

1. KNOWLEDGE ECONOMIES: TRENDS AND FEATURES

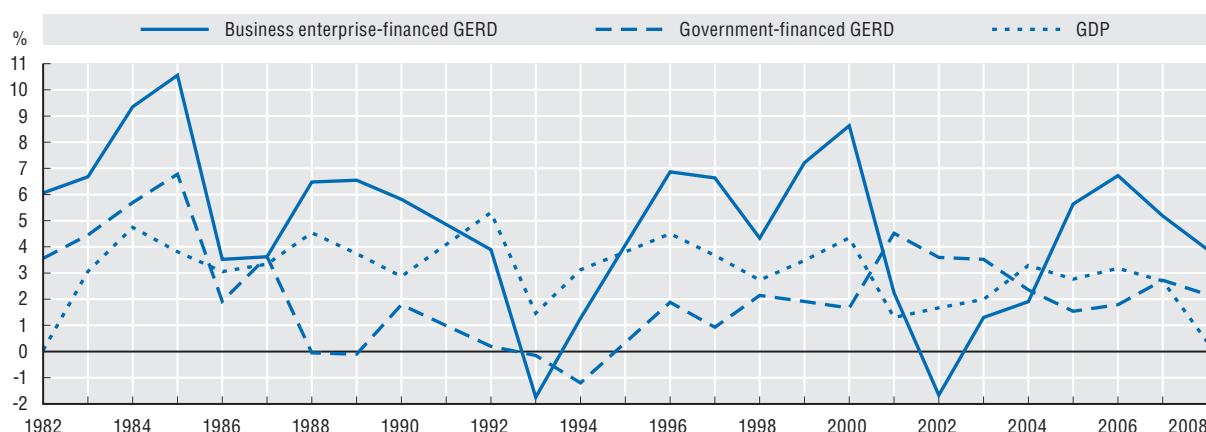
The changing landscape of innovation

R&D and innovation in the crisis

R&D (research and development) expenditure is an investment aimed at new knowledge, products or processes. Funding may come from government or business. Government-funded R&D aims mainly at producing new fundamental knowledge or satisfying social needs such as health or defence and is not expected to affect productivity as currently measured. Business-funded R&D is typically oriented towards new processes and new products and is expected to increase productivity when successful. It is normally mildly pro-cyclical, i.e. it is affected by the business cycle, as it is subject to financing constraints (the availability of cash limits R&D expenditures, as high risk and little collateral make financial markets reluctant to fund R&D). The most recent data show that trademark activity has been strongly affected by the economic crisis, with a marked drop in finance- and insurance-related trademarks at the US Patent and Trademark Office (USPTO) from mid-2007. Goods and other services trademark activity turned down with the cycle and then up with the cycle at the beginning of 2009.

R&D growth over the business cycle by source of financing, OECD area, 1982-2008

Average annual real growth rate, percentage

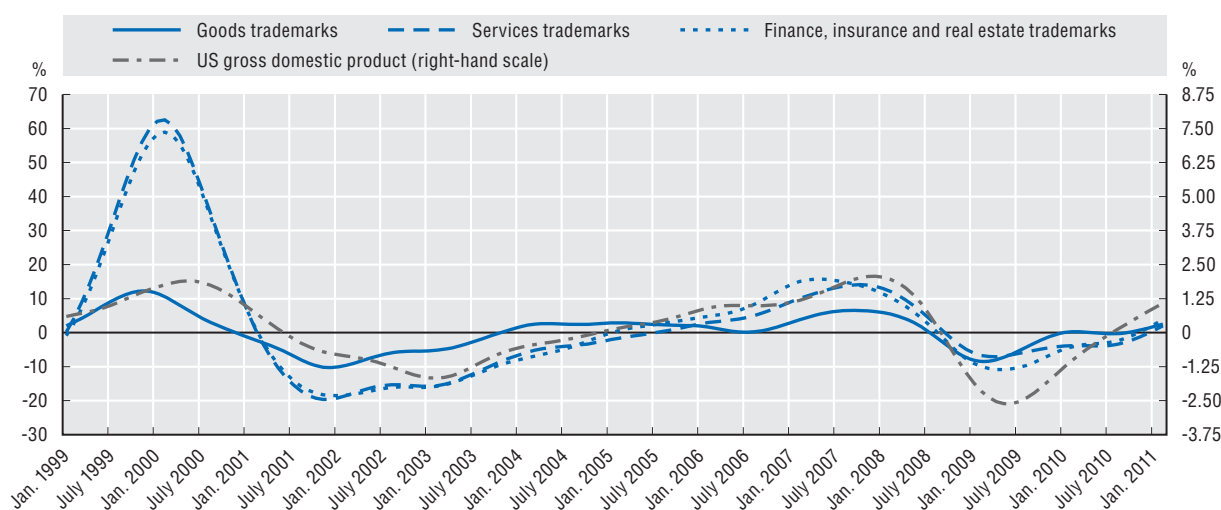


Source: OECD, Main Science and Technology Indicators Database, June 2011.

