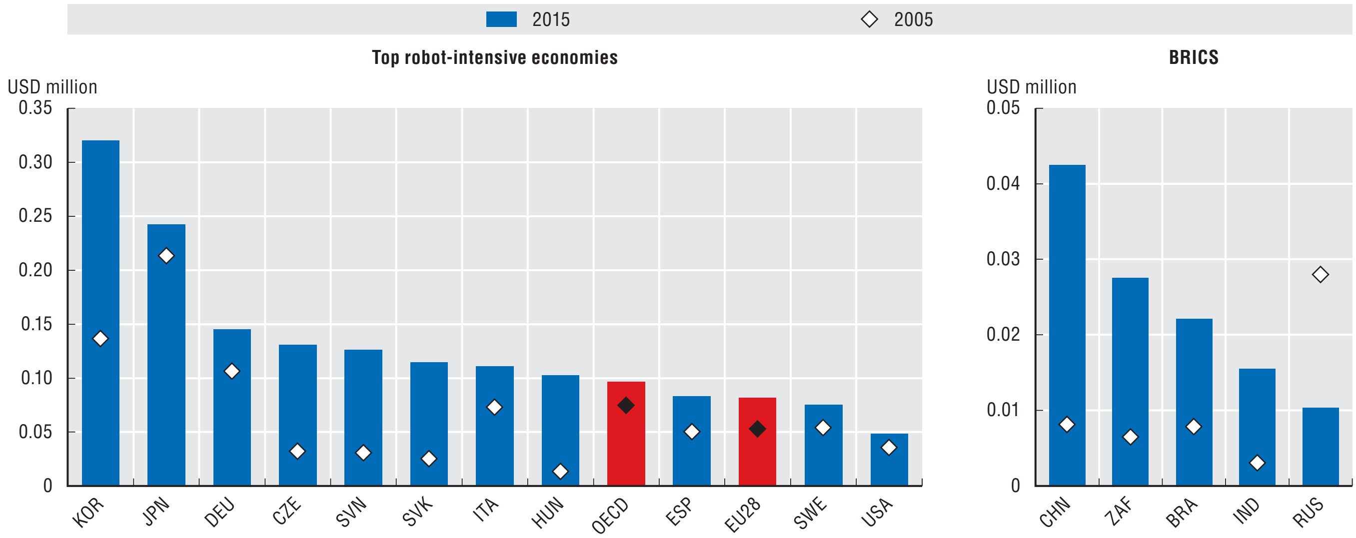
A corrigendum has been issued for this page. See: http://www.oecd.org/about/publishing/Corrigendum_OECD_STI_Scoreboard_2017.pdf

Robotisation in manufacturing

Production is being transformed by advances in fields such as big data, 3D printing, machine-to-machine communication and robots. Comparable and representative data for 2015 on the deployment of industrial robot technologies, for example, show that Korea and Japan lead in terms of robot intensity (i.e. the industrial stock of robots over manufacturing value added). Robot intensity in these economies is about three times that of the average OECD country. Selected Eastern European countries also emerge as intensive robot users, perhaps mirroring their specialisation within manufacturing value chains and their possible role as suppliers of large multinational corporations. Robot intensity in Czech Republic, Hungary, the Slovak Republic and Slovenia has increased three to six times since 2005, considerably above the average growth rate for OECD or EU28 countries (+29% and 54%, respectively). Robot intensity in BRICS economies has also increased, while remaining relatively low compared to OECD countries. In particular, robot intensity in China increased from 23% to 88% of that of the United States. However, these figures should be interpreted with caution, since the indicators are based on the quantity of robots active in an economy at a specific moment and do not capture changes in the effectiveness or quality of robots over time.

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

Industrial robot stock over manufacturing value added, millions USD, current values



Source: OECD calculations based on International Federation of Robotics data, and the World Bank, Word Development Indicators Database, September 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617377

What is an industrial robot?

An industrial robot is defined by ISO 8373:2012 as “an automatically controlled, reprogrammable, multipurpose manipulator programmable on three or more axes, which can be either fixed in place or mobile for use in industrial automation applications”. The International Federation of Robotics (IFR) collects information on shipments (counts) of industrial robots from almost all existing robot suppliers worldwide. The measure of the stock of robots displayed above has been calculated by taking the first-year stock value from the IFR, adding the sales of robots for subsequent years and assuming an annual depreciation rate of 10%. As a consequence, these metrics do not capture increases in the value of robots or their ability to perform tasks (i.e. no equivalent for horsepower exists for robots). These figures are restricted to manufacturing, mining, construction and utilities, as IFR data obtained by the OECD do not include robots used in services industries other than the R&D sector.

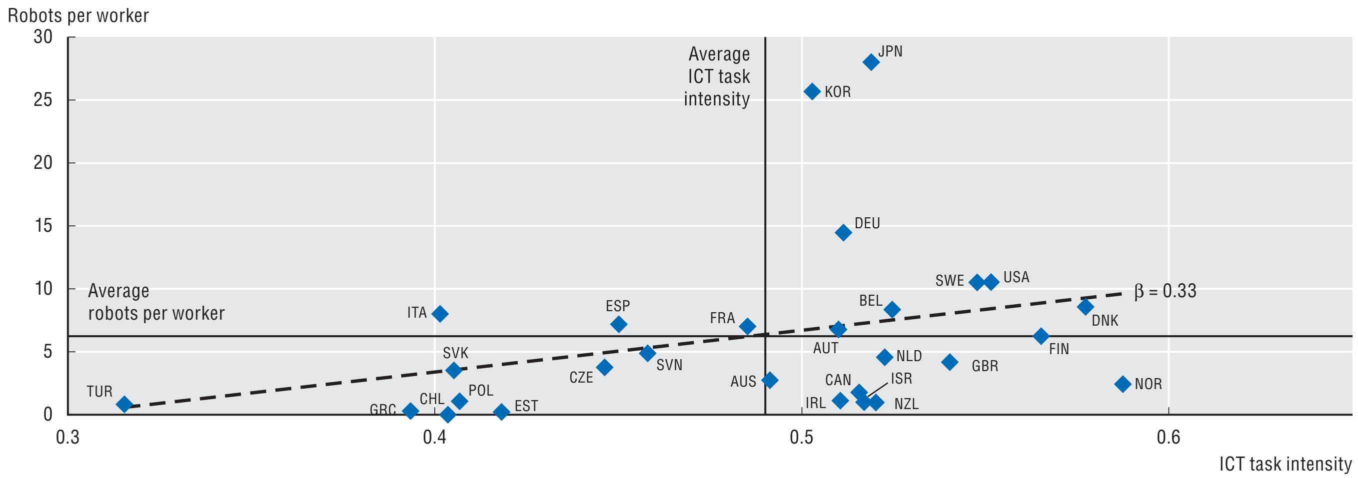
A corrigendum has been issued for this page. See: http://www.oecd.org/about/publishing/Corrigendum_OECD_STI_Scoreboard_2017.pdf

Robotisation in manufacturing

In addition to catalysing growth, technological innovations may have disruptive effects with far-reaching consequences on many domains, including productivity, employment and well-being. Some fear that the increasing use of robots may result in significant loss of jobs, particularly in the case of industrial robots which are designed to carry out tasks otherwise performed by humans. Recent studies find that robots do improve productivity, but that their impact on employment and wages is ambiguous. The figure below shows that the use of robots may complement the use of other technologies, because robots (while not classified as ICT tools) rely on ICT, e.g. software, for their functioning. Workers will therefore need the ICT skills to be able to operate them. The correlation between ICT use on the job and robot intensity emerges as positive, albeit not strong, and points to complementarity between technological and human capital investment to implement transformative industrial processes. As these data relate to the use of robots in manufacturing, economies characterised by relatively larger manufacturing sectors have higher than average robot intensities. Some, including Japan, Korea, Germany and the United States, display above average intensities for both robots and ICT tasks. Conversely, economies where services sectors are relatively more important (e.g. the United Kingdom, Ireland and the Netherlands) tend to display above average ICT task intensities, but a lower than average number of robots per worker.

