funding pool is not fixed). There is no particular interaction between the two funding mechanisms of teaching and research and institutions are free to use the performance-based funding received for education as they wish (*e.g.* it may be used to fund research). The United Kingdom has a parallel assessment system for teaching, but it has no interaction with the research system.

Several countries are in the process of incorporating more performance-based assessment into teaching funding decisions. For example, Australia currently does not have a performance-based funding model for teaching in universities (a 2006 Learning and Teaching Performance fund aimed at rewarding universities which best demonstrated excellence in teaching and learning was discontinued). However, from 2012 the Australian government will introduce new performance funding (AUD 206 million over four years) to reward universities that meet agreed targets in key areas including improving the quality of learning and teaching and outcomes for students from low socioeconomic backgrounds. Interaction is not expected between this at-risk funding for universities and the performance-based block grants for research and research training. In New Zealand, a performance-based funding system to support educational performance in the tertiary sector is currently under development. It will make some funds subject to educational achievement

targets (such as qualification and course completions and transitions to further education), but is not expected to specifically interact with the PBRF. In Sweden, the government presented a bill in early 2010 that proposed rewarding universities receiving high appraisals in quality evaluations based on three criteria: students' degree projects, self-evaluations of HEIs in combination with site visits, and questionnaires sent to alumni.

Other countries do not use performance-based funding for teaching. Belgium's funding of teaching in universities is based on the number of credits taken by students, in addition to other factors. Denmark does not have a performance-based model for teaching. In Poland, the funding of teaching is predominantly metrics-based and is regulated by a different law.

Other evaluation exercises

A number of countries identified other research evaluation exercises and, from the information provided, it does not appear that these evaluation exercises clash with the performance-based funding system. However, countries should check periodically that the exercises continue to be complementary and that their results and recommendations are not imposing contradictory demands on TEIs. Examples of other evaluation exercises include:

- In Austria, the major annual statistics reporting system for public universities (*Wissensbilanz*) includes a number of research indicators, such as personnel numbers in research programmes, publications, patents, external presentations, scholarships and clinical studies.
- Czech ministries conduct an evaluation of all measures focused on research funding (programmes, projects, grants, final results), according to the Act No. 130/2002 Coll.
- Flemish universities organise an external evaluation of the quality of their research management in general, and of the operations of their research boards in particular, every eight years. The results of these evaluations are made publicly available. The government also regularly evaluates research councils, strategic research centres and other R&D partners that receive public funding.
- Finland noted that the Finnish Higher Education Evaluation Council (attached to the Ministry of Education) and the Academy of Finland undertake regular evaluations and external audits of quality assurance systems in universities, to enhance the quality and impact of their activities. The Academy of Finland and the Finnish Funding Agency for Technology (Tekes) are currently undertaking a project to construct a model for systematic and permanent evaluation of the impact and quality of research that they fund.

- New Zealand's Ministry of Research, Science and Technology (MoRST), the Foundation for Research, Science and Technology (FRST), the Ministry of Education, and the TEC all conduct evaluations of publicly funded research outcomes. The focus is generally on the value of specific policy interventions rather than the value of the research itself.
- In Norway, the Norwegian Research Council conducts national-level subject-specific evaluations of research to provide a critical review of the research system in an international perspective and recommendations to increase the quality and efficiency of research. On average, two subjects are evaluated each year. Also, in the context of quality assurance exercises, the Norwegian Agency for Quality Assurance in Education (NOKUT) may consider the research capacity of the institutions and subjects evaluated and may include research-relevant proposals in national development plans for subjects.
- There are a number of evaluation exercises in the United Kingdom, including periodic reviews by research councils of the quality and effectiveness of their support in specific areas or disciplines and monitoring reports and surveys from the Department of Business Innovation and Skills on the use of resources and the outcomes and outputs of research council investments.

Australia, Denmark and Poland noted no other national systems of regular evaluation of research conducted by ministries, research councils or other bodies. Several countries noted systems of *ex ante* evaluation of research proposals by researchers and research groups.