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US gross domestic product and trademark applications at the USPTO, 1999-2011

Comparing cycles, by type of trademarks, percentage deviation from the long-term trend



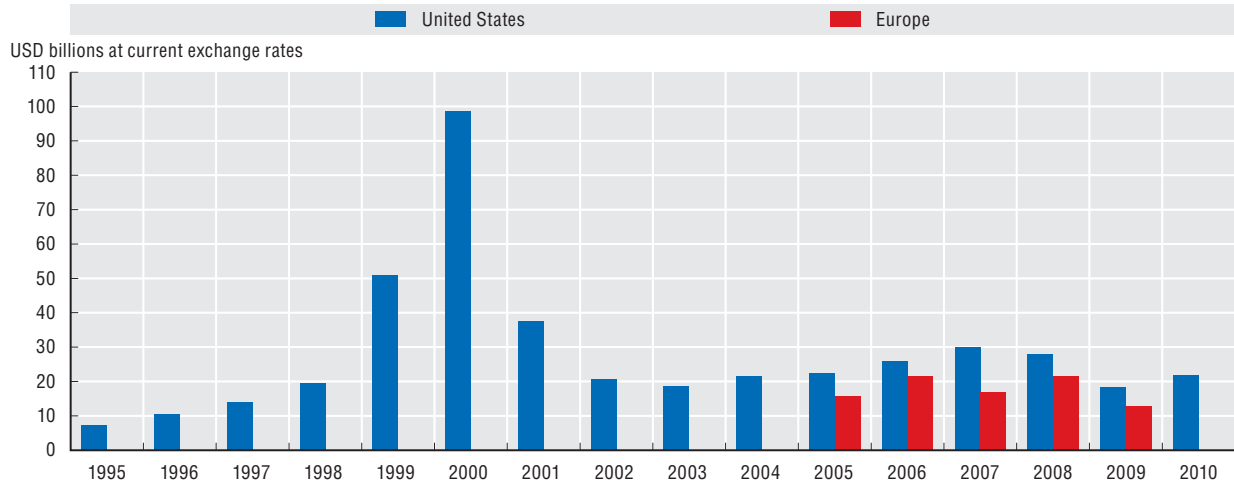
Source: OECD, based on USPTO, Trademark Electronic Search System (TESS), May 2011; and OECD, Quarterly National Accounts Database, May 2011. See chapter notes.

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Financing innovation

Access to finance for new and innovative small firms involves both debt and equity finance. Even before the recent financial crisis, banks were reluctant to lend to small, young firms. The financial crisis widened the existing gap for seed funding and early-stage financing, as venture capital firms moved to later-stage investments where risks are lower. Angel investors are often experienced and successful entrepreneurs or business people. As more and more venture capitalists have moved to later-stage financing to reduce risk, the role of angel financing has grown.

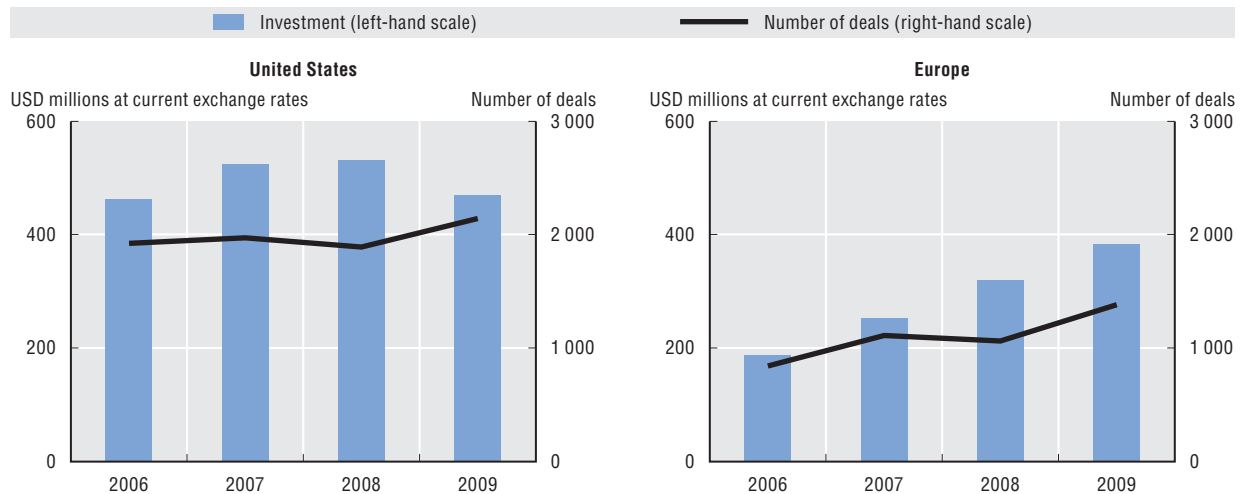
Venture capital investment in the United States (1995-2010) and in Europe (2005-09)



Source: OECD, calculations based on PwC/National Venture Capital Association MoneyTree, EVCA/PEREP_Analytics and EVCA/Thomson Reuters/PwC, March 2011. See chapter notes.

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Investment by business angel groups/networks in the United States and Europe, 2006-09



Source: OECD, calculations based on ACA (Angel Capital Association) and networks surveyed by EBAN (The European Trade Association for Business Angels, Seed Funds, and other Early Stage Market Players), March 2011. See chapter notes.