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

Correlation of robots per worker and average ICT task intensity



Source: OECD calculations based on OECD Programme for International Assessment of Adult Competencies (PIAAC) Database and International Federation of Robotics, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617396

How to measure ICT task intensity

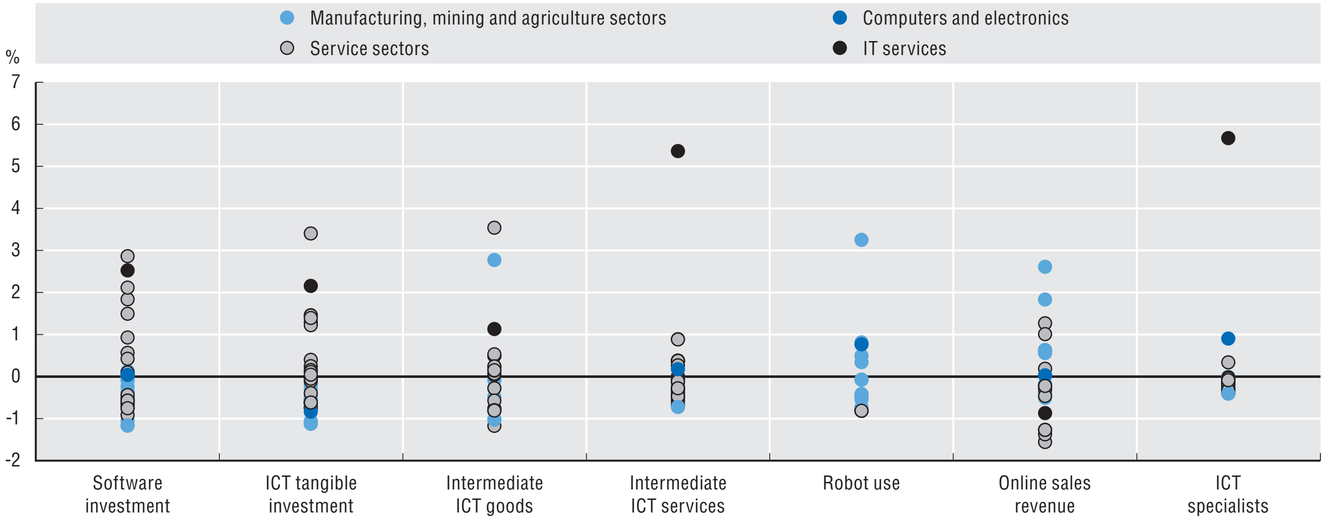
Recent OECD analysis has developed an indicator of the ICT task intensity of occupations (Grundke et al., 2017), based on information from the OECD Programme for the International Assessment of Adult Competencies (PIAAC). Compared to earlier studies, this approach helps to distinguish between the tasks that workers perform on the job and the skills with which they are endowed. The indicator reflects the extent to which workers perform tasks ranging from simple use of the Internet to the use of Word or Excel software or a programming language. Not all countries in Figure 28 are reported in Figure 29, because they do not appear in the PIAAC dataset and consequently lack a corresponding measure of ICT task intensity.

Industries' digital maturity

Due to their pervasive nature, digital technologies are profoundly transforming economies and societies. The innumerable ways in which the digital transformation is affecting production activities, manufacturing and services impede efforts to provide an encompassing definition of this multifaceted phenomenon. Recent OECD work assesses the digital content of sectors by looking at digitalisation in its technological component (tangible and intangible ICT investment, purchases of intermediate ICT goods and services, robots), the human capital required to embed technology in production (ICT specialist intensity), and the ways in which it changes how firms interface with the market (online sales). While the digital transformation progressively touches all sectors in the economy, it does so in different ways and to various extents across sectors. Some sectors, however, stand out across several dimensions. "IT and other information services" ranks among the top three sectors for all indicators, where such information is available, with the exception of online sales. However, its manufacturing equivalent (i.e. the Computer, electronic and optical equipment sector), does not stand out from other sectors.

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

Values averaged across countries and years, and standardised across sectors



Source: OECD calculations based on Annual National Accounts, STAN, ICIO, PIAAC, International Federation of Robotics, World Bank, Eurostat Digital Economy and Society Statistics, national Labour Force Surveys, US CPS, INTAN-Invest and other national sources. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617415

How to read this figure

Each dot represents a sector. For each indicator, a sector's value is obtained averaging the values across years and countries. The graph then plots the standardised values across sectors, so that the average sector has value zero. The blue dots represent manufacturing sectors, and the grey ones represent services industries. The darker blue and grey dots represent ICT manufacturing and ICT services sectors, respectively.

