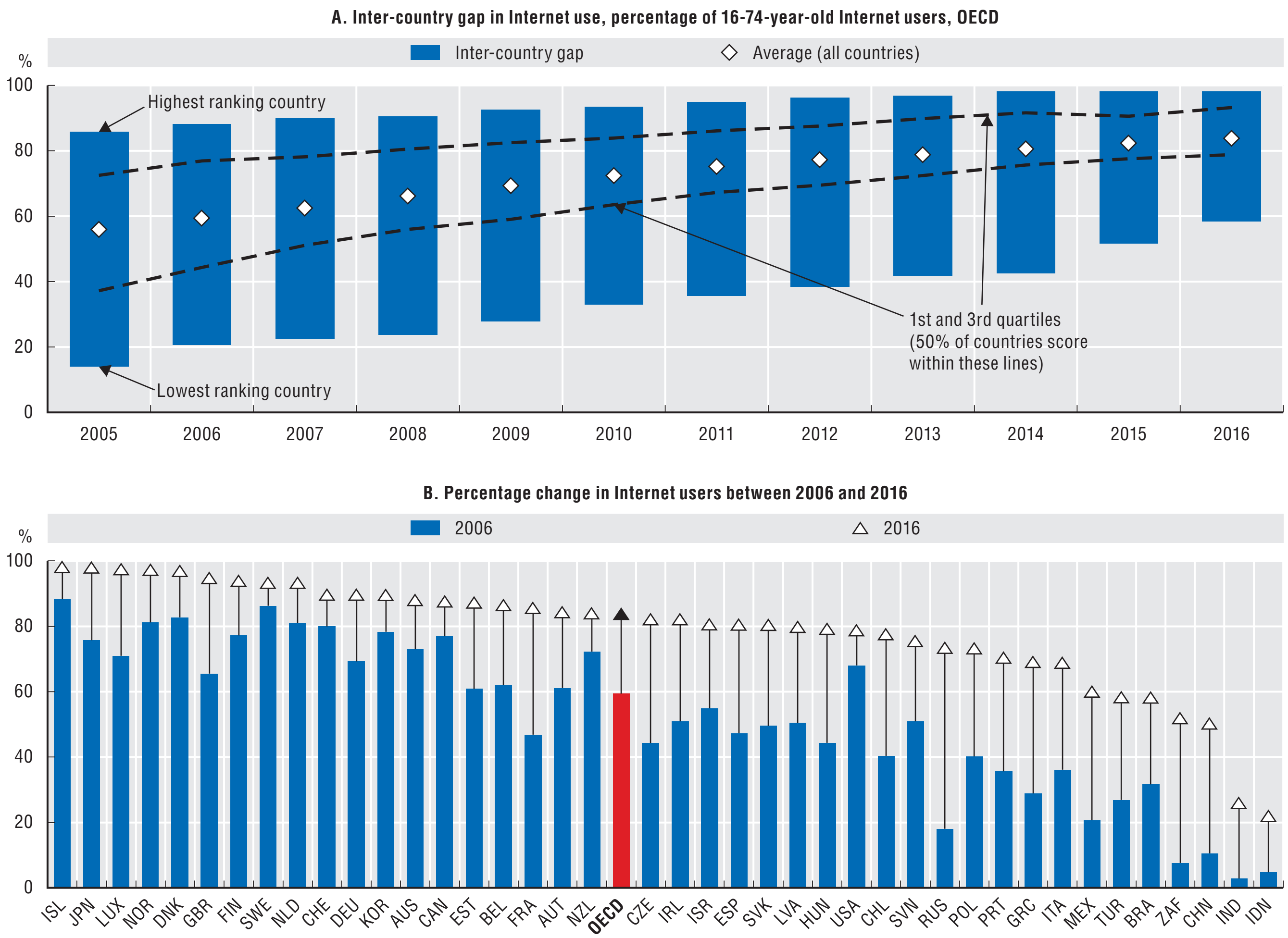
3. Innovation today: Taking action

Narrowing the digital divide

Today's digital economy is characterised by connectivity between users and between devices, as well as the convergence of formerly distinct parts of communication ecosystems such as fixed and wireless networks, voice and data, and telecommunications and broadcasting. The Internet and connected devices have become a crucial part of most individuals' everyday life in OECD countries and emerging economies. The share of Internet users in OECD countries grew on average by 30 percentage points over the last ten years (85% in 2016 as compared to 56% in 2005), and more than doubled in the cases of Greece, Mexico and Turkey. Over 50% of 16-74 year olds in Brazil, China and South Africa use the Internet today, narrowing the gap with OECD countries. Some economies are reaching saturation (uptake by nearly 100% of individuals), while there remains significant potential for catch-up in others, especially lower income countries.

57. Internet usage trends, 2005-16



Source: OECD calculations based on OECD, ICT Access and Usage by Households and Individuals Database, *http://oe.cd/hhind*; ITU, World Telecommunication/ICT Indicators Database and national sources, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617928

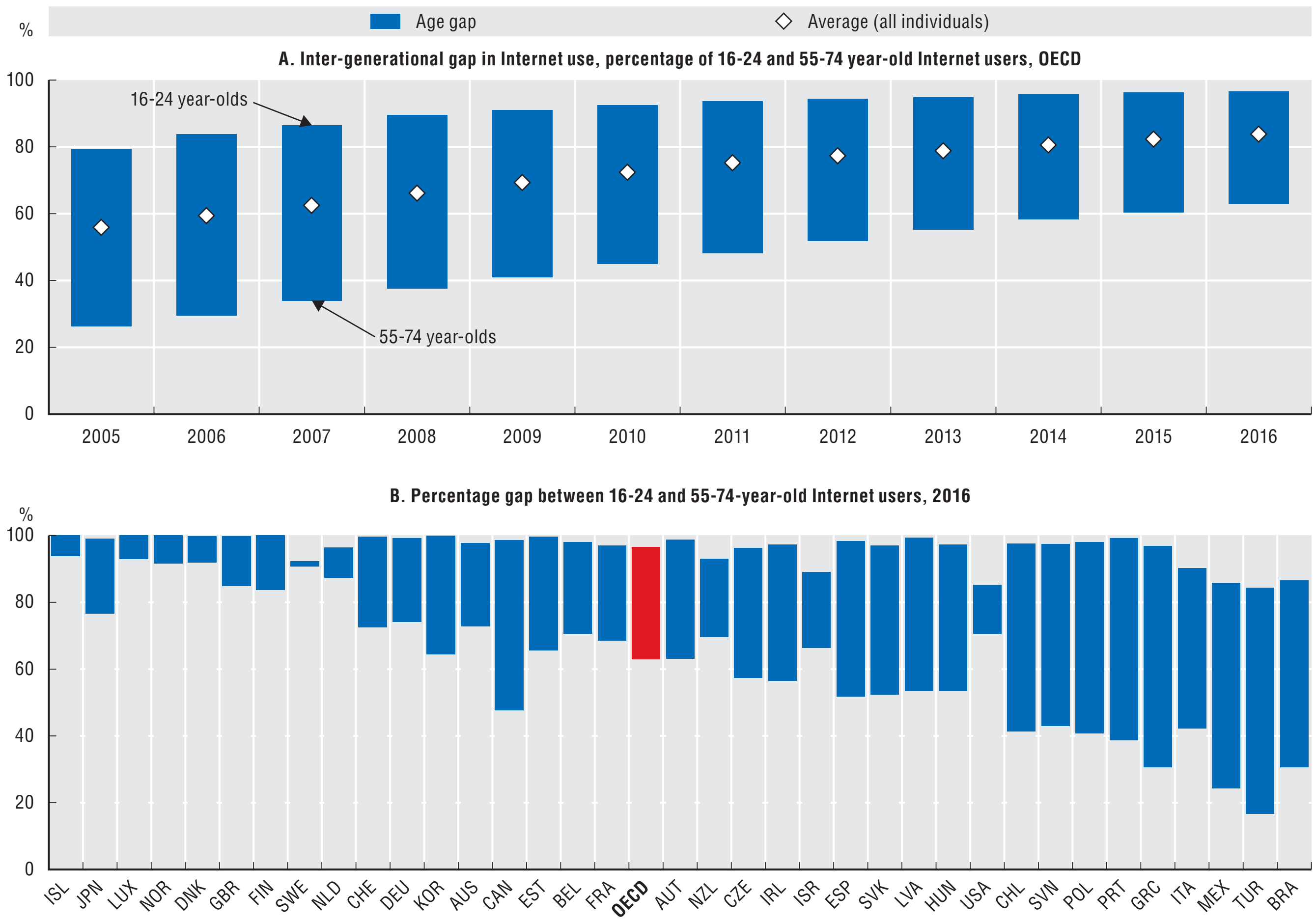
How to read these figures

Panel A shows the inter-country gap of 16-74-year-old Internet users between 2005 and 2016. In 2016, on average across all OECD countries, 84% of individuals aged 16-74 were Internet users with half of the countries ranging between the first (79%) and the third (93%) quartiles of the distribution. Internet users in the lowest-ranking country represented 58% of the population as opposed to 98% in the highest-ranking country. Panel B indicates the change in Internet use among 16-74 year olds between 2006 and 2016 for each country. In Greece, only about one-third of the population were Internet users in 2006 compared to 70% in 2016.

Narrowing the digital divide

The age gap among Internet users has been closing steadily since 2005. The near future is likely to see further narrowing as technology continues to reduce the cost of online access and today's "digital natives" become adults. However, there remain significant differences between younger and older generations in a majority of OECD countries, raising the policy issue of digital inclusion of the elderly. In 2016, Internet penetration was slightly above 60% for individuals aged 55-74 as opposed to more than 95% among 16-24 year olds in OECD countries. Cross-country differences remain wide in terms of Internet use by older generations. Over 90% of 55-74 year olds in Denmark, Iceland, Luxembourg, Norway and Sweden reported using the Internet in 2016, against less than 20% in Turkey.

58. Internet usage trends, by age, 2005-16



Source: OECD calculations based on OECD, ICT Access and Usage by Households and Individuals Database, *http://oe.cd/hhind*; ITU, World Telecommunication/ICT Indicators Database and national sources, June 2017. StatLink contains more data. See chapter notes.

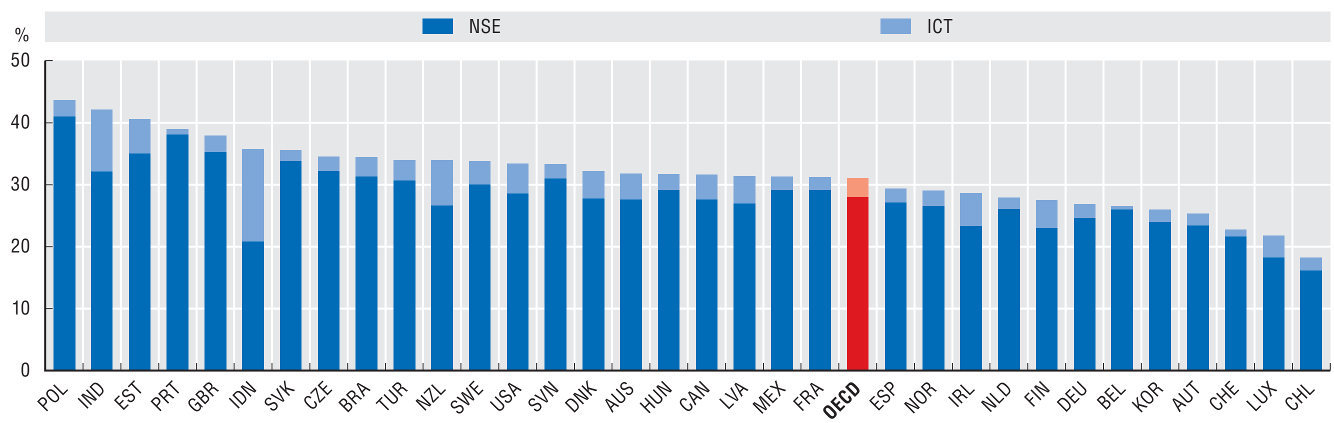
StatLink http://dx.doi.org/10.1787/888933617947

Empowering women in science and innovation

Gender equality is an objective of research and innovation policy in many countries and organisations. It aims to promote equal participation and opportunities for women and men, from compulsory education to achieving a better gender balance in research careers from entry positions through to more senior roles. It also entails the integration of the gender dimension in research content, taking into account the biological characteristics and social and cultural features of both women and men. In the OECD area, approximately 30% of graduates in the natural sciences, engineering and ICTs (NSE & ICT) are women, implying considerable under-representation. Women representation among the population of corresponding scientific authors, at close to 22%, is significantly lower than women's graduation rates at tertiary and doctorate level. Women's representation is even lower among subgroups of authors with "leadership" characteristics, reflected in high earnings, paid review, editorial activity, as well as a full dedication to research. One potential cause of concern is the relative under-representation of women in certain external engagement activities that are increasingly recognised in governmental research assessment exercises, such as the reported use of research in media reports or technical documents such as patents.

59. Women tertiary graduates in natural sciences, engineering and ICTs (NSE & ICT), 2015

As a percentage of all tertiary graduates in NSE & ICT

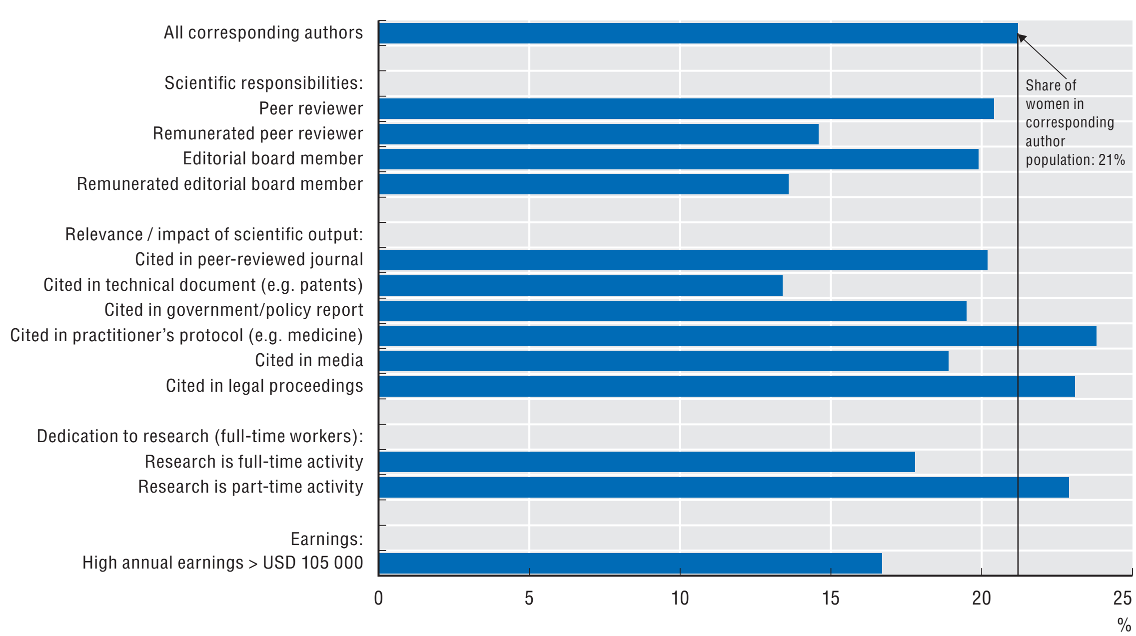


Source: OECD calculations based on OECD, Education Database, September 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617966

60. Women in science, 2015

Share of women within the relevant group of corresponding scientific authors



Source: OECD analysis, based on OECD (2016), "International Survey of Scientific Authors: Public use microdata for 2015 pilot study – ISSA1", OECD, Directorate for Science, Technology and Innovation, *http://oe.cd/issa*, June 2017. See chapter notes.

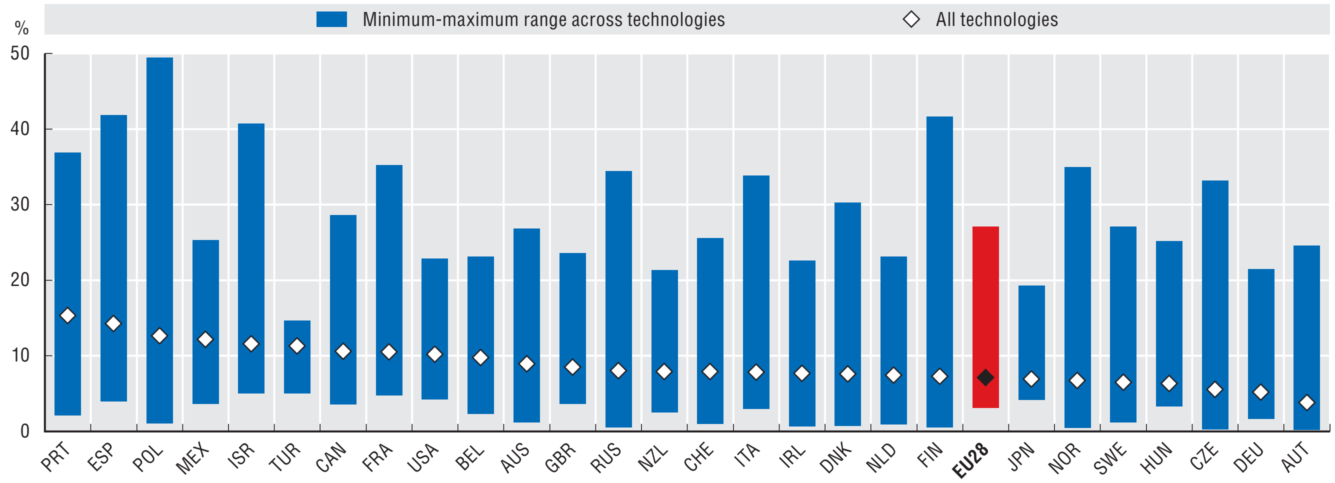
StatLink http://dx.doi.org/10.1787/888933617985

Empowering women in science and innovation

The contribution of women to the development of new technologies, as measured by the proportion of patents featuring women inventors, ranges between about 4% in Austria to over 15% in Portugal, on average. In 2012-15, in the United States, 10% of patents were invented by women, compared to 7% in Japan. Significant differences in the share of women inventors are also observed across technology fields. In most countries, the contribution of women to patented inventions is highest in pharmaceuticals (up to 42% in Spain) and biotechnology (49% in Poland), whereas the technology fields where the presence of women inventors is lowest are civil engineering and telecommunications (0.3% in the Czech Republic and Austria). Factors that may contribute to explain these observed patterns include differences in the technological and industry specialisation of countries and in the share of women graduating in science-related fields, and the participation of women in the labour market.

