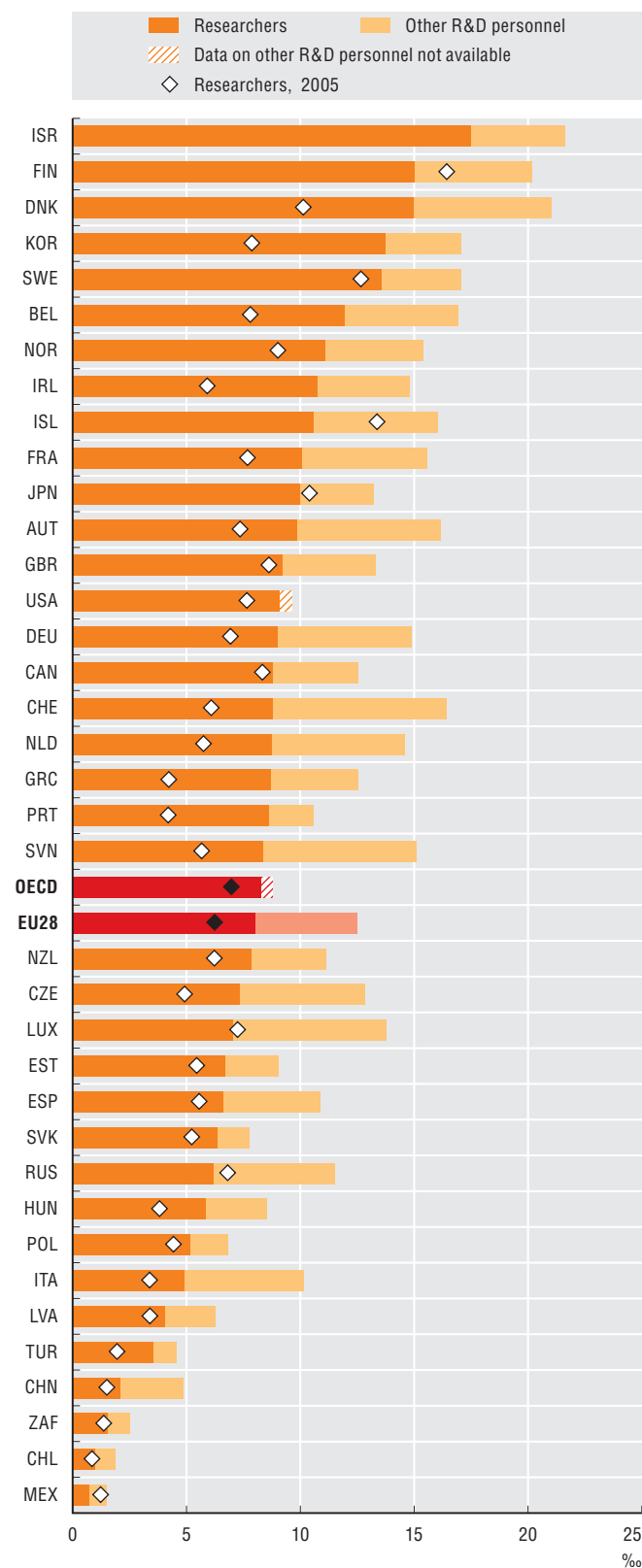


2. KNOWLEDGE, TALENT AND SKILLS

4. Researchers

R&D personnel, 2015

Per thousand employment



Source: OECD, Main Science and Technology Indicators Database, <http://oe.cd/msti>, July 2017. StatLink contains more data. See chapter notes.

StatLink <http://dx.doi.org/10.1787/888933618517>

Did you know?

Latvia achieves gender parity in the number of researchers, while in Sweden women perform more research in companies than men.