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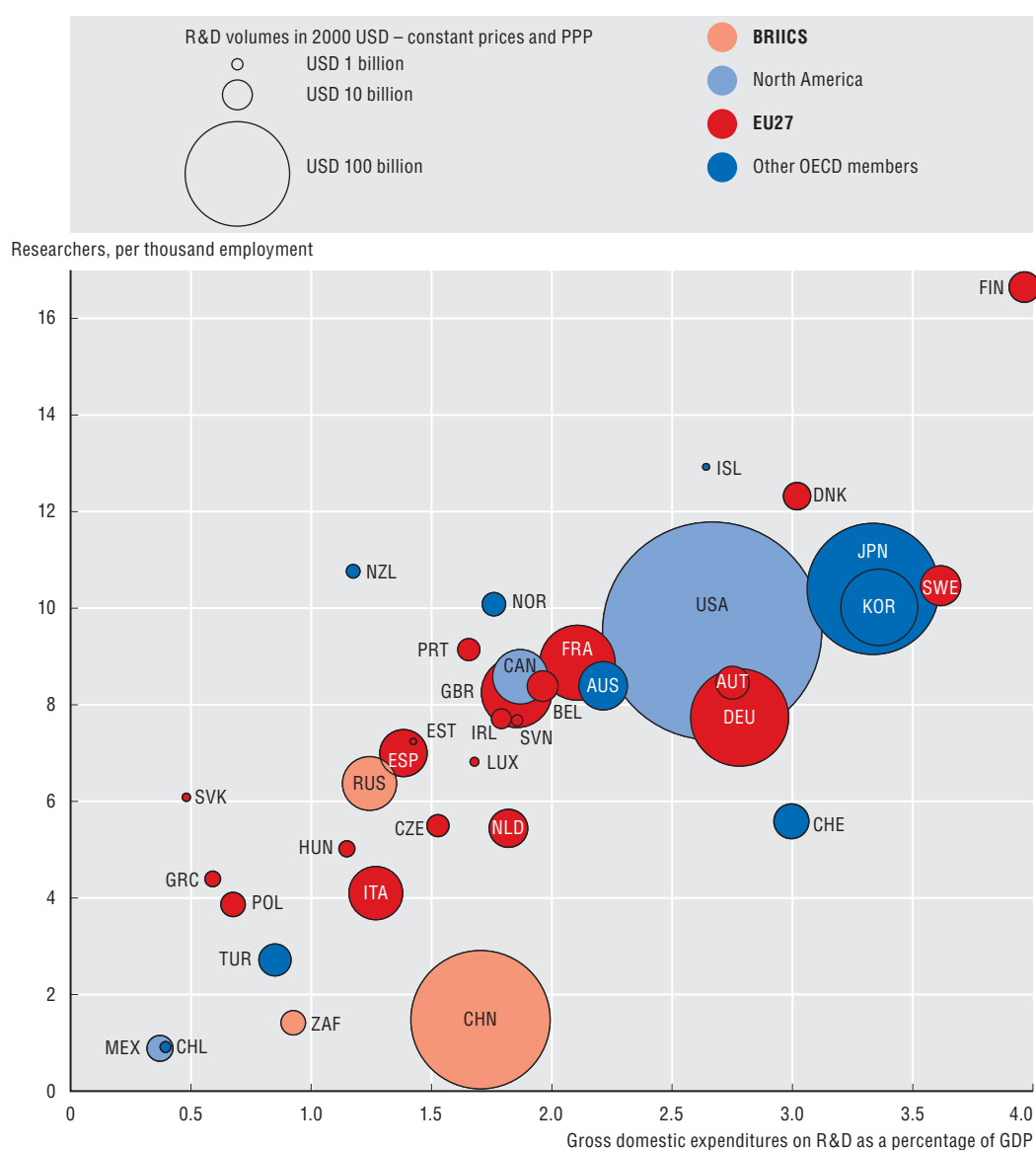
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The global landscape of R&D players

The United States, with nearly USD 400 billion of intramural R&D expenditures in 2008, performs the most research and development (R&D). It is followed by China with nearly one third of that value (in current purchasing power parity terms), just ahead of Japan. The combined European Union accounts for nearly three quarters of the US R&D total. Non-OECD economies account for a growing share of the world's R&D, measured in terms both of total researchers and R&D expenditures. Personnel costs, which include researcher costs, account in most economies for the largest share of R&D expenditures. This explains the close relationship between R&D as a percentage of GDP and number of researchers as a percentage of total employment. Finland exhibits the highest research intensity on both measures. Variations can be related to differences in the price of R&D inputs, such as researcher costs, the pattern of R&D specialisation and the requirements in terms of capital expenditure, and the possibility that some countries may be developing their research infrastructure for future use.

R&D in OECD and non-OECD economies, 2009 or latest available year



Source: OECD, Main Science and Technology Indicators Database, June 2011. See chapter notes.