61. Patenting activity by women inventors, 2012-15

As a percentage of IP5 patent families by technology and inventors' country



Source: OECD, STI Micro-data Lab: Intellectual Property Database, *http://oe.cd/ipstats*, June 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618004

How to identify women inventors?

Identification of women inventors is based on a methodology that relies on country-specific gender-name dictionaries applied to inventors' names listed in patent documents (for details, see Lax Martínez, Raffo and Saito, 2016). Statistics are available only for economies where more than 80% of inventors' names can clearly be attributed by gender. As names of inventors from Asian economies remain difficult to disentangle by gender, the indicator could not be compiled for economies such as China or Korea. Data refer to IP5 families by filing date and are grouped according to the inventors' residence and gender, using fractional counts. Patents are allocated to technology fields on the basis of the International Patent Classification's (IPC) codes listed in patent documents following the concordance provided by WIPO (2013).

How is women's representation in science measured?

Estimates of women's representation in science are based on authors' self-reported information in the online-based OECD Pilot Survey of Scientific Authors, carried out in 2015 (*http://oe.cd/issa*). The sample was drawn from documents published in 2011 and indexed in the Scopus database, focusing on the document's author designated as "corresponding author". The fields covered in this survey were: Arts and Humanities, Business, Chemical engineering, Immunology and Microbiology, Materials Science, Neuroscience, Physics and Astronomy. Weighted averages take into account the online survey sampling design and non-response patterns by fields, country and journal status. In the chart, women's absolute and relative representation along various dimensions of scientific research can be assessed through comparison with the 50% benchmark and the share of women in this specific population. Public use microdata files for the ISSA 2015 pilot survey are available for download from the project's site for research purposes.

Funding long-term, higher-risk research

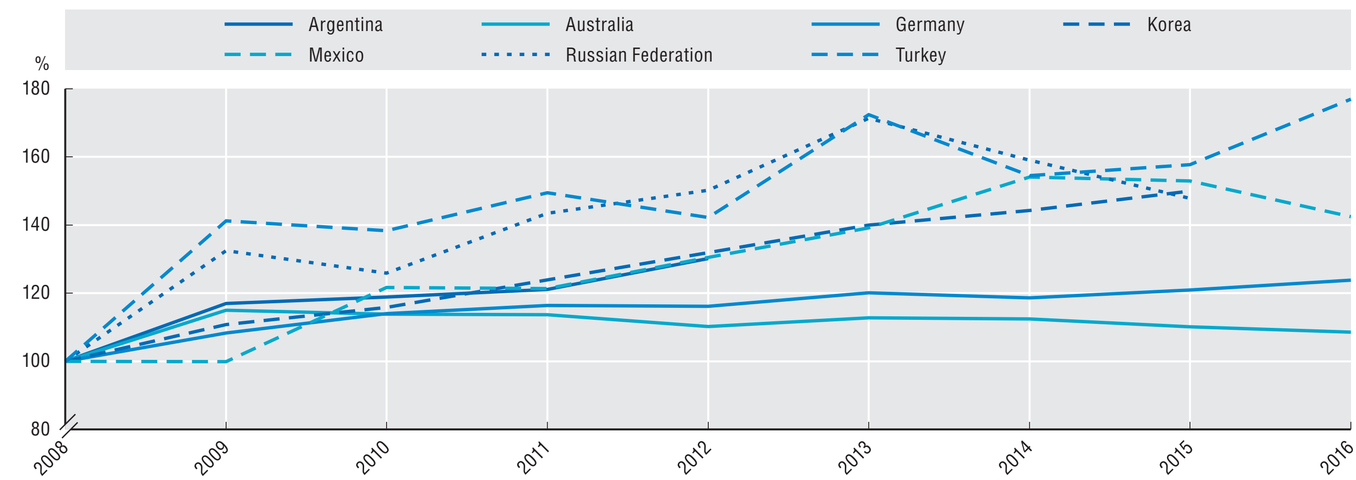
Research and development (R&D) is a key driver of long-term economic performance. Government plays an important role in supporting investment in this area, especially in cases where the private sector is reluctant to spend due to the scale of investment required, the non-excludability of the resulting assets, or the degree of uncertainty or risk involved.

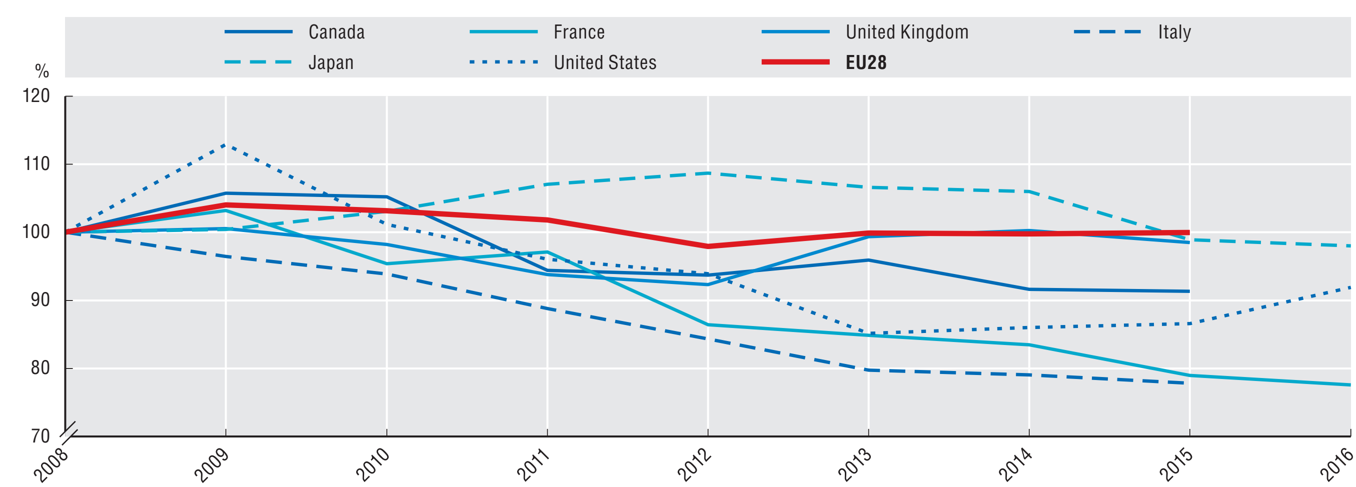
Over the period 2007-16, overall government investment fell both as a share of government spending and as a share of GDP in almost all OECD countries (OECD, 2017b). As a corollary to this, government R&D budgets have levelled-off or declined in many OECD countries and G20 economies. While the level of government R&D budgets in EU 28 countries remained roughly constant over the period 2008-15, France and Italy experienced a decline in real terms of over 20%, with a decrease of over 30% in Latvia and Spain. Government R&D budgets in the United Kingdom and the United States have begun to recover after declining between 2009 and 2012/13. Meanwhile, some countries have witnessed rises in the R&D budget, most notably Turkey (up by almost 80%) and Korea (up by 50%).

In some cases, a fall in government R&D budgets may be partially explained by a re-orientation towards other innovation support instruments, such as R&D tax incentives. However, changes in the R&D support policy mix may impact overall funding for long-term, higher-risk research as R&D tax incentives usually target businesses, which tend to perform less basic research than other sectors.

62. Government R&D budgets, selected economies, 2008-16

Constant price index (USD PPP 2008 = 100)





Source: OECD, Research and Development Statistics Database, *http://oe.cd/rds*; Eurostat, Statistics on Research and Development, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618023

 OECD SCIENCE, TECHNOLOGY AND INDUSTRY SCOREBOARD 2017: THE DIGITAL TRANSFORMATION © OECD 2017

Funding long-term, higher-risk research

While governments fund a wide variety of research areas, there is increasing support for long-term and higher-risk research related to societal challenges such as climate change, feeding the growing world population and health conditions such as dementia. In 2016, the United States had a total government R&D budget of USD 149 billion – more than the next nine countries combined. Of this, 60% is allocated to defence and space-related R&D. Turkey and the United Kingdom are the only other OECD countries to devote 20% or more of their government R&D budgets to defence and space R&D. Such data are unavailable for China, Israel, and the Russian Federation.

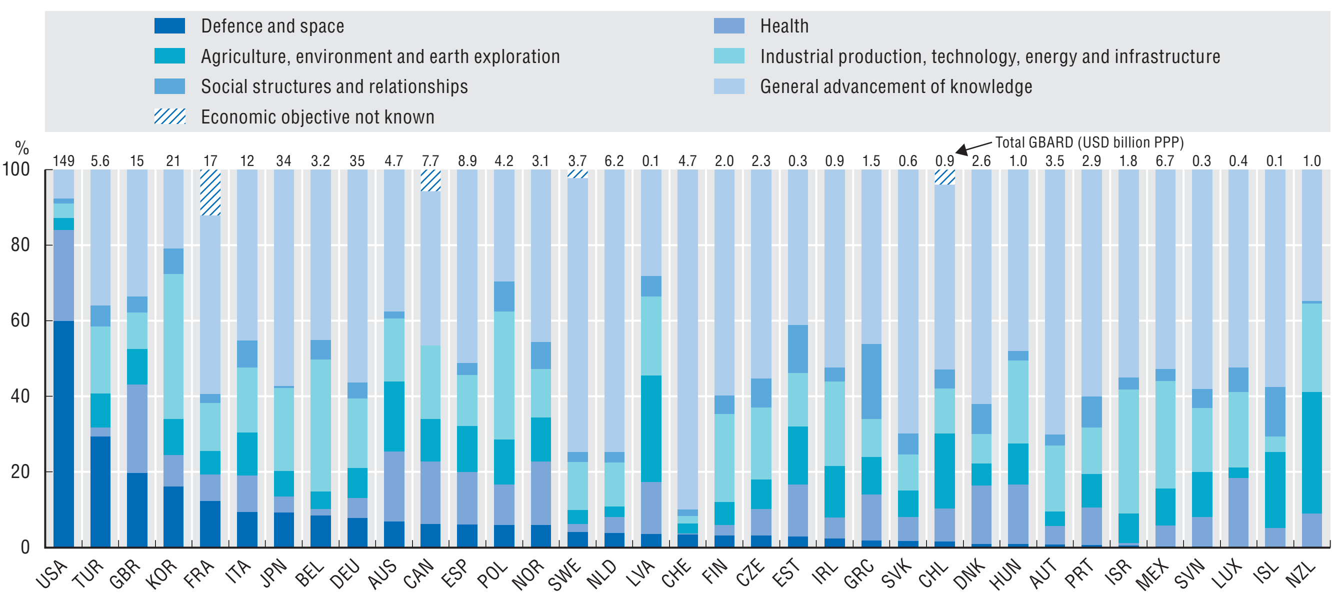
General advancement of knowledge (GAK) is the main socio-economic objective (SEO) in many countries because it includes all budget allocations earmarked for R&D but which cannot be attributed to a specific objective, as well as all R&D financed from general purpose grants from ministries of education. Further details are available for a subset of 15 European countries, with natural sciences being the main recipient of these funds for R&D.

In many countries, a sizeable proportion of funding is allocated to agriculture, environment and earth exploration, in order to address key societal challenges related to sustainably feeding the growing global population and mitigating climate change. Industrial production, technology, energy and infrastructure also accounts for a large share. The share earmarked for social structures and relationships, which includes R&D related to improving educational provision, is generally relatively small.

Across OECD countries, defence and space-related R&D budgets fell in real terms, from 32% in 2006 to 24% in 2016. Defence R&D bore the brunt of these reductions, most notably in France (-80%), and Sweden (-77%). Only Korea and Poland experienced rises in defence R&D budgets. GAK rose from 28% to 32% over the same period with other areas remaining relatively stable.

63. Government R&D budgets, by socio-economic objective, 2016

Share of total government budget allocations for R&D



Source: OECD, Research and Development Statistics Database, *http://oe.cd/rds*; Eurostat, Statistics on Research and Development, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618042

How is direct government support of R&D measured?

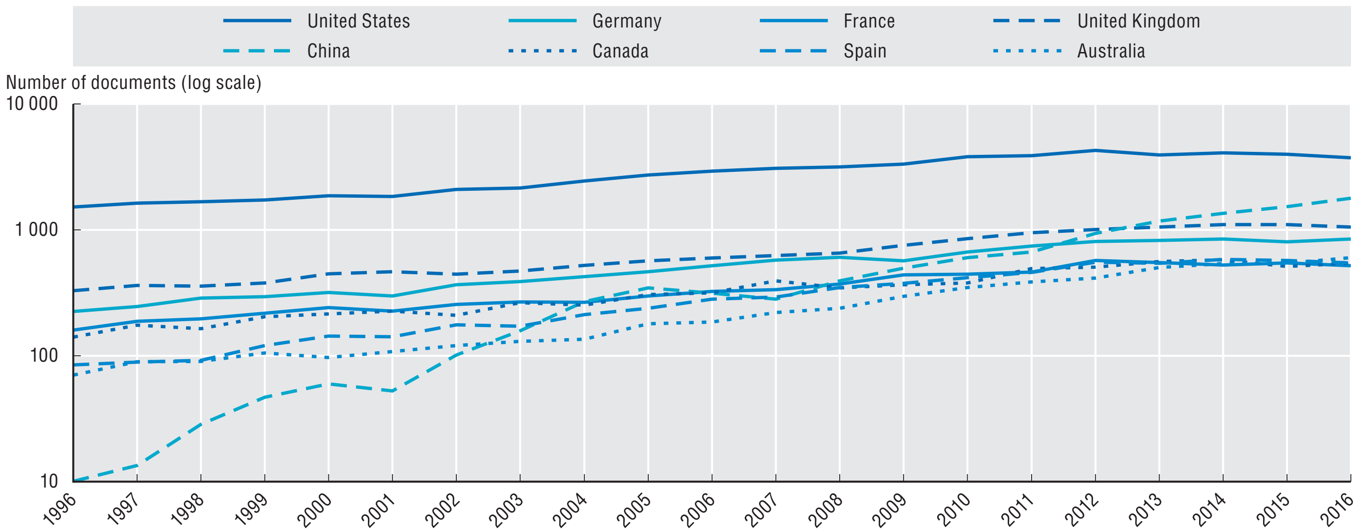
Data on "government budgetary allocations for R&D" (GBARD) encompass all allocations from sources of government revenue (e.g. taxes) foreseen within the budget. Only funds allocated through the government budgetary process are included; extra-budgetary units and public corporations' funds are excluded. These data are typically more timely than R&D survey data, but may not precisely follow the OECD *Frascati Manual* definition of R&D due to limited detail in budgetary systems. Likewise, allocating R&D-related items to socio-economic objectives (SEOs) can be challenging. In some cases, funding for a long-term R&D project may be allocated in a single year. For a number of G20 economies (e.g. China and the Russian Federation), it is not possible to distinguish budgetary support for R&D from other public investments in STI. Further data are available from *http://oe.cd/rds*.

Addressing global challenges: Dementia

As with many neurodegenerative diseases (NDDs), dementia is a debilitating condition for which there is currently no cure. Both the human and financial costs of dementia are of growing concern, especially given the ageing worldwide population. Scientific research is a cornerstone of efforts to address this global challenge, leading the OECD to issue a call for action to rebalance the risks and rewards of research in order to encourage a broader approach that helps target the disease from an early stage (OECD, 2015b). Experimental analysis of scientific publications' abstracts over two decades shows a steady increase in research related to dementia among leading countries up to 2012. Thereafter, the rising trend slowed in most leading countries including the United States, where 1.2% of the government's research budget was estimated to be allocated to NDDs in 2012 (OECD, 2015b). This cannot be accounted for by the incomplete indexing of publications in recent years that is common to bibliometric databases – which should only affect 2015 and 2016 values. However, China has made major strides in this area from a very low initial base.

64. Scientific research on dementia and neurodegenerative diseases, selected countries, 1996-2016

Total number of dementia-related documents in the Scopus database, fractional counts



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618061

Which documents are related to dementia?

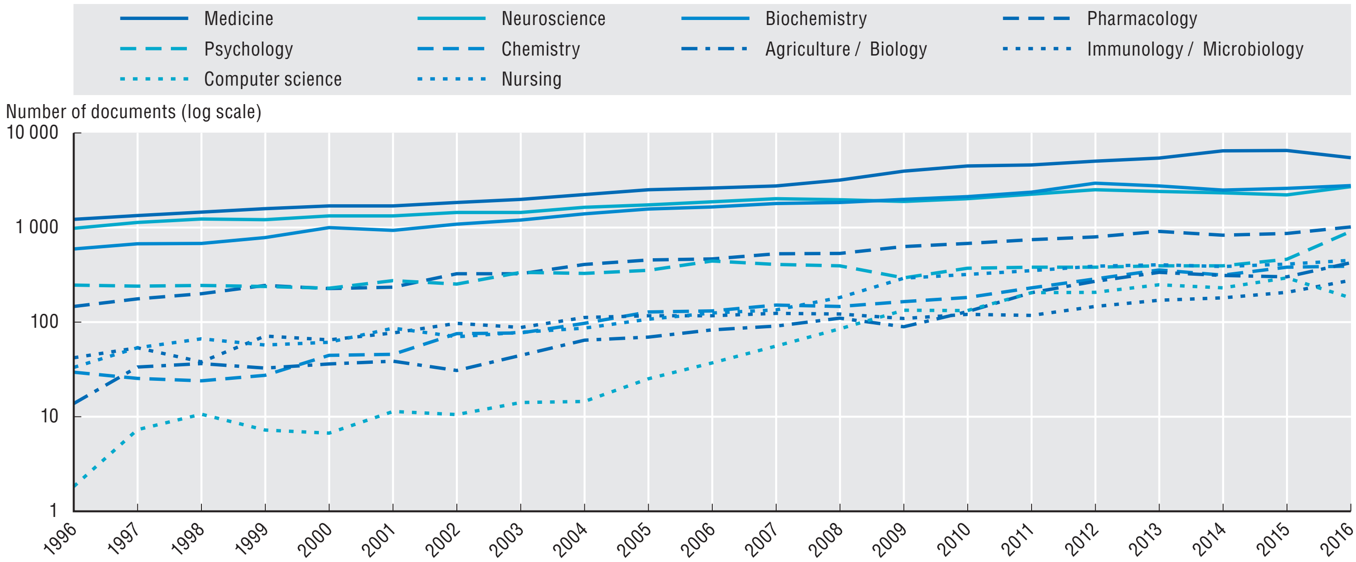
These experimental estimates are based on searches for the text items "neurodegenerat*", "dementia" and "Alzheimer" in the abstracts of articles published between 1996 and 2016 in the Scopus database. Neurodegenerative diseases include Alzheimer's disease and related dementia, Huntington's disease, Parkinson's disease and a range of motor neuron diseases. While there is a risk of capturing documents that are not strictly relevant (false positives), the main challenge is to capture all relevant documents with the chosen keywords, minimising the incidence of false negatives in the selection process. This risk is higher for basic brain research with no specific application in sight being alluded to in the abstract. The accuracy of this approach depends on the comprehensiveness of abstract indexing, which implies a bias towards English-speaking journals.

