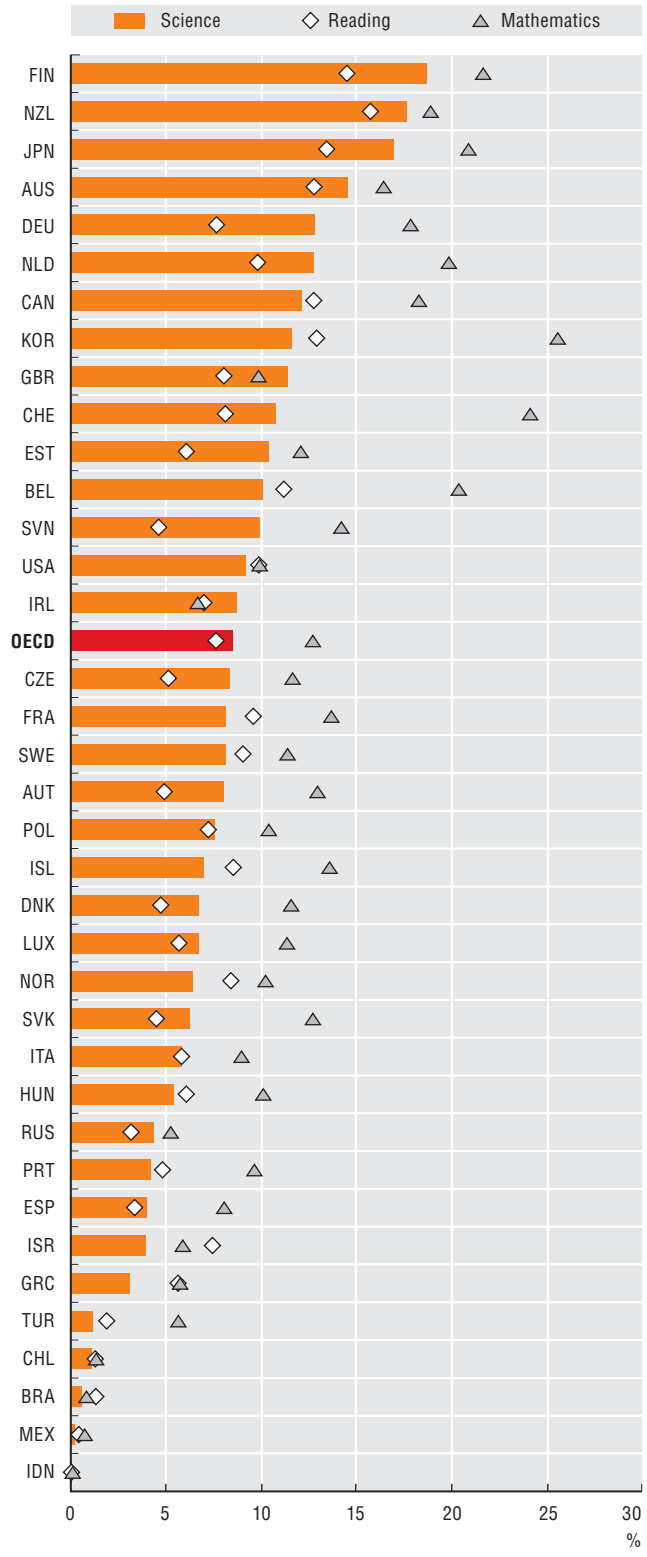
3. Learning for innovation

Science, reading and mathematics proficiency at age 15, 2009

Percentage of top performers



Source: OECD (2010), *PISA 2009 Results: What Students Know and Can Do: Student Performance in Reading, Mathematics and Science*, Vol. 1, OECD Publishing. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888932890675

The rapidly growing demand for highly skilled workers has led to global competition for talent. High-level skills are critical for creating new knowledge, technologies and innovation and, as such, are key to economic growth and social development, and top-performing students in reading, mathematics and science are likely to contribute to a country's future talent pool. Results from the 2009 OECD PISA study show that, in the OECD area, 8.5% of students were top performers in science, 7.6% in mathematics and 12.7% in reading. Economies with better performance in mathematics and science often also invest more in R&D. However, Israel has low PISA scores and a high R&D-to-GDP ratio.

The difference between entry rates into university and graduation rates at the qualifying secondary level may be due to factors such as students coming to study from abroad. High tuition fees may discourage qualified candidates from remaining in education while limited employment opportunities may reduce the opportunity cost of higher education. Graduation rates at tertiary level may be low relative to entry rates in countries with longer degrees.