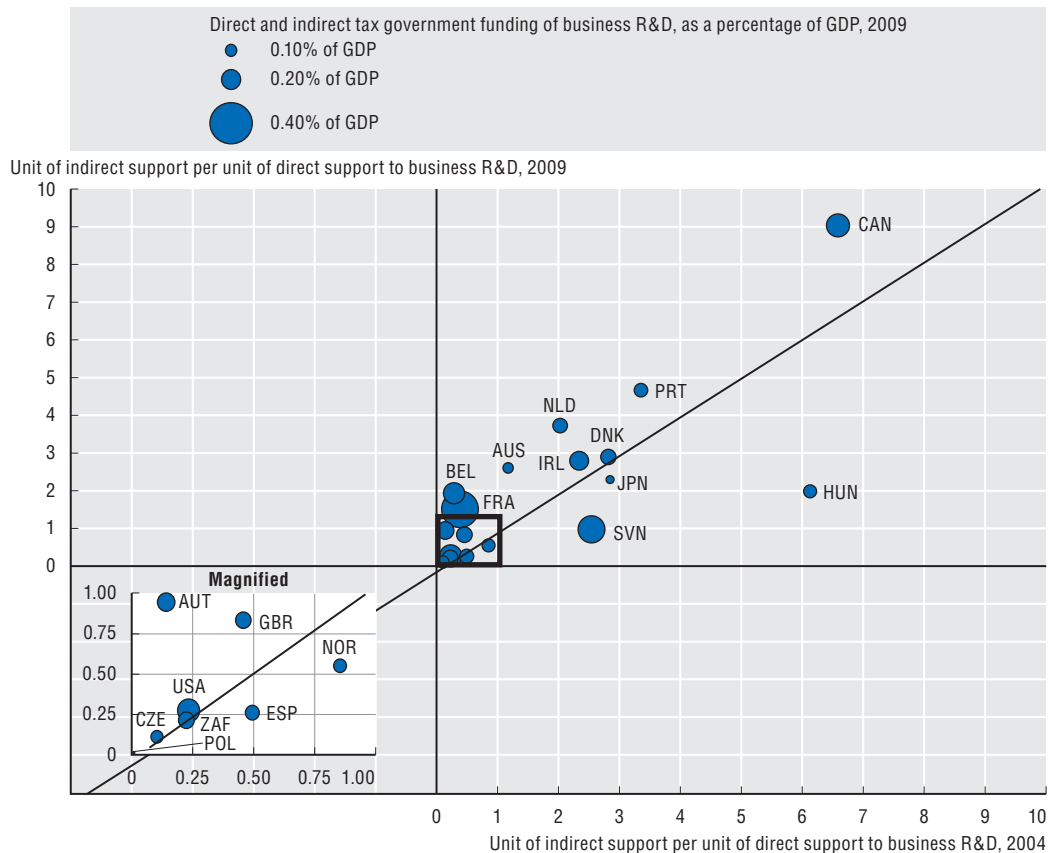
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A shift in the policy mix for R&D

Governments can choose among various tools to leverage private-sector R&D. They can procure R&D from companies, provide direct support via grants or loans, or use fiscal incentives, such as R&D tax credits or allowances. Direct R&D grants/subsidies target specific projects with potentially high social returns: tax credits reduce the marginal cost of R&D activities and allow private firms to choose which projects to fund. Today, 26 out of 34 OECD countries and a number of non-OECD economies have R&D tax incentives in place. New estimates of the cost of R&D tax incentives and data on the value of direct public funding to support business R&D show that some countries provide more indirect than direct support (e.g. Denmark and Portugal) while others provide relatively greater direct support (e.g. the United States and the United Kingdom). In recent years there appears to have been a general shift towards greater reliance on R&D tax incentives, as revealed by the number of countries located above the 45-degree line. This shift has been particularly marked for Canada, Portugal and Belgium. Several countries are considering introducing new tax incentives or increasing the generosity of their schemes.

R&D tax incentives versus direct support to business R&D, 2004 and 2009

Cost of foregone tax revenues on R&D for USD 1 of direct support



Source: OECD, based on OECD R&D tax incentives questionnaires, January 2010 and June 2011; and OECD, Main Science and Technology Indicators Database, June 2011. See chapter notes.

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The figure charts a country's balance of support in 2004 (X axis) and 2009 (Y axis). Countries with a value higher than one place relatively more emphasis in their support mix on R&D tax incentives. A country located above the 45 degree line should be interpreted as having increased its ratio of tax to direct support funding over the period. The size of the bubbles represent the combined volume of support for business R&D (the sum of the figures for government-funded business R&D and the reported cost of R&D tax incentives) relative to GDP. For example, having further increased its relative preference for tax incentives over direct support for business R&D, Canada has a high value of total support relative to GDP.

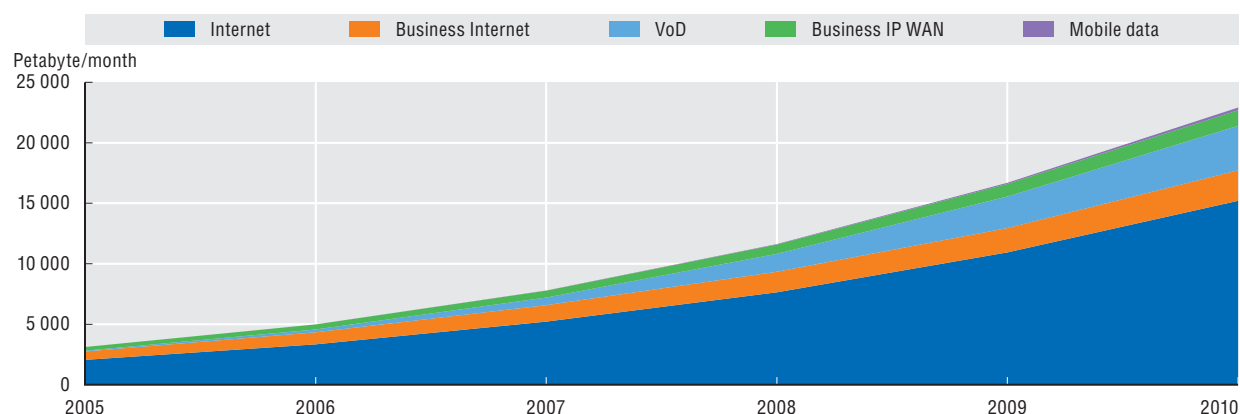
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The growth and use of the Internet