Addressing global challenges: Dementia

Data on the disciplinary areas of journals in which dementia-related papers are published show the contribution of a wide range of fields, from neuroscience and pharmacology to psychology and nursing. Consistent with a recent OECD analysis of government R&D budgets for research on neurodegenerative diseases (OECD, 2015b), a significant share of these efforts (as implied by publication outputs) is devoted to areas related to the understanding of the basic science behind the disease (e.g. neuroscience, biochemistry). Efforts in the areas of clinical or healthcare-related research for dementia can be implied from the fields of medicine (largest by number), nursing and psychology. The fast growth in the importance of computer science testifies to the crucial role of big data in addressing the complexity of dementia as a means to advance the understanding of risk reduction factors, care and treatment.

65. Disciplinary areas contributing to the scientific output on dementia and neurodegenerative diseases, 1996-2016

Total number of dementia-related documents in the Scopus database, by ASJC journal field, fractional counts



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618080

How are the disciplinary areas identified?

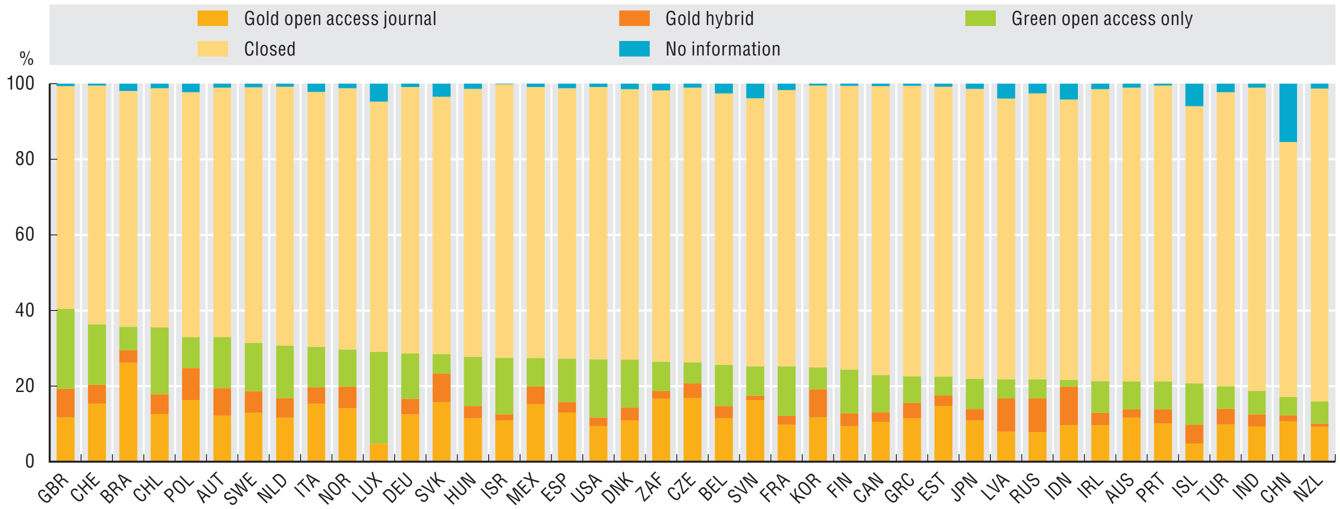
The disciplinary areas are based on Elsevier's classification approach whereby each journal in Scopus is assigned to one or more subjects using its "All Science and Journal Classification" (ASJC). This comprises 27 main fields and 334 more narrowly defined subjects. Results are presented for the main fields on a fractional basis. In the case of documents in general journals, each document is apportioned across substantive areas based on the distribution of citing and cited documents ASJC fields. Further work is necessary to understand the extent and nature of interdisciplinary in this area. For example, evidence of interdisciplinarity can be found in instances of highly cited documents on the use of graphene (a nanotechnology product) in the early detection of dementia in patients.

Opening access to science

Access to scientific research articles plays an important role in the diffusion of scientific knowledge. Today's digital opportunities facilitate the sharing of scientific knowledge to promote its use for further research and innovation. The promotion of open access (OA) to publications is relevant to open science (i.e. efforts to make the outputs of publicly funded research more widely accessible in digital format to the scientific community and to society more broadly). A new and experimental indicator, based on online queries for documents about one year after publication, reveals that 60% to 80% of content published in 2016 is only available one year after to readers via subscription or payment of a fee. Journal-based OA (gold) is particularly noticeable in Brazil, as well as in many other Latin American economies. Repository-based OA (green) is especially important for authors based in the United Kingdom. Nowadays, about 5% of authors appear to be paying a fee to make their papers publicly available within traditional subscription journals (gold hybrid).

66. Open access of scientific documents, 2017

As a percentage of a random sample of 100 000 documents published in 2016



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017; and roaDOI "wrapper" routine for the oaDOI API, *https://oaDOI.org*, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618099

How to measure open access using online tools

The last edition of this publication measured open access to scientific publications using the results of an online survey of scientific authors worldwide carried out by OECD (*http://oe.cd/issa*). This edition derives the indicator from an automated online query on a random (non-stratified) sample of 100 000 citable documents (articles, reviews and conference proceedings) published in 2016 and contained in the Scopus database, with associated DOIs (over 90% of cases). Assessment of the OA status of the documents was conducted in June 2017 using the R-language based "wrapper" routine for the oaDOI application programme interface (API) produced by ImpactStory, an open-source website that works to help researchers explore and share the online impact of their research. The API returns information on the ability to secure legal copies of the relevant document for free and the different mechanisms:

Gold open access journal applies to documents associated to publishers included in the Dictionary of Open Access Journals that make their content openly available at no charge to readers.

Gold hybrid indicates that a document is accessible from a publisher that typically requires subscription for general access, but allows open access to the specific document, normally with the author or their sponsors paying article processing charges that provide for open access by third parties (as for most gold open access journals).

Green open access indicates that legal versions of the document exist in repositories or related outfits, and do not match either of the gold categories. This value may be underestimated if the oaDOI fails to identify all legally available copies or nearly identical versions.

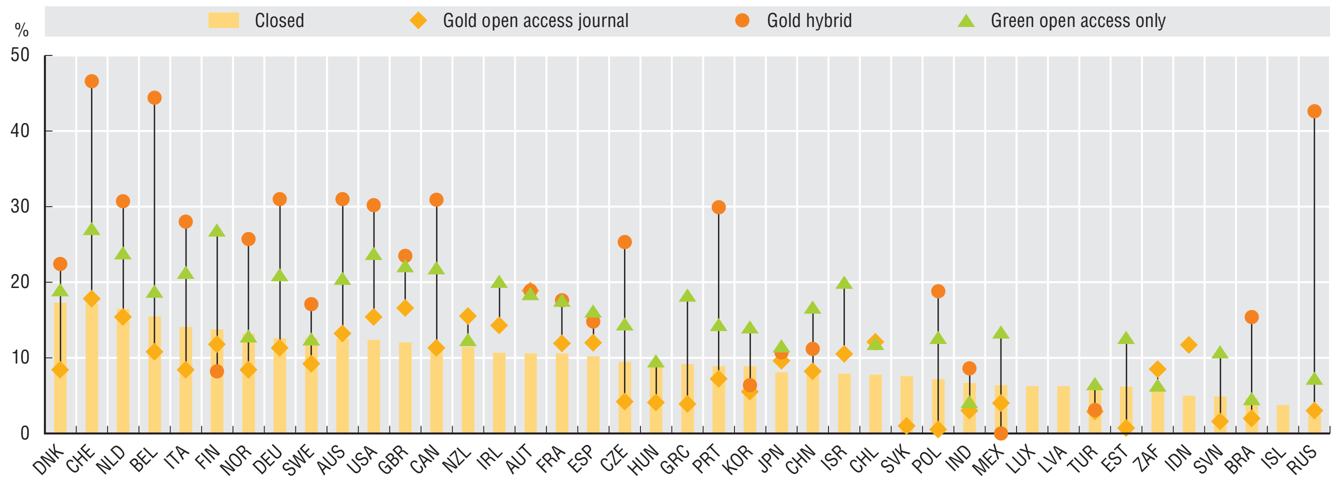
When the DOI cannot be resolved to any source of access information, the result is marked as "No information - status not available". This category is particularly high for China at more than 15%. When the DOI resolves and the return indicates that there are no legal open versions available, the document is marked as "Closed". This includes documents under embargo.

Opening access to science

Assessing the extent to which open access (OA) publications receive more citations than non-OA publications helps policy makers evaluate the social costs and benefits of alternative scientific publication funding mechanisms. This has led to efforts to measure the so-called “open access citation advantage”. Bibliometric results using the latest wave of data available confirm previous survey results presenting a mixed picture (OECD, 2015c; Boselli and Galindo-Rueda, 2016), as not all forms of OA appear to confer an advantage. OA is associated overall with higher citation rates among documents covered by major indices, but this does not apply to documents published in OA journals, which on average tend to be more recent and present lower historical citation rates. Repository-based (green) OA systematically confers a citation advantage. In most cases, higher citation rates are found within countries among “gold hybrid” documents (i.e. those published in subscription journals whose authors pay publishers a fee to enable free online access on the part of potential readers).

67. Highly cited scientific documents, by open-access status, 2017

Percentage within the 10% most-cited published in 2016



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017; and roaDOI wrapper for the oaDOI API, *https://oaDOI.org*, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618118

The impact of open access beyond citation by peers

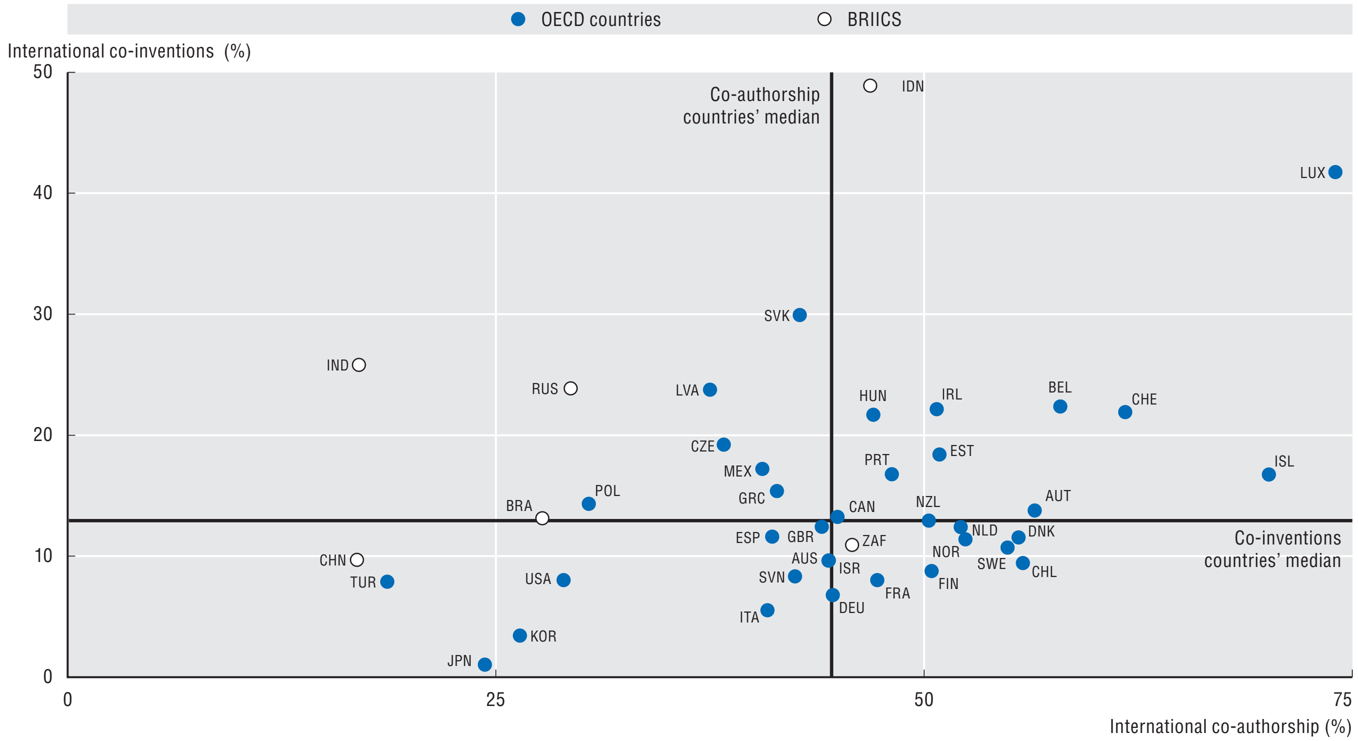
Citation rates are imperfect measures of scientific impact, even when normalised by field, cohort and type of document. A major concern is that they do not capture the relevance and usefulness of the research to a wider community of potential users of scientific knowledge, who are less likely to publish in peer-reviewed scholarly journals (e.g. general medical practitioners, inventors in business, government officials, etc.). Based on self-reported information by authors, the OECD ISSA1 study shows that open-access documents are more likely to have been cited in a broader set of use settings, such as government reports, patents, legal cases or practitioner protocols, as well as non-peer-reviewed working papers. Given the increasing digital fingerprint of many of those activities, Internet-based metrics are increasingly being used to provide information on broader types of impacts. However, one possible drawback is that these metrics may actually provide measures of “popularity” and in turn distort behaviours if used to conduct research assessment (*http://oe.cd/blue-sky*). Analysis of the link between different forms of open access to scientific documents and research impact appears to point to a potential decoupling of the quality assurance and access roles traditionally played by academic journals.

Promoting international collaboration and mobility

Collaboration within and across countries is a pervasive feature of research and innovation activities worldwide, and a key driver of knowledge exchange. International collaboration can be documented by tracking the affiliation(s) of co-authors of scientific publications and co-inventors of patented inventions. With the exception of India and Indonesia, all BRIICS (white circles) and OECD countries (blue circles) display higher rates of scientific collaboration than international co-invention. While exhibiting similar levels of engagement in international co-authorships, scientifically and technologically advanced economies such as Japan, Korea and the United States present different levels of co-inventorship, with Asian inventors being relatively less engaged in cross-country collaboration. Small, open economies tend to display higher collaboration rates. Factors such as scientific and technological specialisation, collaboration opportunities, and geographical and institutional proximity may help explain these patterns.

68. International collaboration in science and innovation, 2005-16

Co-authorship and co-invention as a percentage of scientific publications and IP5 patent families



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017 and OECD, STI Micro-data Lab: Intellectual Property Database, *http://oe.cd/ipstats*, July 2017. StatLink contains more data. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933618137*

Interpreting the indicators

International co-inventions are the share of inventions that include at least one foreign co-inventor in total patents invented domestically. Data refer to IP5 patent families (inventions patented in the five top IP offices) filed in 2005-15 according to the inventor's residence, by first filing date and according to the inventor's residence, using whole counts.

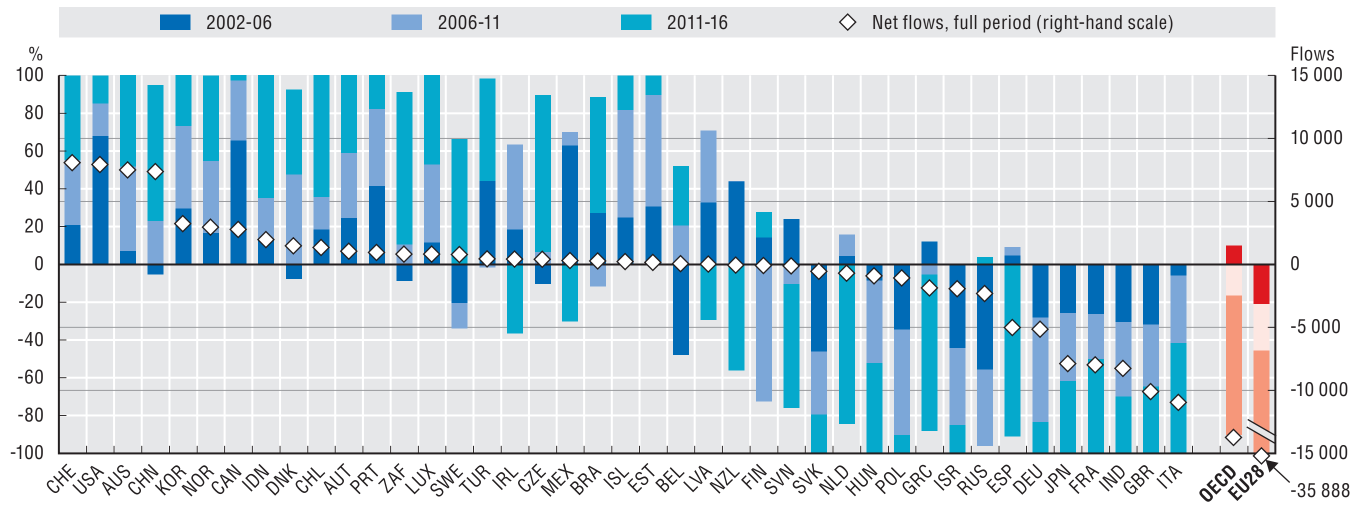
International co-authorship of scientific publications is measured in terms of the share of articles featuring authors affiliated with foreign institutions (from a different country or economy) in total articles produced by domestic institutions. For comparability with data on co-inventions, a whole counts approach is used in this case. This results in larger estimates than presented on a fractional basis in Chapter 3 of this publication.