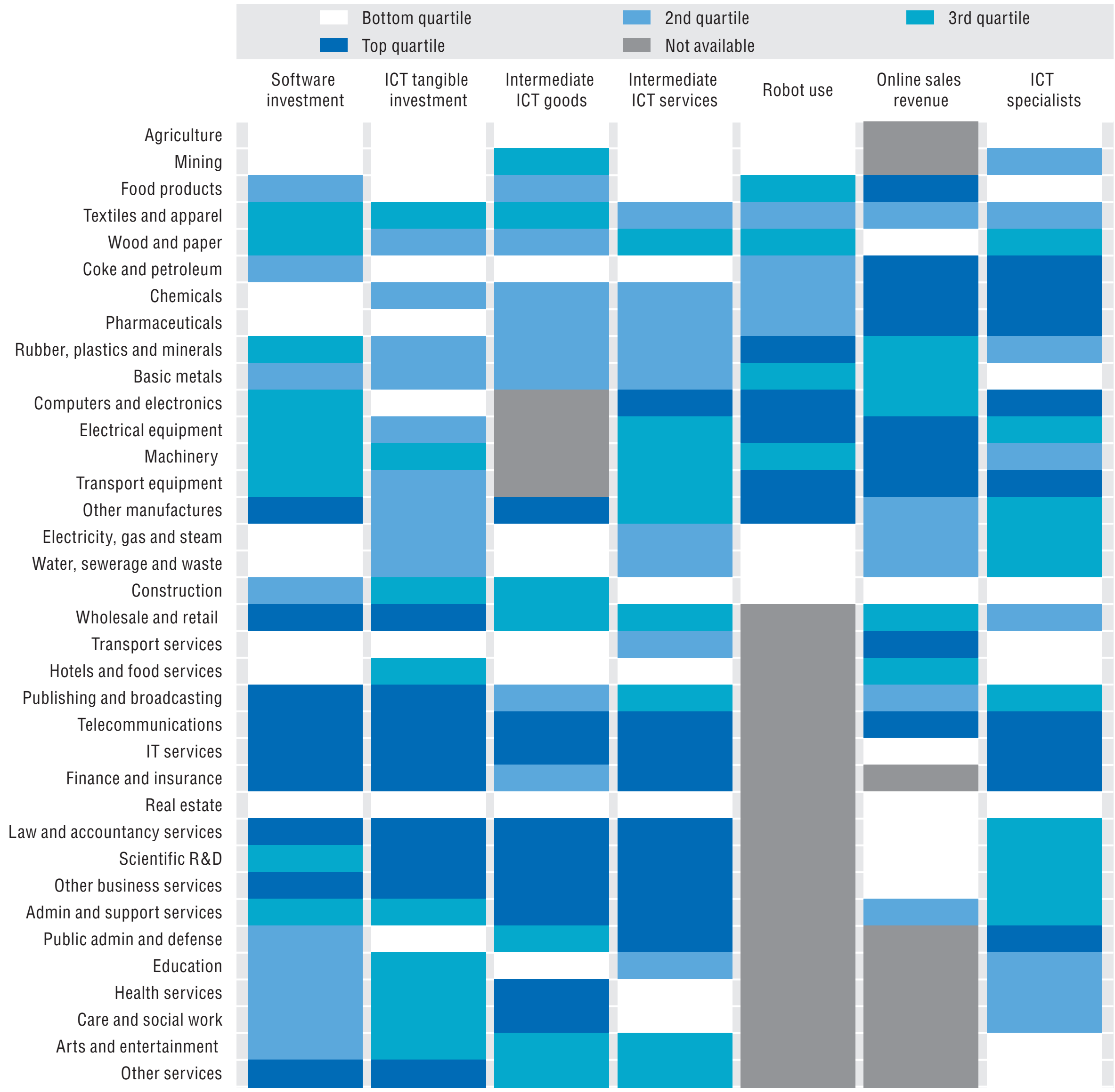
Measuring the digital transformation in sectors: A multidimensional approach

Recent OECD work (Calvino et al., forthcoming) develops a taxonomy of sectors by their digital content, taking into consideration a multiplicity of dimensions. All indicators are expressed as sectoral intensities. "Software and ICT tangible investment" is the ratio of Gross Fixed Capital Formation (GFCF) in ICT and software over total GFCF, both in volumes. "Intermediates" represents the ratio of intermediate ICT goods or services purchased by the sector to the purchasing sector's output, both in real terms. "Robot use" refers to the stock of robots divided by employment in the sector. "Online sales" measures the proportion of turnover coming from online sales. "ICT specialists" relates to the proportion of ICT specialists in total employment. 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.

Industries' digital maturity

Sectors generate, adopt and use technologies at different paces and vary in the extent to which they rely on different types of skills. This is true for the wide array of technologies and skills shaping the digital transformation across economies and societies. OECD analysis shows that some sectors are lagging behind others in terms of the pace of are undergoing digital transformation, regardless of the type of indicator used to measure such a transformation. Agriculture, mining and real estate rank in the bottom quartile of digital intensity across all available indicators. Conversely, telecom and IT services rank consistently at the top of the distribution. Sectors in the middle of the overall ranking often display a large heterogeneity, suggesting that they are engaged in the transformation at different rates, depending on the aspects considered.

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



Source: OECD calculations based on Annual National Accounts, STAN, ICIO, PIAAC, International Federation of Robotics, World Bank, Eurostat Digital Economy and Society Statistics, national Labour Force Surveys, US CPS, INTAN-Invest and other national sources. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617434

How to read this figure

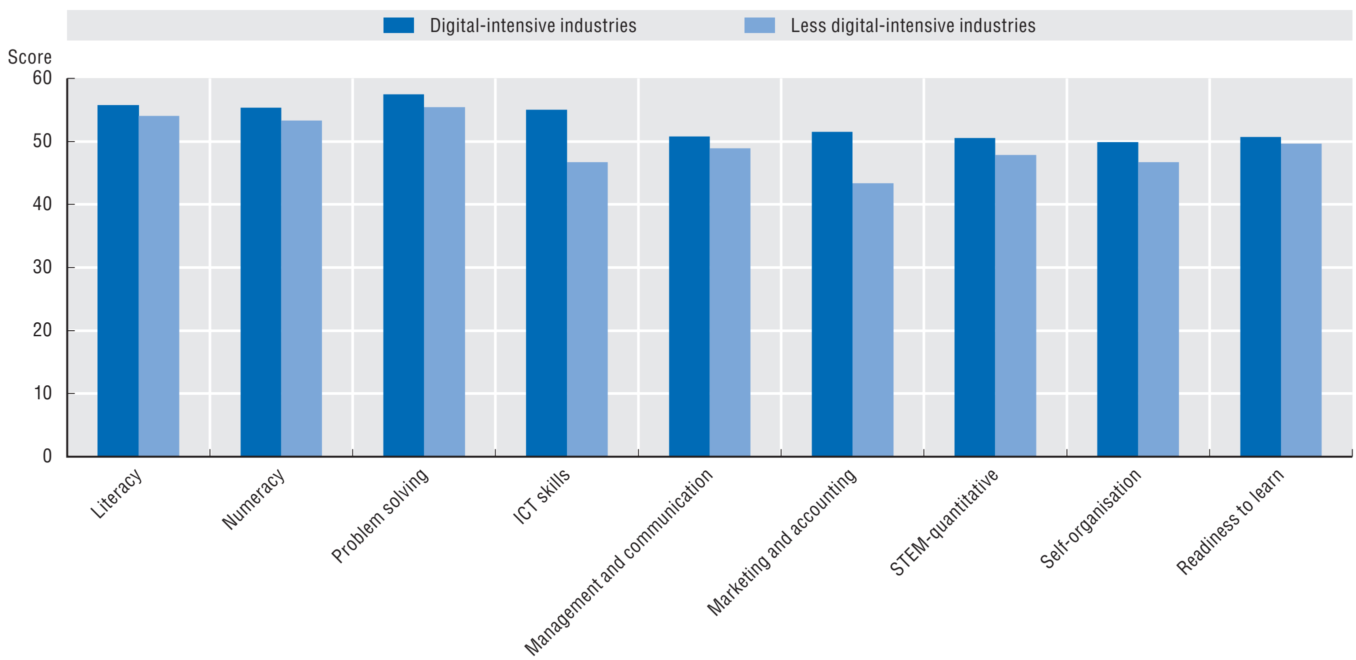
For each indicator, sectors are ranked by their value as an average across countries and years. The sectors with the highest intensity (top quartile) are coloured dark blue, while those with the lowest intensity are coloured white. Data on robot use are not available for services other than utilities and constructions (i.e. all ISIC Rev.4 services above 43), while online sales data are not available for "Agriculture" (Division 1-3), "Mining" (5-9), "Financial services" (64-66) and all sectors numbered above 84 in ISIC. Purchases of ICT intermediate goods by the machinery manufacturing sectors are not considered, to avoid mismeasurement.