The Internet has become a critical infrastructure that supports businesses, consumers/users and the public sector. It continues to experience remarkable growth, from 72 million hosts in 2000 to over 730 million in 2010. According to CISCO traffic over the Internet has grown exponentially since 1984 to reach just over 20 000 Petabytes (PB) a month in 2010. It has increased eightfold since 2005. Greater online interactivity and the willingness to share, contribute and create online communities are changing media consumption habits of Internet users, in particular among younger age groups. Various social networking sites have emerged in recent years. Among the most popular are Facebook, MySpace and Twitter, while Orkut is one of the most visited websites in India and Brazil. On average, 50% of Internet users in OECD countries declared having a social networking activity in 2010. Blogs, wikis, podcasting, tagging technologies and techniques from community and social networking sites can help to advance product development and raise the quality of interactions with users and consumers. They also lead to the creation of virtual goods and services. It is not always clear how consumer protection laws apply in these new environments. New uses of the Internet have raised privacy concerns among consumer groups and privacy advocates, particularly with respect to the collection and use of consumers' and children's personal information.

Global Internet Protocol (IP) traffic, 2005-10

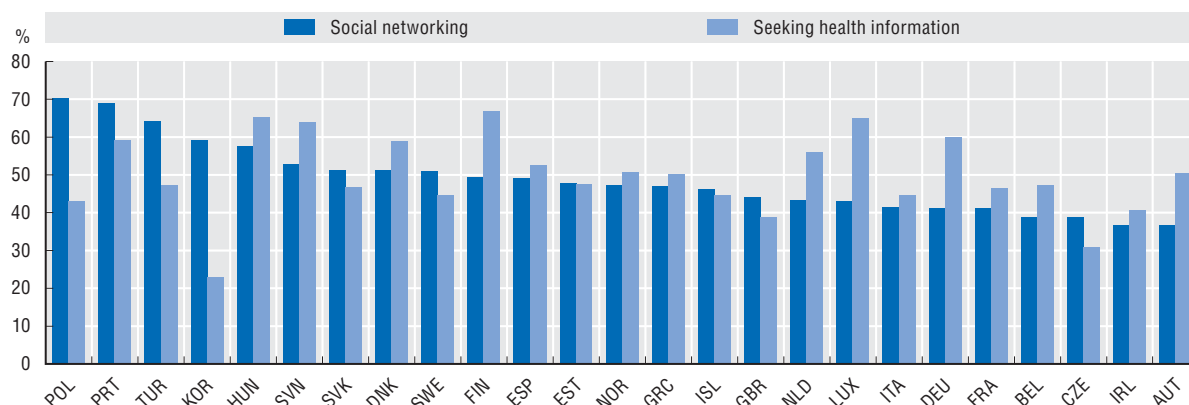


Source: Cisco Visual Networking Index (VNI). See chapter notes.

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New uses of the Internet: social networking and health information, 2010

Individuals having used Internet for social networking and seeking health information as a percentage of Internet users



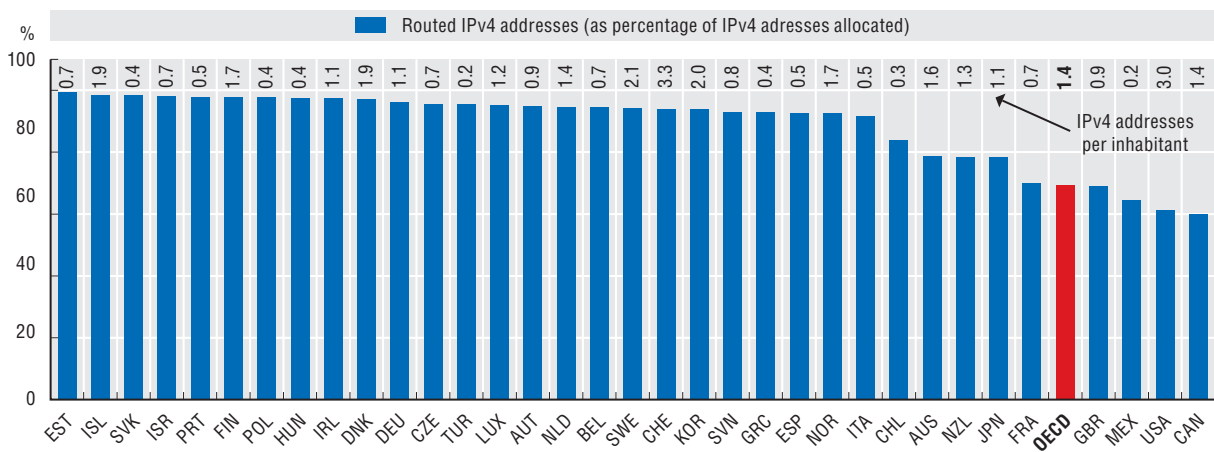
Source: OECD, ICT Database, May 2011; and Eurostat, Community Survey on ICT usage in Households and by Individuals, April 2011. See chapter notes.

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Smart infrastructures

Mobile devices, always-on broadband connections and virtualised hosts on a single computer have greatly increased the demand for IP addresses. However, the Internet was originally designed as a research network, and its subsequent widespread commercialisation and expansion has meant that the Internet Protocol, IPv4, is now insufficient to meet today's needs. In fact the central pool of unused IPv4 addresses ran out in February 2011 and the Regional Internet Registries (RIRs) are expected to assign the remaining IPv4 addresses relatively soon. IPv6, which was designed to succeed IPv4 and whose deployment began in 1999, provides significantly greater address space. However, its implementation remains slow, and considerable challenges must be met to achieve a complete and successful transition. The costs of deployment of IPv6 and the need for a critical mass of actors to adopt the new protocol are the main hurdles. Experience to date indicates the need for increased awareness and the commitment of the necessary resources.