Promoting international collaboration and mobility

Indicators of international scientist mobility, based on changes in authors' affiliations, reveal that mobility is mostly characterised by mutual "brain circulation", rather than one-directional flows ("brain gain/drain"). However, analysis of net entry and exit flows of scientific authors over time can be highly informative, especially with regard to a science system's response to events and policies adopted by countries linked to the funding of scientific research, support for scientific international mobility and policies designed to attract the highly qualified. Data on net flows since 2001 show that Switzerland, the United States and Australia attract the largest numbers of scientists, followed closely by China, which has gone from being a large net "donor" to becoming the largest net recipient among major economies. In the United States, the net entry of scientists has slowed in recent years. Japan and India have accumulated net losses, while the Russian Federation began to attract more publishing scientists since 2014. The EU28 area became a net attractor for a short period in 2008-09, but registered a very significant deficit after 2011. Over the last 15 years, almost 36 000 more scientific authors left the EU than entered. This is explained in part by the return mobility of individuals who arrived as students before becoming published scientists. There are significant variations across the largest EU28 countries, with the United Kingdom attracting scientists in 2014-16, while Spain joined Italy in becoming the largest relative net donors among economies with high levels of scientific output.

69. International net flows of scientific authors, selected economies, 2002-16

Difference between annual fractional inflows and outflows, as a percentage of total flows



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618156

How to read this figure

This figure decomposes the overall net flow of scientific authors across different years for OECD countries and BRIICS economies over the period 2001-16, expressed in relative terms. This helps to identify the timing and intensity of different phases of net entry and net exit from the perspective of a given country. For example, Germany and Spain experienced a similar cumulative net loss over the period (see the diamond value on the right-hand scale). In the case of Spain, this is the result of a phase of moderate gains in the 2000s, followed by a significant net outflow of scientific authors after the crisis. In contrast, Germany's pattern is relatively more stable and it has reduced its deficit in recent years.

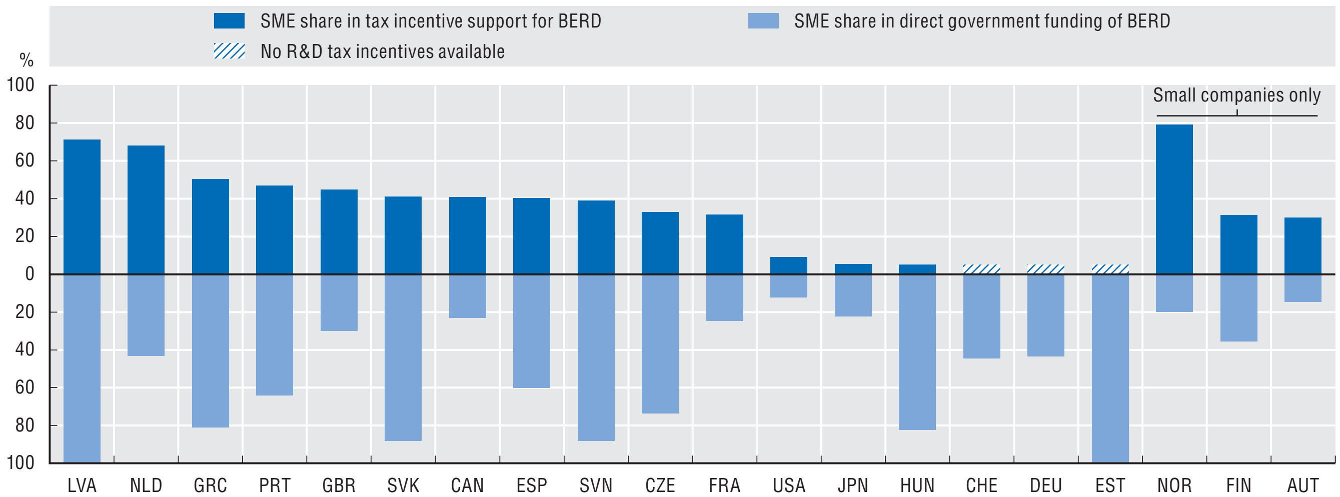
Monitoring changes in scientist affiliations in global repositories of publications provides a complementary source of detailed information. However, its scope is limited to authors who publish and do so regularly, as otherwise their affiliations cannot be detected and timed in a sufficiently accurate way. Mobility can only be computed among authors with at least two publications. These indicators are likely to understate flows involving countries and fields where there are moves to industry or organisations within which scholarly publication is not the norm. Furthermore, the measurement of mobility can be hard to disentangle from that of collaboration in the case of authors with multiple affiliations in different countries. A fractional mobility count approach has been used in this case.

Supporting business innovation

Government support for business R&D seeks to encourage firms to invest in knowledge that can result in innovations that transform markets and industries and result in benefits to society. Governments can adopt various instruments to incentivise R&D by business. In addition to direct support such as grants and buying R&D services, 30 out of the 35 OECD countries provided fiscal incentives in 2017, up from 16 OECD countries in 2000. As R&D is highly concentrated in large firms, the latter tend to be the main recipients of direct and tax support for business R&D (BERD). New OECD analysis sheds light on the distribution of support by business size for a number of countries. The SME share in R&D tax support ranges from 5% in Hungary to 71% in Latvia and 79% in Norway (small companies only). While direct support is by and large discretionary, the SME share in tax support tends to be more closely aligned with the SME share in BERD, confirming the notion that tax incentives are generally a demand-driven complement to direct government support for R&D. It is worth noting that the SME share in tax support exceeds the share of direct funding in Austria, Canada, France, the Netherlands, Norway and the United Kingdom. All these countries offer refundable R&D tax incentives that particularly target smaller R&D performers, allowing them to make use of earned tax credits even in the case of insufficient tax liability where any excess credits are paid in full or in part to the taxpayer.

70. Direct funding and tax incentive support for business R&D by SMEs, 2015

As a percentage of government support for BERD in each category



Source: OECD, R&D Tax Incentive Indicators, *http://oe.cd/rdtax*, July 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618175

How to measure R&D tax incentives

OECD estimates of the cost of R&D tax incentives are combined with data on direct R&D funding, as reported by firms through R&D surveys, to provide a more complete picture of government efforts to promote business R&D. These efforts can now be mapped over time. The OECD data collection on R&D tax incentives (now in its fifth edition) attempts to identify and address subtle differences in the tax treatment of R&D, the relevant tax benchmark and measurement approaches. National experts on science and technology indicators have collaborated with public finance and tax authorities to provide the most up-to-date and internationally comparable figures possible. The estimated cost of provisions for the treatment of R&D expenditures by firms is presented relative to a common benchmark (full deductibility of current R&D) whenever possible. Estimates reflect the sum of foregone tax revenues – on an accruals basis – and refunds where applicable. The latest edition of the OECD *Frascati Manual* incorporates a new chapter dedicated to the measurement of R&D tax incentives (OECD, 2015a): see *http://oe.cd/frascati*.

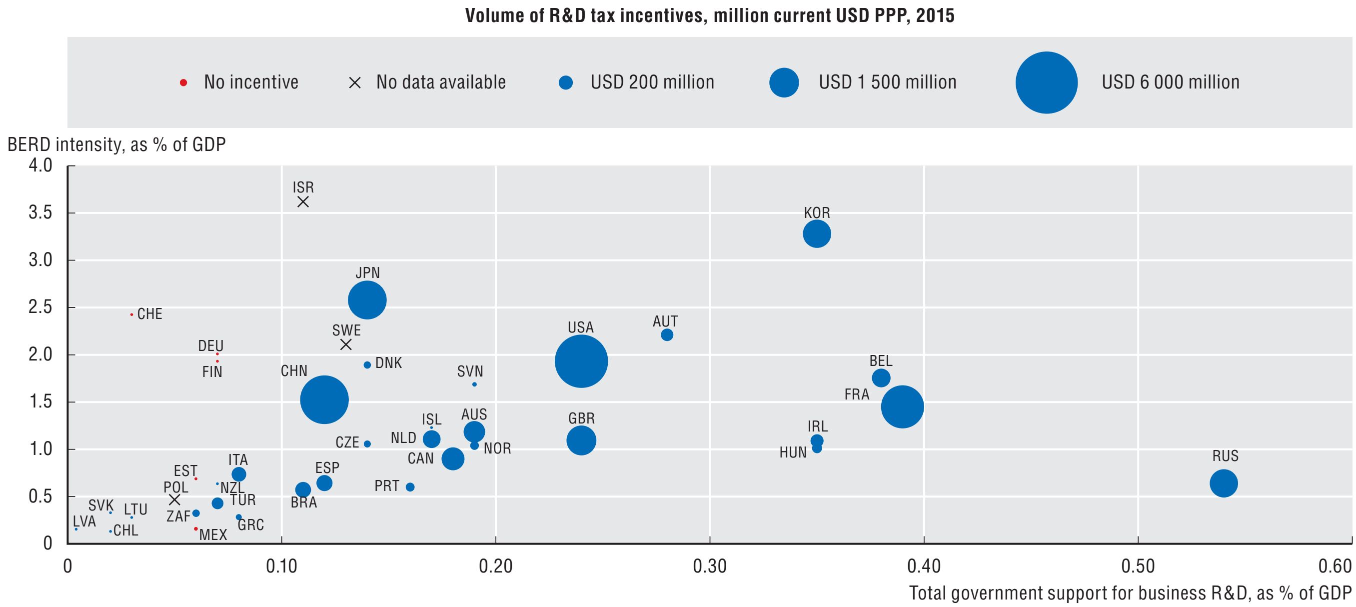
This specific indicator is presented on a experimental basis. International comparability may be limited (e.g. due to variations in SME definitions for business R&D versus R&D tax relief reporting purposes). For BERD and government-funded BERD, SME figures generally refer to enterprises with 1 to 249 employees (i.e. excluding firms with zero employees), unless otherwise specified. A number of countries adopt additional criteria to define SME status. For SME definitions, see *http://oe.cd/sb2017_notes_rdtax*.

Supporting business innovation

Across countries, R&D intensity in the business sector has a positive correlation (0.3) with the level of government support to business R&D, with some notable exceptions. Germany and Korea present relatively high business R&D intensities compared to their degree of measured government support, while France, Hungary and the Russian Federation have high rates of support relative to countries with similar business R&D-to-GDP ratios. A complementary indicator compares the evolution of government support for R&D and business R&D intensity. Over the 2006-15 period, countries with the largest increase in government support exhibited higher growth in R&D intensity. China and Korea's growth in R&D intensity is higher than predicted by their change in measured government support. Changes in government support appear to account for approximately 17% of the observed variation in business R&D intensity over the 2006-15 period. Additional analysis shows that almost two-thirds of this explained variation is accounted for by changes in direct support and the remainder by tax support.

71. Business R&D intensity and government support to business R&D, 2015

As a percentage of GDP

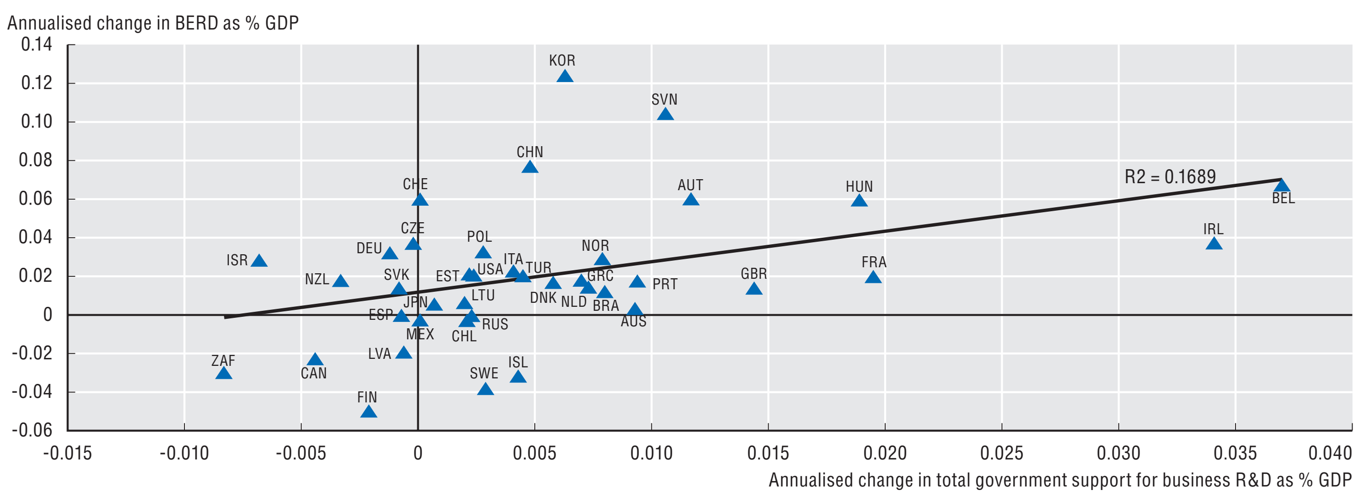


Source: OECD, R&D Tax Incentive Indicators, *http://oe.cd/rdtax*, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618194

72. Changes in government support to business R&D and total business expenditures on R&D, 2006-15

Annualised absolute changes of figures as a percentage of GDP



Source: OECD, R&D Tax Incentive Indicators, *http://oe.cd/rdtax*, July 2017. StatLink contains more data. See chapter notes.

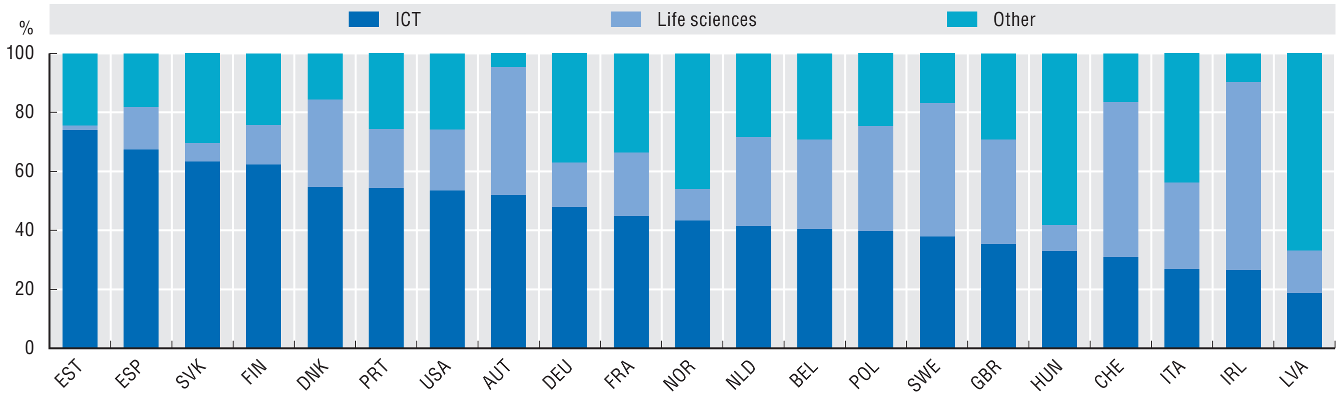
StatLink http://dx.doi.org/10.1787/888933618213

Financing entrepreneurship and innovation

Access to finance for new and innovative small firms involves both debt and equity finance. Venture capital (VC) and business angel investments are important sources of equity funding, especially for young technology-based firms. Available industry level data show that VC investments in 2016 were concentrated mostly in the ICT sector, especially in countries such as Estonia, Spain and the Slovak Republic. In Europe, data for 2015 show that more than one-third of business angel deals involved the ICT sector, while in the United States, data for 2016 show that 45% of all deals related to software, Internet and mobile phones.

73. Venture capital investment in selected countries, by sector, 2016

As a percentage of total venture capital investment

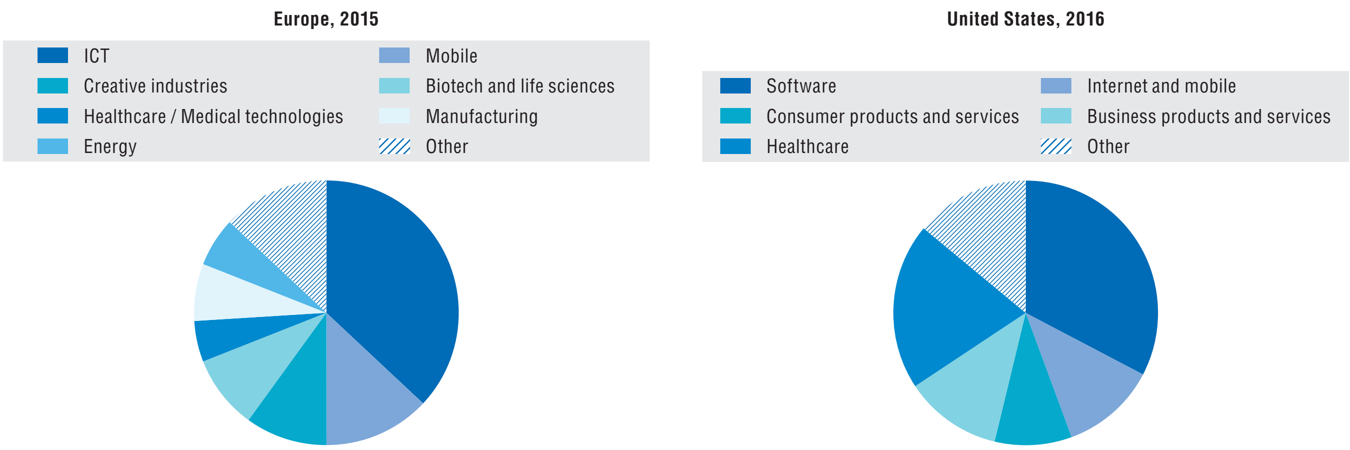


Source: OECD, based on OECD Entrepreneurship Financing Database, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618232

74. Business angel deals by sector, Europe, 2015 and the United States, 2016

As a percentage of total business angel deals



Source: OECD calculations based on ARI (Angel Resource Institute) and networks surveyed by EBAN (European Trade Association for Business Angels, Seed Funds and other Early Stage Market Players), September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618251

Measuring venture capital and angel capital

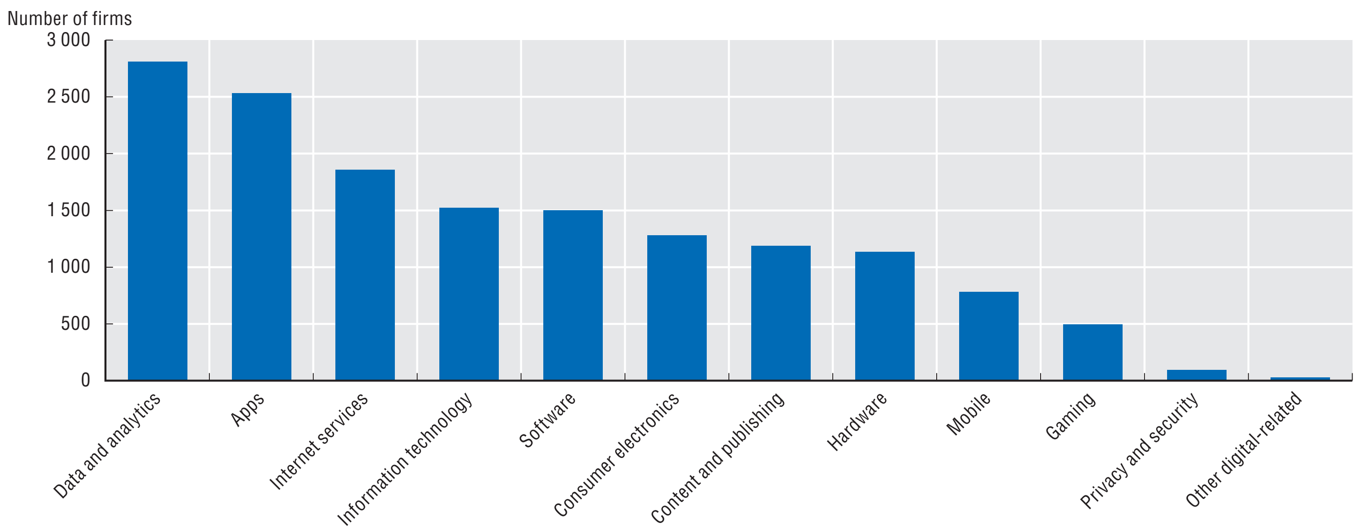
Data on VC are drawn from national or regional venture capital associations and commercial data providers. There is no standard international definition of VC or an available breakdown by stage of development and industry. The OECD Entrepreneurship Financing Database aggregates original data to fit the OECD classification of venture capital by stages and by aggregate industries. Increased co-operation among national/regional VC data providers is likely to improve data availability to provide internationally comparable information on VC investment in different sectors across countries. Angel capital data are collected from the angel networks and groups surveyed by business angel associations. Data on angel investment are difficult to assess due to the discrete nature of such financing (leading to an “invisible market”) and differences in definitions across countries regarding what constitutes an angel investor. In addition, survey-based data typically suffer from inconsistencies regarding the year-on-year number of respondents, as well as from incomplete market coverage (OECD, forthcoming).