What skills for the digital future?

Digitalisation is bringing change to jobs and labour markets across the OECD and beyond. Some jobs are being lost to automation, others will change in their nature and tasks, while new jobs will also emerge as technologies such as artificial intelligence (AI), the Internet of Things (IoT) or big data develop. Workers in industries that are currently most affected by the digital transformation exhibit higher levels of cognitive, as well as non-cognitive and social skills. As the digital transformation unfolds, and increasingly affects other industries that are at present less impacted, the need for solid cognitive skills combined with a good endowment of social skills will continue to increase and extend to the rest of the economy.

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

Cross country averages



Source: OECD calculations based on the OECD Programme for International Assessment of Adult (PIAAC) Database, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617453

Mapping skills and identifying digital-intensive sectors

This analysis encompasses both cognitive and non-cognitive skills, i.e. skills that are generally only partially learnt at school and that relate to people's attitudes and personality. Measures for non-cognitive skills and social skills have been developed using information about the tasks that workers perform on the job from the OECD Programme for International Assessment of Adult (PIAAC). The mapping exercise has identified six task-based skills that relate to performance on the job and to economic performance, namely: information and communication technologies (ICT)-related skills; science, technology, engineering and mathematics (STEM) and quantitative skills; non-cognitive skills such as managing and communication and self-organisation; and socio-emotional skills such as readiness to learn and creative problem solving (see Grundke et al., 2017)

Digital-intensive and non-digital-intensive industries have been identified by benchmarking sectors across a number of dimensions: the ratio of Gross Fixed Capital Formation (GFCF) in ICT and software over total GFCF; the ratio of intermediate ICT goods or services purchased by the sector to the purchasing sector's output; the stock of robots per employed person; the proportion of sectoral turnover coming from online sales; and the proportion ICT specialists over total employment, by sector (see Calvino et al., forthcoming, for details).

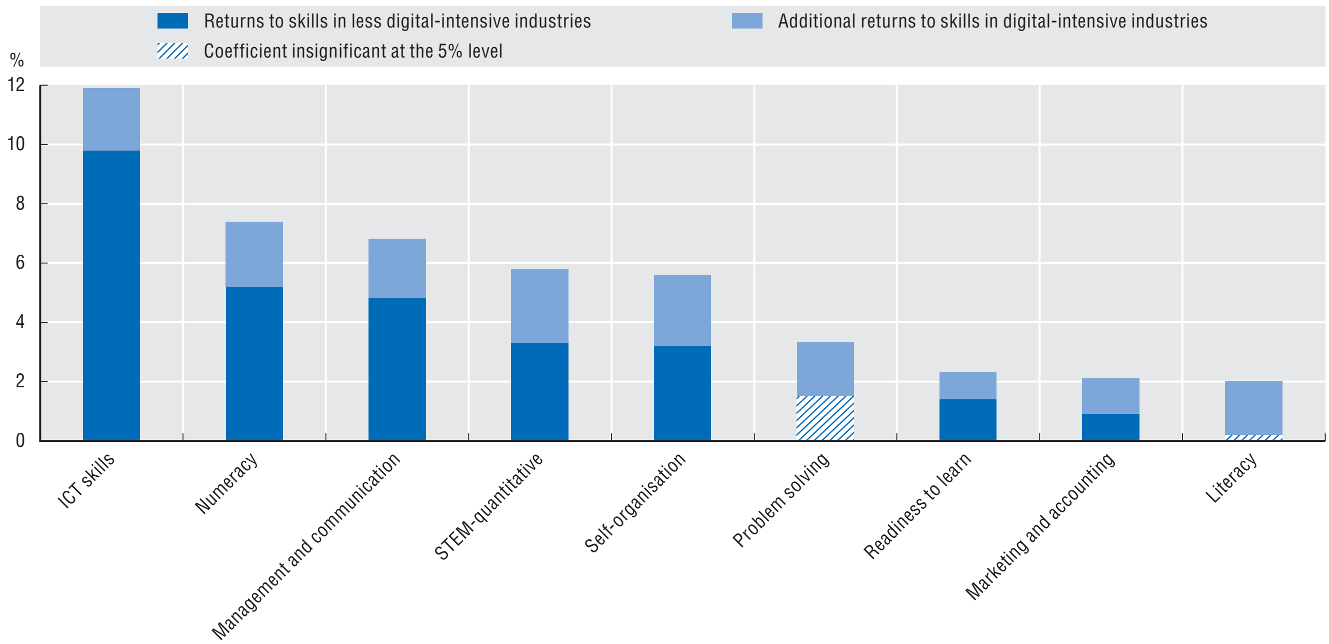
What skills for the digital future?

Understanding which skills are in short supply (and/or high demand) and command a wage premium in digital- or less-digital-intensive industries can help understand what skills matter for the digital transformation.

For a number of skills that are important to firm performance, labour market returns are higher in digital-intensive industries than in less digital-intensive industries. Furthermore, quantitative skills, ICT skills, numeracy and STEM skills as well as self-organisation and management and communication skills seem to be especially important in digital-intensive industries. This may be because workers in those industries operate in a more independent and decentralised fashion (e.g. through teleworking), perform relatively more non-routine tasks, or have to deal with continuously changing settings for which technical skills coupled with communication and organisational skills are increasingly important.

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

Percentage change in hourly wages for a standard deviation increase in skills



Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, June 2017. See chapter notes.

