PUBLIC RESEARCH POLICY

Rationale and objectives

Public research, *i.e.* research primarily funded with public money and carried out by public research institutions (PRIs) and research universities, plays an extremely important role in innovation systems by ensuring the provision of new knowledge. Public-sector research is considerably smaller than business research and development (R&D) in the majority of OECD countries: government intramural expenditure on R&D was on average 0.29% of gross domestic product for the OECD area in 2009, and higher education expenditure on R&D was 0.44% (including a small percentage funded by business), while business expenditure on R&D stood at 1.69%.

The fundamental justification for government support of research is the classical market failure argument: the market does not provide sufficient incentives for private investment in research owing to the non-appropriable, public good, intangible character of knowledge and the risky nature of research. In addition to basic research, public research is also needed to meet specific needs of national interest, such as defence, and of the population at large, *e.g.* regarding health. A recent OECD study of public research (OECD, 2011a) found that university research has now taken the place of PRIs as the main performer of public research in many OECD countries.

Major aspects

Conducting scientific research requires significant amounts of funding and research infrastructure. *Discretionary institutional funding* ("block grants") and *competitive R&D project grants* have been the mainstay of funding for PRIs and research universities. Block grants are the traditional funding instrument for allocating funding to *PRIs* and *research universities* according to various criteria (*e.g.* formulae, performance indicators, budget negotiations). They provide these organisations with stable funding over the long term and a certain degree of autonomy for their research. Competitive R&D project grants are instruments for distributing public funds on a competitive basis to researchers in research universities and PRIs. Competitive R&D project-based funding regimes put more emphasis on the outcomes and quality of the research performed by researchers in the shorter run. Achieving the optional impact of the two funding mechanisms is a challenging balancing art for policy makers.

With rapid changes in how innovation takes place in the knowledge economy and in a global context, PRIs and universities need to reform and modernise their management to increase the efficiency and responsiveness of their research and to redefine their role in the globalising R&D space. Indeed, there is ongoing fierce debate regarding how much autonomy PRIs and universities should have in order to improve the efficiency, responsiveness and impact of public research.

Policy measures introduced in this regard focus on balancing stable institutional funding with a fair level of pressure from competitive R&D project grants, on encouraging the commercialisation of public research, and on improving science-industry relations and other linkages within the national innovation system and internationally.

Boosting PRIs' links with industry and their contribution to innovation is another main policy objective, because there is increasing pressure for public investments in research to be held accountable for their contribution to innovation and growth. Two types of measures are typically used: one to link PRIs and universities to other innovation system

actors, particularly firms, through *collaborative R&D programmes*, *technology platforms*, *cluster initiatives* and *technology diffusion schemes*; and another to better commercialise the results of public research through *science and technology parks*, *technology incubators* and *risk capital measures in support of spin-offs*, technology transfer offices, and policies on intellectual property of public research.

Provision of infrastructure for scientific research is another important aspect of public research policy. Investment in large, expensive, key research equipment and facilities, such as information archive systems, which are essential for public and private R&D and innovation, are at the heart of the government's role in encouraging innovation.

Recent policy trends

Despite the stringent budgetary situation in many countries following the economic crisis, public funding for research has increased in recent years in Argentina, Australia, Austria, Belgium, Chile, the People's Republic of China, the Czech Republic, Denmark, Estonia, Finland, Germany, Korea, Norway, Poland, Portugal, the Russian Federation, Slovenia, South Africa, Turkey and the United States (for civil R&D). The adoption of national STI strategies (in many countries in the above list), including targets for R&D spending, has provided governments with strong legitimacy to increase spending on R&D or to prevent severe cuts due to their fiscal austerity measures. The stimulus plans introduced in many countries since 2008 in response to the economic crisis have played a role in offsetting, at least in part and temporarily, the negative impact of the crisis on public and private R&D spending (*e.g.* Canada, Israel). However, despite such contingency efforts, R&D spending declined in a few countries (*e.g.* Ireland, Spain) in the last few years.

While Argentina, China, the Russian Federation and South Africa are expected to continue to increase public funding for R&D strongly, few OECD countries (*e.g.* Austria, Belgium) expect increases in absolute terms in the coming years. In most countries the outlook for an increase in public funding for R&D is guarded, owing to uncertainty about the extent to which the budgetary capability to do so may be further weakened. In crisis-strapped countries that envisage a decrease in R&D funding, governments consider it imperative to allocate their limited resources to selected priorities.