Financing entrepreneurship and innovation

Experimental indicators relying on detailed data from Crunchbase© reveal that the majority of equity funds flowing into digital-related start-ups is concentrated in the apps, data and analytics industries. From 2011 to 2016, equity funding in these two sectors accounted for 80% of all equity funding in the digital-related sectors in Estonia and Latvia, and 70% in China.

75. Start-ups in digital-related sectors that attracted equity funding in OECD and BRIICS, 2011-16

Firms aged five years old or less

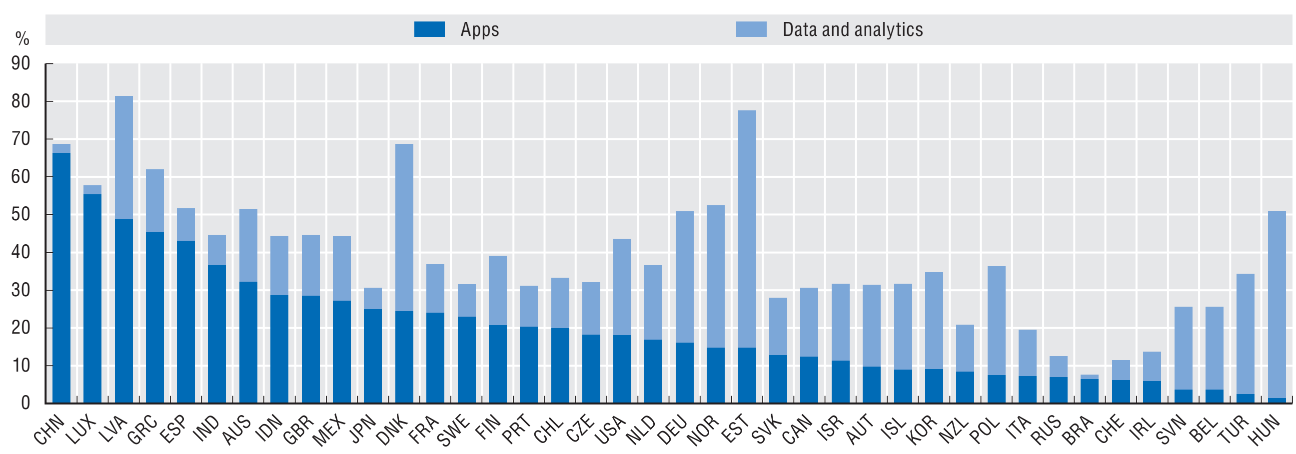


Source: Crunchbase© data, *www.crunchbase.com*, September 2017, as reported in Breschi, Lassebie and Menon (forthcoming). See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618270

76. Top digital-related sectors that attracted equity funding, 2011-16

As a percentage of total equity funding in digital-related sectors



Source: Crunchbase© data, *www.crunchbase.com*, September 2017, as reported in Breschi, Lassebie and Menon (forthcoming), September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618289

Insights from *Crunchbase©*

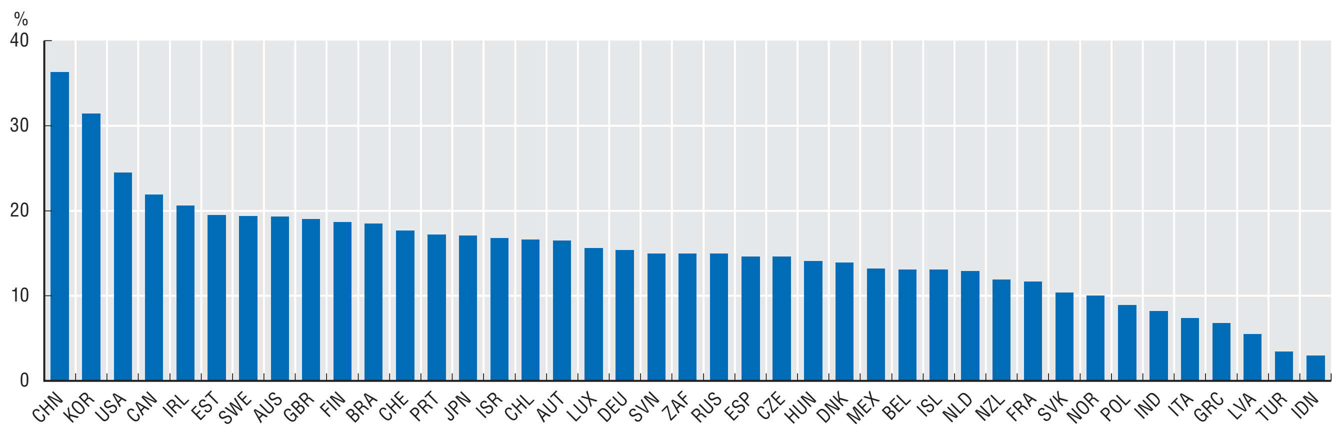
Crunchbase© provides information on start-up activity and financing within and across countries worldwide. Available variables include company size class, location (city and region), primary role (firms, group, investor or school), status (operational, acquired, IPO or closed), founding date and the dates on which the record was created and updated, respectively. For more information, see Dalle, Denbesten and Menon (forthcoming). In the figures presented here, the sample is restricted to firms founded after 2010 (i.e. five years old or less in 2016) that attracted equity funding over the 2011-16 period. Equity funding includes venture capital and other risk finance such as business angel investments or debt financing. Digital-related sectors are identified on the basis of correspondence between the sectors available in the database with the ISIC Rev.4 industry list. Results reported here should be considered as an initial exploration of Crunchbase© data for the purposes of statistical and economic analysis.

Promoting scientific excellence

How effective are different mechanisms for funding scientific research? A new and experimental indicator explores the extent to which publishing scientists secure direct funding for their research based on whether authors acknowledge funders in their publications. This provides an approximate, bottom-up view of the extent of activity-specific (and likely competitive) funding, from the viewpoint of researchers, that is linked to scientific outputs. Authors who do not cite specific funders are more likely to rely on institutional resources for research, including their own salaries. Authors based in China, Korea and the United States – where project-based funding is most common – are the most likely to acknowledge sources of funding in their papers. In contrast, authors based in Italy and France presents some of the lowest funding acknowledgement rates, reflecting the relatively higher importance of institutional funding in those countries. A comparison of citation patterns within countries reveals that funding acknowledgement is associated with a significantly higher excellence rate, measured by the proportion of each class that features among the world's 10% most-cited documents in their field and cohort. This result may be indicative of selection by funders of the most "impactful" activities or a reflection of the benefits of securing additional funding. Assessing the relative efficiency of alternative resource allocation mechanisms requires additional information on funding amounts and selection mechanisms as applied at the micro level. This calls for a more fine-grained data infrastructure to complement the top-down view provided by government R&D budget statistics.

77. Scientific documents acknowledging direct sources of funding, 2016

As a percentage of all citable documents

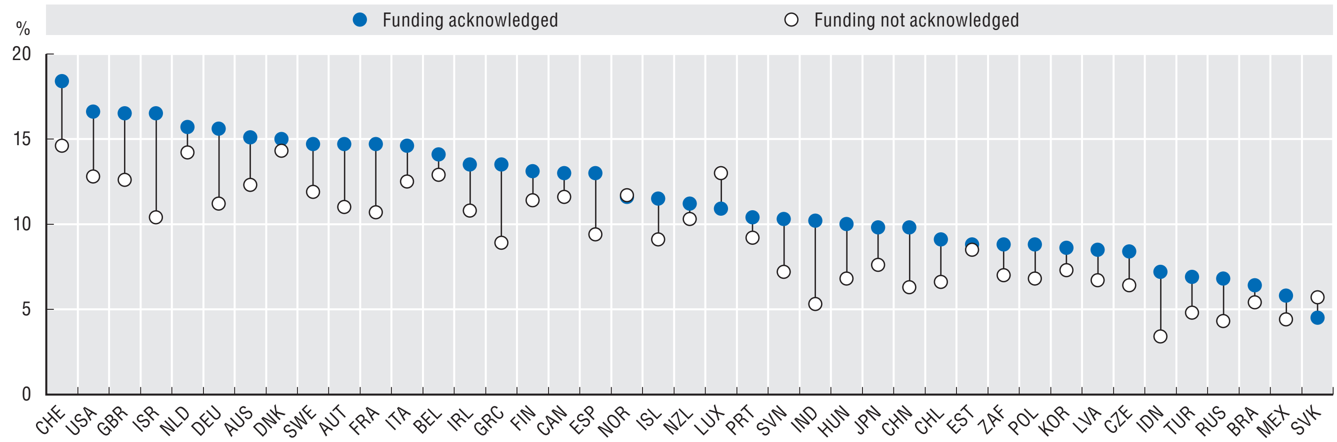


Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618308

78. Funding acknowledgement in scientific publications and their citation impact, 2016

As a percentage of top 10% ranked documents within each category



Source: OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017; and 2015 Scimago Journal Rank from the Scopus journal title list (accessed June 2017), July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933618327

Notes and references

Cyprus

The following note is included at the request of Turkey:

"The information in this document with reference to 'Cyprus' relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the 'Cyprus issue'."

The following note is included at the request of all of the European Union Member States of the OECD and the European Union:

"The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus."

Israel

"The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities or third party. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

"It should be noted that statistical data on Israeli patents and trademarks are supplied by the patent and trademark offices of the relevant countries."

2. Mobile broadband penetration, OECD, G20 and BRIICS, 2016

For Argentina, Brazil, China, India, Indonesia, the Russian Federation, Saudi Arabia and South Africa, the data source is ITU World Telecommunication/ICT Indicators Database, July 2017.

For Israel, the data source is GSMA Intelligence.

For Switzerland and the United States, data are estimates.

3. M2M SIM card penetration, OECD, World and G20 countries, June 2017

Data for 2017, refer to the second quarter.

To ensure comparable data using the same methodology, data for all economies including OECD countries are sourced from GSMA Intelligence (www.gsmaintelligence.com, extracted September 2017). GSMA uses the following definition for measuring M2M connections: "A unique SIM card registered on the mobile network at the end of the period, enabling mobile data transmission between two or more machines. It excludes computing devices in consumer electronics such as e-readers, smartphones, dongles and tablets."

4. Top M2M SIM card connections, June 2017

Data refer to the second quarter of 2017.

To ensure comparable data using the same methodology, data for all economies including OECD countries are sourced from GSMA Intelligence (www.gsmaintelligence.com, extracted September 2017). GSMA uses the following definition for measuring M2M connections: "A unique SIM card registered on the mobile network at the end of the period, enabling mobile data transmission between two or more machines. It excludes computing devices in consumer electronics such as e-readers, smartphones, dongles and tablets."

5. Top players in emerging ICT technologies, 2012-15

Data refer to IP5 families, by filing date and the applicant's residence, using fractional counts. Patent "bursts" correspond to periods characterised by a sudden and persistent increase in the number of patents filed by International Patent Classification (IPC) classes. Top patent bursts are identified by comparing the filing patterns of all IPC classes. The intensity of a patent burst refers to the relative strength of the observed increase in filing patterns. Only IPC classes featuring a positive burst intensity from 2010 are included. Data for 2014 and 2015 are incomplete.

Descriptions of IPC groups are available at: *http://web2.wipo.int/classifications/ipc/ipcpub*.

6. Intensity and development speed in ICT-related technologies, 2000-14

Patent “bursts” correspond to periods characterised by a sudden and persistent increase in the number of patents filed in ICT-related technologies. Top patent bursts are identified by comparing the filing patterns of all other technologies. The intensity of a patent burst refers to the relative strength of the observed increase in filing patterns. Data refer to IP5 patent families, by filing date, using fractional counts. Patents in ICT are identified using the list of IPC codes in Inaba and Squicciarini (2017). Only the top 25 ICT-related patent classes featuring a positive burst intensity from 2000 are included.

Descriptions of IPC groups are available at: *http://web2.wipo.int/classifications/ipc/ipcpub*.

7. Patents in artificial intelligence technologies, 2000-15

Data refer to the number of IP5 patent families in artificial intelligence (AI), by filing date and inventor’s country, using fractional counts. AI refers to the “Human interface” and “Cognition and meaning understanding” categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). 2014 and 2015 figures are estimated based on available data for those years.

8. Patents for top technologies that embed artificial intelligence, 2000-05 and 2010-15

Data refer to the number of IP5 patent families in artificial intelligence (AI), by filing date and International Patent Classification (IPC) codes listed in patent documents that are not related to AI, using fractional counts. AI refers to the “Human interface” and “Cognition and meaning understanding” categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). Data for 2014 and 2015 are incomplete.

9. Top 10 medical technologies combined with artificial intelligence, 2000-05 and 2010-15

Data refer to the number of IP5 patent families in medical technologies and in artificial intelligence (AI), by filing date and International Patent Classification (IPC) codes listed in patent documents that are not related to AI, using fractional counts. Patents are allocated to medical technologies on the basis of the IPC codes, following the concordance provided by WIPO (2013). AI refers to the “Human interface” and “Cognition and meaning understanding” categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). Data for 2014 and 2015 are incomplete.

10. R&D in OECD and key partner countries, 2015

Owing to methodological differences, data for some OECD partner economies may not be fully comparable with figures for other countries.

Researchers’ data are in full-time units.

For Brazil, India and Indonesia, data are provided by the UNESCO Institute for Statistics.

For Canada and Mexico, data refer to 2015, 2013 and 2015.

For Australia, data refer to 2013, 2010 and 2013.

For Brazil, data refer to 2014, 2010 and 2014.

For France, data refer to 2015, 2014 and 2015.

For Indonesia, data refer to 2013, 2009 and 2013.

For Ireland, data refer to 2014, 2015 and 2014.

For Israel, data refer to 2015, 2012 and 2015 and defence R&D is partly excluded from available estimates.

For South Africa, data refer to 2013.

For the United States, data for researchers have been estimated based on contemporaneous data on business researchers and past data for other sectors.

11. Economies with the largest volume of top-cited scientific publications, 2005 and 2016

“Top-cited publications” are the 10% most-cited papers normalised by scientific field and type of document (articles, reviews and conference proceedings). The Scimago Journal Rank indicator is used to rank documents with identifical numbers of citations within each class. This measure is a proxy indicator of research excellence. Estimates are based on fractional counts of documents by authors affiliated to institutions in each economy.

12. Recent trends in scientific excellence, selected countries, 2005-16

"Top-cited publications" are the 10% most-cited papers normalised by scientific field and type of document (articles, reviews and conference proceedings). The Scimago Journal Rank indicator is used to rank documents with identifical numbers of citations within each class. This measure is a proxy indicator of research excellence. Estimates are based on fractional counts of documents by authors affiliated to institutions in each economy.

13. R&D expenditures by performing sector, OECD area, 1995-2015

These statistics are based on the OECD Main Science and Technology Indicators Database (*http://oe.cd/msti*). For more information on these data, including on data issues such as breaks in series, please see this source.

14. Trends in total R&D performance, OECD and selected economies, 1995-2015

For the United States, except for GOVERD, which includes capital expenditure used for R&D, reported figures refer to current expenditures but include a depreciation component, which may differ from the actual level of capital expenditure.

OECD estimates for the EU28 zone may differ slightly from those published by EUROSTAT. In this publication, national estimates are aggregated using USD Purchasing Power Parity indices (PPPs) instead of EUR exchange rates applied by EUROSTAT. For example, the EU28 measure of GERD to GDP intensity is an average of EU countries' GERD intensities, weighted by the share of countries' GDP to EU GDP in USD PPPs, as opposed to EUR-based GDP shares.

These statistics are based on the OECD Main Science and Technology Indicators Database (*http://oe.cd/msti*). For more information on these data, including on data issues such as breaks in series, please see this source.

15. R&D expenditures over the business cycle by source of financing, OECD area, 1995-2016

Business and government-financed R&D expenditures are subcomponents of Gross Domestic Expenditure on R&D (GERD) (i.e. intramural R&D expenditures on R&D performed in the national territory). Funding sources are typically identified by the R&D-performing units.

Government budget data tend to be more timely, but may not coincide with R&D performer-reported funding by government, owing to factors such as differences between budgetary plans and actual disbursements.

These statistics are based on the OECD Main Science and Technology Indicators Database (*http://oe.cd/msti*). For more information on these data, including on data issues such as breaks in series, please see this source.