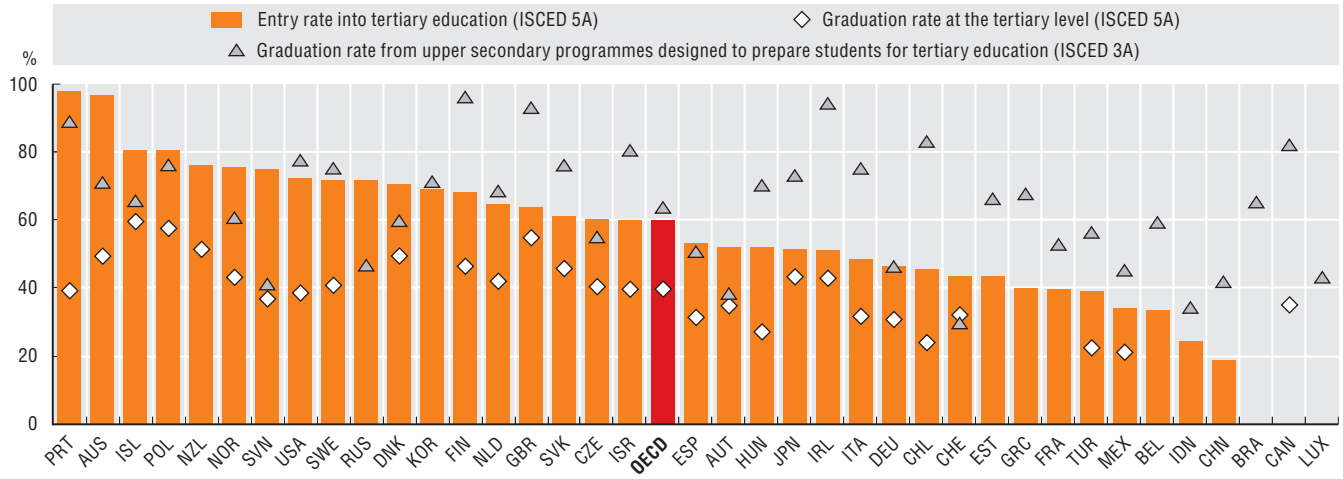
Once in the workforce, individuals often engage in formal adult education or training, sometimes sponsored by their employers. A new indicator from the OECD PIAAC survey shows a consistently positive relation between job-related training and education and the level of workers' skills, in this case proficiency in problem solving in technology-rich (e.g. computer-based) environments. This may reflect decisions by employers to train employees with high potential since much knowledge work is facilitated by the use of ICT.

Definitions

Top performers are students proficient at level 5 or 6 of the PISA assessment in the relevant subject. To attain that level, students need more than 626, 607 or 633 points in reading, mathematics and science, respectively. *University education* denotes tertiary-type A education. *Graduation rates* are the estimated share of an age cohort that will complete the relevant level of education during their lifetime. *Entry rates* represent the proportion of an age cohort that will enter a university programme for the first time in their lifetime. *Job-related education and training* refers to organised, systematic education and training activities to obtain knowledge and/or learn new skills for a current or a future job, and generally to improve opportunities for advancement and promotion. *Problem solving in technology-rich environments* in the PIAAC survey involves testing the ability to use digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks (OECD, 2009).

Transition from upper secondary to graduation at university level, 2011

Graduation and entry rates

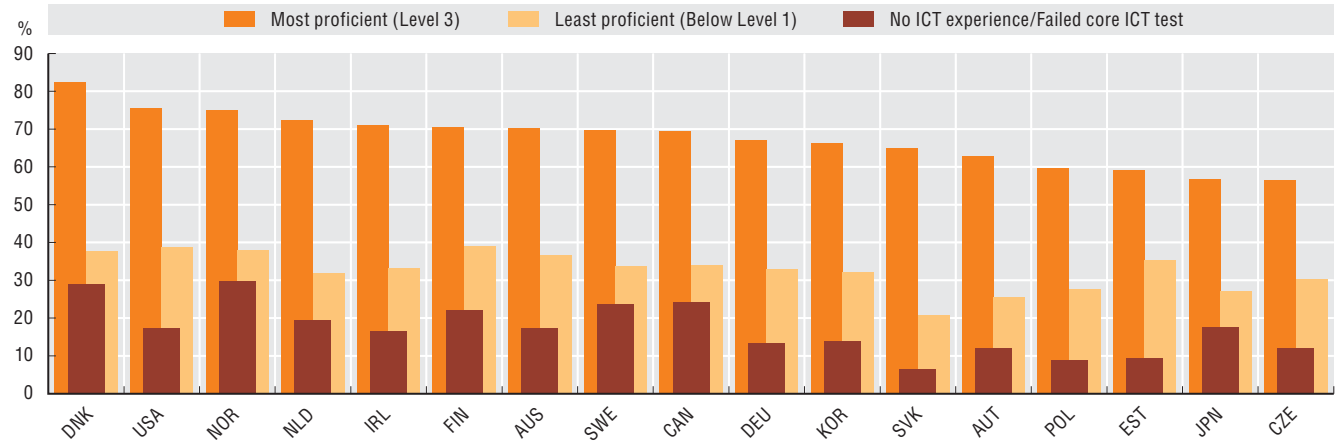


Source: OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing. See chapter notes.

