Executive summary

Public research institutions are crucial for innovation due to their role in knowledge creation and diffusion

Public research institutions (PRIs) are one of the two main actors in the public research system and are a primary tool for governments seeking to spur research and innovation in their economies. PRIs remain critical for countries’ innovation and economic performance through their activities in creating, discovering, using and diffusing knowledge. Their structures, functions and performance are diverse across countries, and their activities vary according to their mission and type. Some perform “blue sky” research, while others focus on more short-term market oriented projects. Other roles can include education and training, technology transfer, the provision of major scientific infrastructure, and the support of public policy. Their activities can help firms to expand their capabilities and generate spillovers for the wider economy.

This report presents the results of a project by the OECD Working Party on Research Institutions and Human Resources (RIHR), on “the Transformation of Public Research Institutions”. To date, PRIs have been the subject of fewer analyses, and work has often been at the national or institutional level. Yet PRIs have seen much change in recent years, the results of which have implications for current and future policy approaches. To enhance the level of policy debate and provide input into policy making, the project aimed to provide new information on PRIs and government strategies. The project benefited from an array of rich material contributed by countries participating in the RIHR group; submissions included 20 “country context” notes, 12 institutional case studies, and a survey of 449 institutes. It also drew on national-level data to help describe the PRI sector and the changes it has seen in recent years.

Traditional statistics on PRIs may give a blurred view of the sector

The evolution of PRIs means that data on the Frascati Manual\textsuperscript{*}-defined government sector, as is usually used to analyse PRIs, may not fully capture the group of institutes considered to be public research entities. For this project, a wider definition of PRIs was developed, which sought to include relevant institutes regardless of their statistically-defined sector. Its focus was on public and semi-public research entities, excluding pure university institutes; the scope aimed to provide information about new types of research institutes that serve public objectives. As well as analysis of the Frascati government sector, the report describes the results of a re-tabulation of national data that gives a snapshot of the wider project-defined PRI population in selected countries.

Data showed that absolute real expenditure on R&D in the Frascati government sector has risen, but this expenditure now accounts for a smaller share of total R&D spending by OECD countries and of OECD GDP. For most countries, applied research and experimental development account for the bulk of government sector R&D, but there are differences across countries in focal research fields and the amounts of expenditure attributed to them. Re-tabulating national-level data to the project definition changed the picture of the PRI sector. The data typically showed more business funding, more applied research, more engineering and technology and more industrial production than in the Frascati-defined government sector. However, any future statistical exercise would require greater consistency in the treatment of certain entities.

Country-level evidence highlighted the strong focus on applied research

The evidence collected from countries via the country context notes, case studies and survey painted a picture of diversity and ongoing change, along with some common trends in response to shared challenges. It revealed that countries’ conceptions of “what is a PRI” differ, and countries took varying approaches to the inclusion of institutes with a strong cultural focus (e.g. museums), with important public service goals (e.g. hospitals) and with defence missions. Civil society institutes were also viewed as a grey area. Any future analysis would benefit from strong agreement on the desired approach to these entities.

The country-level information showed that the targets and focus of many PRIs have evolved in recent years. Changing activities, new policy challenges and wider economic and political developments have driven change in missions and mandates, and “excellence” and linkages have become focal points for many. Surveyed PRIs suggested applied research and dissemination of research results to the public had increased in the past decade. Fields of research remained relatively stable, although increases in “trans- and multi-disciplinary sciences” were identified. Broader public-oriented missions appeared more common than industry-oriented ones, with PRIs focused on particular sectors, fields or tasks. Applied research was a key activity, although PRIs often had multiple goals and undertook a number of other tasks (e.g. training researchers). The basic rationale for PRIs varied, but most often related to supporting the growth and productivity of industry, conducting research of benefit to society and conducting policy-relevant research.

PRI structures and governance have evolved to engage more stakeholders

PRIs’ organisational arrangements have undergone active change. The survey suggested organisational structure had been the most significant area of change in institutes in the past decade, with growth in institutes and the size of research groups common. Numerous examples of structural changes were detailed, including the introduction of institutes with more business-like operational models and public-private partnerships. Changing goals and rationales may have been a key driver, alongside the trend towards increased openness, a move towards increased market responsiveness, budget pressures and effects to increase clarity over research roles.
Governance arrangements also evolved, partly in response to PRIs’ structural changes, and now exhibit notable cross- and within-country diversity. High-level strategic directions played an important role in driving PRI activities, and were delivered in a variety of ways, including government plans and high-level advisory bodies. Oversight arrangements ranged from tight government control through to fully independent entities. The country-level evidence showed PRIs often pursue multi-faceted missions and rationales, and that decision-making across a range of issues is predominantly considered the domain of internal management rather than public authorities. While governments continue to express their desired directions for PRIs via funding, regulations and senior appointments, if not direct management and ownership, there is a question as to how clear this direction is and how closely it can be followed, especially when PRIs have numerous other interests to satisfy.

**Funding has become increasingly competitive**

PRIs’ sources of income are diverse, as is the manner in which funding is delivered, although there was a trend towards competitive channels. Increased industry involvement was highlighted, and income from abroad has also increased. The core institutional (or “block”) component of public funding is evolving, with some countries introducing performance-based elements or moving towards more contractual arrangements. There were strong increases in public competitive funding and private contract income for PRIs participating in the survey. Competitive funding had raised issues for some countries, and revisions to funding and governance structures were foreseen.