16. Trends in basic and applied research and experimental development in the OECD area, 1985-2015

Due to the presence of missing breakdowns of GERD by type of R&D (basic, applied and experimental development), as well as breaks in series, long-term trends have been estimated by chain-linking year-on-year growth rates. These are calculated each year on a variable pool of countries for which balanced data are available in consecutive years without intervening breaks. The trend series is an index of the volume of expenditures on basic and applied research and experimental development, based on GERD data in USD PPP 2010 constant prices. Some OECD countries are completely missing from the calculations due to the unavailability of detailed breakdowns by type of R&D. Further details on the calculations are available on request.

China's share of GERD by type of R&D has been estimated based on the sum of current and capital expenditures. For the OECD, a GERD-weighted estimate has been computed on the pool of 14 countries for which data by type of R&D were available in 2015. Data used for each country refer to the sum of current and capital expenditures, except for Chile, Norway and the United States, for which only current costs are included in estimates reported to the OECD.

17. Concentration of business R&D: top 50 and top 100 performers, 2014

This is an experimental indicator. International comparability may be limited. For more information on the OECD microBeRD project, see *http://oe.cd/microberd*.

Figures may differ or appear to differ from official R&D statistics owing to different methodologies adopted for the purpose of micro-data analysis. The estimates presented should be taken as experimental and are not intended as substitutes for existing official statistics.

For Austria, Belgium, Germany, France and Italy, figures refer to 2013. For Portugal, figures refer to 2012.

Figures refer to the enterprise as the statistical unit of analysis, except for Israel where figures are at establishment level.

The analysis covers enterprises with 10 or more employees except for Japan, where it covers enterprises with 50 or more employees.

The analysis covers industry sectors (ISIC Rev.4, two-digit level) 5-72, excluding 45, 47, 55-56 and 68-69, except for Canada and the United States.

Figures for Canada and the United States were calculated by the countries using their own procedures.

18. Business R&D performance by size and age, 2014

This is an experimental indicator. International comparability may be limited. For more information on the OECD microBeRD project, see *http://oe.cd/microberd*.

Figures may differ or appear to differ from official R&D statistics owing to different methodologies adopted for the purpose of micro-data analysis. The estimates presented should be taken as experimental and are not intended as substitutes for existing official statistics.

For Belgium and Italy, figures refer to 2013. For Portugal, figures refer to 2012.

Figures refer to the enterprise as the statistical unit of analysis, except for Israel where figures are at establishment level.

The analysis covers enterprises with 10 or more employees. Small firms have 10-49 employees, medium firms 50-249 employees and large firms 250 or more employees. Firms are classified as old if they are more than five years old.

The analysis covers industry sectors (ISIC Rev.4, two-digit level) 5-72, excluding 45, 47, 55-56 and 68-69.

19. External sources of R&D funding by firm size and age, 2014

This is an experimental indicator. International comparability may be limited. For more information on the OECD microBeRD project, see *http://oe.cd/microberd*.

Figures may differ or appear to differ from official R&D statistics owing to different methodologies adopted for the purpose of micro-data analysis. The estimates presented should be taken as experimental and are not intended as substitutes for existing official statistics.

For Belgium, figures refer to 2011. For Portugal, figures refer to 2012.

Figures refer to the enterprise as the statistical unit of analysis, except for Israel where figures are at establishment level.

The analysis covers enterprises with 10 or more employees. Small firms have 10-49 employees, medium firms 50-249 employees and large firms 250 or more employees. Firms are classified as old if they are more than five years old.

The analysis covers industry sectors (ISIC Rev.4, two-digit level) 5-72, excluding 45, 47, 55-56 and 68-69.

20. R&D expenditures and the IP bundle of the top R&D companies, 2014

Data relate to companies in the top 2 000 corporate R&D sample, ranked by R&D expenditures.

The IP bundle refers to the number of patents, trademarks and designs filed in 2012-14, and owned by the top R&D companies, using fractional counts. Data covers: IP5 patent families; trademark applications filed at the EUIPO, the JPO and the USPTO; design applications filed at the EUIPO and the JPO, and design patents filed at the USPTO.

21. Patent portfolio of top R&D companies, by industry, 2012-14

Data refer to IP5 families, by filing date, owned by top R&D companies, using fractional counts. Patents in ICT are identified using the list of IPC codes in Inaba and Squicciarini (2017). Data for 2014 are partial.

22. Top corporate R&D with IP, 2012-14

Data relate to the share of the patent (design) portfolio of companies in total patents (designs) filed by the top 2 000 corporate R&D sample in 2012-14.

Patent data refer to IP5 patent families; design data include applications filed at the EUIPO and the JPO, and design patents filed at the USPTO.

Industries are defined according to ISIC Rev.4. The ICT sector covers ICT manufacturing industries (classes 2610, 2620, 2630, 2640 and 2680), ICT trade industries (4651 and 4652), ICT services industries (5820), Telecommunications (61), Computer programming (62), Data processing (631), and Repair of computers and communication equipment (951).

23. Top 20 emerging technologies developed by top R&D companies, 2012-14

Data refer to the share of IP5 patent families owned by the top 2 000 corporate R&D investors sample in all IP5 patent families, by filing date and International Patent Classification (IPC) classes. The top 20 emerging technologies correspond to the IPC classes featuring a positive “burst” intensity within the patent portfolio of top R&D companies from 2010. A patent burst corresponds to periods characterised by a sudden and persistent increase in the number of patents by IPC classes. Top patent bursts are identified by comparing the filing patterns of all IPC classes within the portfolio of top R&D companies. The intensity of a patent burst refers to the relative strength of the observed increase in filing patterns. Data for 2014 are partial.

Technologies are displayed following the WIPO IPC-Technology concordance (2013) and the ICT taxonomy.

Descriptions of IPC groups are available at: http://web2.wipo.int/classifications/ipc/ipcpub.

24. Artificial intelligence patents by top 2 000 R&D companies, by sector, 2012-14

Data refer to IP5 patent families related to artificial intelligence (AI) owned by companies in the top 2 000 corporate R&D investors sample, filed in 2012-14. Artificial intelligence patents refer to IP5 patent families that belong to the "Human interface" and "Cognition and meaning understanding" categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). Data for 2014 are partial.

Industries are defined according to ISIC Rev.4.

25. Artificial intelligence patents by top R&D companies, by headquarters' location, 2012-14

Data refer to IP5 patent families related to artificial intelligence (AI) owned by companies in the top 2 000 corporate R&D investors sample, filed in 2012-14, by location of the companies' headquarters. Artificial intelligence patents refer to IP5 patent families that belong to the "Human interface" and "Cognition and meaning understanding" categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). Data for 2014 are partial.

26. Trends in scientific publications related to machine learning, 2003-16

This is an experimental indicator.

Estimates are based on fractional counts of documents by authors affiliated to institutions in each economy.

These estimates are based on a search for the text item "*machine learn*" in the abstracts, titles and keywords of documents published between 2003 and 2016 and indexed in the Scopus database.

27. Top-cited scientific publications related to machine learning, 2006 and 2016

This is an experimental indicator.

This figure provides a count of each country or economy's top-cited publications related to machine learning (ML). These are the 10% most-cited papers normalised by scientific field and type of document (articles, reviews and conference proceedings). The Scimago Journal Rank indicator is used to rank documents with identical numbers of citations within each class. This measure is an indicator of research excellence. Estimates are based on fractional counts of documents by authors affiliated to institutions in each economy.

These estimates are based on a search for the text item "*machine learn*" in the abstracts, titles and keywords of documents published between 2006 and 2016 and indexed in the Scopus database.

28. Top robot-intensive countries and BRICS, 2005 and 2015

Robot use collected by the International Federation of Robotics (IFR) is measured as the number of robots purchased by a given country/industry. Robot stock is constructed by taking the initial IFR stock starting value, then adding to it the purchases of robots from subsequent years with a 10% annual depreciation rate. The graph covers all manufacturing, mining and utilities sectors. Data for the following countries is extrapolated for the years 2014 and 2015 due to the lack of data: Australia, Chile, Estonia, Finland, Greece, Iceland, Ireland, Latvia, Lithuania, New Zealand, Norway and Slovenia. Due to lack of available data, the OECD average excludes Canada, Israel, Luxembourg and Mexico. The EU28 average excludes Cyprus and Luxembourg.

29. Robot intensity and ICT task intensity of manufacturing jobs, 2012 or 2015

Robot use data collected by the International Federation of Robotics (IFR) is measured as the number of robots purchased by a given country/industry. Robot stock is constructed by taking the initial IFR stock starting value, then adding to it the purchases of robots from subsequent years with a 10% annual depreciation rate. The sample covers the manufacturing and utilities sectors only. The indicator of the ICT task intensity of jobs relies on exploratory state-of-the-art factor analysis. It captures the use of ICT tasks on the job and relies on 11 items from the OECD Programme for International Assessment of Adult Competencies (PIAAC) ranging from simple use of the Internet to the use of Word or Excel software or a programming language. The detailed methodology can be found in Grundke et al. (2017).

Data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom

(England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey as far as ICT task intensity is concerned.

30. Dispersion of sectors in each considered dimension of digitalisation, 2013-15

All underlying indicators are expressed as sectoral intensities. For each indicator, the sectoral values are averages across countries and years. These values are then standardised relative to the mean, such that the resulting series by indicator have mean zero and standard deviation 1.

The taxonomy is based on information for the following countries: Australia, Austria, Denmark, Finland, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States, for which values for all indicators in all considered sectors and years are non-missing, with the exception of robot use and online sales, where some sectors are not sampled.

"Software investment" is the ratio of volumes of GFCF in software over volumes of total GFCF. The same applies to "ICT tangible investment". For these indicators, data are sourced from the OECD Annual National Accounts and Intan-Invest. Volumes are obtained from current price series, which are deflated using country-specific deflators derived from Intan-Invest (software) and national accounts (ICT tangible).

Intermediate ICT goods is the ratio of purchases of intermediate materials by the sector from the ICT goods-producing sector ("Computer, electronic and optical equipment", or ISIC Rev.3 sectors 30, 32, 33) over the output of the purchasing sector, both sourced from the OECD Inter-Country Input-Output Database and national input-output tables. The same applies to Purchases of ICT services but for a sector's purchases from the ICT service-producing sector ("Computer and related activities", or ISIC Rev.3 sector 72). Purchases of ICT goods or services are deflated by the price of output in the ICT goods or service-producing sectors in a given country, while the sectoral output is deflated by the sector's output price in the country. Deflators are sourced from the OECD Structural Analysis (STAN) database or the OECD National Accounts database. Purchases of ICT goods by machinery-producing sectors (ISIC Rev. 3 sectors 29 to 35) are replaced with missing values by design.

Data on purchases of robots is collected by the International Federation of Robotics (IFR) in terms of the number of robots purchased by a given country/industry. Robot use here is the ratio between the stock of robots purchased by the sector and the sector's employment. The stock is constructed by taking the initial IFR stock starting value, then adding to it purchases of robots from subsequent years with a 10% annual depreciation rate. The dataset covers agriculture, mining, manufacturing, constructions and utilities (and the R&D-producing sector, which is excluded from this analysis).

Revenues from online sales measure the proportion of the sector's turnover coming from online sales, as collected by the Eurostat Digital Economy and Society Statistics database. The data refer to European countries only and exclude the following ISIC Rev.4 sectors by sampling design: sectors 1 to 9 (Agriculture, Mining), 64 to 66 (Finance and insurance), and 84 and above (Public services, Social and personal services).

"ICT specialists" is measured as the number of individuals employed in an ICT specialist occupation in the sector, over total sectoral employment. The choice of which occupations are considered ICT specialists in this exercise is explained in Calvino et al. (forthcoming). These occupations are ISCO2008 occupation 251 (Software and applications developers and analysts), 252 (Database and network professionals), 133 (Information and communications technology service managers) and 351 (Information and communications technology operations and user support). Data on employment by occupation and sector is sourced from Australian, Canadian, European and Japanese Labour Force Surveys, the U.S. Current Population Survey, the Japanese Employment Census, and the Korean Labour and Income Panel Study.

For additional information on the assumptions applied in calculating the indicators, as well as any cleaning or interpolation/extrapolation the series may have undergone, refer to Calvino et al. (forthcoming): "A Taxonomy of Digital Sectors".

31. Taxonomy of sectors by quartile of digital intensity, 2013-15

All underlying indicators are expressed as sectoral intensities. For each indicator, the sectoral values are averages across countries and years. These values are then standardised relative to the mean, such that the resulting series by indicator have mean zero and standard deviation 1. The colour of the cells in the table correspond to the quartile of the sectoral distribution in which the sector is ranked. Values for the construction of the quartiles by indicator are reported at the bottom of the table.

The taxonomy is based on information for the following countries: Australia, Austria, Denmark, Finland, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States, for which values for all indicators in all considered sectors and years are non-missing, with the exception of robot use and online sales, where some sectors are not sampled.

"Software investment" is the ratio of volumes of GFCF in software over volumes of total GFCF. The same applies to "ICT tangible investment". For these indicators, data are sourced from the OECD Annual National Accounts and Intan-Invest. Volumes are obtained from current price series, which are deflated using country-specific deflators derived from Intan-Invest (software) and national accounts (ICT tangible).

Intermediate ICT goods is the ratio of purchases of intermediate materials by the sector from the ICT goods-producing sector ("Computer, electronic and optical equipment", or ISIC Rev.3 sectors 30, 32, 33) over the output of the purchasing sector, both sourced from the OECD Inter-Country Input-Output Database and national input-output tables. The same applies to Purchases of ICT services but for a sector's purchases from the ICT service-producing sector ("Computer and related activities", or ISIC Rev.3 sector 72). Purchases of ICT goods or services are deflated by the price of output in the ICT goods or service-producing sectors in a given country, while the sectoral output is deflated by the sector's output price in the country. Deflators are sourced from the OECD Structural Analysis (STAN) database or the OECD National Accounts database. Purchases of ICT goods by machinery-producing sectors (ISIC Rev. 3 sectors 29 to 35) are replaced with missing values by design.

Data on purchases of robots is collected by the International Federation of Robotics (IFR) in terms of the number of robots purchased by a given country/industry. Robot use here is the ratio between the stock of robots purchased by the sector and the sector's employment. The stock is constructed by taking the initial IFR stock starting value, then adding to it purchases of robots from subsequent years with a 10% annual depreciation rate. The dataset covers agriculture, mining, manufacturing, constructions and utilities (and the R&D-producing sector, which is excluded from this analysis).

Revenues from online sales measure the proportion of the sector's turnover coming from online sales, as collected by the Eurostat Digital Economy and Society Statistics database. The data refer to European countries only and exclude the following ISIC Rev.4 sectors by sampling design: sectors 1 to 9 (Agriculture, Mining), 64 to 66 (Finance and insurance), and 84 and above (Public services, social and personal services).

"ICT specialists" is measured as the number of individuals employed in an ICT specialist occupation in the sector, over total sectoral employment. The choice of which occupations are considered ICT specialists in this exercise is explained in Calvino et al. (forthcoming). These occupations are ISCO2008 occupation 251 (Software and applications developers and analysts), 252 (Database and network professionals), 133 (Information and communications technology service managers) and 351 (Information and communications technology operations and user support). Data on employment by occupation and sector is sourced from Australian, Canadian, European and Japanese Labour Force Surveys, the U.S. Current Population Survey, the Japanese Employment Census, and the Korean Labour and Income Panel Study.

For additional information on the assumptions applied in calculating the indicators, as well as any cleaning or interpolation/extrapolation the series may have undergone, refer to Calvino et al. (forthcoming): "A Taxonomy of Digital Sectors".

32. Skill levels in digital and less-digital industries, 2012 or 2015

All differences in skill means between digital and non-digital industries are significant at the 5% level.

The individual-level skill indicators are based on data from the OECD Programme for International Assessment of Adult Competencies (PIAAC). Literacy, numeracy and problem solving in technology-rich environments are cognitive skills that are measured through assessment tests. The other skill indicators are constructed using data on the frequency of tasks workers carry out on the job and by applying a state-of-the-art factor analysis. The detailed methodology can be found in Grundke et al. (2017). All skill indiciators are rescaled to the interval 0-100. Averages are calculated for digital and non-digital industries across all 31 PIAAC countries with the same weight given to each country.

A taxonomy of digital-intensive sectors is proposed in Calvino et al. (forthcoming), which accounts for the multidimensionality of the digital transformation by considering sector intensities in: ICT tangible and intangible investment, purchases of ICT goods and services, robot use, revenues from online sales and ICT specialists. The sectors ranking above the median sector by the joint distribution of these indicators are defined as digital-intensive.

The pooled sample of countries includes 31 countries (round 1 and 2 of PIAAC). The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the following eight countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey: Chile, Greece, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey.

OECD SCIENCE, TECHNOLOGY AND INDUSTRY SCOREBOARD 2017: THE DIGITAL TRANSFORMATION © OECD 2017

33. Additional labour market returns to skills in digital-intensive industries, 2012 or 2015

Shaded bars indicate that the coeffcient is insignificant at the 5% level.

The individual-level skill indicators are based on data from the OECD Programme for International Assessment of Adult Competencies (PIAAC). Literacy, numeracy and problem solving in technology-rich environments are cognitive skills that are measured through assessment tests. The remaining skill indicators are constructed using data on the frequency of tasks workers carry out on the job and by applying a state-of-the-art factor analysis. The detailed methodology can be found in Grundke et al. (2017).

Labour market returns to skills are based on OLS wage regressions (Mincer equations) using data from the OECD Programme for International Assessment of Adult Competencies (PIAAC). Estimates rely on the log of hourly wages as a dependent variable and include a number of individual-related control variables (including age, years of education, gender and the cognitive skills literacy and numeracy) as well as country, industry and occupation dummy variables. The coefficients are obtained by estimating the specification for the pooled sample of 31 countries.

A taxonomy of digital-intensive sectors is proposed in Calvino et al. (forthcoming), which accounts for the multidimensionality of the digital transformation by considering sector intensities in: ICT tangible and intangible investment, purchases of ICT goods and services, robot use, revenues from online sales and ICT specialists. The sectors ranking above the median sector by the joint distribution of these indicators are defined as digital intensive.

The pooled sample of countries includes 31 countries (round 1 and 2 of PIAAC). The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. The data for the following eight countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey: Chile, Greece, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey.

34. Where people gained and lost jobs, 2010-16

Data refer to 2010-15 for Israel, Japan, Korea, Mexico, New Zealand and the OECD area aggregate.

Changes in levels of employment by economic activity can be “normalised” to highlight their relative contributions, in each country, to the total change in employment between two periods. This is achieved, for each country, by expressing sectoral changes as a percentage of the sum of absolute changes. The aggregate activity groups are defined according to ISIC Rev.4 classes.