StatLink http://dx.doi.org/10.1787/888932890694

Participation in job-related education and training by level of problem solving in technology-rich environments, 2012

As a percentage of the adult population at the relevant proficiency level



Source: OECD, Survey of Adult Skills Database, Programme for the International Assessment of Adult Competencies (PIAAC), April 2013. See chapter notes.

StatLink http://dx.doi.org/10.1787/888932890713

Measurability

The OECD Programme for International Student Assessment (PISA) assesses the extent to which students near the end of compulsory education have acquired key knowledge and skills, with a focus on reading, mathematics and science. The 2009 survey was conducted in 34 OECD and 31 partner economies; 470 000 students aged 15 to 16 participated (OECD, 2010).

The calculation of graduation and entry rates on a net basis requires information that is not always available. In this case, gross rates, which divide the total number of entrants or graduates by the population at the typical entry or graduation age, are used. In Europe, the Bologna process for harmonising higher education systems may result in limited comparability of education statistics during the transition.

Education and training participation rates are calculated on an adjusted adult population that excludes students who have not completed their first formal cycle of education. Individuals aged 16 to 19 who recently completed or are engaged in short-duration education or training at level ISCED 3C or below, as well as those aged 20 to 24 for ISCED 3A,B,C, are included.

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 recognised 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."

2.1. Investment in knowledge

Spending on higher education, 2000 and 2010

Estimates for Canada refer to 2009. Estimates for Chile refer to 2011.

Estimates for Brazil, Canada, Hungary, Ireland, Italy, Poland, Portugal and Switzerland refer to public institutions only.

Core educational services include all expenditures directly related to instruction: all expenditures on teachers, school buildings, teaching materials, books, and administration of schools. Other expenditures include ancillary education expenditures, such as housing, meals and transport provided by institutions, and R&D expenditures at higher education institutions. The breakdown of total expenditures is not available for Argentina, Denmark, Iceland, Japan and the Russian Federation.

Gross domestic expenditure on R&D, 2001 and 2011

For Australia, data refer to 2002 and 2010 instead of 2001 and 2011.

For Chile and the Netherlands, data refer to 2010 instead of 2011.

For Iceland and South Africa, data refer to 2009 instead of 2011.

For Luxembourg, data refer to 2000 instead of 2001.

For Switzerland, data refer to 2000 and 2008 instead of 2001 and 2011.

ICT Investment by asset, 2000 and 2011

For Australia, data refer to 2008.

For Denmark and the United Kingdom, data refer to 2009.

For Ireland, Japan, New Zealand, Portugal and Switzerland data refer to 2010.

For the Slovak Republic, data refer to 2004 instead of 2000.

For Denmark, communication equipment is included under IT equipment.

National sources (used only for investment data) include the National Statistical Institutes of Canada, Denmark, Germany, Japan, the Netherlands, New Zealand, Switzerland, the Central Bank of Korea, the United States Bureau of Economic Analysis (BEA).

2.2. Human resources and knowledge-based capital

General notes for all figures:

Identification of occupations that relate to knowledge-based capital (KBC) is based on survey results from the Occupational Information Network Database of the United States Bureau of Labor Statistics. Results for the United States are based on the Standard Occupational Classification system (SOC, 2010) and those for the other countries are based on the International Standard Classification of Occupations (ISCO, 2008). Therefore, the selection of KBC-related occupations slightly differs between the United States and the other countries.

Additional notes:

Knowledge-based capital related workers, 2012 and;

Workers contributing to more than one activity related to knowledge-based capital, 2012

The category "Overlapping assets" refers to all employed persons who are related to more than one knowledge-based asset.

2.3. Learning for innovation

Transition from upper secondary education to graduation at the university level, 2011

Upper secondary graduation rates include students who graduated at the ISCED 3A, 3B and 3C levels for Portugal, the United Kingdom and the United States and from ISCED 4A programmes "Berufsbildende höhere Schulen" for Austria.

Gross upper secondary graduation rates for China, Germany, Japan, Korea, the Russian Federation, Spain, Switzerland and the United Kingdom.

Gross entry rates into tertiary education for China.

Gross graduation rates at the tertiary level for Japan, Turkey and the United States.

Participation in job-related education and training by level of problem solving in technology-rich environments, 2012

Participation in adult education and training is calculated by excluding students who are considered to be still in their first formal cycle of studies. However, those aged 16 to 19, who recently completed or are still in a programme of short duration at ISCED 3C or below, are considered adult learners. Similarly, those aged 20 to 24 who recently completed or are still at ISCED 3A,B,C or below are considered adult learners.

On the basis of their test results, respondents are assigned a proficiency level. "Below Level 1" is the lowest level and corresponds to a score of less than 241 points out of 500 (12.3% of respondents). "Level-3" is the highest level and corresponds to a score of more than 340 points out of 500 (5.8% of respondents). "No ICT experience/ Failed core ICT test" corresponds to respondents whose ICT skills were insufficiently developed to take the computer-based test and whose problem-solving skills were not evaluated (22.8% of respondents).