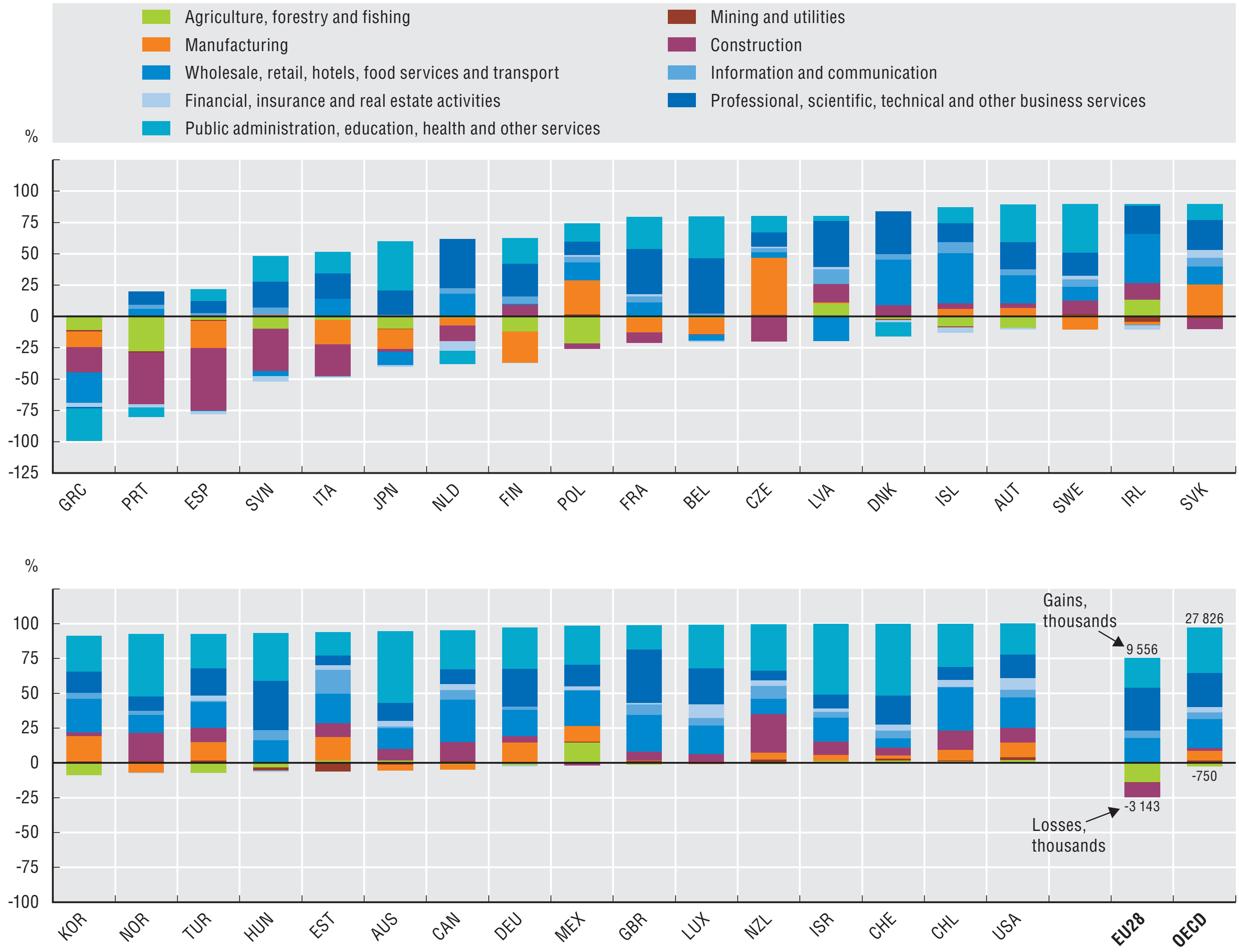
StatLink http://dx.doi.org/10.1787/888933617472

Jobs gained, jobs lost

Between 2010 and 2015, total employment in the OECD area grew by 4.9% (a net gain of about 27 million jobs). This increase was driven mainly by non-EU countries, with NAFTA alone experiencing a net gain of 12.9 million compared to a more modest gain of 3.6 million in the European Union. OECD service sectors accounted for the majority of net gains with an increase of 24.8 million, while manufacturing activities added a further 2 million jobs. In 2016, the European Union experienced solid gains for the third year running, with an overall net gain for the period 2010-16 of 6.4 million jobs, including a notable rise in "Professional, scientific, technical and other business services" (3.9 million jobs). However, this trend masks significant variation with Germany and the United Kingdom both experiencing net gains of about 2.5 million jobs, while Greece, Portugal and Spain struggled to return to pre-crisis levels of employment collectively suffering a net loss of 1.5 million jobs over the same period.

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

Relative contribution to change in total employment by major sectors of economic activity



Note: Data refer to 2010-15 for Israel, Japan, Korea, Mexico, New Zealand and the OECD area aggregate.
Source: OECD calculations based on Annual National Accounts Database, *www.oecd.org/std/na*, Structural Analysis (STAN) Database, *http://oe.cd/stan* and national sources, September 2017. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617491*

How to read these figures

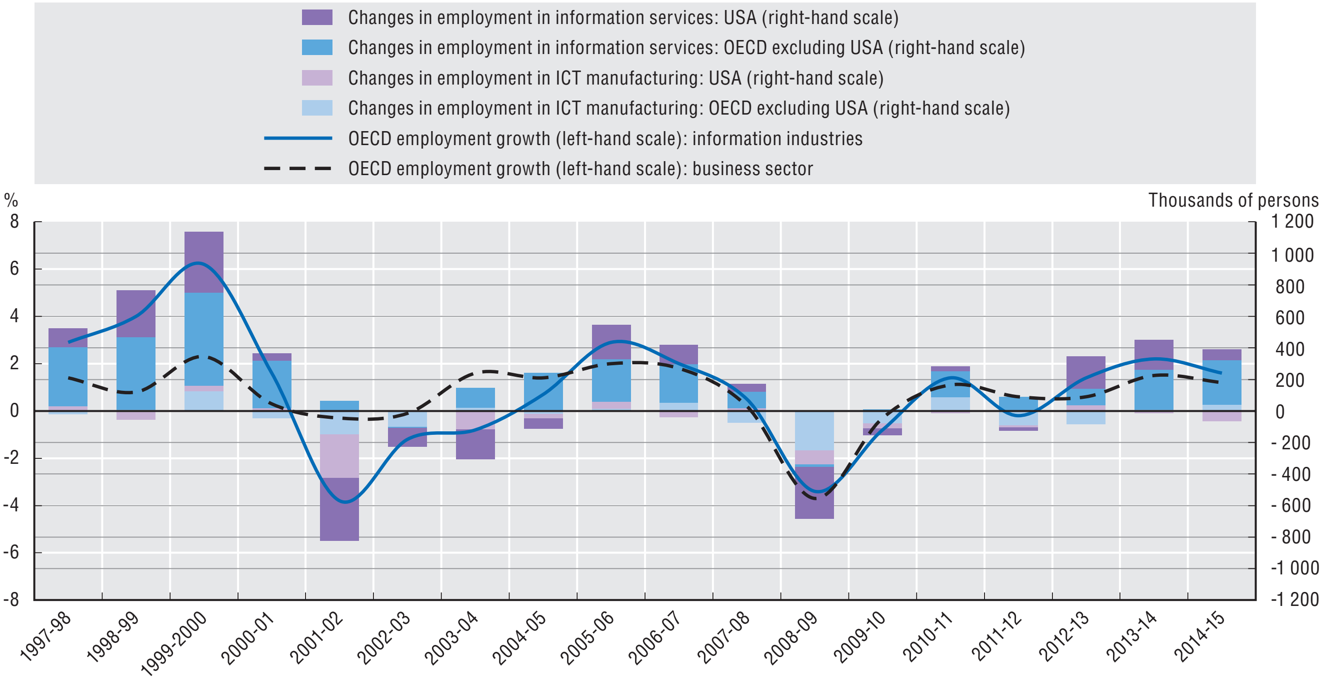
Changes in employment levels by economic activity can be "normalised" to highlight their relative contributions, in each country, to the total change in employment between two periods. This is achieved by expressing the sectoral changes in each country as a percentage of the sum of the absolute changes. The aggregate activity groups are defined according to ISIC Rev.4 classes. The gains and losses represent the sum of those aggregate sectors with positive changes and the sum of those aggregate sectors with negative changes, respectively. Using a finer activity breakdown (e.g. ISIC Rev.4 2-digit Divisions) would produce different estimates for total gains and losses, although the total net change would remain the same.