Aggregate industrial activities are defined according to ISIC Rev.4: Agriculture, forestry and fishing (Divisions 01-03); Mining and utilities (05-09 and 35-39); Manufacturing (10-33); Construction (41-43); Wholesale, retail trade, hotels, food services, transportation (45-56); Information and communication (58-63); Finance and insurance (64-68); Professional, scientific and technical and other business services (69-82); and Public administration, education, health and other services (84-99).

The gains and losses are expressed in thousands and represent the sum of those aggregate sectors with positive changes and the sum of those aggregate sectors with negative changes, respectively. A finer activity breakdown (e.g. 2-digit ISIC Rev.4) would produce different estimates for total gains and losses.

The employment data are drawn mostly from National Accounts (SNA) sources and are measured in terms of persons, except for Canada, Japan and Mexico where they are measured in terms of jobs.

35. Employment growth in information industries, OECD, 1997-2015

Information industries are defined according to ISIC Rev.4 and cover ICT manufacturing: Division 26 (Computer, electronic and optical products) and, Information services: ISIC Rev.4 Divisions 58 to 60 (Publishing, audio-visual and broadcasting activities), 61 (Telecommunications) and 62 to 63 (IT and other information services).

Business sector corresponds to ISIC Rev.4 Divisions 05 to 66 and 69 to 82 (i.e. Total economy excluding Agriculture, forestry and fishing (Divisions 01 to 03), Real estate activities (68), Public administration (84), Education (85), Human health and social work activities (86 to 88) and Arts, entertainment, repair of household goods and other personal services (90 to 99)).

36. Origin of demand sustaining business sector jobs in the OECD, 1995-2014

The business sector corresponds to ISIC Rev.3 Divisions 10 to 74 (i.e. Total economy excluding Agriculture, forestry and fishing (Divisions 01-05), Public administration (75), Education (80), Health (85) and Other community, social and personal services (90-95)).

EU28 refers to the 28 members of the European Union; Southeast Asia (excluding Indonesia) comprises Brunei Darussalam, Cambodia, Malaysia, Philippines, Singapore, Thailand and Viet Nam; East Asia covers Japan, Korea, Hong Kong-China and Chinese Taipei; NAFTA includes Canada, the United States and Mexico; and BRIICS (excluding China) consists of Brazil, the Russian Federation, India, Indonesia and South Africa.

37. Origin of demand sustaining jobs in OECD information industries, 1995-2014

Information industries correspond to ISIC Rev.3 Divisions 30, 32, 33, 64 and 72.

EU28 refers to the 28 members of the European Union; Southeast Asia (excluing Indonesia) comprises Brunei Darussalam, Cambodia, Malaysia, Philippines, Singapore, Thailand and Viet Nam; East Asia covers Japan, Korea, Hong Kong-China and Chinese Taipei; NAFTA includes Canada, the United States and Mexico; and BRIICS (excluding China) consists of Brazil, the Russian Federation, India, Indonesia and South Africa.

39. Share of non-routine employment and ICT task intensity, 2012 or 2015

The index of the ICT task intensity of jobs relies on exploratory state-of-the-art factor analysis and captures the use of ICT on the job. It relies on 11 items of the OECD Programme for International Assessment of Adult Competencies (PIAAC) ranging from simple use of the Internet, to the use of Word or Excel software or a programming language. The detailed methodology can be found in Grundke et al. (2017). Intensities have been rescaled from the 0-1 to the 0-100 interval.

The share of non-routine employment represents the proportion of the industry's total employment accounted for by the 3-digit occupations found to be intensive in non-routine tasks. Occupations are ranked in terms of their intensity in routine tasks following the methodology detailed in Marcolin et al. (2015). Routine-intensive occupations are those ranking above the median in terms of the routine intensity of the tasks performed on the job; non-routine occupations score below the median.

The differences observed in the trend lines of macro industries should be considered with caution, as the Wald test fails to reject the hypothesis of equality between the correlations in the market service and manufacturing industries.

Dots represent simple averages of industry values in the manufacturing vs. market service sectors. Manufacturing covers mining; food and beverages; textiles, apparel and leather; wood, paper and publishing; basic and fabricated metals; chemicals, rubber, plastics and other non-metallic mineral products; machinery and equipment n.e.c; electronic, optical, and computing equipment; transportation equipment; manufacturing n.e.c. Market services include utilities, construction, trade, repairers, hotels and accomodation; transportation and telecommunication services; finance; and business services.

The data for the following 22 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey.

40. Workers receiving firm-based training, by skill level, 2012 or 2015

The percentages of trained people are calculated as the ratio of total employed persons displaying a given skill level and receiving training at least once in the year, over total employment in the economy. Training refers to formal, on-the-job, or both types as defined in Squicciarini et al. (2015). Low-skilled individuals refers to persons who have not completed any formal education or have attained 1997 ISCED classification level 1 to 3C degrees (if 3C is lower than two years). Medium-skilled individuals have attained a 3C (longer than two years) to 4 level degree. High-skilled individuals have attained a higher than ISCED1997 category 4 degree. Values are reweighted to be representative of the countries' populations.

The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey.

41. Gender wage gap by country, 2012 or 2015

The estimates for the gender wage gap are based on OLS wage regressions (Mincer equations) using data from the OECD Programme for International Assessment of Adult Competencies (PIAAC). Estimates rely on the log of hourly wages as the dependent variable and include a number of individuals-related control variables (including age, years of education, gender and various skill measures detailed in Grundke et al., 2017) as well as industry dummy variables.

The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey.

42. Labour market returns to ICT tasks by gender, 2012 or 2015

The index of the ICT task intensity of jobs relies on exploratory state-of-the-art factor analysis. It captures the use of ICT tasks on the job and relies on 11 items of the OECD Programme for International Assessment of Adult Competencies (PIAAC) ranging from simple use of the Internet, to the use of Word or Excel software or a programming language. The detailed methodology can be found in Grundke et al. (2017).

Labour market returns to task intensities are based on OLS wage regressions (Mincer equations) using data from the OECD Programme for International Assessment of Adult Competencies (PIAAC). Estimates rely on the log of hourly wages as the dependent variable and include a number of individual-related control variables (including age, years of education, gender and the other skill measures detailed in Grundke et al., 2017) as well as industry dummy variables. The coefficients for male and female workers are obtained by estimating the specification for each sub-sample, respectively. The country mean of ICT task intensity that is used to compute the percentage changes in wages for a 10% change in ICT task intensity refers to the country mean for male and female workers, respectively.

The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey.

43. Employees participating in on-the-job training by gender, 2012 or 2015

The proportion of women and men engaged in on-the-job training excludes individuals who did not provide information on whether the activity was carried out during or outside working hours (around 4% of the cross-country sample). The number of women and men engaged in on-the-job training during working hours is computed as the number of employees that confirmed attending the learning activity "only" or "mostly" during working hours. The proportions are computed over the total number of employees of the given gender in the economy.

The data for the following 23 countries from the first round of PIAAC refer to the year 2012: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Germany, Denmark, Estonia, Finland, France, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation (excluding Moscow), the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. Data for the remaining countries refer to 2015 and are sourced from the second round of the first wave of the PIAAC survey.

44. Decomposition of labour productivity growth by industry, 2001-07 and 2009-15

The latest period for Ireland and New Zealand is 2009-14. For Switzerland, the latest period is 2010-15, and Manufacturing includes Mining and utilities.

Labour productivity growth is defined as the annual change in gross value added (in volume terms) per hour worked.

The aggregate industrial activities are defined according to ISIC Rev.4: Mining and utilities (Divisions: 05 to 09 and 35 to 39); Manufacturing (10 to 33); Construction (41 to 43); Wholesale, retail, hotels, food services, transportation (45 to 56); Information and communications (58 to 63); Finance and insurance (64 to 66); and Professional, scientific, technical and other business services (69 to 82). Total non-agriculture business sector covers ISIC Rev.4 Divisions 05 to 66 and 69 to 82. Real estate activities (68) are excluded as the value added of this sector includes an imputation made for dwelling services provided and consumed by home-owners.

45. Labour productivity levels in the information industries, 2015

Labour productivity is defined as current price value added per hour worked and per person employed.

Information industries are defined according to ISIC Rev.4: Computer, electronic and optical products (Division 26), Publishing, audio-visual and broadcasting (58 to 60), Telecommunications (61) and IT and other information services (62, 63).

Total non-agriculture business sector covers ISIC Rev.4 Divisions 05 to 66 and 69 to 82. Real estate activities (68) are excluded as the value added of this sector includes an imputation made for dwelling services provided and consumed by home-owners.

Estimates for Israel, Korea, Latvia and Luxembourg do not include Computer, electronic and optical products (Division 26).

Estimates for Germany, Ireland, Poland, Portugal, New Zealand, Spain, Sweden and Switzerland refer to 2014; estimates for Canada and Korea refer to 2013; estimates for Australia and New Zealand refer to fiscal year 2014-15.

The OECD average is an unweighted average of value added per person employed for the countries shown.

46. Multifactor productivity growth 1995-2015

Estimates for Ireland, Portugal and Spain refer to 1995-2014.

47. Extended ICT domestic value added footprint, 2011

In this analysis, information and communication technology (ICT) industries are defined according to ISIC Rev.3 and consist of Computer, electronic and optical products (Divisions 30, 32 and 33), Post and telecommunications services (Division 64), and Computer and related activities (Division 72). The underlying ICIO database is constructed from contemporaneous SNA93 National Accounts statistics and, hence, the figures for ICT value added presented here may not match the latest equivalent SNA08, ISIC Rev.4, ICT value added statistics.

48. ICT-related domestic value added, 2011

Information and communication technology (ICT) industries are defined according to ISIC Rev.3 and consist of Computer, electronic and optical products (Divisions 30, 32 and 33), Post and telecommunications services (Division 64), and Computer and related activities (Division 72).

Value added of domestic ICT industries is embodied in a wide range of final goods and services meeting final demand both at home and abroad. Similarly, domestic value added (DVA) from other industries ("non-ICT") can be embodied in final ICT goods and services consumed globally.

49. ICT-related foreign value added content of domestic final demand, 2011

Information and communication technology (ICT) industries are defined according to ISIC Rev.3 and consist of Computer, electronic and optical products (Divisions 30, 32 and 33), Post and telecommunications services (Division 64), and Computer and related activities (Division 72).

Value added of foreign ICT industries can be embodied in a wide range of final goods and services meeting domestic demand. Similarly, value added from other foreign industries ("non-ICT") can be embodied in final ICT goods and services consumed domestically.

50. Contribution of ICT equipment and knowledge capital assets to KBC-augmented labour productivity growth, 2000-14

The graph shows the contribution of KBC and tangible ICT capital to labour productivity growth as a percentage of labour productivity growth itself over 2000-14. Contributions are calculated using a standard non-parametric growth accounting method for the overall period, assuming constant returns to scale and full competitive markets, where production technology takes a log linear form and output elasticities are equal to factor shares. KBC capital includes software, R&D and organisational capital (from Le Mouel et al., 2016). Software, R&D and ICT equipment investment data are sourced from the OECD System of National Accounts (SNA) Database, except for the United States, whose investment in R&D is sourced from the U.S. Bureau of Economic Analysis Satellite Accounts.

All underlying data are expressed in real terms. Capital stocks estimations rely on applying the Perpetual Inventory Method on investment data with 1993 as the initial year. Some data points are interpolated or extrapolated, where necessary.

The sample covers the market sectors only (i.e. ISIC Rev.4 Divisions 01 to 82 excluding 68 and 90 to 96).

51. Contribution of KBC and MFP to KBC-augmented labour productivity growth, 2000-14

The graph shows the contribution of KBC and MFP to labour productivity growth as a percentage of labour productivity growth itself over 2000-14. Contributions are calculated using a standard non-parametric growth accounting method for the overall period, assuming constant returns to scale and full competitive markets, where production technology takes a log linear form and output elasticities are equal to factor shares. KBC capital includes software, R&D and organisational capital (from Le Mouel et al., 2016). Software and R&D investment data are sourced from the OECD System of National Accounts (SNA) Database, except for the United States, whose investment in R&D is sourced from the U.S. Bureau of Economic Analysis Satellite Accounts.

All underlying data are expressed in real terms. Capital stocks estimations rely on applying the Perpetual Inventory Method on investment data with 1993 as the initial year. Some data points are interpolated or extrapolated, where necessary.

The sample covers the market sectors only (i.e. ISIC Rev.4 Divisions 01 to 82 excluding 68, and 90 to 96).

52. KBC intensity for the market and non-market sectors, 2015

The market sector covers ISIC Rev.4 Divisions 01 to 82 excluding 68, and 90 to 96. The non-market sector follows the definition proposed by SPINTAN and covers both public and non-profit entities in the ISIC Rev.4 Divisions 72 and 84 to 88.

Intensities are defined as investment over Gross Value Added as sourced from the OECD System of National Accounts (SNA) Database. For the non-market sector, KBC investment data are sourced from SPINTAN and are extrapolated, where necessary, using the past cross-country average growth rate of non-market investment in SPINTAN. Data on investment in other non-SNA KBC assets are sourced from INTAN-Invest and extrapolated, where necessary, using the growth rate of Intellectual Property Gross Fixed Capital Formation from the OECD System of National Accounts (SNA) Database. Investment and value added data are in current prices.

53. Change in the centrality of IT manufacturing across economies, 1995-2011

IT manufacturing is defined as ISIC Rev.3 sectors 30, 32 and 33: Computer, electrical and optical products.

Economies are placed according to their location. The size of the nodes reflects the magnitude of the change (in levels) of total foreign centrality over the period 1995-2011. These changes are graphed using a log scale for readability. Blue coloured nodes reflect increasing centrality and red denotes falling centrality.

Centrality indicators are derived from OECD's (2015) Inter-Country-Input-Output Database, which provides data on input flows for 61 countries and 34 industries from 1995 to 2011. Centrality is calculated for each country-industry as a baseline centrality, plus a weighted sum of centralities of their trade partners, where the weights are input shares. Total centrality is the average of centrality calculated using forwards linkages (exports of inputs) and backwards linkages (imports of inputs). Centrality is decomposed into foreign and domestic origins. Foreign centrality represents the centrality due to (direct and indirect) linkages to foreign sectors, and domestic centrality represents the component due to (direct and indirect) linkages to domestic sectors.

54. Change in the centrality of IT services across economies, 1995-2011

IT services consist of ISIC Rev.3 sector 72: Computer and related activities.

Economies are placed according to their location. The size of the nodes reflects the magnitude of the change (in levels) of total foreign centrality over the period 1995-2011. These changes are graphed using a log scale for readability. Blue coloured nodes reflect increasing centrality and red denotes falling centrality.

Centrality indicators are derived from OECD's (2015) Inter-Country-Input-Output Database, which provides data on input flows for 61 countries and 34 industries from 1995 to 2011. Centrality is calculated for each country-industry as a baseline centrality, plus a weighted sum of centralities of their trade partners, where the weights are input shares. Total centrality is the average of centrality calculated using forwards linkages (exports of inputs) and backwards linkages (imports of inputs). Centrality is decomposed into foreign and domestic origins. Foreign centrality represents the centrality due to (direct and indirect) linkages to foreign sectors, and domestic centrality represents the component due to (direct and indirect) linkages to domestic sectors.

55. Largest changes in foreign and domestic centrality: IT manufacturing and services, 1995-2011

IT manufacturing is defined as ISIC Rev.3 sectors 30, 32 and 33: Computer, electrical and optical products.

IT services consist of ISIC Rev.3 sector 72: Computer and related activities.

Centrality indicators are derived from OECD's (2015) Inter-Country-Input-Output Database, which provides data on input flows for 61 countries and 34 industries from 1995 to 2011. Centrality is calculated for each country-industry as a baseline centrality, plus a weighted sum of centralities of their trade partners, where the weights are input shares. Total centrality is the average of centrality calculated using forwards linkages (exports of inputs) and backwards linkages (imports of inputs). Centrality is decomposed into foreign and domestic origins. Foreign centrality represents the centrality due to (direct and indirect) linkages to foreign sectors, and domestic centrality represents the component due to (direct and indirect) linkages to domestic sectors.

56. Top 10 most central IT hubs, 1995 and 2011

Centrality indicators are derived from OECD's (2015) Inter-Country-Input-Output Database, which provides data on input flows for 61 countries and 34 industries from 1995 to 2011. Centrality is calculated for each country-industry as a baseline centrality, plus a weighted sum of centralities of their trade partners, where the weights are input shares. Total centrality is the average of centrality calculated using forwards linkages (exports of inputs) and backwards linkages (imports of inputs). Centrality is decomposed into foreign and domestic origins. Foreign centrality represents the centrality due to (direct and indirect) linkages to foreign sectors, and domestic centrality represents the component due to (direct and indirect) linkages to domestic sectors.

57. Internet usage trends, 2005-16

Notes for Panel A:

Data are based on OECD estimations.

Notes for Panel B:

Unless otherwise stated, Internet users are defined for a recall period of 3 months. For Australia, Canada and Japan, the recall period is 12 months. For the United States, the recall period is 6 months for 2015, and no time period is specified in 2006. For Korea and New Zealand, the recall period is 12 months in 2006. For Chile in 2009, China, India, Indonesia, the Russian Federation and South Africa, no time period is specified.

For Australia, data refer to the fiscal years 2006/07 ending on 30 June and 2014/15.

For Brazil, data refer to 2008 and 2015.

For Canada, data refer to 2007 and 2012. In 2007, data refer to individuals aged 16 and over instead of 16-74.

For Chile, data refer to 2009 and 2015.

For China, India, Indonesia, the Russian Federation and South Africa, data originate from ITU, ITU World Telecommunication/ICT Indicators Database, and refer to 2015 instead of 2016.

For Iceland and Switzerland, data refer to 2014 instead of 2016.

For Indonesia, data relates to individuals aged 5 or more.

For Israel, data refer to 2015 instead of 2016 and to individuals aged 20 and more instead of 16-74.

For Japan, data refer to 2015 instead of 2016 and to individuals aged 15-69.

For Korea, data refer to 2015 instead of 2016.

For New Zealand, data refer to 2012 instead of 2016.

For Turkey, data refer to 2007 instead of 2006.

For the United States, data refer to 2007 and 2015.

58. Internet usage trends, by age, 2005-16

Notes for Panel A:

Data are based on OECD estimations.