Human resources remain a major input, although PRIs exhibit considerable diversity in staff sizes and employment structures. Countries have seen a rebalancing of R&D personnel towards a greater share of researchers, and many institutes play a role in researcher development. Some PRIs have experienced recruitment difficulties, related to specific groups or skills, while others faced difficulties due to wider labour market regulations. Institutes are also challenged in their recruitment of foreign staff. Internally, establishing systems of staff motivation and reward that support the research outputs foreseen by PRIs missions may be a challenge for some institutes.

**Linkages and internationalisation have increased and relationships are frequently collaborative**

PRIs rarely operate in isolation and there has been a clear increase in the importance of their relationships with most other players. Surveyed institutes particularly increased their country links, joint research projects and participation in international committees. Institute design, changes to legislation, co-ordination mechanisms and various policy initiatives helped drive linkages and internationalisation; so too did PRIs’ need to access knowledge and the globalised organisation of R&D. Methods of linking are varied and depend on the partner; options ranged from informal exchange and researcher interaction on projects, to collaborative centres. The survey results highlighted the importance of personal interactions, showing that joint positions and regular meetings were the top linkage method between PRIs and universities; they were also important linkage methods with firms, alongside joint projects and training. Collaborative relationships appeared to dominate for the majority of institutes.
Countries expressed some concerns about the strength of PRI linkages and internationalisation. Industry funding of government sector R&D is low on average in the OECD and a low percentage of innovative firms collaborate with PRIs. The survey results revealed that PRIs are interested in pursuing knowledge transfer and dissemination, yet linkages are driven more by knowledge acquisition than knowledge exploitation. However, expectations cannot be uniform across PRIs; for instance, large entities, those with multiple research areas, and those with more intensive academic orientations tended to have more diverse international linkages. Also, geographically proximate countries appear to be the main partners for PRIs and case study evidence underlined how such linkages develop over a long time.

**PRI evaluations are often positive but entities are seeking to increase their scientific impact**

Evaluations of PRI performance are often positive overall. Nevertheless, they highlight several reoccurring issues, particularly the difficulties in establishing governance and funding structures that can cope well with multiple stakeholders and funders and complex environments, the challenges in establishing and maintaining industry links, and the ongoing need for clear missions. These themes were echoed in the survey and case studies. Surveyed PRIs identified “increasing scientific impact”, “increasing the degree of internationalisation”, “recruitment and retention of highly qualified personnel” and “increasing contract research” as their main challenges in the next five years. Similar issues were identified in the case studies, with PRIs especially expecting changes in their activities, international linkages and funding arrangements.

Ongoing changes in the form and function of PRIs are thus to be expected. The information and evidence points to a policy agenda for PRIs centred on ensuring the relevance of PRI activities, shaping government funding to support PRI goals, enabling linkages and bolstering human resources. These issues are not self-contained and it is important to embed focused slices of policy analysis within a “bigger picture” of PRI systems as a whole.

**Testing and assessing different methods of steering and governance is a key task for policy makers**

Effective steering and governance is essential to ensuring PRIs’ relevance, and learning lessons from existing models and changes via evaluation should be given high priority. This should include scheduling evaluations and assessments of performance that explicitly attempt to trace the effects of structural and management changes on outcomes and compare these to *ex-ante* goals, as well as evaluating the increasing number of PRIs with business-like operational models against their stated goals of increased autonomy, collaboration and responsiveness to stakeholders. Testing and evaluating different methods of gathering, co-ordinating and operationalising key stakeholders’ inputs to target-setting would also yield important information for policy making, as would assessments of the effectiveness of the performance agreements and contracts that some countries have established with their PRIs. At the same time, governments need to recognise the trade-offs often inherent in their visions for PRIs; pursuing greater collaboration with industry, for instance, necessarily reduces the control of governments over PRIs and their research priorities.
PRIs’ funding issues demand instruments which balance short- and long-term goals and the requirements of different users, uphold research quality and ensure the sustainability of PRI activities. Analysing how different government funding instruments impact on PRI behaviour and performance, especially in research and service provision, but also regarding their longer-term investments in infrastructure and equipment, should continue. A number of governments still make strong use of institutional (or “block”) funding, raising questions over how allocation of institutional funding can be used to shape PRI behaviour. Some work has been done on performance-based funding in tertiary education institutions, and the OECD’s RIHR group will continue to examine different public funding tools at the cross-country level. Examining the impacts of competitive project funding on PRIs would also be informative.

The role for policy in further stimulating linkages is not clear. Given the wide variety of linking methods and the differences across countries and PRI partners, as well as the evolutionary nature of collaboration, there is a question of what policy can do to improve the situation. Action on linkages and internationalisation might best focus on how steering and funding arrangements impact on PRIs’ incentives for collaboration and competition with other entities.

Finally, human resources, as a key input to PRI activities, may also require policy attention. Analysis on human resource issues could focus on the role of policy in supporting researcher training efforts, analysing the effects of internal incentive systems on research outputs, and assessing the scope for change in wider labour market regulations.