OECD Science, Technology and Industry
Outlook 2010

OECD Science, Technology and Industry Outlook 2010 Highlights

Innovation can play an important role in the economic recovery

Science, technology and innovation must be at the core of a sustained recovery

In the wake of the financial crisis, science, technology and innovation (STI) will make a vital contribution to a sustainable and lasting recovery and to the longer-term growth prospects of OECD and non-OECD economies. STI can open new avenues to meet some of the major challenges facing societies: demographic change, global health issues and climate change. To deliver on these agendas, it is essential for countries to maintain productive investments in knowledge. STI has never been more important.

But the current economic environment is challenging…

However, the economic events of the past two years have been the source of serious difficulties for STI. Firms have faced weaker demand as well as problems of credit availability which hamper their efforts to maintain innovative activity. Sharp declines in trade, foreign investment and access to international financing have also had negative impacts which have affected the global value chains that provide companies with technical expertise, market intelligence, business contacts and international partners.

… and OECD country policies show signs of diverging

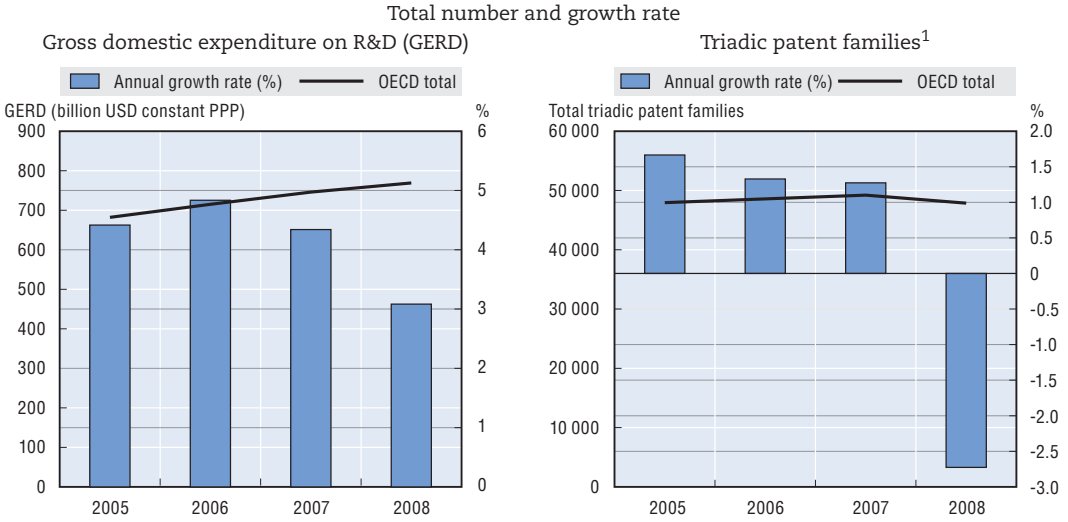
OECD countries have responded to these pressures in different ways. Some have announced cuts in their annual budget provisions for research and development (R&D) and tertiary education, and others look poised to follow. This reduces resources for public research and private R&D activities in the short term, and could lead, over the longer term, to declines in the human resources available for innovation. However, others, including Austria, Germany, Korea and the United States have recently increased investment in the science base, strengthening public research and human resources in order to improve future innovation and growth prospects. In the medium term, the need for broader fiscal consolidation may place yet further pressure on the ability of some OECD governments to maintain their investment in STI.

Overall investment in R&D has slowed in OECD countries…

In the OECD area, real growth in R&D spending slowed between 2007 and 2008, with annual growth falling from over 4% in recent years to 3.1% (Figure 1). Patent numbers grew steadily at an average annual rate of 2.4% from 1995 to 2008, though growth has weakened in recent years, and the number of OECD-area (triadic) patents fell in 2008. Similarly, trademarks, which measure product or marketing advances, fell by 20% in 2008. To some extent the drop in the quantity of patents could be offset by a rise in quality, and firms may be using other approaches to protect their knowledge base, such as trade secrecy or collaborative IP mechanisms. More positively, all OECD countries except the United States increased their output of scientific articles between 1998 and 2008. However, there remains some concern about the extent to which the withdrawal of temporary fiscal stimulus – which in some cases has been used to strengthen the science base – could dampen investment and output.