Notes for Panel B:

Unless otherwise stated, Internet users are defined for a recall period of 12 months, and data for all individuals refer to individuals aged 16-74. For the United States, no time period is specified.

For Australia, data refer to the fiscal year 2014/15 and the recall period is 3 months.

For Brazil, Chile, Colombia, Israel, Japan, Korea and the United States, data refer to 2015.

For Canada, data refer to 2012 and to individuals aged 65 or more instead of 55-64.

For Iceland and Switzerland, data refer to 2014.

For Israel, data refer to individuals aged 20 or more instead of 16-74 and to individuals aged 20-24 instead of 16-24.

For Japan, data refer to individuals aged 15-69 instead of 16-74 and 60-69 instead of 55-74. Data for individuals aged 60-69 originate from the Consumer Usage Trend Survey 2015, Ministry of Internal Affairs and Communications.

For New Zealand, data refer to 2012.

59. Women tertiary graduates in natural sciences, engineering and ICTs (NSE & ICT), 2015

Tertiary education comprises Levels 5 to 8 of the ISCED-2011 classification.

The Information and communication technologies field of study refers to the ISCED-F 2013 Fields of education classification.

The OECD aggregate is an unweighted average of countries with available data.

60. Women in science, 2015

This is an experimental indicator based on a stratified random sample of scientific authors.

Samples are drawn from documents published in 2011 and indexed in the Scopus database. Fields covered include Arts and Humanities, Business, Chemical Engineering, Immunology & Microbiology, Materials Science, Neuroscience and Physics & Astronomy.

Weighted estimates take into account sampling design and non-response patterns by field, country and journal status.

61. Patenting activity by women inventors, 2012-15

The share of patents invented by women refers to the number of patents with women inventors located in a given country divided by the total number of patents invented in the country. Data refer to IP5 families, by filing date, according to the inventors' residence and gender, using fractional counts. Inventors' gender were identified using a gender-name dictionary (first names by country), following the methodology described in Lax Martínez, Raffo and Saito (2016). Patents are allocated to technology fields on the basis of their International Patent Classification (IPC) codes, following the concordance provided by WIPO (2013). Only countries with more than 100 patent families in total and 25 patent families in each depicted technology for 2012-15, and with more than 80% of inventor's names allocated to gender, are included. Figures for 2014 and 2015 are estimated based on available data for those years.

62. Government R&D budgets, selected economies, 2008-16

These statistics are based upon OECD R&D databases including the R&D Statistics (*http://oe.cd/rds*) and Main Science and Technology Indicators Databases (*http://oe.cd/msti*). For more information on these data, including on data issues such as breaks in series, please see those sources.

For Australia, Canada, Japan, Korea and the United States, only Central or Federal government budget allocations for R&D are included.

63. Government R&D budgets, by socio-economic objective, 2016

These statistics are based upon OECD R&D databases including the R&D Statistics (http://oe.cd/rds) and Main Science and Technology Indicators Databases (http://oe.cd/msti). For more information on these data, including on data issues such as breaks in series, please see those sources.

For Australia, Austria, Canada, Iceland, Japan, Korea and the United States, only Central or Federal government budget allocations for R&D are included.

64. Scientific research on dementia and neurodegenerative diseases, selected countries, 1996-2016

This is an experimental indicator.

These estimates are based on a search for the text items "neurodegenerat", "dementia" and "Alzheimer" in the abstracts of articles published between 1996 and 2016 contained in the Scopus database.

Country-level counts are on a fractional basis.

65. Disciplinary areas contributing to the scientific output on dementia and neurodegenerative diseases, 1996-2016

This is an experimental indicator.

These estimates are based on a search for the text items "neurodegenerat", "dementia" and "Alzheimer" in the abstracts of articles published between 1996 and 2016 contained in the Scopus database.

Subject-level counts are on a fractional basis.

66. Open access of scientific documents, 2017

This is an experimental indicator.

This indicator is based on an automated query on a random (non-stratified) sample of 100 000 citable documents (articles, reviews and conference proceedings) published in 2016 and indexed in the Scopus database, with valid DOIs associated to them (more than 90% of cases). The open access status of the documents has been assessed using the R wrapper for the oaDOI API produced by ImpactStory, an open-source website that aims to help researchers explore and share the online impact of their research. The API returns information on the possibility of securing legal copies of the relevant document and the different mechanisms.

"Gold open access" applies to documents associated to publishers included in the Dictionary of Open Access Journals that make their content openly available at no charge to readers. "Gold hybrid" indicates that a document is accessible from a publisher that typically requires a subscription for general access, but allows open access to the specific document, normally with the author or their sponsors paying article-processing charges that provide for open access by third parties (as for most "gold open access" journals). "Green open access" denotes the existence of legal versions of the document in repositories or related outfits, which do not match either of the gold categories. When the DOI can not be resolved to any source of access information, the result is marked as "status not available". When the DOI resolves and the return indicates that there are no legal open versions available, the document is marked as "closed".

Effective open access may be underestimated as a result of imperfect resolution of DOIs in tracing legal open versions as well as the existence of versions non-compliant with copyrights. This indicator reflects the access status of documents within six months to one year and a half after publication. Documents under temporary embargo will fall under the "closed" category but would be categorised as open at a later stage.

67. Highly cited scientific documents, by open-access status, 2017

This is an experimental indicator.

This indicator is based on an automated query on a random (non-stratified) sample of 100 000 citable documents (articles, reviews and conference proceedings) published in 2016 and indexed in the Scopus database, with valid DOIs associated to them (more than 90% of cases). The open access status of the documents has been assessed using the R wrapper for the oaDOI API produced by ImpactStory, an open-source website that aims to help researchers explore and share the online impact of their research. The API returns information on the possibility of securing legal copies of the relevant document and the different mechanisms.

"Gold open access" applies to documents associated to publishers included in the Dictionary of Open Access Journals that make their content openly available at no charge to readers. "Gold hybrid" indicates that a document is accessible from a publisher that typically requires a subscription for general access, but allows open access to the specific document, normally with the author or their sponsors paying article-processing charges that provide for open access by third parties (as for most "gold open access" journals). "Green open access" denotes the existence of legal versions of the document in repositories or related outfits, which do not match either of the gold categories. When the DOI can not be resolved to any source of access information, the result is marked as "status not available". When the DOI resolves and the return indicates that there are no legal open versions available, the document is marked as "closed".

Effective open access may be underestimated as a result of imperfect resolution of DOIs in tracing legal open versions as well as the existence of versions non-compliant with copyrights. This indicator reflects the access status of documents within six months to one year and a half after publication. Documents under temporary embargo will fall under the "closed" category but would be categorised as open at a later stage.

Highly cited documents are the 10% most-cited papers normalised by scientific field and type of document (articles, reviews and conference proceedings). The Scimago Journal Rank indicator is used to rank documents with identifical numbers of citatations within each class. This measure is an indicator of research excellence. Estimates are based on fractional counts of documents by authors affiliated to institutions in each economy.

68. Intenational collaboration in science and innovation, 2005-16

International co-inventions are measured as the share of IP5 patent families featuring inventors located in at least two economies, out of the total number of IP5 patent families having inventors located in the economy considered. Data refer to IP5 patent families filed in 2005-15 according to the inventor's residence. Only economies with more than 100 patents families in 200515 are included. A whole-counts approach has been used.

International co-authorship of scientific publications is defined at the institutional level. A scientific document is deemed to involve an international collaboration if institutions from different countries or economies are present in the list of affiliations reported by single or multiple authors. For comparability with data on co-inventions, a whole-counts approach is used in this case. This results in larger estimates than presented on a fractional basis in Chapter 3 of this publication.

69. International net flows of scientific authors, selected economies, 2002-16

This is an experimental indicator.

Estimates are based on differences between implied inflows and outflows of scientific authors for the reference economy, as indicated by a change in the main affiliation of a given author with a Scopus ID over the author's indexed publication span. This chart decomposes net flows recorded over the period on a year-by-year basis for selected economies. An inflow is computed for year t and economy c if an author who was previously affiliated to another economy is first seen to be affiliated to an institution in that economy and year. Likewise, an outflow is recorded when an author who was affiliated to c in a previous period is first observed to be affiliated in a different economy in year t. In the case of affiliations in more than one economy, a fractional counts approach is used. In the case of multiple publications per author in a given year, the last publication in any given year is used as reference, while others are ignored.

The actual mobility date is undetermined as the span between publications may be more than one year. As a result, the timing implied by this figure may be subject to a lag with respect to the point at which mobility flows took place. The timing will be more accurate for more prolific authors. Estimates for early years are not reported because mobility flows can only be computed once a second publication by an author is captured in the database. Likewise, incomplete indexing of all authors over 2000-03 may result in understating total flows and as a consequence estimated net flows, albeit to a lesser extent.

70. Direct funding and tax incentive support for business R&D by SMEs, 2015

This is an experimental indicator. International comparability may be limited (e.g. due to variations in SME definitions for business R&D vs. R&D tax relief reporting purposes).

For BERD and government-funded BERD, SME figures generally refer to enterprises with 1-249 employees (i.e. excluding firms with zero employees), unless specified otherwise. A number of countries adopt additional criteria to define SME status. Independence is one relevant criterion currently adopted by a few countries (e.g. Canada, the United Kingdom) in reporting government-funded BERD and R&D tax support by firm size. This further limits international comparability. For SME definitions, see country-specific notes.

For more information on R&D tax incentives, see *http://oe.cd/rdtax*, and for general notes and country-specific notes for this R&D tax incentive indicator, see *http://oe.cd/sb2017_notes_rdtax*.

71. Business R&D intensity and government support to business R&D, 2015

For more information on R&D tax incentives, see http://oe.cd/rdtax, and for general notes and country-specific notes for this R&D tax incentive indicator, see *http://oe.cd/sb2017_notes_rdtax*.

72. Changes in government support to business R&D and total business expenditures on R&D, 2006-15

For more information on R&D tax incentives, see http://oe.cd/rdtax, and for general notes and country-specific notes for this R&D tax incentive indicator, see *http://oe.cd/sb2017_notes_rdtax*.

73. Venture capital investment in selected countries, by sector, 2016

For the United States, data also include venture capital investments by other investors alongside venture capital firms, but exclude investment deals 100% financed by corporations and/or business angels.

Data providers are Invest Europe for European countries and NVCA for the United States.

"ICT" refers to "Communications" and "Computer and consumer electronics" for European countries and "Information technology" for the United States.

"Other" includes Agriculture, Business products and services, Chemicals and materials, Construction, Consumer goods and services, Energy and environment, Financial and insurance activities, Real estate and Transportation sectors for European countries and Energy, Materials and resources, B2C (Business to consumer), B2B (Business to business) and Financial services industries for the United States.

74. Business angel deals by sector, Europe, 2015 and the United States, 2016

A business angel is a private investor who generally provides finance and business expertise to a company in return for an equity share in the firm. Some business angels form syndicates or networks in order to take on larger deals and share the risk.

Business angel groups are formed by individual angels who join forces to evaluate and invest in entrepreneurial ventures. The groups are able to pool their capital to make larger investments.

A business angel network is an organisation designed to facilitate the matching of entrepreneurs with business angels.

Data refer to networks and groups surveyed by the business angel associations.

Europe includes: Andorra, Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia, Malta, the Netherlands, Norway, Poland, Portugal, the Russian Federation, Serbia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom.

For the United States, data refer to the simple average of the following regions: Northwest, California, Southwest Texas, Great Plains, Great Lakes, Southeast, Mid-Atlantic, New York and Northeast.

75. Start-ups in digital-related sectors that attracted equity funding in OECD and BRIICS, 2011-16

The sample is restricted to firms founded after 2010 (i.e. five years old or less in 2016) that attracted equity funding over the 2011-16 period.

Equity funding includes venture capital and other forms of risk finance such as business angel investments or debt financing.

Digital-related sectors are identified by the OECD on the basis of the correspondence between the sectors available in the database with the ISIC Rev.4 industry list.

"Other digital related" includes Navigation and mapping, Payments, Messaging and telecommunications and Platforms.

76. Top digital-related sectors that attracted equity funding, 2011-16

The sample is restricted to firms founded after 2010 (i.e. five years old or less in 2016) that attracted equity funding over the 2011-16 period.

Equity funding includes venture capital and other forms of risk finance such as business angel investments or debt financing.

Digital-related sectors are identified by the OECD on the basis of the correspondence between the sectors available in the database with the ISIC Rev.4 industry list.

77. Scientific documents acknowledging direct sources of funding, 2016

This is an experimental indicator.

This indicator is constructed for citable scholarly documents (articles, reviews or conference proceedings) published in 2016 and indexed in the Scopus database according to whether a record exists of the author(s) acknowledging funding by any given organisation(s). It provides a proxy measure of the extent to which scientists have to secure direct funding for their research activities on the basis that support needs to be acknowledged within relevant outputs.

78. Funding acknowledgment in scientific publications and their citation impact, 2016

This is an experimental indicator.

This indicator is constructed for citable scholarly documents (articles, reviews or conference proceedings) indexed in the Scopus database according to whether a record exists of the author(s) acknowledging funding by any given organisation(s).

The proportion of top-ranked indicators for each country and document type according to funding acknowledgement is computed based on a field and document-type normalised impact indicators that rank documents within each group by actual citations and, on parity of citations, according to the prestige of the journal according to the Scimago Journal Rank indicator for 2015. Documents are assigned to the top 10% of their class and aggregated using fractional counts by field and country. Given the short citation window (one year after publication), the results are heavily influenced by the journal ranking.

References

Boselli, B. and F. Galindo-Rueda (2016), "Drivers and Implications of Scientific Open Access Publishing: Findings from a Pilot OECD International Survey of Scientific Authors", *OECD Science, Technology and Industry Policy Papers*, No. 33, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jlr2z70k0bx-en*.

Breschi, S., J. Lassebie, and C. Menon (forthcoming), "A micro-data analysis of innovative start-ups and venture-capital investments across countries".

Calvino et al. (forthcoming), "A Taxonomy of Digital Sectors".

Corrado, C., C. Hulten and D. Sichel (2009), "Intangible capital and US economic growth", *Review of Income and Wealth*, Vol. 55/3, pp. 661-685.

Criscuolo, C. and J. Timmis (forthcoming), "GVCs and centrality: Mapping key hubs, spokes and the periphery", *OECD Productivity Working Papers*.

Daiko, T. et al. (2017), *World Corporate Top R&D Investors: Industrial Property Strategies in the Digital Economy*, a JRC and OECD common report, Publications Office of the European Union, Luxembourg.

Dalle, J.M., M. Denbesten and C. Menon (forthcoming), "Using Crunchbase for academic and managerial research".

Dernis, H. et al. (2015), *World Corporate Top R&D Investors: Innovation and IP Bundles*, a JRC and OECD common report, Publications Office of the European Union, Luxembourg.

Dernis, H., Squicciarini M. and R. de Pinho (2016), "Detecting the emergence of technologies and the evolution and co-development trajectories in science (DETECTS): A 'burst' analysis-based approach", *Journal of Technology Transfer*, Vol. 41/5, pp. 930–960.

Grundke, R. et al. (forthcoming), "Which skills for the digital era? A returns to skills analysis".

Grundke, R. et al. (2017), "Skills and global value chains: A characterisation", *OECD Science, Technology and Industry Working Papers*, No. 2017/05, OECD Publishing, Paris, *http://dx.doi.org/10.1787/cdb5de9b-en*.

Haines, W., L. Marcolin, and M. Squicciarini (forthcoming), "Intangibles and productivity growth: a new assessment".

Inaba, T. and M. Squicciarini (2017), "ICT: A new taxonomy based on the international patent classification", *OECD Science, Technology and Industry Working Papers*, No. 2017/01, OECD Publishing, Paris, *http://dx.doi.org/10.1787/ab16c396-en*.

International Federation of Robotics (2016), *World Robotics: Industrial Robots*, Frankfurt am Main, Germany.

Kalantari, A. et al. (2017), "A bibliometric approach to tracking big data research trends", *Journal of Big Data*, Vol. 4/30, pp. 1-18, *https://doi.org/10.1186/s40537-017-0088-1*.

Le Mouel, M., L. Marcolin, and M. Squicciarini (2016), "Investment in organisational capital: Methodology and panel estimates", *SPINTAN Working Papers*, No. 21, European Commission, Brussels.

Lax Martínez G., Raffo J. and K. Saito (2016), "Identifying the gender of PCT inventors", *Economic Research Working Paper No. 33*, World Intellectual Property Organization (WIPO), Geneva, *www.wipo.int/publications/en/details.jsp?id=4125*.

Marcolin, L., S. Miroudot, and M. Squicciarini (2016), "The routine content of occupations: New cross-country measures based on PIAAC", No. 188, *OECD Trade Policy Papers*, OECD Publishing, Paris.

OECD (forthcoming), *Financing SMEs and Entrepreneurs 2018: An OECD Scoreboard*.

OECD (2017a), *OECD Compendium of Productivity Indicators 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/pdtvy-2017-en*.

OECD (2017b), *Government at a Glance 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/gov_glance-2017-en*.

OECD (2015a), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264239012-en*.

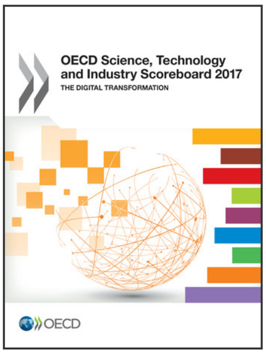
OECD (2015b), *Addressing Dementia: The OECD Response*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264231726-en*.

OECD (2015c), "Making Open Science a Reality", *OECD Science, Technology and Industry Policy Papers*, No. 25, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jrs2f963zs1-en*.

OECD (2011), *OECD Guide to Measuring the Information Society 2011*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264113541-en*.

Squicciarini, M., L. Marcolin and P. Horvát (2015), "Estimating cross-country investment in training: An experimental methodology using PIAAC data", *OECD Science, Technology and Industry Working Papers*, No. 2015/09, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jrs3sftp8nw-en*.

WIPO (2013), "IPC Concordance Table", WIPO, Geneva, *www.wipo.int/ipstats/en/statistics/technology_concordance.html* (accessed 1 June 2017).



From:

OECD Science, Technology and Industry Scoreboard 2017

The digital transformation

Access the complete publication at:

https://doi.org/10.1787/9789264268821-en

Please cite this chapter as:

OECD (2017), “Innovation today: Taking action”, in *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/sti_scoreboard-2017-6-en

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to rights@oecd.org. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at info@copyright.com or the Centre français d’exploitation du droit de copie (CFC) at contact@cfcopies.com.