OECD MULTILINGUAL SUMMARIES

OECD Science, Technology and Industry: Outlook 2006

Summary in English

A brighter outlook for science, technology and innovation

Investment in science, technology and innovation has benefited from stronger economic growth

Several years of economic growth have benefited investment in science, technology and innovation. Although the pace of growth has varied across the main OECD regions, business investment has increased and consumer spending has rebounded overall. This has increased demand for innovative products, processes and services. OECD-wide investment in research and development (R&D) has begun to recover from its slump earlier in the decade. Total R&D spending increased almost 10% in real terms from 2000, and measured as a share of GDP, it stood at 2.26% of GDP in 2004.

Government spending drives recent R&D growth in the United States and the European Union but less in Japan

Trends in the financing of R&D vary significantly across the main OECD regions. In Europe and the United States, recent gains were driven primarily by government expenditure; whereas in Japan and other Asia-Pacific nations, industry has been the main engine of growth. OECD-wide industry R&D funding, declined between 2000 and 2004, from 1.43% to 1.40% of GDP. Prospects for future growth in R&D investments are brightening. Government deficits are expected to decline in coming years, and this may loosen constraints on government R&D expenditure. Moreover, surveys indicate that firms in the United States and Europe intend to increase their R&D spending moderately in the coming years, especially if corporate profits remain strong.

Public-sector research has seen a resurgence and services now comprise one-quarter of total business R&D in the OECD

Important shifts are also under way in R&D performance. Public-sector research has grown from 0.63% to 0.68% of GDP between 2000 and 2004. Business-performed R&D across the OECD reached 1.5% of GDP. Its composition continues to evolve, with service industries accounting for a growing share. Between 1990 and 2003, services sector R&D grew at an annual rate of 12%, compared to 3% for manufacturing. Services now comprise one-quarter of total business R&D in the OECD.

Multinational enterprises are driving the globalisation of R&D

Accompanying these shifts in financing and performance of R&D is the rapid globalisation of science, technology and innovation. In most OECD countries, the share of R&D performed by foreign affiliates has increased as multinational enterprises have acquired foreign firms and establish new R&D facilities outside their home country. More than 16% of business R&D in the OECD area was

performed in foreign affiliates in 2004, up from 12% in 1993. Most R&D by foreign affiliates remains within OECD countries, but the regions of fastest growth lie outside the OECD area, in particular in Asia.

Policies to foster innovation have grown in importance

Many OECD countries have developed a national science and innovation strategy

More countries are developing formal plans and strategies for science, technology and innovation – and are backing them up with funding increases and changing institutional structures.

Reform of universities and public research institutions remain a priority

Central to many of these efforts to boost innovative capacity are reforms of public research organisations. Most reforms aim to improve the responsiveness of universities and government research institutions to social and economic needs. Funding models are also evolving. Many countries are moving to more competitive funding models for public research.

Public support to business R&D is being streamlined

Support to business R&D is being streamlined and consolidated. Countries continue to boost support for business R&D either directly (through grants or loans) or indirectly (through tax incentives for R&D and early-stage capital funds). Support to small firms has also increased and is channelled through a broadening array of programmes. Some aim at fostering spin-offs from public research, while others stimulate seed capital.

Innovation policies focus on collaboration

In keeping with the growing interest in better links between science and industry, a number of countries have introduced or expanded public/private partnership programmes for innovation. Co-operation is also increasingly viewed as a way to strengthen regional economies.

Innovation policy addresses new challenges, notably the growing role of services and rapid globalisation

Policy makers still require a better understanding of some of the major forces that are changing OECD economies and call for policy attention. The services sector is an area of particular interest. Countries are also grappling with the challenges of globalisation, both to attract foreign investment in R&D and innovation and to foster greater international linkages, especially within their public research sectors.

Ensuring the supply of human resources for science and technology

Demand for human resources in S&T has grown...

Issues of human resources are also important, as demand for human resources in science and technology has increased in OECD countries. Workers in professional occupations related to S&T represent between 25% and 35% of the labour force in OECD countries, and growth in employment in these occupations continues to outpace overall employment growth.

…while there is a relative decline in S&T graduates in some countries

The supply of S&T graduates continues to expand in absolute terms, but in some countries the share of university graduates with science and engineering degrees dropped. The United States experienced a decline in first-time, full-time enrolments of foreign PhD students. Irrespective of their own recent declines, EU countries still produce a greater share of S&T graduates than Japan or the United States, despite the smaller share of researchers in the workforce.

Most policy measures focus on boosting supplies of new S&T graduates and researchers

Countries have taken a number of actions to boost supplies by raising interest and enrolments in S&T. Measures include the reform of curricula; improvements in teaching; and increased enrolment flexibility. Public/private partnerships are also being developed to improve student performance, enhance the relevance of instruction and raise enrolments. At the graduate level, countries are shortening the duration of PhD studies while providing more supervision to reduce dropout rates. Improvements in international mobility are also seen as a way of matching supply and demand, especially for specific skills that are in short supply.

The share of women among OECD researchers has increased, but more remains to be done

OECD countries are giving greater attention to increasing the participation of women in science and technology. Women account for some 30% of science and engineering graduates in OECD countries and for 25% to 35% of researchers in most OECD countries. Policies to improve the participation of women in S&T range from the use of quantitative targets for the share of women on scientific boards and in senior positions to mentoring and networking initiatives as well as programmes to help women re-enter the research workforce after taking parental leave.