Researchers and other R&D personnel constitute a vital input to R&D performance. Measured on a full-time equivalent (FTE) basis, over 2% of persons employed in Denmark, Finland, and Israel work in R&D – almost double the average of other countries (1.1%). Norway and Ireland rank highly even though their R&D spending is below the OECD average. The number and share of researchers has risen between 2005 and 2015 in most countries, though the share of researchers in total R&D personnel varies widely: from over 80% in Israel, Korea, the Slovak Republic, Sweden, and Portugal to 49% in Italy and 43% in China.

The business enterprise and higher education sectors are the main employers of researchers. Business represents the greatest share - over 70% of researchers in Israel, Japan, Korea, and the United States. The share of researchers working in the business sector has increased markedly between 2005 and 2015 in Hungary, Poland, and Turkey, but fallen in Greece, Luxembourg, Mexico, and South Africa.

Over 40% of researchers in Estonia, Latvia, Portugal, the Slovak Republic, and South Africa are women, while fewer than 25% are women in Austria, the Czech Republic, and Germany. Higher education institutions often employ the greatest share of women researchers. In Luxembourg, the creation of the country's first and only public research university in 2003 helped to produce a 10 percentage point increase in women researchers up to 2015.

Definitions

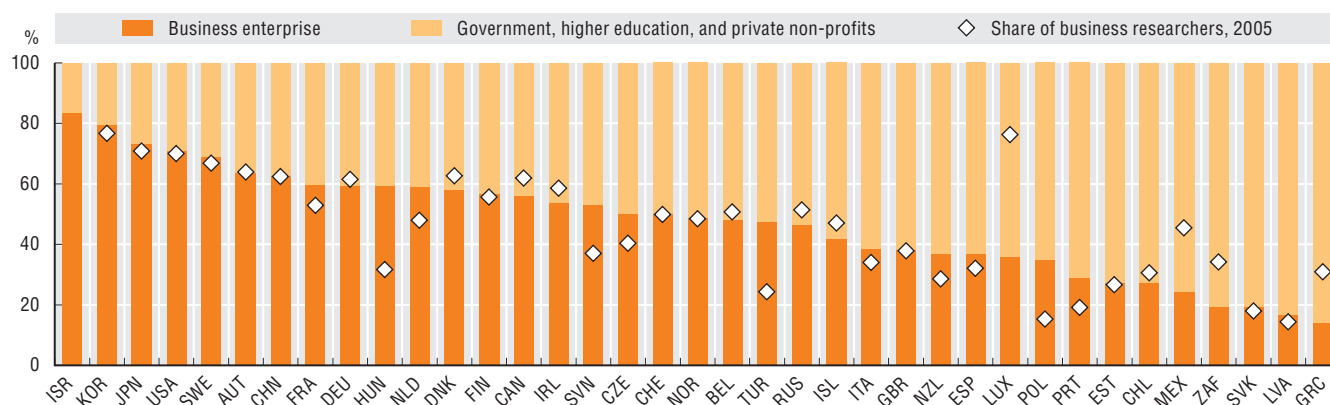
Research and development personnel include all persons employed directly in R&D activities, and comprises technicians and support staff as well as researchers.

Researchers are defined as professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software, or operational methods and are typically directly involved in the management of R&D projects.

R&D personnel are represented in *full-time equivalent* units defined as the ratio of working hours actually spent on R&D during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or a group. A person working half-time on R&D is thus considered 0.5 of a person-year in R&D FTEs. This yields a more accurate measure of the volume of human resources devoted to R&D in a country than headcounts or jobs. For international comparisons, R&D personnel figures are normalised by total employment, as reported in OECD National Accounts statistics.