Jobs gained, jobs lost

The information industries are considered an important source of growth in OECD countries despite accounting for only 5.5% of business sector employment in the OECD area. Between 1997 and 2015, OECD employment in the information industries grew by 18%, higher than growth in business sector employment over the same period (13%). However, employment in the information sector has been susceptible to relatively high volatility over the business cycle since 1997. After the financial crisis, for example, employment in the information industry fell 4.2% between 2008 and 2010 in the OECD area, shedding over 800 000 jobs. The United States now accounts for about 30% of OECD employment in the information industries (from a peak of about 35% prior to 2001), and remains an important driver of changes in OECD information sector employment. Information services dominate in terms of jobs gained, while the ICT manufacturing sector has experienced a reduction in workforce in many OECD countries, including the United States, over the past decade.

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

Annual change in percentage and in thousands of persons



Source: OECD calculations based on Annual National Accounts Database, *www.oecd.org/std/na*, Structural Analysis (STAN) Database, *http://oe.cd/stan* and national sources, June 2017. StatLink contains more data. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617510*

Definition of information industries

"Information industries" are defined according to ISIC Rev.4 and cover ICT manufacturing: "Computer, electronic and optical products" (Division 26) 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"). This definition includes both the ICT sector and the Content and Media sector as defined in OECD (2011). The 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)).

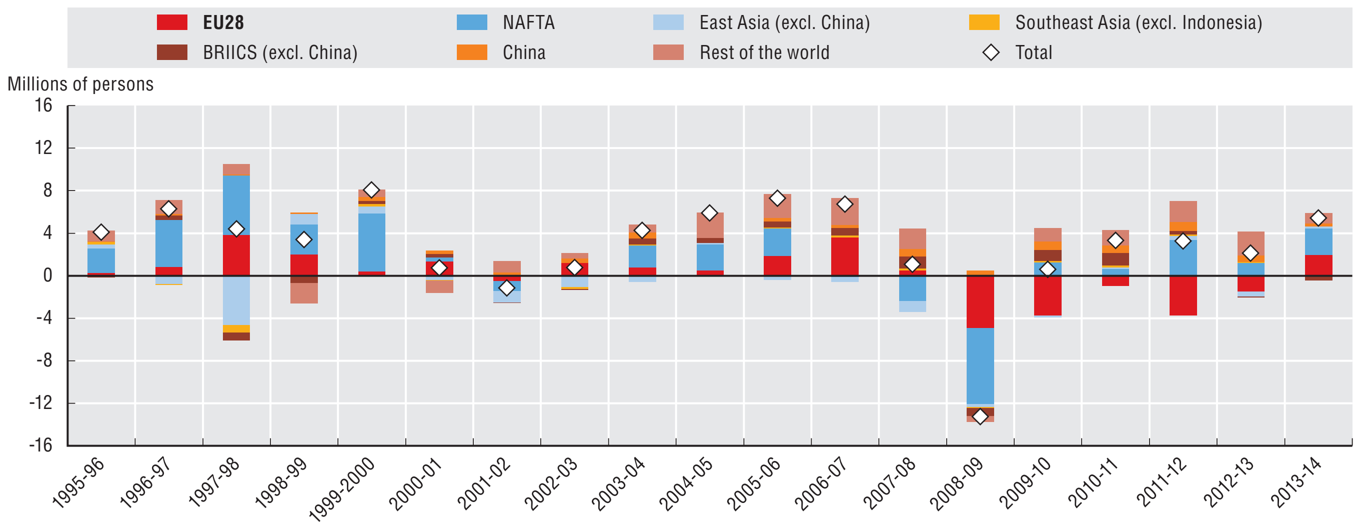
Employment data are drawn mostly from National Accounts (SNA) sources and are measured in terms of persons, except for Canada, Japan and Mexico, which provide figures for jobs. Care should be taken when comparing changes in structural employment in these three countries with the other countries.

Your job depends on my demand for products

Growing economic and political integration worldwide has increased the reliance of employment in one country or region to changes in demand in other countries or regions. The OECD's Inter-Country Input-Output (ICIO) database enables the decomposition of annual changes in OECD employment to account for changes in final demand for goods and services across different countries and regions. For example, the apparent overall increase of about 9.2 million business sector jobs in the OECD area, between 2009 and 2013, masked a fall of about 10 million jobs due to reduced demand in the European Union, which was more than offset by an increase of about 19.2 million to meet demand in non-EU economies. By 2014, EU demand had picked up sufficiently to exert a positive effect on OECD business sector jobs. In recent years, changes in OECD employment have been increasingly influenced by changes in demand in OECD partner economies.

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

Millions of persons, annual changes by region of demand

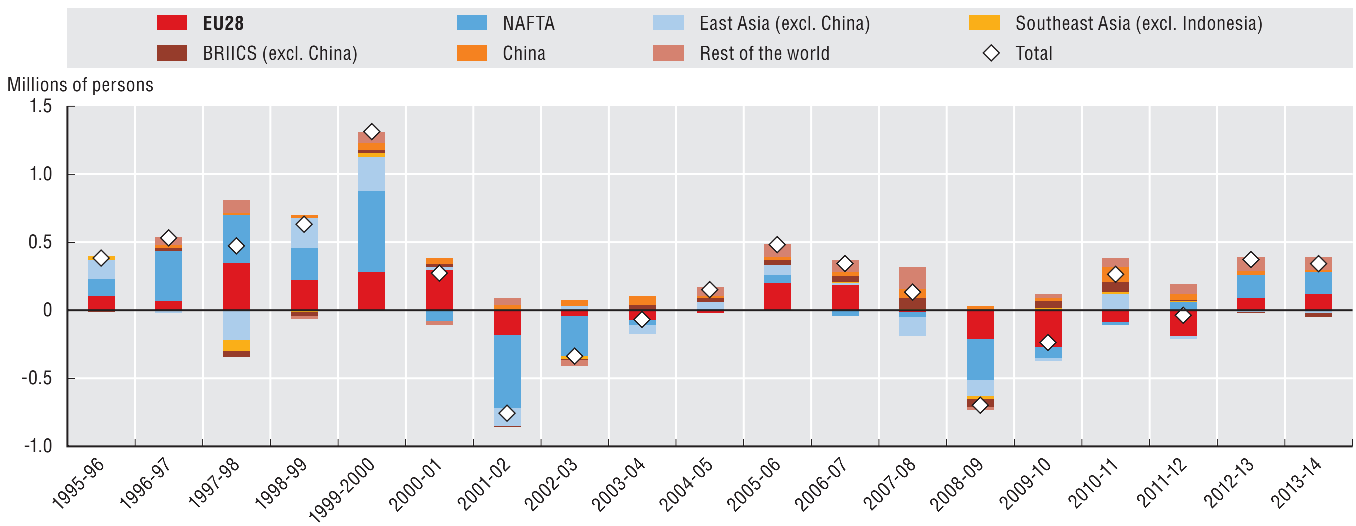


Source: OECD calculations based on the Inter-Country Input-Output (ICIO) Database, the Structural Analysis (STAN) Database, the Annual National Accounts Database, Trade in Employment (TiM) and national sources, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617529

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

Millions of persons, annual changes by region of demand



Source: OECD calculations based on the Inter-Country Input-Output (ICIO) Database, the Structural Analysis (STAN) Database, the Annual National Accounts Database, Trade in Employment (TiM) and national sources, June 2017. See chapter notes.