On ways to distribute institutional funding for research, Belgium, the Czech Republic, Denmark, Hungary, Norway, the Slovak Republic, Slovenia, and South Africa have introduced competition mechanisms by adopting or strengthening performance-based criteria (*e.g.* bibliometric index, number of university graduates). Block funding of PRIs and universities is expected to decrease in Greece and the Netherlands. In parallel, there is a trend towards strengthening the share and importance of competitive project funding in France, Hungary and Norway; Slovenia already allocates 80%, and Australia at least 60%, of government funding for R&D through competitive funding.

In contrast, Israel significantly increased the share of block funding for research in 2010, from approximately 40% in previous years to 51%, against the background that Israeli project funding is allocated entirely based on competition of bottom-up research proposals without predefined research themes. In parallel, there is a trend to strengthen the autonomy of PRIs and universities. Reforms are also under way in Germany, where the funding system for higher education is going through a period of change; in Sweden, which is now working on new methods of reallocating direct grants; and in the United States, where several changes to funding mechanisms for universities and PRIs are to be proposed in 2012.

In emerging and transition economies the reforms tend to focus on creating new funding and management mechanisms so that PRIs can fulfil their new roles in a market environment. For example, the Russian Federation has introduced performance assessment of PRIs and included evaluation in its federal targeted programmes; in Poland five new Acts aimed at reforms of PRIs came into force in 2011; and in China and the Czech Republic there are calls for continued reforms of PRIs. In many OECD economies the focus is different. Apart from ensuring the quality and effectiveness of research, the current round of PRI reforms aims at better articulating the role of public research in the firm-centred national system of innovation and at allocating resources to top-level research and strategic focus areas ("excellence" and "relevance").

Wide-ranging reforms have been carried out in the PRI and university sectors in Finland, Hungary and Spain. A new department was established in 2011 in Japan's Science and Technology Agency to make recommendations on the reform of Japan's science and technology system. Turkey is planning to launch a new reform initiative in 2012. Many of the United Kingdom's public laboratories have recently gone from contractor status, to "arm's-length" executive agency status, to full privatisation. This has led to a shift in the relationship between these agencies and their former parent departments or ministries, as the latter have become customers (rather than sponsors) of their research and services. The laboratories now have to compete against one another and against universities for government contract research funds.

As mentioned, some reforms aim at making the management and research of PRIs and universities more autonomous, in recognition of the need for greater autonomy given today's more dynamic and multifaceted mode of innovation. Finland's new *Universities Act* (2010) grants universities independent legal status; Hungary's new *Academy Law* (2009) gives the Hungarian Academy of Sciences self-governing rights; and Portugal's new law on higher education provides PRIs with greater autonomy for their management and activities.

PRIs and universities continue their internationalisation. For example, Finland's current university reform aims at facilitating operating in an international environment by tapping into international research funding, in addition to co-operating with foreign universities and research institutes.

Other trends include structural reforms to reduce overlapping of PRIs, to enhance the systemic efficiency of the PRI sector and to create critical mass through mergers and restructuring.

Enhancing linkages within the national innovation system, including science-industry relations and relations between PRIs and universities, continues to be a focus of public research reforms in many countries.

Australia, the Czech Republic, Denmark, Estonia, Finland, the Netherlands, Poland and Slovenia have adopted in recent years roadmaps to guide future infrastructure development. China and the Russian Federation have invested heavily in expanding and modernising their R&D infrastructures. R&D infrastructures in emerging platform technology areas (nanotechnology, biotechnology, grid computing and information and communication technologies [ICTs] more generally) have been a particular focus in Australia, Israel, the Russian Federation, Slovenia and South Africa, while infrastructure for research on social challenges such as health have received special attention in Germany and Italy. ICT-based information infrastructures are another focus in China, Hungary, New

Zealand, Portugal and South Africa. Improvement of national R&D infrastructures has also been carried out with the objective of creating world-class centres for R&D and innovation (Ireland, the United Kingdom) and, where possible, through participation in international infrastructure initiatives such as ESFRI (Hungary, Norway, Spain) and the European Spallation Source (Denmark, Sweden).

References and further reading

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OECD Innovation Policy Platform (forthcoming), *www.oecd.org/innovation/policyplatform*.