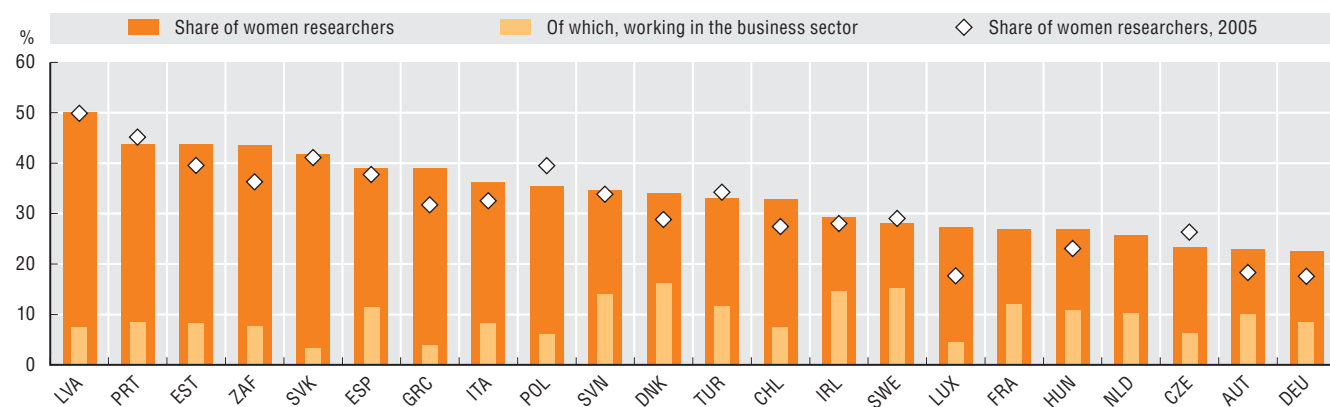
Researchers, by sector of employment, 2015

As a percentage of total researchers, full-time equivalents

Source: OECD, Research and Development Statistics Database, <http://oe.cd/rds>, June 2017. StatLink contains more data. See chapter notes.StatLink <http://dx.doi.org/10.1787/888933618536>

Women researchers, 2015

As a percentage of total researchers, full-time equivalents

Source: OECD, Research and Development Statistics Database, <http://oe.cd/rds>, June 2017. StatLink contains more data. See chapter notes.StatLink <http://dx.doi.org/10.1787/888933618555>

Measurability

Gathering detailed information (e.g. gender, age-band, qualifications, geographic origin, etc.) on people performing R&D can prove challenging. The Frascati Manual 2015 (<http://oe.cd/frascati>) prescribes breakdowns for R&D employees, because R&D performers are more likely to be in a position to provide such details for people they employ directly. However, some countries also include external persons, such as on-site consultants or unpaid volunteers, in their R&D personnel figures. In recent years, a number of countries have extended coverage of certain groups – such as funded PhD students or all permanent university academic staff – as researchers. Estimation methods also vary; for example, methods used to calculate FTEs may vary not only from country to country but also across sectors within countries, owing to differences in the data sources used to estimate R&D in each sector. Estimating FTEs is particularly challenging in higher education, as many researchers typically engage in other activities, such as teaching or administrative tasks – some at the boundary of R&D. Such variations between countries impact international comparability.

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.”

2.1. Investment in knowledge

Expenditure on tertiary education and vocational programmes, 2014

For Chile and Indonesia, data refer to 2015.

For Denmark and Poland, vocational programmes include information from both upper and lower secondary education.

For the Slovak Republic, tertiary education data refer to expenditure on public institutions only.

For Switzerland, data refer to public expenditure only.

Gross domestic expenditure on R&D, by type of R&D, 2015

Data for total GERD (all types of R&D) refer to 2005 and 2015. Where the breakdown of 2015 GERD by type of R&D is not available directly, this is estimated based on the most recent year for which the breakdown is available: 2014 for France, Italy, the Netherlands, Poland, Portugal, Slovenia and the United Kingdom; 2013 for Austria, Belgium, Denmark, Greece, Ireland and Israel.

The breakdown by type of R&D is usually based on total GERD including expenditure on capital inputs to R&D. However, for Chile, Norway and the Russian Federation, shares by type are based on current R&D expenditure, with capital expenditure reported in the “breakdown not available, in total or in part” category. For the United States, and with the exception of GOVERD, which includes expenditure on capital used for R&D, figures reported (both total R&D and R&D by type) refer to current expenditures but include a depreciation component which may differ from the actual level of capital expenditure (reported in the “breakdown not available, in total or in part” category).