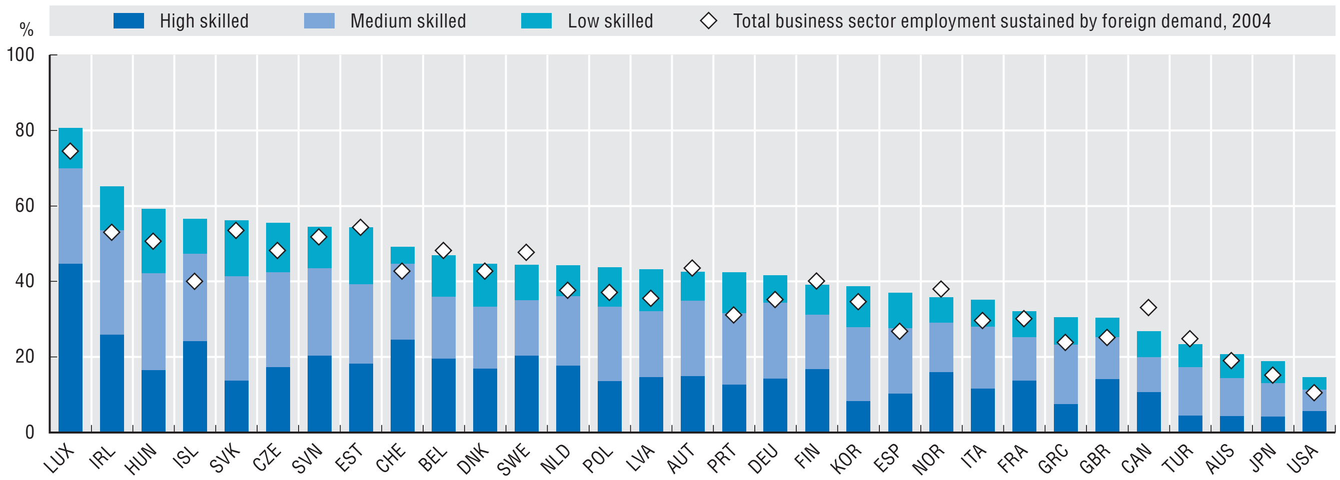
StatLink http://dx.doi.org/10.1787/888933617548

Your job depends on my demand for products

Greater integration in global value chains has implications for the demand for skills in countries. In 2014, in the United States, an estimated 38% of approximately 13 million business sector workers engaged in production to satisfy foreign final demand were high skilled. A similar share (36%) was apparent for the 54 million workers engaged in meeting foreign demand in the 22 EU countries of the OECD, although the bulk of foreign demand originated from other EU countries. Such shares varied across EU countries, ranging from about 25% in Greece and the Slovak Republic to over 40% in countries with large service sectors such as Luxembourg (56%), the United Kingdom (47%), Sweden (46%), Finland (43%) and France (43%). For other OECD countries, the share of high-skilled workers engaged in meeting foreign demand varied between 40% in Canada to about 21% in Australia and Korea. Variations reflect differences in the skills required in production for domestic consumption versus exports, differences in the skill profiles of workers in foreign versus domestic companies, and differences in the structural composition of domestic versus foreign final demand.

38. Business sector jobs sustained by foreign final demand, by skill intensity, 2014

As a percentage of total business sector employment



Note: Estimates for jobs sustained by foreign final demand are derived directly from OECD's Inter-Country Input-Output (ICIO) table for 2004, while estimates for 2014 are preliminary projections or nowcasts. This experimental indicator decomposes total employment sustained by foreign final demand into three groups of skill intensity defined according to major groups of the International Standard Classification of Occupations 2008 (ISCO-08): high-skilled occupations (ISCO-08 major groups 1 to 3), medium-skilled (4 to 7) and low-skilled (8 and 9).

Source: OECD calculations based on OECD's Inter-Country Input-Output (ICIO), Annual National Accounts, Structural Analysis (STAN) and Trade in Employment (TiM) databases, the World Input-Output Database, European Labour Force Surveys, national Labour Force surveys and other national sources, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617567

Measuring jobs sustained by foreign final demand

The goods and services people buy are composed of inputs domestically produced or imported from various countries around the world. However, the flows of goods and services within these global production chains are not always apparent from conventional international trade statistics, or from national Input-Output or Supply and Use tables, which reveal flows of intermediate goods and services between industries (or product groups) within a country for production to meet domestic and foreign demand. Building on these data sources and other sources, the OECD's Inter-Country Input-Output (ICIO) database provides estimates of flows of goods and services between 63 economies and 34 economic activities (based on ISIC Rev.3 and including 16 manufacturing and 14 service sectors) for 1995-2011. In this analysis, ICT industries are defined according to ISIC Rev.3 and consist of "Computer, electronic and optical products" (ISIC Rev.3 Divisions 30, 32 and 33), "Post and telecommunications services" (Division 64), and "Computer and related activities" (Division 72).

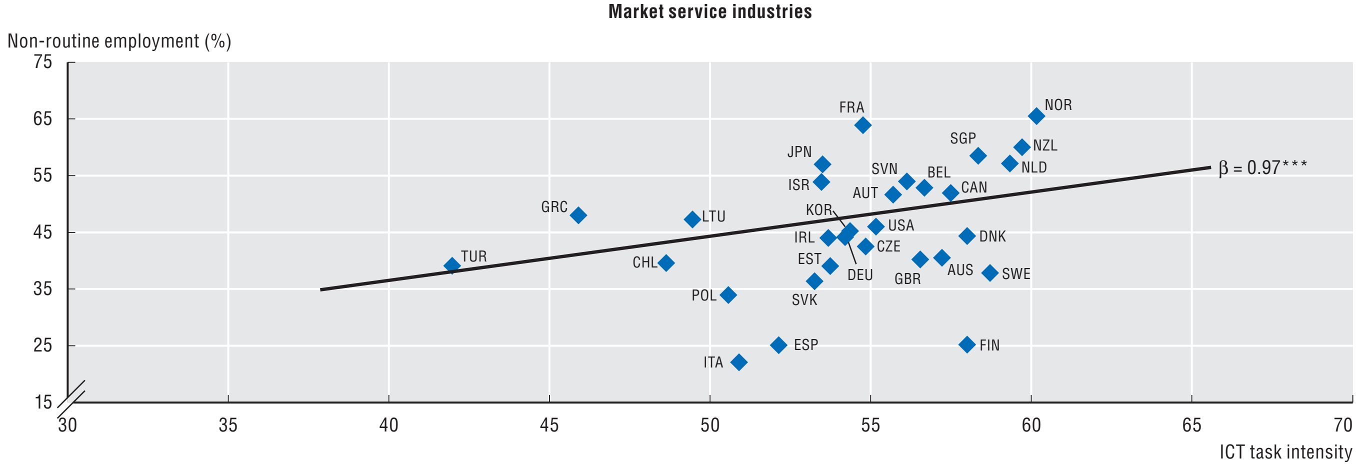
The most visible use of the ICIO is the development of Trade in Value Added (TiVA) indicators, which highlight the value-added origin (both domestic and foreign) of countries' exports and final demand. Estimates of jobs embodied in (or sustained by) foreign final demand, can be calculated in a manner similar to estimates of domestic value added embodied in foreign final demand. However, experimental jobs-related indicators rely on some broad assumptions. In particular, they assume that within each industry labour productivity in exporting firms is the same as firms producing goods and services for domestic use only, and that all firms use the same share of imports for a given output, whether exporters or domestic producers only. However, evidence suggests that exporting firms have a higher level of labour productivity and use more imports in production. More effort is required to account for firm heterogeneity within the ICIO framework, in order to reduce the potential upward biases resulting from these current assumptions.