Other funding

The wide range of research funding channels for TEIs may raise the possibility of tensions with performance-based funding systems, particularly if co-ordination processes are not in place. The Australian survey response pointed to the potential for friction and co-ordination problems when research funding comes in several different streams (block grants, project funds) provided by different government departments and, in its case, different levels of government (commonwealth, state and territory). For example, other government departments need to work with the DIISR to ensure that undue pressure is not put on the performance-based RIBG scheme when introducing new competitive grant programmes for research (since the RIBG aims to meet project-related infrastructure costs associated with Australian competitive grants). For its part, Australia has interdepartmental co-ordination processes in place for major policy development that help to

minimise friction and ensure complementarity of policies. There are also formal bodies, such as the Prime Minister's Science, Engineering and Innovation Council, which aid with governance and co-ordination at the national innovation system level. However, Poland noted that while there are no visible frictions between different funding instruments, there is unfortunately also no co-ordination between project and institutional funding provided by the Ministry of Science and Higher Education and between the funding of the Ministry and the Foundation for Polish Science. In the United Kingdom, there is no explicitly imposed co-ordination mechanism, but many elements of the funding system are interlinked and are developed jointly by the responsible funding bodies. The Czech Republic noted that synergies between different types of funding are monitored, and double- or cross-financial usage is legally forbidden.

In Germany, research has suggested that the “discretionary-incrementalist” components of funding alongside performance-based components have the potential to undermine or neutralise the impact of indicator-driven funding (Orr and Jaeger, 2009). Discretionary-incrementalist funds can be characterised as “single-case”, non-transparent decisions that determine funding levels (*e.g.* a decision to allocate funds equal to the previous year plus a discretionary increase), and this type of funding remains significant in Germany for grant allocations. As such, traditional and new steering mechanisms must be better linked, so that “single-case” decisions do not undermine the budget-related effects of the performance-based schemes.

Some countries identified frictions between the performance-based system and external sources of funding. Norway's tertiary sector has suggested that indicators based on funding from the EU and the Norwegian Research Council bring challenges, namely that TEIs find it difficult to pursue research strategies not directly in line with research areas covered by the EU and the Council, and that the co-funding required with such project funding means less liberty for TEIs in allocating their block grants. Slovenia also mentioned the funding mechanisms provided by the EU Structural Funds, noting that while the funding brings significant developments (*e.g.* it gives rise to new forms of co-operative research and strengthens intermediary institutions such as technology centres), the complexity of the administrative procedures for this financing weakens the efficiency of these interactions and needs simplification.

The role of performance-based funding in the overall governance mechanisms of TEIs

As a tool for governing and steering research activities in TEIs, performance-based funding systems sit alongside (and, ideally, complement) other policy mechanisms within each country's higher education and research environment. For instance, in Australia, the Powering Ideas Innovation Agenda announced in the 2009-10 budget will see the introduction of mission-based compacts with universities, which will define each university's particular mission and describe how it will be fulfilled. The mission-based funding compacts, to take effect from 2011, are aimed at both capacity building and accountability, and will allow universities to determine their own research and collaboration agendas in line with national priorities. They are also expected to promote collaboration by encouraging universities to organise themselves into research hubs and spokes and to pursue opportunities to undertake more industry-driven research (Commonwealth of Australia, 2009). The compacts will facilitate the distribution of performance-based funds by defining targets for improvement and reform that will trigger reward payments.

Norway noted that the performance-based funding system is one of several tools used by the Ministry of Education and Research in its management of the higher education sector. In general, the *Act relating to Universities and University Colleges* gives institutions academic freedom and authority to determine their internal structure, while the ministry sets general goals and management parameters for the institutions as well as performance requirements in chosen areas. The system as a whole aims: to facilitate stable and long-term funding of universities and university colleges so that boards can set long-term strategies; to enhance the quality of education and research; to provide the impetus for efficient resource utilisation; and to allow institutions flexibility to adapt to the needs of society in accordance with their strategies. The funding system supports the goals for the sector as set out in the Act and specified in the annual national budget.

In Finland, the funding model is seen as enabling universities to undertake long-term development and encouraging them to develop distinct profiles, quality and productive and cost-effective activities. The funding criteria were designed to be as clear and transparent as possible so that future funding can be predicted to a reasonable degree. In the United Kingdom, the performance-based funding tool of the quality-related (QR) research block funding to institutions is part of the "Dual Support" mechanism of public-sector funding for research in HEIs. The second part of the mechanism is project-based funding via the research councils.