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

For Australia, data for total GERD refer to 2004 and 2013.

For Chile, data for total GERD refer to 2007 and 2015.

For Chile, the official GDP figures used to normalise R&D ratios are compiled according to the System of National Accounts (SNA) 1993, rather than the SNA 2008 used in all other cases.

For Ireland, data for total GERD refer to 2014.

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

For South Africa, data for total GERD refer to 2013.

For Switzerland, data for total GERD refer to 2004 and 2015.

ICT investment by asset, 2015

Investment refers to Gross Fixed Capital Formation (GFCF) as defined by the System of National Accounts 2008 (SNA08).

Data for Iceland correspond to business sector investment in office machinery and computers.

Data for Korea are OECD calculations based on detailed national input-output tables supplied by the Bank of Korea and OECD Annual National Accounts SNA08.

2.2. Higher education and basic research

Higher education expenditure on R&D, 2015

Public General University Funds (GUF) estimates identify the component of general institutional grants provided by government to the higher education sector that are ultimately used by the latter for R&D. Estonia, Poland and the United States report no relevant grants fitting the GUF description. No GUF estimates are available for China, the Czech Republic, Germany, Hungary, Korea, Latvia, Luxembourg, the Netherlands, Portugal or 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: Belgium (2013), France (2014), Israel (2013), Italy (2014), New Zealand (2013) and Sweden (2013).

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 issues such as breaks in series, please see that source.

For Australia, data refer to 2004 and 2014.

For Chile, data refer to 2007 and 2015.

For Chile, the official GDP figures used to normalise R&D ratios are compiled according to the System of National Accounts (SNA) 1993, rather than the SNA 2008 used in all other cases.

For Israel and Korea, R&D in the social sciences and humanities is not included in 2005 estimates.

For South Africa, data refer to 2013.

For Switzerland, data refer to 2004 and 2015.

For the United States, figures reported refer to current expenditures, but include a depreciation component which may differ from the actual level of capital expenditure.

Basic research performed in the higher education and government sectors, 2015

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

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 issues such as breaks in series, please see those sources.

For Austria, Belgium, Denmark, Greece, Ireland, Israel and South Africa data refer to 2013.

For France, Italy, the Netherlands, Portugal, Slovenia and the United Kingdom, data refer to 2014.

For the earlier share of higher education and government basic research in GERD, data refer to 2005, except for Austria and Switzerland which refer to 2004, Chile, Denmark and the United Kingdom which refer to 2007, and Mexico which refers to 2003.

For France, the methodology of the public administration survey was changed in 2010: the method for measuring the resources devoted to R&D in ministries and some public organisations has been modified, leading to better identification of their financing activities and to a drop in GOVERD of 900 million Euros.

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

For the Netherlands, part of expenditure dedicated to experimental development in the higher education sector is reported within basic research. Additionally, PNP expenditures are included in the government sector.

For Poland, the 2005 share of higher education and government basic research in GERD is calculated based on data including current costs only, while 2014 higher education and government data include capital and current expenditure.

For Spain, the 2005 share of higher education and government basic research in GERD is calculated based on data including current costs only, while 2015 higher education and government data include capital and current expenditure.

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

For the United Kingdom, the methodology for distributing GOVERD by type of R&D was improved in 2010, resulting in a break in series.

For the United States, the figures reported comprise current expenditure, but include a depreciation component which may differ from the actual level of capital expenditure; the exception is GOVERD, which includes capital expenditure instead.

Funding of R&D in higher education, 2015

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 issues such as breaks in series, please see those sources.

For all countries except China, “PNP/other not elsewhere classified” consists of funds from PNPs overseas only.

2. KNOWLEDGE, TALENT AND SKILLS

Notes and references

General University Funds (GUF) paid from government to universities for use for R&D are recorded in the Government sector where the funds originate.