2.4. Skills for innovation

Professionals and technicians, 2012

"Professionals" and "Technicians and associate professionals" are defined according to the International Standard Classification of Occupations 2008 (ISCO-08) major groups 2 and 3 respectively, except for Australia, Brazil, Canada, Chile, China, India, Indonesia, Israel and the Russian Federation, for which the corresponding ISCO-88 groups are reported.

For Australia, Brazil, Canada, Chile, India, Indonesia, Israel, Mexico, the Russian Federation and South Africa, data are drawn from the Laborsta Database maintained by the International Labour Organization (ILO).

For China, data are drawn from China's *Labour Statistical Yearbook 2012*.

For India, data refer to the period July 2011-June 2012 covered by the Indian National Sample Survey, Ministry of Statistics and Program Implementation, June 2013.

For the United States, data refer to March 2012, based on the Current Population Survey (CPS). CPS data were converted from US 2010 census codes to 1-digit ISCO-08 major groups via published correspondences with US 2010 Standard Occupational Classification (SOC) codes.

For Brazil, data refer to 2009.

Notes and References

For Canada, Chile, Indonesia, Israel, Mexico and the Russian Federation, data refer to 2010.

For China, data refer to 2011.

Professionals and technicians in business sector services and manufacturing, 2012

The occupations considered here correspond to major groups 2, "Professionals", and 3, "Technicians and associate professionals" of the International Standard Classification of Occupations 2008 (ISCO-08).

Manufacturing refers to the ISIC Rev.4 (NACE Rev.2) Divisions 10-33 (Section C) while Business sector services cover Divisions 45-82 (G-N).

Data refer to total employment (including self-employed).

For the Netherlands data refer to 2011.

For the United States, data refer to March 2012, based on the Current Population Survey (CPS). CPS data were converted from US 2010 census codes to 1-digit ISCO-08 major groups via published correspondences with US 2010 Standard Occupational Classification (SOC) codes.

Firms using innovation-relevant skills, 2008-10

Estimates are based on the voluntary, ad-hoc module in the EU Community Innovation Survey 2010 on the skills available in enterprises and on methods to stimulate new ideas and creativity. The indicator corresponds to the percentage of firms in the relevant innovation category responding affirmatively to the question: "During the three years 2008 to 2010, did your enterprise employ individuals in-house with the following skills, or obtain these skills from external sources?"

Innovative enterprises had innovation activities during 2008-10, relating to the introduction of new products, processes, organisational or marketing methods. This includes enterprises with ongoing and abandoned activities for product and process innovation. The question on innovation-relevant skills also applies to non-innovative enterprises.

Estimates are based on firms with in "core" NACE Rev.2 economic activities (B, C, D, E, G46, H, J58, J61, J62, J63, K and M71).

2.5. New doctorates

Graduation rates at doctorate level, 2000 and 2011

For Australia, Canada, France, Iceland and Indonesia data refer to 2010.

Because of the increasing harmonisation of programme durations among European countries within the Bologna Process, some countries have seen rapid changes in their graduation rates.

General notes:

Graduates at doctorate level, 2011 and;

New doctorates in science and engineering, 2007-11

For Brazil, China, Norway and South Africa, data are based on national sources: for Brazil, Capes Database, Ministry of Education of Brazil, July 2013; for China, Ministry of Education of the Peoples' Republic of China, Educational Statistics website, July 2013; for Norway, the Nordic Institute for Studies in Innovation, Research and Education (NIFU), June 2013; and for South Africa, Higher Education Management and Information System (HEMIS), South African Department of Higher Education and Training, July 2013.

For Brazil, China and South Africa, an approximate conversion of nationally available information was carried out to map to the ISCED-1997 classification of fields of study.

For Norway, data are based on NIFU's Doctoral Degree Register, which also includes "Licentiate" degrees (equivalent to a doctorate degree).

Additional notes:

Graduates at doctorate level, 2011

For Australia, Canada, France and Iceland, data refer to 2010.

New doctorates in science and engineering, 2007-11

Owing to data availability by field of education, data refer to the 2007-10 average for Australia, Canada and France; 2009-11 average for China; and the average of the years 2005, 2006 and 2011 for Italy.

2.6. Doctorate holders

Doctorate holders in the working age population, 2009

For Chinese Taipei, data only include PhDs in the National Profiles of Human Resources in Science and Technology (NPHRST) compiled by STPI, NARL, *http://hrst.stpi.narl.org.tw/index.htm#noticeChinese*.

For Australia and Canada, data refer to 2006; for Finland, data refer to 2008.

For Korea, OECD estimates based on national sources. Data refer to 2010.

General notes:

Doctorate holders working as researchers, 2009 and;

Doctorate holders by sector of employment, 2009

For Belgium, the Netherlands and Spain, data refer to graduation years 1990 onwards.

For Spain, there is limited coverage of graduates who received their doctorate between 2007 and 2009.

For the United States, data exclude those with a doctorate in the humanities.