Figure 1. **Trends in OECD R&D and patents**

Total number and growth rate



Source: OECD, *Main Science and Technology Indicators* (MSTI) (May 2010).

1. Patents filed at the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japan Patent Office (JPO) which protect the same invention.

Source: OECD, *Main Science and Technology Indicators* (MSTI) (May 2010).

StatLink http://dx.doi.org/10.1787/888932358903

… while science and innovation performance in emerging economies continues to expand…

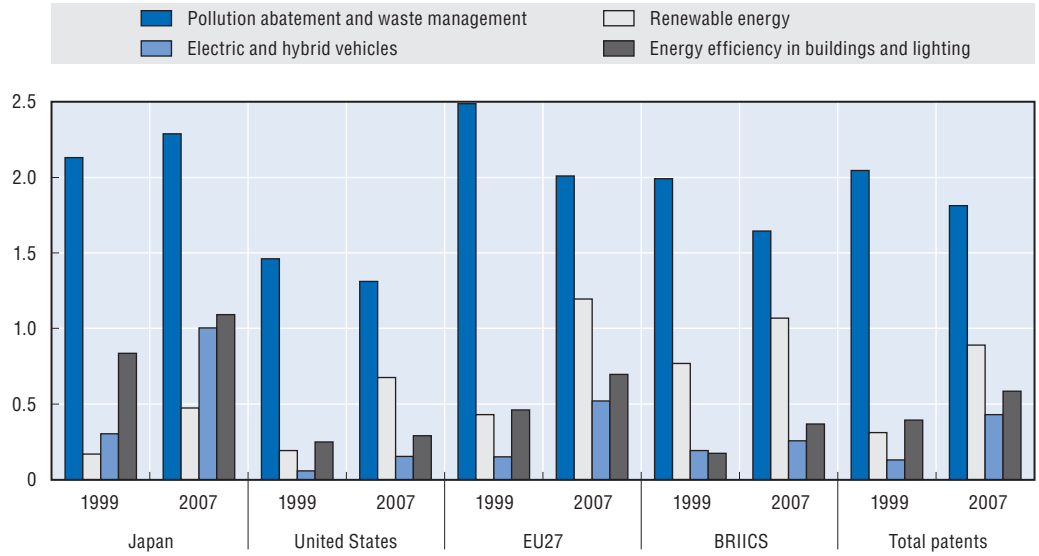
The situation in some non-OECD economies is brighter. Worldwide, STI activities are intensifying and expanding across more regions. Non-OECD economies continue to increase their expenditures on R&D and have become important players. China's real gross domestic expenditure on R&D in 2008 was equivalent to 13.1% of the OECD total, up from around 5% in 2001. The Russian Federation's R&D spending of USD 17 billion (constant 2000 dollars, PPP) in 2008 was equal to 2.2% of the OECD total, close to the shares of Canada and Italy.

… with growing focus on environmental technologies

Such increases matter. Non-member BRIICS economies (Brazil, Russia, India, Indonesia, China and South Africa) are making significant investments in environmental technologies, a dynamic area with enormous growth potential and clear practical relevance for global challenges such as climate change, water and food. In 2007 the BRIICS countries were already focusing more on renewable energy applications than the global norm, as seen in their higher than average patent applications (Figure 2).

Figure 2. **Patents in selected environmental technologies**

As a percentage of total PCT patent applications



Note: Data relate to patent applications filed under the PCT, at international phase, designating the European Patent Office (EPO). Patent counts are based on the priority date, the inventor's country of residence and fractional counts. BRIICS refers to Brazil, China, India, Indonesia, the Russian Federation and South Africa.

Source: OECD Patent Database (July 2010).