Routed IPv4 addresses per country, year end 2010

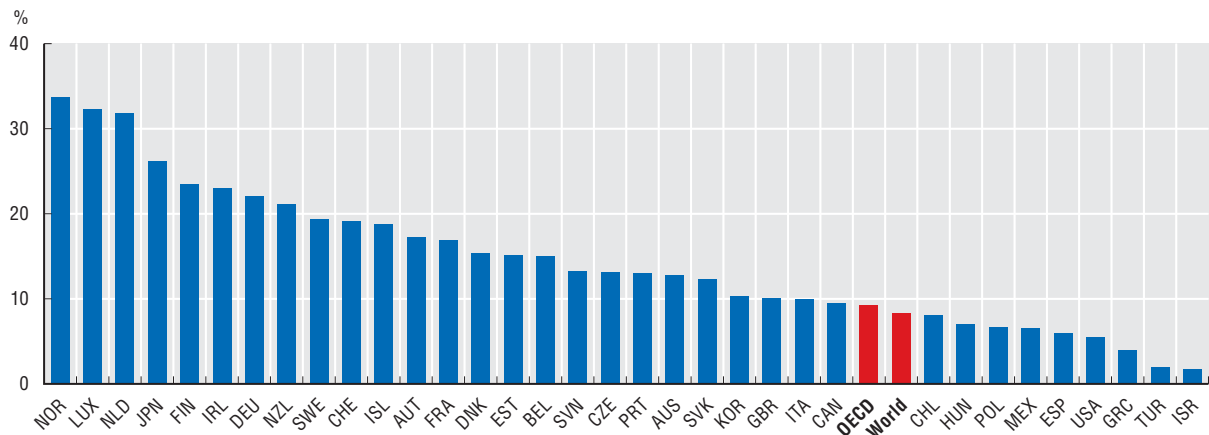


Source: OECD (2011), *OECD Communications Outlook 2011*, OECD Publishing, Paris. Based on data from the RIRs and Potaroo (www.potaroo.net). See chapter notes.

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OECD countries with IPv6-enabled networks, 2010

Percentage of autonomous systems supporting IPv6



Source: OECD (2011), *OECD Communications Outlook 2011*, OECD Publishing, Paris. Based on Potaroo (www.potaroo.net). See chapter notes.

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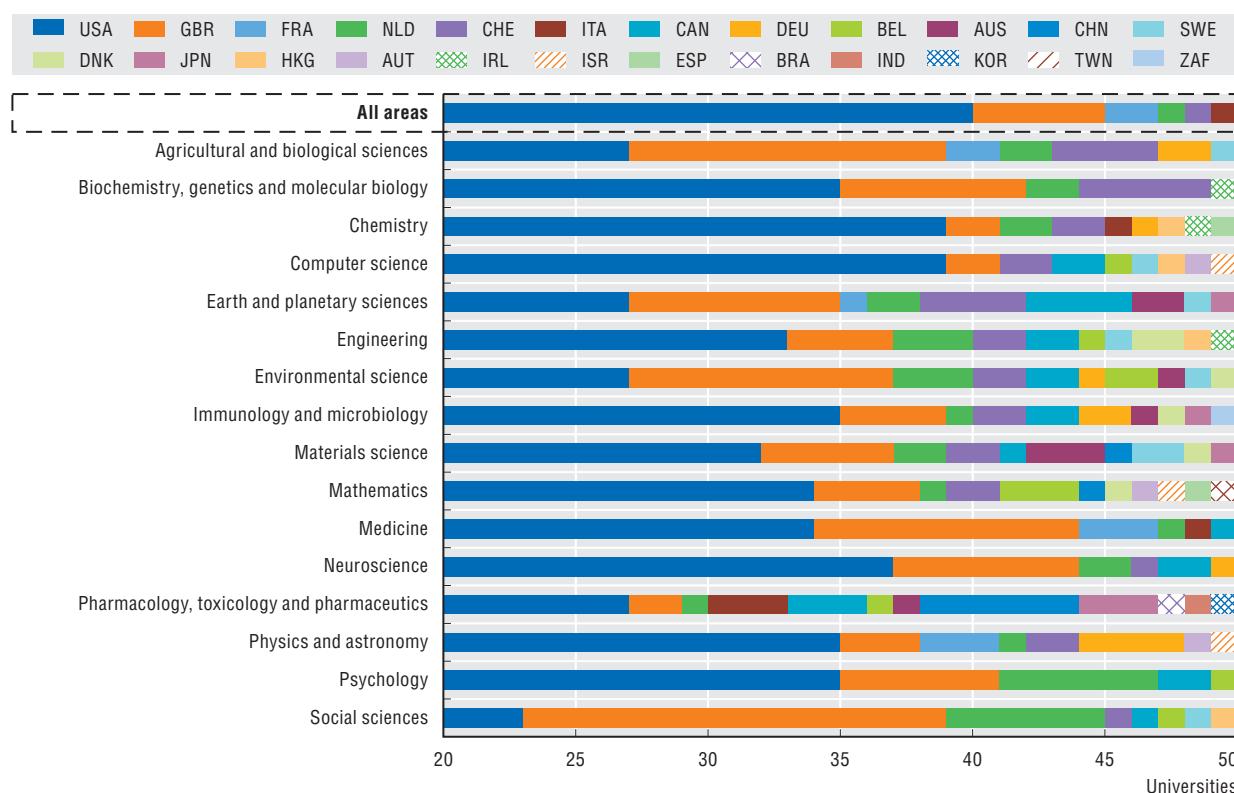
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High impact universities