Recent doctorates (right-hand side bars) are defined as follows: France, 2006/07 graduates between March and July 2010; Japan, 2002-06 graduates in April 2008; United Kingdom, 2006/07 graduates in November 2010.

Additional notes:

Doctorate holders working as researchers, 2009

For Norway, the figure is a lower bound estimate.

For Japan, Norway, Poland, Romania and the United States, data refer to 2008; for France and the United Kingdom, data refer to 2010.

Doctorate holders by sector of employment, 2009

For Chinese Taipei, data only include PhDs in the National Profiles of Human Resources in Science and Technology (NPHRST) compiled by STPI, NARL, *http://hrst.stpi.narl.org.tw/index.htm#noticeChinese*. Doctorate holders working in the business sector are under-represented.

For the Russian Federation, data relate only to doctoral graduates employed as researchers and teachers.

For Denmark, Japan, Poland and the United States, data refer to 2008; for France and the United Kingdom, data refer to 2010.

2.7. Researchers

R&D personnel, 2001 and 2011

For Australia, 2002 and 2008 instead of 2001 and 2011.

For Austria, 2002 instead of 2001.

For Canada, Chile, EU28, France, Germany and the Netherlands, 2010 instead of 2011.

For Iceland and South Africa, 2009 instead of 2011.

For Luxembourg, 2000 instead of 2001.

For Switzerland, 2000 and 2008 instead of 2001 and 2011.

Researchers by sector of employment, 2011

For Australia and Switzerland, data refer to 2008.

For Austria, Belgium, Germany, Iceland, Luxembourg and South Africa, data refer to 2009.

For Canada, Chile, France, Hungary and the Netherlands, data refer to 2010.

Female researchers by sector of employment, 2011

For Austria, Belgium, Denmark, Germany, Iceland, Luxembourg, South Africa and Sweden, data refer to 2009.

For Chile, Italy, France, Hungary, Portugal and Spain, data refer to 2010.

2.8. R&D

R&D expenditure by performing sectors, 2011

For Australia, Chile and the Netherlands, data refer to 2010.

For Iceland and South Africa, data refer to 2009.

For Switzerland, data refer to 2008.

For Israel, defence R&D is partly excluded from available estimates.

For Hungary, total GERD combines survey data and data from the central budget on R&D support. It includes R&D expenditures that cannot be attributed to a specific sector on a performance basis.

For the Netherlands, expenditures in the private non profit (PNP) sector are included in the government sector.

For the Slovak Republic, defence is excluded from the government sector.

For the United States, capital expenditures are excluded from R&D performed in the business, higher education and PNP sector. Government is federal or central government only.

Direct government funding of business R&D, 2001 and 2011

For Australia, Chile, EU28, France, Israel, Italy, the Netherlands, Portugal and Spain, data refer to 2010 instead of 2011.

For Austria, data refer to 2002 and 2009 instead of 2001 and 2011.

For Belgium, Iceland and South Africa, data refer to 2009 instead of 2011.

For China, data refer to 2000 instead of 2001.

For Luxembourg, data refer to 2000 and 2009 instead of 2001 and 2011.

For Switzerland, data refer to 2000 and 2008 instead of 2001 and 2011.

In Austria, "research premium" funding is part of direct government funding since 2006. In previous R&D surveys (reference years 2002 and 2004) it was not listed as a separate source of funds.

For Israel a substantial part of defence R&D funding is not reported.

Gross expenditures on research and development, by type of R&D, 2001 and 2011

Shares by type of R&D are based on total GERD, except for Chile, Estonia, Norway, Poland, the Russian Federation, Spain and the United States. For these countries, estimates are based on current R&D estimates as complete records with capital costs are not available.

Data refer to 2001 and 2011 except for Australia (2002, 2008), Austria (2002, 2009), Chile (2010), Denmark (2003, 2010), France (2001, 2010), Iceland (2001, 2009), Ireland (2002, 2011), Israel (2001, 2010), Italy (2005, 2010), Mexico (2003, 2009), Portugal (2001, 2010), the Russian Federation (2001, 2010), South Africa (2001, 2009), Spain (2001, 2010), Switzerland (2000, 2008), the United Kingdom (2010) and the United States (2001, 2010).

Estimates for Austria, France, Hungary and Japan are based on R&D expenditures for which a breakdown by type of R&D is available: non-classified R&D accounts for 2.0%, 3.8%, 1.6% and 4.6% of the total, respectively. For Austria, R&D expenditure of provincial hospitals is estimated and no breakdown is available by type of R&D. For France, data by type of R&D for defence are not available. For Hungary, total GERD combines survey data and data from the central budget on R&D support, including R&D expenditure that cannot be allocated by type of R&D. For Japan, classification by type of R&D for natural sciences and engineering is limited to physical sciences, engineering, agriculture and health expenditures.