For Australia, data refer to 2014.

For Austria, data refer to 2013.

For Belgium, Israel, Luxembourg, Sweden and South Africa, data refer to 2013.

For Germany, France, Italy and Portugal, data refer to 2014.

For Australia, Australian Competitive Grants (ACG) – federal and other schemes – are identified separately and included respectively in direct government and private non-profit.

For China, expenditure by source of funds is divided into government, business enterprise, funds from abroad and “other”. These categories differ slightly from those in the Frascati Manual. Money that has no specific source of financing has been allocated to “other sector (domestic)”. This includes self-raised funding, in particular for independent research institutions (IRIs, formerly GRIs) and the higher education sector, and leftover government money from previous years/grants. This “other” amount is recorded in “PNP/other not elsewhere classified in this presentation”.

For Denmark, higher education funds are included in government funds.

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

For Germany, higher education and private non-profit funds are included in government funds.

In Luxembourg’s survey, R&D data by source of funds are broken down as percentages between: Enterprise group, Ministry of Economy, Partner enterprise of R&D projects, European Commission, International organisations, and Other foreign sources (other national governments, higher education, others).

2.3. Scientists and engineers

Tertiary graduates in natural sciences, engineering and ICTs (NSE & ICT), 2005 and 2015

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

Fields of study refer to the ISCED-F 2013 Fields of education classification.

For Japan, data on Information and communication technologies are included in the other fields.

For the Netherlands, data exclude doctoral graduates.

For South Africa, data refer to 2014.

Tertiary graduates in Information and communication technologies, by gender, 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.

Doctorate holders in the working age population, 2016

International comparability may be limited.

Sources (Working age population):

United Nations, Department of Economic and Social Affairs, Population Division (2017), *World Population Prospects: The 2017 Revision*. Custom data acquired via website.

Sources (Doctorate holders):

For Brazil, Canada, Chile, the Czech Republic, Estonia, Germany, Korea, Norway, Portugal and the United Kingdom: OECD Careers of Doctorate Holders 2017 data collection.

For all other countries: OECD (2017).

Data for 2007 are derived from OECD (2009).

2016 and 2007 attainment data are based on two different ISCED classifications (ISCED 2011 and ISCED 97, respectively) and have not been harmonised. Although the definition of a “doctorate holder” is broadly similar across ISCED classifications, comparisons over time must be interpreted with caution.

For Brazil, data refer to doctoral graduates from 1996 to 2014.

For Canada, data refer to 2011 and exclude non-residents or foreign residents, persons living in institutional and non-institutional collective dwellings, Canadian citizens living in other countries, and full-time members of the Canadian Forces stationed outside Canada. Foreign citizens are covered partially.

For Chile, data refer to 2015.

For the Czech Republic data refer to a moving average computed over the period 2014-2016.

For Korea, data refer to 2012 and include foreign citizens, but attainment cannot be disaggregated by citizenship.

For the Russian Federation, there is limited coverage of unemployed graduates, inactive graduates, foreign citizens and non-residents.

2.4. Researchers

R&D personnel, 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 issues such as breaks in series, please see that source.

For Austria, Greece, Latvia and Spain, R&D personnel include internal as well as some external personnel; some double counting may arise if the same personnel are reported by multiple respondents.

For Canada, Mexico and South Africa, data refer to 2013.

For China, Ireland and Turkey, no R&D survey was carried out in the PNP sector as the corresponding R&D activity is considered to be negligible.

For China and Israel, the military part of defence R&D is excluded.

For China, the data for researchers before 2009 are surveyed according to the UNESCO concept of “scientist and engineer”, and according to the Frascati Manual notion of researcher from 2009 onwards. For this reason, there is a break in series between 2008 and 2009.

For Chile, data refer to 2007 and 2015.