StatLink http://dx.doi.org/10.1787/888932332835

The growth by the BRIICS creates opportunities and challenges for OECD countries

The rise of STI in non-member economies presents both opportunities and challenges for OECD countries. The big emerging economies offer large consumer markets, new sources of skilled people and ideas, and new opportunities for collaboration. At the same time, the resulting reorganisation of production and research pushes OECD countries to adopt policy frameworks that support the reallocation of resources to new activities and help businesses to adjust to new opportunities and markets. Just as the improved STI performance of individual OECD countries is a source of combined strength and an opportunity to expand the global stock of knowledge to drive growth and meet social challenges, the increased activity and proficiency of non-member economies can ultimately deliver global benefits.

Science, technology and innovation policies evolve towards green

As policies evolve with globalisation…

At first glance, the national innovation strategies of OECD countries appear broadly similar, focused on strengthening innovation to improve industrial competitiveness, especially by raising productivity growth, as well as on jobs and living standards. Emerging and other non-member economies also see innovation as a means to modernise economic structures and to achieve sustainable growth. However, just as R&D investments are diverging, policies for STI continue to evolve and can vary substantially even among OECD members.

… national research agendas are becoming "greener"

In parallel with what seems to be happening in many of the BRIICS countries, recent policy trends in many OECD countries point to a "greening" of national research and innovation strategies. Countries are placing environmental issues, climate change and energy high on their national science and innovation agendas. Health and quality of life are also among their important priorities.

Building capacity through international collaboration is becoming more important…

Improving international collaboration to address global challenges is high on national agendas. Much of the focus appears to be on better governance. Some countries have reorganised ministerial or departmental functions to strengthen links between R&D and higher education or between industry and research. Others have broadened structures to involve community stakeholders. Germany and the Nordic countries have also launched strategies to internationalise their public-research sector and build their capacity for multilateral collaboration on STI.

… as are efforts to target policy support

At the same time, countries maintain their focus on key research areas and enabling technologies such as biotechnology, nanotechnology, ICT, new materials and advanced manufacturing. While most countries support research in these technologies, there is a growing effort to improve policy support at different stages of the innovation value chain (for example by providing incentives for R&D via grants or tax credits, fostering specific technology clusters or development of venture funds) in order to enhance firms' ability to capitalise on public and private investments in these emerging technologies.

Indirect support is growing…

More countries are using tax incentives than a decade ago and the schemes are more generous than ever. Today, more than 20 OECD governments provide fiscal incentives to encourage business R&D, up from 12 in 1995 and 18 in 2004. Among those that do not, Germany and Finland are currently discussing their introduction. Non-OECD countries

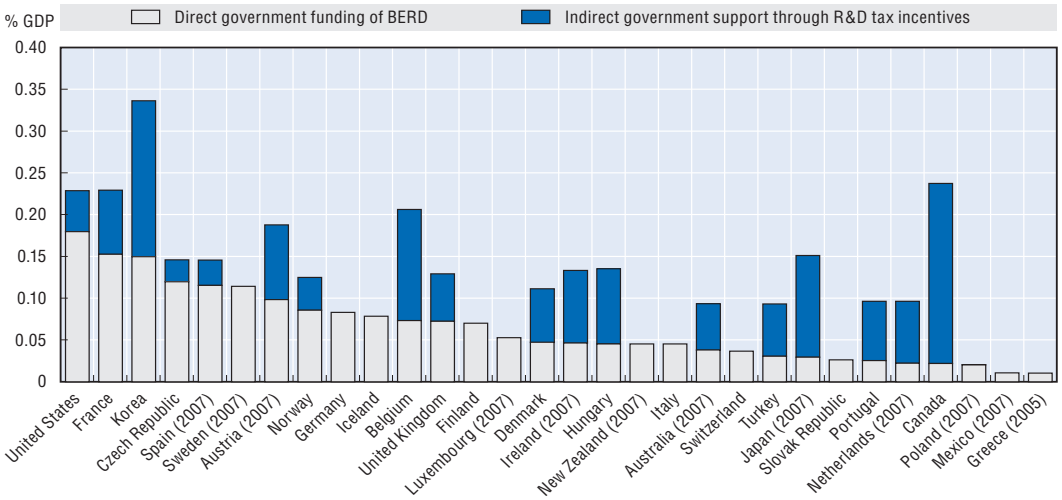
such as Brazil, China, India, Singapore and South Africa also provide a generous and competitive tax environment for investment in R&D. China provides generous (general) tax reductions for R&D firms located in certain new technology zones or investing in key areas such as biotechnology, ICT and other high-technology fields.