2.9. Higher education and basic research

Higher education expenditure on R&D, 2001 and 2011

General university funds (GUF) estimates identify the component of general grants received by the higher education sector that are ultimately used for R&D. Estonia, Poland and the United States report no relevant grants fitting the GUF description. No estimates are available for China, the Czech Republic, Germany, Hungary, Korea, Luxembourg, Mexico, the Netherlands,

Portugal and Turkey. The GUF figures correspond to the same reference year as HERD, or, in their absence, are based on shares for the most recent available year: Canada, France, Spain (2010), Belgium and Israel (2009).

For Australia, data refer to 2002 and 2010 instead of 2001 and 2011.

For Austria, data refer to 2002 instead of 2001.

For Chile and the Netherlands, data refer to 2010 instead of 2011.

For Iceland and South Africa, data refer to 2009 instead of 2011.

For Switzerland, data refer to 2002 and 2010 instead of 2001 and 2011.

R&D in the social sciences and humanities are not included in estimates for Israel (2001 and 2011) and Korea (2001).

Government funding of R&D in higher education, by type of funding, 2010

For Canada, Denmark, Israel, the Netherlands, New Zealand and Poland, data refer to 2008.

Basic research performed in the higher education and government sectors, 2011

Data refer to the sum of current and capital expenditures, except for Chile, Estonia, Norway, Poland, the Russian Federation, Spain and the United States, for which only current costs are included in estimates reported to the OECD.

For Australia and Switzerland, data refer to 2008.

For Austria, Iceland, Mexico and South Africa, data refer to 2009.

For Chile, Denmark, France, Israel, Italy, Portugal, the Russian Federation, Spain, the United Kingdom and the United States data refer to 2010.

For Israel and Switzerland, most expenditures on defence R&D are not reported or are excluded from the government sector.

For Switzerland and the United States, the government sector refers to the federal or central government only.

For Israel higher education excludes R&D in the social sciences and humanities.

2.10. Business R&D

Business enterprise expenditure on R&D, 2001 and 2011

For Australia, Chile and the Netherlands, data refer to 2010 instead of 2011.

For Austria, data refer to 2002 instead of 2001.

For Iceland and South Africa, data refer to 2009 instead of 2011.

For Luxembourg, data refer to 2000 instead of 2001.

For Switzerland, data refer to 2000 and 2008 instead of 2001 and 2011.

Business R&D by size class of firms, 2011

National statistical agencies use different minimum thresholds for inclusion in R&D surveys and estimates. There are variations in the definition of small and medium-sized firms. Small firms (fewer than 50 employees): for Belgium, 1-49 employees; for the United States, 5-49 employees; for Luxembourg, the Netherlands and Sweden, 10-49 employees. For Japan, the survey excludes firms with capital of less than JPY 10 million.

For Australia, Canada, Chile, France, Germany, Italy, the Netherlands, Portugal, Spain, the United Kingdom and the United States, data refer to 2010.

For Austria, Belgium, Denmark, Luxembourg and Sweden, data refer to 2009.

For Switzerland, data refer to 2008.

R&D expenditures incurred by foreign-controlled affiliates, 2009

Financial intermediation excluded for the Czech Republic, Israel, Japan and Poland.

Community, social and personal services excluded for the Czech Republic and Poland.

For Finland, Hungary, the Netherlands, Slovenia and Spain, only sections B to F of ISIC Rev.4 are covered.

For Japan, data refer to majority and minority foreign-controlled affiliates.

For Australia, Canada, France, Italy, the United Kingdom and the United States, data refer to 2010.

For Switzerland, data refer to 2008.

For Norway, Portugal and the Slovak Republic, data refer to 2007.

2.11. R&D Tax incentives

Direct government funding of business R&D and tax incentives for R&D, 2011

For Australia, Belgium, Brazil, Chile, Ireland, Israel and Spain, data refer to 2010. For China, Luxembourg and South Africa, data refer to 2009 and for Switzerland to 2008.

Estimates of direct funding for Belgium, France, Italy and Portugal are based on imputing the share of direct government-funded BERD in the previous year to the current ratio of BERD to GDP. For Austria, the 2009 share is used for 2011. For Brazil, the 2008 share, based on national sources, is used for 2010.

In Austria, Poland and South Africa, R&D tax incentive support is included in official estimates of direct government funding of business R&D. It is removed from direct funding estimates to avoid double-counting.

Estonia, Finland, Germany, Luxembourg, Mexico, New Zealand, Sweden and Switzerland did not provide information on expenditure-based R&D tax incentives for 2011. For Israel the R&D component of incentives cannot be separately identified at present.

Estimates do not cover sub-national and income-based R&D tax incentives and are limited to the business sector (excluding tax incentive support to individuals). Data refer to estimated initial revenue loss (foregone revenues) unless otherwise specified.

Estimates refer to costs of incentives for business expenditures on R&D, both intramural and extramural unless otherwise specified. Direct support figures refer only to intramural R&D expenditures, except for Brazil.

Country specific notes available at *www.oecd.org/sti/rd-tax-stats.htm*.