World-wide, the 50 universities with the highest impact – in terms of normalised citations to academic publications across all disciplines – are concentrated in a handful of economies. Overall, 40 of the top 50 are located in the United States, with the rest in Europe. A more diverse picture emerges on a subject-by-subject basis. The United States accounts for less than 25 of the top 50 universities in social sciences, a field in which the United Kingdom plays a key role. The universities producing the top-rated publications in the areas of Earth sciences, environmental science and pharmaceuticals are spread across economies. There is evidence that universities in Asia are emerging as leading research institutions: China has six in the top 50 in Pharmacology, Toxicology and Pharmaceuticals. The Hong Kong University of Science and Technology is among the top universities in computer science, engineering and chemistry. In the United States, some universities excel in a wide range of disciplines. Stanford University features among the top 50 for all 16 subject areas, and 17 other US universities feature in the top 50 in at least 10 scientific fields.

University hotspots – geographical distribution of highest impact institutions, 2009

Location of top-50 universities by main subject areas



Source: OECD and SCImago Research Group (CSIC) (forthcoming), *Report on Scientific Production*, based on Scopus Custom Data, Elsevier, June 2011. See chapter notes.

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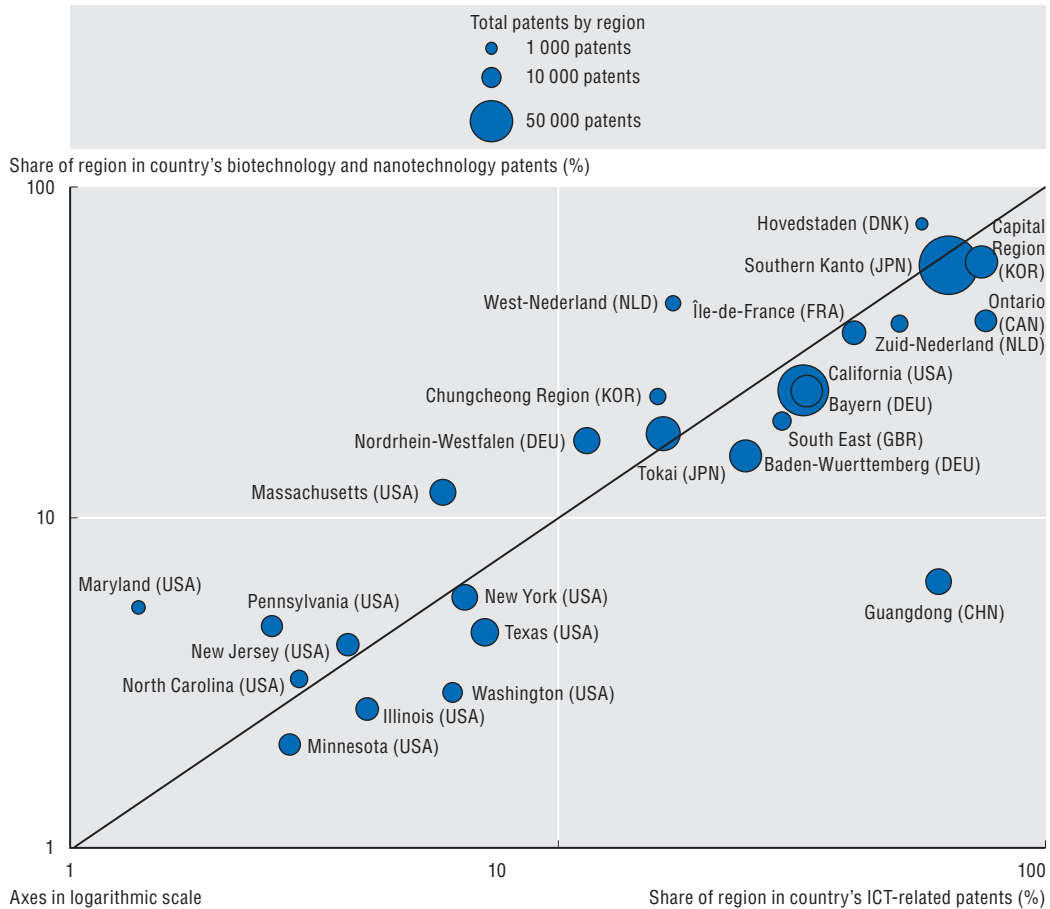
The X axis (note that the value starts at 20) shows the geographic distribution of the top 50 universities in the main subject areas (Y axis) according to their normalised impact. The publication threshold set for the institutions is at least 100 documents in 2009. The normalised impact is the ratio between the average number of citations received by a specific unit and the world average of citations in the same time period, document type and subject area, i.e. the normalisation is done at the level of the individual article. If an article belongs to several subject areas a mean value of the areas is calculated. The normalised impact of these institutions is calculated for 2003-09.