For Greece, a change in methodology occurred in 2011 with the extension of coverage of the government and higher education sector to include public hospitals, all institutions administered by the Ministry of Culture, all Technological Educational Institutes (TEI) and post-secondary establishments, which resulted in an increase in the number of researchers.

For Iceland and the reference year 2013, the R&D data collection methodology was changed resulting in breaks in series. The main differences concern the redesign of the questionnaire, the use of business registers, the legal obligation for firms to respond, the definition of key R&D concepts in the questionnaire, and changes in the allocation of institutions into business or government sectors.

For Ireland, a change in methodology occurred in 2014 with the inclusion of PhD students in the higher education sector, which resulted in a substantial increase in the number of researchers.

For Israel, data refer to 2014 and the shares are estimated based on the 2014 available data.

For Korea, 2005 R&D personnel data excludes R&D performed in the social sciences and humanities.

For Luxembourg, a change in methodology occurred in 2012 leading to better identification of R&D in software-related activities, which resulted in a decrease in the number of researchers.

For the Netherlands, a change in methodology occurred in 2012 with modification of the personnel data by function in Dutch surveys, which resulted in a substantial increase in the number of researchers.

For Norway, data refer to university graduates instead of researchers in the business sector.

For Portugal, R&D personnel increased in 2008, mainly due to methodological improvements in the different institutional sectors (government, higher education and private non-profit institutions): the results of the individual survey forms were compared with information from other internal databases resulting, notably, in the inclusion of all permanent academic staff and all researchers funded by the Ministry of Science, Technology and Higher Education in 2008.

For Slovenia, a change in methodology occurred in 2011 leading to the improvement of non-response analysis and new administrative sources to better identify R&D performers, which resulted in a substantial increase in the number of researchers.

For Sweden, data refer to university graduates instead of researchers in the business sector in 2005. A change in methodology occurred in 2013; for the business enterprise sector, PNPs and the government sector, reporting units were asked to report according to two and not three occupations: “researchers” and “other staff”. “Other staff” includes “technicians and equivalent staff” and “other supporting staff”. A proportion of personnel are from the 2013 reference year reallocated from the category “technicians” to “researchers”.

For Switzerland, data refer to 2004 and 2015, and R&D personnel in the PNP sector are not included in total R&D personnel.

For the United States, the proportion of non-business R&D personnel who are researchers has been estimated based on historical data.

2. KNOWLEDGE, TALENT AND SKILLS

Notes and references

Researchers, by sector of employment, 2015

These statistics are based on the OECD R&D Statistics database (<http://oe.cd/rds>). For more information on these data, including on issues such as breaks in series, please refer to this source.

For Austria, Greece, Latvia and Spain, R&D personnel include internal as well as some external personnel; some double counting may arise if the same personnel are reported by multiple respondents.

For Canada, Mexico and South Africa, data refer to 2005 and 2013.

For China, Ireland and Turkey, no R&D survey was carried out in the PNP sector as the corresponding R&D activity is considered to be negligible.

For China and Israel, the military part of defence R&D is excluded.

For Canada, R&D performed in the social sciences and humanities are excluded from the business and PNP sectors.

For Chile, data refer to 2007 and 2015.

For China, the data for researchers before 2009 are surveyed according to the UNESCO concept of “scientist and engineer”, and according to the Frascati Manual notion of researcher from 2009 onwards. For this reason, there is a break in series between 2008 and 2009.

For Greece, a change in methodology occurred in 2011 with the extension of coverage of the government and higher education sector to include public hospitals, all institutions administered by the Ministry of Culture, all Technological Educational Institutes (TEI) and post-secondary establishments, which resulted in an increase in the number of researchers.

For Iceland and the reference year 2013, the R&D data collection methodology was changed resulting in breaks in series. The main differences concern the redesign of the questionnaire, the use of business registers, the legal obligation for firms to respond, the definition of key R&D concepts in the questionnaire, and changes in the allocation of institutions into the business or government sectors.