Change in government support for business R&D through direct funding and tax incentives, 2006-11

Results restricted to countries providing information on expenditure-based R&D tax incentives for four or more years between 2006 and 2011. A minimum 2% threshold for the tax incentive share of government support for R&D (2011 or latest year) is applied to ensure reliable estimates of growth rates.

For Australia, Belgium, Ireland and Spain data refer to 2010 instead of 2011. For South Africa data refer to 2009 instead of 2011.

For Belgium, Denmark, Korea, Mexico and Slovenia data refer to 2007 instead of 2006. For Turkey data refer to 2008 instead of 2006. For New Zealand figures for tax incentives refer to 2008 instead of 2006, and for direct government support for BERD, figures are an average of 2007 and 2009 values.

Mexico and New Zealand repealed tax incentive schemes in 2009. In 2008, the cost of R&D tax support amounted to MXN 4 500 million in Mexico and to NZD 103 million in New Zealand.

Estimates of direct funding for Belgium, France, Italy and Portugal in 2011 are based on imputing the share of direct government-funded BERD in the previous year to the current ratio of BERD to GDP. The same applies to the Netherlands for 2006. For Austria, the 2009 share is used for 2011.

In Austria, Poland and South Africa, R&D tax incentive support is included in official estimates of direct government funding of business R&D. It is removed from direct funding estimates to avoid double-counting.

Estonia, Finland, Germany, Luxembourg, Mexico, New Zealand, Sweden and Switzerland did not provide expenditure-based R&D tax incentives for 2011. For Israel the R&D component of incentives cannot be separately identified at present.

Estimates do not cover sub-national and income-based R&D tax incentives and are limited to the business sector (excluding tax incentive support to individuals). Data refer to estimated initial revenue loss (foregone revenues) unless otherwise specified.

Estimates refer to the costs of incentives for business R&D expenditures, both intramural and extramural unless otherwise specified. Direct support figures refer only to intramural R&D expenditures, except for Brazil.

Country specific notes available at *www.oecd.org/sti/rd-tax-stats.htm*.

Tax subsidy rates on R&D expenditures, 2013

The tax subsidy rate is calculated as 1 minus the B-index, a measure of the before-tax income needed to break even on USD 1 of R&D outlays (Warda, 2001). It is based on responses from national finance/tax/innovation authorities and R&D statistical agencies to the OECD questionnaire on R&D tax incentives and also draws on other publicly available information.

Benchmark tax data information, including statutory corporate income tax rates, is obtained from the OECD Tax Database, basic (non-targeted) corporate income tax rates, May 2013.

Estimates allow for differences in the treatment of the various components of R&D expenditures: current (labour, other current) and capital (machinery and equipment, facilities/buildings) expenditures. A common 60:30:5:5 percentage distribution of labour, other current, machinery and equipment, and building expenditures is applied based on average estimates for OECD countries (*www.oecd.org/sti/rds*).

Expenditures on capital assets used for R&D are depreciated over their useful life, using a straight-line or declining balance depreciation method, as applicable. Estimates of the net present value of provisions relating to R&D capital expenditures are based on multiple sources of information about the benchmark tax treatment of capital expenditures. Estimates of tax subsidy rates are fairly robust to different choices of sources and methodologies because of the small weight of this component in eligible R&D expenditures.

R&D tax allowances are deducted from taxable income while R&D tax credits are applied against corporate income tax payable (as also for payroll withholding tax incentives and wage taxes). Tax benefits are treated as taxable when appropriate (e.g. Canada).

The model excludes incentives related to personal income, value added, property taxes as well as taxes on wealth and capital and other forms of direct government support (grants and subsidies).

Unless otherwise specified, figures refer to "representative" firms in their class for which caps or ceilings that limit the amount of eligible expenditures or tax support are not applicable.

The B-index for the profit scenario assumes that the "representative firm" generates a sufficiently large profit to achieve the incentive's full potential benefit. An adjusted B-index is reported for a loss-making firm that is unable to claim tax benefits in the reporting period, using an adjusted effective tax rate that takes into account refundability and carry-forward provisions.

Refunds are generally modelled as immediate and full payment of tax incentive claims unless excess claims are payable over time and require discounting.

Carry-forwards are modelled as discounted options to claim the incentive in the future, assuming a constant annual probability of returning to profit of 50% and a nominal discount rate of 10%.

For simplicity, loss-making firms are assumed to enjoy an infinite carry-forward of standard deductions of current R&D expenditures and depreciation expenses arising from the use of machinery, equipment and buildings in R&D, unless expenditures are refundable.

The definitions of SMEs and large firms vary across countries and may also vary over time.

Estimates are not included for some countries that provide expenditure-based R&D tax incentives as these lack sufficient detail to carry out calculations for representative firms in the relevant categories.

Figures for Germany, Israel, Luxembourg, Mexico, New Zealand, Sweden and Switzerland, which apply no special treatment to R&D, reflect the value (or lack thereof) of available allowances for current and capital expenditures.