In some cases, however, other steering mechanisms may work against the goals of performance-based funding. In Germany, state initiatives to restructure the higher education system, by merging or closing institutions to reduce numbers of HEIs, were viewed as working against the autonomy of universities and other HEIs. Strengthening autonomy and institutional responsibility were core aims of performance-based allocations in the German *Länder*.

Key findings and policy issues raised by the questionnaire responses

The OECD RIHR questionnaire yielded information about a variety of national- and regional-level performance-based funding systems for public research in TEIs. Most current schemes have been introduced since 2000, although some have much longer histories. The rationales for these schemes generally include raising the quality of research, but many countries have additional goals, such as accountability and autonomy of TEIs, collaboration and technology transfer, and increasing critical mass (or, in contrast, for some countries, spreading funding more widely). Some countries do not have research-specific rationales for their schemes, as they also encompass teaching and other activities.

The funding systems generally operate on an annual basis, although some assessment processes (notably peer reviews) are conducted less frequently. Around two-thirds of schemes cover all TEIs, while one-third cover only public establishments, but all schemes cover all types of research and fields of activity. In the majority of cases, the systems affect a tranche of institutional funding, although some schemes operate via more disaggregated funding policies. Generally, funding is from a fixed pool, of which institutions receive a share based on their relative performance. There is open disclosure of processes and results in most countries, and institutions are relatively free to allocate funds received from performance-based systems as they wish.

The range of indicators used in the schemes reveals both similarities among countries and clear differences. They are similar in that third-party income, publications, student numbers and degree completions are commonly used, but different in that various combinations and weightings are employed. Some countries add many more indicators to the mix (*e.g.* patents, spin-offs), some do not use bibliometrics at all, some use peer review as a major or complementary component, and others are based purely on quantitative indicators. The weightings used for each item vary quite significantly.

The dimensions that differ most between countries, in addition to the indicators, are the budget impact of the schemes and the role of institutions in their development and administration. The questionnaire showed that different countries use different measurements and nomenclature in funding,

and it is difficult to compare how much institutional funding is performance-based. From the numbers, the range may be anything from 6% to 75% of annual block funding. It appears that a bigger allocation of performance-based funding is associated with the use of more indicators. The level of involvement of TEIs also ranges from being closely involved in scheme design and data collection to no role at all.

There have been few formal evaluations of performance-based funding schemes, but the evidence suggests positive effects on research outputs and research management. At the same time, it is difficult to attribute these effects directly to the performance-based schemes, as they are just one piece of the funding environment. Negative and unintended effects were also highlighted, with concerns about a narrowing of research focus as academic outputs, journal articles, certain fields and certain journals are favoured in more risk-averse environments.

Over time, indicators have been fine-tuned, with changes to weightings and design. However, there remain criticisms, including whether certain indicators are relevant, whether they provide appropriate rewards, and whether they are suitably field-specific. Future changes include both simplification and added complexity, and some countries intend wider system redesign, notably the United Kingdom. Interactions with teaching allocations and other evaluations were considered unproblematic, but the variety of funding streams for research was seen to require co-ordination in order to avoid frictions.

Some interesting policy issues that emerge from the questionnaire results include:

- How effective is it to have multiple goals for performance-based funding systems – can they all be achieved?
- What are the merits of seeking critical mass *versus* funding dispersion (both outcomes were sought in the studied systems)?
- Which indicators have the greatest impact on research incentives and which are peripheral to research decision making?
- What is the required amount of budget impact to provide incentives to TEIs? In some systems, the amount at stake is low, and some systems have caps or bands to limit the size of the budget impact. Gauging the effect of different levels of budget impact requires more accurate attribution of observed outputs and outcomes to the features of funding systems.

- To what extent is there an “ideal system”, given that the questionnaire shows some countries moving towards more complex systems and others moving towards simplification?
- Should funding systems for teaching be more entwined with funding systems for research, given the dual purpose of TEIs?
- How should government co-ordination mechanisms be arranged so as to avoid frictions between different funding tools and channels?