Regional innovation hotspots

Many of the leading firms in knowledge-intensive industries – such as information and communication technologies (ICT) and the life sciences – have emerged in a limited number of regions. Such regions appear to provide particularly conducive environments for business innovation. Much of the effort of policy makers in other regions aims to replicate or nurture the positive environmental conditions that the best-performing regions offer.

Innovation hotspots in ICT, biotechnologies and nanotechnologies, 2006-08

Top patenting regions by technology field as a percentage of the country's patents in the field



Source: OECD, REGPAT Database, June 2011. See chapter notes.

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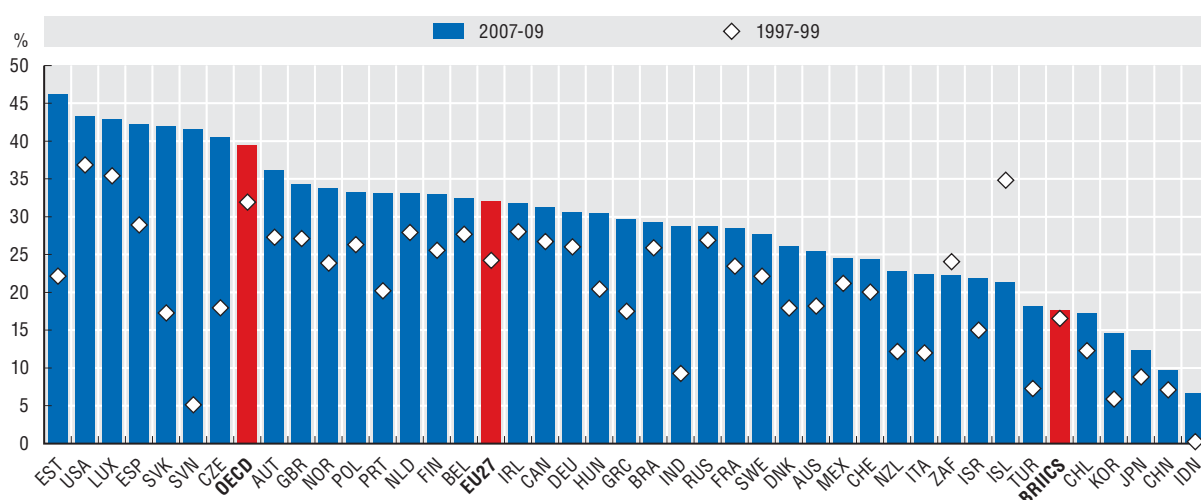
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Rising innovation in services

The average share of trademark applications relating to service classes has increased over the last decade from 32% to 39% in all economies except South Africa and Iceland. Most service trademarks are related to knowledge-intensive activities, particularly in emerging countries such as Indonesia and Brazil. Trademarks can be R&D-related. For example “Siemens climate solution” covers research and development consultancy services in the fields of electrical engineering, electronics, information technology, medical engineering, physics, chemistry and mechanical engineering.

Service-related trademarks applications at USPTO and OHIM, OECD and BRIICS, 1997-99 and 2007-09

As a percentage of total trademark applications at OHIM and USPTO

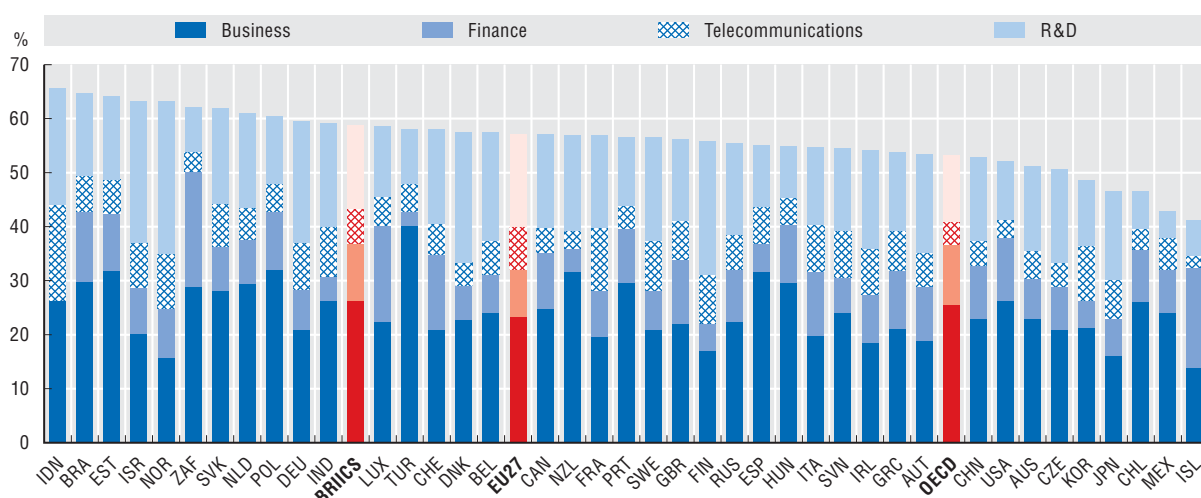


Source: US Patent and Trademark Office (2011), “The USPTO Trademark Casefile Dataset (1884-2010)”; OHIM Community Trademark Database; CTM Download, April 2011. See chapter notes.

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Trademarks in knowledge-intensive services, OECD and BRIICS, 2007-09

As a percentage of total service-related trademarks



Source: US Patent and Trademark Office (2011), “The USPTO Trademark Casefile Dataset (1884-2010)”; OHIM Community Trademark Database; CTM Download, April 2011. See chapter notes.

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