Country specific notes available at *www.oecd.org/sti/rd-tax-stats.htm*.

2.12. International funding of R&D

Business enterprise R&D funded from abroad, 2011

For Australia, Chile, the EU28, France, Israel, Italy, Portugal and Spain, data refer to 2010.

For Austria, Belgium, Iceland, Luxembourg, the Netherlands and South Africa, data refer to 2009.

For Switzerland, data refer to 2008.

Notes and References

Business enterprise R&D funded from abroad, by source of funds, 2011

"Other/Not elsewhere classified" also includes the private non profit (PNP) sector which accounts at most for 1.4% of all BERD funded from abroad.

For Denmark, France, Italy, Portugal, the Russian Federation, Spain and the United Kingdom, data refer to 2010.

For Austria, Belgium and Sweden, data refer to 2009.

Funding of business R&D by foreign enterprises, 2011

For Canada, France, Italy, Portugal and Spain, data refer to 2010.

For Austria, Belgium and Sweden, data refer to 2009.

For Denmark and Switzerland, data refer to 2008.

Data for Canada and Switzerland are from national sources and separately reported to the OECD.

References

Auriol, L., M. Misu and R. Freeman (2013), "Careers of Doctorate Holders: Analysis of Labour Market and Mobility Indicators", *OECD Science, Technology and Industry Indicators Working Papers*, No. 2013/04, OECD Publishing. Doi: *http://dx.doi.org/10.1787/5k43nxgs289w-en*.

Auriol, L., M. Schaaper and B. Felix (2012), "Mapping Careers and Mobility of Doctorate Holders. Draft Guidelines, Model Questionnaire and Indicators – Third Edition", *OECD Science, Technology and Industry Working Papers*, No. 7, OECD Publishing. Doi: *http://dx.doi.org/10.1787/5k4dnq2h4n5c-en*.

Corrado, C., C. Hulten and D. Sichel, (2009), "Intangible Capital and US Economic Growth", *Review of Income and Wealth*, Vol. 55, No. 3, pp. 661-685.

OECD and Eurostat (1995), *The Measurement of Scientific and Technological Activities: Manual on the Measurement of Human Resources Devoted to S&T* – Canberra Manual, OECD Publishing and ECSC-EC-EAEC, Brussels and Luxembourg. Doi: *http://dx.doi.org/10.1787/9789264065581-en*.

OECD and Eurostat (2005), *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd edition, OECD Publishing and Statistical Office of the European Communities, Luxembourg, *www.oecd.org/sti/oslomanual*. Doi: *http://dx.doi.org/10.1787/9789264013100-en*.

OECD (2002), *Frascati Manual 2002: The Measurement of Scientific and Technological Activities*. Proposed Standard Practice for Surveys on Research and Experimental Development, 6th edition, OECD Publishing, *www.oecd.org/sti/frascatimanual*. Doi: *http://dx.doi.org/10.1787/9789264199040-en*.

OECD (2004), *OECD Handbook for Internationally Comparative Education Statistics: Concepts, Standards, Definitions and Classifications*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/9789264104112-en*.

OECD (2010), *OECD Handbook on Deriving Capital Measures of Intellectual Property Products*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/9789264079205-en*.

OECD (2010), *PISA 2009 Results: What Students Know and Can Do: Student Performance in Reading, Mathematics and Science*, Vol. 1, OECD Publishing. Doi: *http://dx.doi.org/10.1787/9789264091450-en*.

OECD (2010), *Tax expenditures in OECD countries*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/9789264076907-en*.

OECD (2011), *Science, Technology and Industry Scoreboard 2011*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/sti_scoreboard-2011-en*.

OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/eag-2013-en*.

OECD (2013), *Supporting Investment in Knowledge Capital, Growth and Innovation*, OECD Publishing. Doi: *http://dx.doi.org/10.1787/9789264193307-en*.

PIAAC Expert Group in Problem Solving in Technology-Rich Environments (2009), "PIAAC Problem Solving in Technology-Rich Environments: A Conceptual Framework", *OECD Education Working Papers*, No. 36, OECD Publishing. Doi: *http://dx.doi.org/10.1787/220262483674*.

Squicciarini, M. and M. Le Mouel (2012), "Defining and Measuring Investment in Organisational Capital: Using US Microdata to Develop a Task-based Approach", *OECD Science, Technology and Industry Working Papers*, No. 2012/05, OECD Publishing. Doi: *http://dx.doi.org/10.1787/5k92n2t3045b-en*.

Van Steen, J. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", *OECD Science, Technology and Industry Working Papers*, No. 2012/04, OECD Publishing. Doi: *http://dx.doi.org/10.1787/5k98ssns1gzs-en*.

Warda, J. (2001), "Measuring the Value of R&D Tax Treatment in OECD Countries", *STI Review No. 27: Special Issue on New Science and Technology Indicators*, OECD Publishing, *www.oecd.org/sti/37124998.pdf*.