Acronyms

BOF	Special Research Funds (Flemish Community of Belgium)
COBISS	The Slovenian national bibliographic system
DBH	Database for Statistics on Higher Education (Norway)
DFG	German Research Foundation
DIISR	Department of Innovation, Industry, Science and Research (Australia)
ECOOM	Centre for R&D Monitoring (Flemish Community of Belgium)
EFTSL	Equivalent full-time student load
EIT	European Institute of Innovation and Technology
EP	Evidence portfolio
ERA	Excellence in Research for Australia
ERI	External research income
ERIH	European Research Index for the Humanities
EU	European Union
FRST	Foundation for Research, Science and Technology (New Zealand)
GBAORD	Government budget appropriation or outlays for R&D (see OECD, 2002, pp. 137-150)
GDP	Gross domestic product
GUF	General university funds (see OECD, 2002, pp. 158-169)
HDR	Higher degree by research
HEI	Higher education institution
HEP	Higher education provider
IGS	Institutional Grants Scheme (Australia)

IOF	Industrial Research Funds (Flemish Community of Belgium)
ISBN	International Standard Book Number
ISSN	International Standard Serial Number
JCR	Journal citation report
JRE	Joint Research Engagement (Australia)
MoRST	Ministry of Research, Science and Technology (New Zealand)
NESTI	OECD Working Party of National Experts on Science and Technology Indicators
NOKUT	Norwegian Agency for Quality Assurance in Education
PBR	Performance-based reallocation (Norway)
PBRF	Performance-Based Research Fund (New Zealand)
QE	Quality evaluation (New Zealand)
QR	Quality-related (United Kingdom)
RAE	Research Assessment Exercise (United Kingdom)
R&D	Research and development
RDC	Research degree completions
REF	Research Excellence Framework (United Kingdom)
RIBG	Research infrastructure block grants (Australia)
RIHR	OECD Working Party on Research Institutions and Human Resources
SICRIS	The Slovenian current research information system
SRA	Slovenian Research Agency
SRE	Sustainable Research Excellence in Universities (Australia)
TEC	Tertiary Education Commission
TEI	Tertiary education institution
Tekes	Finnish Funding Agency for Technology
UHR	Norwegian Association of Higher Education Institutions
UK	United Kingdom
VLIR	Flemish inter-university council

Notes

1. The terms “institutional funding” and “project funding” are not specifically defined in the *Frascati Manual* (OECD, 2002), although the Manual notes that universities draw on R&D contracts and earmarked grants, as well as part of the general grant they receive from the ministry of education or corresponding local authority (known as “public general university funds” or GUF), in order to finance their R&D activities. These financial flows are in addition to universities’ “own funds” which they may derive from endowments, shareholdings, property, student fees and so on.
2. A new Universities Act came into effect in 2010 in Finland, enlarging universities’ financial and administrative autonomy by giving the former state universities the status of independent corporations under public law or foundations under the Foundations Act.
3. *Wānanga* are a type of New Zealand tertiary institution that provides education in a Māori cultural context. As defined in the Education Amendment Act 1990 s162(b)IV, *wānanga* are characterised by teaching and research that maintains, advances, disseminates and assists the application of knowledge regarding *ahuatanga Māori* (customs and material and spiritual objects and concepts) according to *tikanga Māori* (customs and protocols) (Ministry of Education, 2003).
4. See www.oecd.org/document/3/0,3343,en_2649_34293_44904003_1_1_1_1,00.html.
5. A 2004 survey of German universities found that 91% of universities in *Länder* with indicator-based allocation systems also used indicator systems internally, with 30% of these universities closely following the state-level model and 56% partially following it.
6. A working group under the Finnish Ministry of Education proposed a four-step research career model in universities that would promote transparency and predictability of research careers and would support movement of researchers between universities and other research actors (e.g. research institutes). The working group recommended that the Ministry of Education take into account the implementation of the four-stage research career system in universities when considering their funding and management by results. See www.minedu.fi/OPM/Julkaisut/2008/Neliportainen_tutkijanura.html?lang=en.

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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:

Box, Sarah (2010), "Performance-based funding for public research in tertiary education institutions: Country experiences", in OECD, *Performance-based Funding for Public Research in Tertiary Education Institutions: Workshop Proceedings*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264094611-6-en>

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