For Ireland, a change in methodology occurred in 2014 with the inclusion of PhD students in the higher education sector, which resulted in a substantial increase in the number of researchers.

For Israel, data refer to 2005 and 2014 and the shares have been estimated based on the 2014 available data.

For Korea, 2005 R&D personnel data excludes R&D performed in the social sciences and humanities.

For Latvia, PNP is included in the business sector.

For Luxembourg, a change in methodology occurred in 2012 leading to better identification of R&D in software-related activities, which resulted in a decrease in the number of researchers.

For the Netherlands, a change in methodology occurred in 2012 with modification of the personnel data by function in Dutch surveys, which resulted in a substantial increase in the number of researchers.

For New Zealand, PNP is included in the business sector.

For Norway, data refer to university graduates instead of researchers in the business sector.

For Portugal, R&D personnel increased in 2008, mainly due to methodological improvements in the different institutional sectors (government, higher education and private non-profit institutions): the results of the individual survey forms were compared with information from other internal databases resulting, notably, in the inclusion of all permanent academic staff and all researchers funded by the Ministry of Science, Technology and Higher Education in 2008.

For Slovenia, a change in methodology occurred in 2011 leading to the improvement of non-response analysis and new administrative sources to better identify R&D performers, which resulted in a substantial increase in the number of researchers.

For Sweden, data refer to university graduates instead of researchers in the business sector in 2005. A change in methodology occurred in 2013, for the business enterprise sector, PNPs and the government sector, reporting units were asked to report according to two and not three occupations: “researchers” and “other staff”. “Other staff” includes “technicians and equivalent staff” and “other supporting staff”. A proportion of personnel are from the 2013 reference year reallocated from the category “technicians” to “researchers”.

For Switzerland, R&D personnel in the PNP sector are not included in total R&D personnel.

For the United States, data refer to 2008 and 2015, and the proportion of non-business R&D personnel who are researchers has been estimated based on historical data.

Women researchers, 2015

These statistics are based on the OECD R&D Statistics database (<http://oe.cd/rds>). For more information on these data, including on issues such as breaks in series, please refer to this source.

For Austria, Greece, Latvia and Spain, R&D personnel includes internal as well as some external personnel. Some double counting is possible if separately reported by their direct employers.

For Denmark, Greece, Ireland, Luxembourg, Sweden and South Africa, data refer to 2013.

For Ireland and Turkey, no R&D survey was carried out in the PNP sector as the corresponding R&D activity is considered to be negligible.

For Italy, the Netherlands, Poland, Portugal and Slovenia, data refer to 2014.

For Austria, data refer to 2004 and 2013.

For Chile, data refer to 2007 and 2015.

For Greece, a change in methodology occurred in 2011 with the extension of coverage of the government and higher education sector to include public hospitals, all institutions administered by the Ministry of Culture, all Technological Educational Institutes (TEI) and post-secondary establishments, which resulted in an increase in the number of researchers.

For Hungary, data refer to 2006 and 2015.

For Latvia, PNP is included in the business sector.

For Luxembourg, a change in methodology occurred in 2012 leading to better identification of R&D in software-related activities, which resulted in a decrease in the number of researchers.

For Norway, data refer to university graduates instead of researchers in the business sector.

For Portugal, R&D personnel increased in 2008, mainly due to methodological improvements in the different institutional sectors (government, higher education and private non-profit institutions): the results of the individual survey forms were compared with information from other internal databases resulting, notably, in the inclusion of all permanent academic staff and all researchers funded by the Ministry of Science, Technology and Higher Education in 2008.

For Slovenia, a change in methodology occurred in 2011 leading to the improvement of non-response analysis and new administrative sources to better identify R&D performers, which resulted in a substantial increase in the number of researchers.