… however, direct funding remains the predominant tool

Nevertheless, direct public funding through grants, subsidies and loans remains the most frequent form of support to business R&D, with an increased focus on competitive and merit-based programmes. The balance between direct funding and indirect measures such as R&D tax incentives varies according to factors such as a country's industrial structure, the presence of large R&D-intensive firms, R&D intensity and specialisation (Figure 3).

Figure 3. **Direct and indirect government funding of business R&D and tax incentives for R&D, 2008**

As a percentage of GDP



Note: The estimates of R&D tax expenditures do not cover sub-national R&D tax incentives. The Austrian estimate covers only the refundable research premium. The estimate for the United States covers the research tax credit but excludes the expensing of R&D. Italy, Greece and Turkey offered R&D tax incentives in 2008, but estimates of the foregone tax revenues are not yet available. Claims under the French R&D tax scheme totalled EUR 4.2 billion in 2008 (or 0.21 per cent of GDP), but France's scheme allows carry-forwards and a 3-year lag before total refunds of unused credits, and because the tax credit was much lower until 2007, only EUR 1.5 billion (or 0.08 per cent of GDP) are registered as government forgone tax revenue in the above figure.

Source: Updated from OECD (2010), *Measuring Innovation: A New Perspective*, based on OECD, R&D tax incentives questionnaire, January 2010; and OECD, *Main Science and Technology Indicators Database*, September 2010.

StatLink http://dx.doi.org/10.1787/888932333006

Governments must co-ordinate policy at regional, national and international levels

Public support to the "supply side" of research and innovation remains a key aspect of STI policies, although attention to the "demand" side, such as public procurement, standards and involvement of users to "pull" innovation, continues to gain ground. Changes in innovation processes, especially those driven by the broadening of innovation, the rise of new global players and global value chains, and technological convergence also affect how

governments design, develop and implement policies to support STI performance. This puts pressure on governments to monitor and adjust the effectiveness of national STI governance structures and policies to ensure co-ordination and coherence at the regional, national and international levels.

Support for non-technological and user-driven innovation is rising, especially in services

Government support for non-technological and user-driven innovation is increasing in some countries, in recognition of the importance of non-technological innovation, design and branding for competitiveness, especially in service-sector firms. In particular, Chile, Denmark, Finland and the United Kingdom, and non-member Brazil as well, are trying to raise awareness of this area and encourage non-technological innovation alongside technological innovation.

The innovation "policy mix" concept needs to be applied to improving co-ordination and coherence

Finding an appropriate policy mix is challenging…

New objectives and rationales for policy intervention have opened up a larger policy instrument "toolbox". This has created an even more complex policy landscape, thereby increasing the challenge of achieving balance and coherence in the policy mix. The good news is that during the past few decades, a growing number of countries have made significant efforts to assess and evaluate programmes and instruments aimed at fostering STI. Yet, developing a "policy mix" that combines a range of policies that is well adapted to the prevailing environment and national objectives remains a real challenge. This challenge will persist, since the scope and content of government policies evolve over time, driven by changes in external factors such as globalisation and technical advances as well as economic and institutional development.

… and needs to take account of interaction among the various instruments

The key question in assessing a policy mix is whether it is appropriate, efficient and effective. Ideally, a policy mix takes into account possible interactions among instruments (positive and negative) and ensures balanced support for the range of challenges faced by a country's innovation system. Policy mixes need to be adapted to national circumstances – industry structure in terms of activities and firm size, the role of universities and government research laboratories, etc. Policy coherence can be improved through the establishment of multi-actor forums supported by information systems and advanced analytical capacities.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(00 2010 75 1 P) OECD 2010