Policies to develop human capital in S&T should focus on the demand side as well

Policies to promote human resources in S&T should focus not only on increasing supplies of graduates, but also on the demand side, especially in Europe where industry employs fewer researchers than in the United States or Japan. Ensuring that framework conditions foster mobility and academic entrepreneurship is a longstanding focus of policies in OECD countries. Government incentives for business R&D also provide direct and indirect support for job creation in research-intensive occupations.

Policies still need to adjust to the rapid globalisation of R&D

Globalisation of R&D is expanding through many channels…

Globalisation dominates recent discussions of innovation policy. Until recently, R&D was one of the least internationalised of the activities of multinational enterprises (MNEs). Foreign affiliates of MNEs account for a growing share of all R&D in the OECD area. In addition, half or more of all patent applications to the US and European patent offices are of foreign origin, and some 14% of all domestic patent applications were owned or co-owned by a foreign resident in 2000, up from 11% in 1992.

…and has become an integral part of business R&D strategy

While globalisation of business R&D has long been associated with the customisation of products and services for local markets and the exploitation of knowledge generated in the home country, MNEs' strategies appear to be changing. While the R&D intensity of foreign affiliates remains below that of domestic firms in most countries, there is greater interest in establishing R&D capabilities abroad. Recent surveys suggest that location decisions are determined more by the quality and availability of skilled human resources than by costs.

The most dynamic elements of global innovation networks are in non-OECD countries

Non-OECD economies have become a dynamic element of the globalisation of R&D. China, Israel, Singapore and Chinese Taipei, for example, have seen sizeable increases in their R&D intensity over the past few years. China's R&D intensity has more than doubled from 0.6 to 1.3% of GDP since 1995. At 4.7% of GDP, Israel's R&D intensity exceeds that of all OECD countries.

Policy has yet to catch up with the globalisation of innovation

Most OECD governments recognise that the best way to benefit from global innovation networks is to strengthen domestic innovation capabilities and develop local talent. At the same time, countries have put in place targeted policies to respond to specific challenges posed by globalisation. Several countries use R&D tax incentives to attract and retain foreign R&D investment, while others are helping firms to identify foreign partners and fostering international collaboration in research.

Technology licensing markets are of growing importance

Licensing markets improve the efficiency of innovation systems

Licensing has become an important channel for diffusing inventions and facilitating follow-on innovation. Licensing can increase the efficiency of innovation processes by putting inventions in the hands of those best capable of commercialising them. In a more open innovation system in which firms source technological inputs from a broad range of public and private sources, licensing has become a key mechanism for exchanging patented inventions. International licensing accounts for a significant and growing share of total patent licensing, with world-wide receipts topping USD 100 billion in 2004.

Governments can help improve their operation

The private sector plays a leading role in developing technology licensing markets, but governments can take several steps to improve their efficiency. The basic requirement is a patent administration that ensures patent quality and the timeliness of grants. Governments can also take steps to improve the availability of information about licensable patents. In several countries, governments have worked with industry to develop tools for identifying valuable patents and estimating their value.

Demand for improved evaluation practices has risen

The growing importance of innovation policy has increased demand for better evaluation of policies

Broader recognition of innovation's importance to economic prosperity and social well-being has heightened interest in evaluation of policies and practices. Evaluation is central to the effective management and governance of publicly funded research. It can inform decision making regarding the continuation of innovation policy instruments and the allocation of resources.

New evaluation tools are needed to match the complexity of research and innovation

Evaluation now seeks to address a more complex set of questions in an increasingly complex innovation system. Public research organisations, for example, are increasingly evaluated not only on the quality of their research, but also on the relevance of their results and their ability to promote effective technology transfer. Scientific research is increasingly multidisciplinary, making it harder to use traditional peer review to evaluate research proposals or outcomes. Evaluation tools are evolving to keep pace with changing demand for evaluation. Countries are increasingly shifting their approaches to institutional evaluation from one-off reviews to periodic evaluations. A few countries are also beginning to evaluate funding agencies and research councils, developing new approaches and criteria for doing so.

Further efforts are needed to improve evaluation practices

Continued international co-operation is needed to improve evaluation practices and share them more widely. It is important to encourage wider and more in-depth exchanges between officials in charge of evaluation to share information on methodologies for conducting evaluations, as well as for ensuring their impact on policy making. More systematic comparative analysis of innovative approaches to evaluation should be conducted in international forums. Another important task is to improve practices and methodologies for reviews that more explicitly consider the relationship between innovation and economic performance.

OECD countries need to improve the efficiency of their research and innovation systems and be ready to meet the challenges and opportunities from new global players

In summary, the outlook for public and business investment in R&D and innovation remains bright, but changing macro-economic conditions could restrain investments in the medium-term. Furthermore, the emergence of non-member countries, present additional challenges to OECD countries. OECD countries must step-up policy reforms to improve the efficiency of their research systems while improving incentives for investments in research, human capital and innovation. Several of the smaller OECD economies are moving ahead to tackle these challenges, but some of the larger economies are having greater difficulty. In the not-too-distant future, some non-member economies may become global leaders in R&D and innovation performance.

Multilingual summaries are translated excerpts of OECD publications originally published in English and in French.

They are available free of charge on the OECD Online Bookshop
www.oecd.org/bookshop/

For more information, contact the OECD Rights and Translation unit,
Public Affairs and Communications Directorate.

rights@oecd.org

Fax: +33 (0)1 45 24 99 30

OECD Rights and Translation unit (PAC)
2 rue André-Pascal
75116 Paris
France

Visit our website www.oecd.org/rights/