For Sweden, data refer to university graduates instead of researchers in the business sector in 2005. A change in methodology occurred in 2013, for the business enterprise sector, PNPs and the government sector; reporting units were asked to report according to two and not three occupations: “researchers” and “other staff”. “Other staff” includes “technicians and equivalent staff” and “other supporting staff”. A proportion of personnel are from the 2013 reference year reallocated from the category “technicians” to “researchers”.

2.5. Skills in the digital era

Top and low PISA performers in science and mathematics, 2015

The indicators show the sum of the share of top performers (low achievers) in science and mathematics but not in reading and that of top performers (low achievers) in science, mathematics and reading.

Problem solving in technology-rich environments, 2012 or 2015

Calculations are based on data from the problem solving in technology-rich environments tests conducted by the Programme for International Assessment of Adult Competencies (PIAAC).

Medium and high performance in problem solving in technology-rich environments is defined as individuals having reached level 2 or 3 in the assessment test.

Italy, France and Spain have not participated in the assessment tests for problem solving in technology-rich environments.

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.

Readiness to learn and creative thinking, 2012 or 2015

The readiness to learn and creative thinking indicator is built using exploratory state-of-the-art factor analysis. It relies on six items related to openness to new experiences and creative thinking. The detailed methodology can be found in Grundke et al. (2017).

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.

2.6. Returns to ICT skills

ICT task intensity of jobs, 2012 or 2015

When the mean is below the median, most of the population has above-average task intensities, but a minority has (very) low task intensities.

The ICT task intensity of jobs indicator relies on exploratory state-of-the-art factor analysis and captures the use of ICT on the job. It 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).

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.

Labour market returns to ICT tasks, 2012 or 2015

The ICT task intensity of jobs indicator relies on exploratory state-of-the-art factor analysis and captures the use of ICT on the job. It 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).

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 dependent variables and include a number of individual-related control variables (including age, years of education, gender and other 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.

Returns to management and communication task intensity of jobs: the ICT bonus, 2012 or 2015

The ICT task intensity of jobs indicator and the management and communication (M&C) task intensity of jobs indicator rely on exploratory state-of-the-art factor analysis. These indicators capture the use of ICT and the performance of management and communication tasks on the job, respectively. The ICT indicator relies on 11 items from the OECD Programme for International Assessment of Adult Competencies (PIAAC) ranging from the simple use of the Internet to the use of Word or Excel software or a programming language. The M&C indicator relies on five items ranging from negotiation tasks to planning the tasks of other workers, as well as advising and instructing others. 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 dependent variable and include a number of individuals-related control variables (including age, years of education, gender and other 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.

2.7 Knowledge capital

Workers receiving training, by type of training, 2012 or 2015

Percentages of trained people are calculated as the ratio of total employed persons receiving training at least once per year, by type of training (formal vs. on-the-job vs. both, as in Squicciarini et al., 2015), over total employment in the economy. 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.

Business investment in fixed and knowledge-based capital, 2015

Data, in current prices, refer to the private market sector and follow the definition of INTAN-Invest (i.e. ISIC Rev.4 Divisions 01 to 82 excluding 68 and 72).

Intensities are defined as investment over Gross Value Added as sourced from the OECD System of National Accounts (SNA) Database. Non-residential Gross Fixed Capital Formation (GFCF) is calculated as total GFCF excluding investment in Dwellings and Intellectual Property, and is sourced from the OECD System of National Accounts (SNA) Database. KBC assets in National Accounts are also sourced from the SNA Database, and correspond to the Intellectual Property GFCF. R&D investment by sector for the United States is sourced from the US Bureau of Economic Analysis. Data on Other KBC Assets are sourced from INTAN-Invest and extrapolated, where necessary, using the growth rate of Intellectual Property GFCF from the OECD SNA Database. “Other KBC Assets” include Design, New Financial Products, Brands, Training and Organisational Capital.

Market and non-market sector KBC investment, selected countries, 2000 and 2015

The definition of the market sector follows the definition of INTAN-Invest (i.e. ISIC Rev.4 Divisions 01 to 82 excluding 68 and 72). 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 93.

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

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