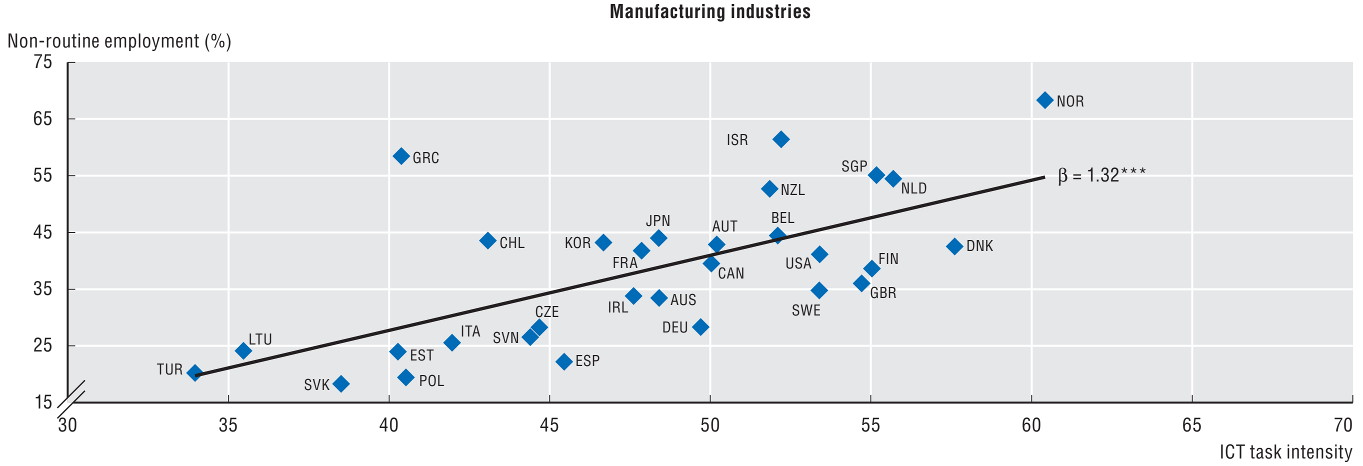
The changing nature of jobs

Innovation and new technologies – especially information and communication technologies (ICTs) – coupled with changes in the way firms organise production, both locally and globally, are changing the jobs and skills profile of the workforce. Economies where workers use ICT more intensively at work are also characterised by a higher share of "non-routine jobs". These jobs entail the performance of relatively more complex tasks that cannot be easily codified or sequenced (e.g. programming or decision making). This is the case for both services and manufacturing jobs. While jobs in services industries appear relatively more "ICT task intensive", the positive relationship between non-routine content and ICT task intensity is generally stronger in manufacturing. Firms' organisational structure, technology adoption, participation in global value chains, and the extent to which routine manufacturing jobs might already have been automated, relocated and offshored are among the factors contributing to these patterns.

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

Correlation of average industry values in the macro sector





Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617586

The routine and ICT task content of jobs

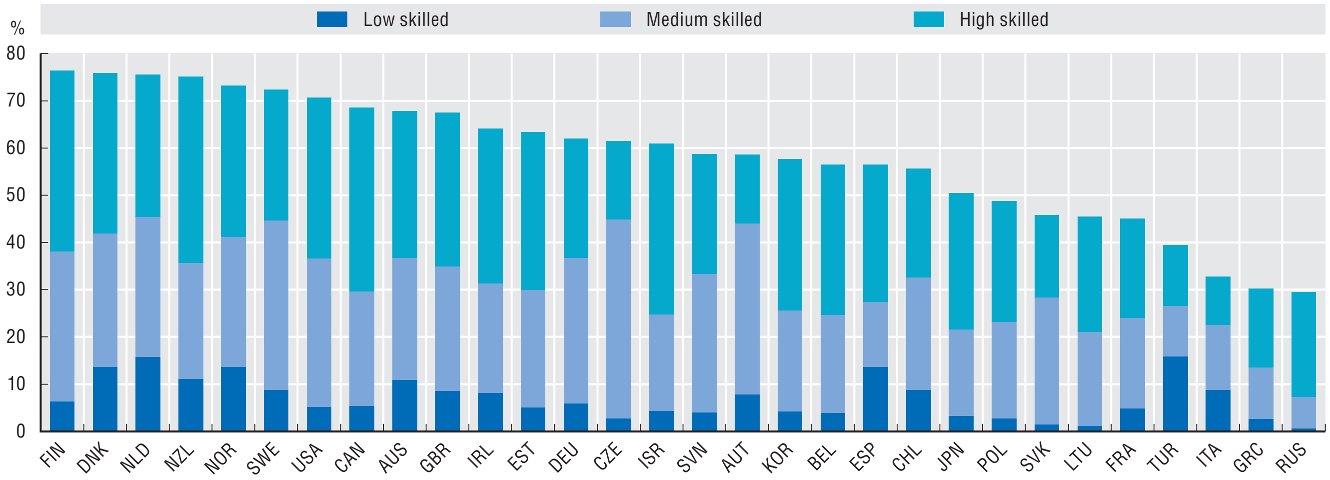
Recently, OECD has developed task-based indicators to measure the "routine intensity" (Marcolin et al., 2016) and "ICT task intensity" of occupations (Grundke et al., 2017). Both sets of indicators are built using information from the OECD Programme for the International Assessment of Adult Competencies (PIAAC). The "routine intensity of jobs" captures the degree of independence workers have to plan and organise their activities and time, as well as their freedom to decide what to do on the job and in what sequence. The "ICT task intensity of jobs" reflects the extent to which workers perform tasks ranging from simple use of the Internet to the use of Word or Excel software or a programming language. Compared to earlier studies, these task-based approaches help to distinguish between the tasks that workers perform while at work and the skills with which they are endowed.

Training in firms

Workers performing non-routine tasks or ICT-intensive tasks are generally endowed with relatively higher skills. Firm-based training helps to motivate and reward employees, and align workers' competences to firms' needs. Training may also help to reduce inequality and provide low-skilled workers with the skills needed to navigate the digital transformation. Evidence nevertheless suggests that training has been used mostly to further upskill medium and high-skilled workers. On average, in the countries considered, between 30% (the Russian Federation and Greece) and 76% (the Netherlands, Denmark and Finland) of workers receive some training from their employers. With the exception of Turkey, only a quarter or less of workers receiving training are low skilled, whereas high-skilled workers account for between one-quarter (Austria) and three-quarters (the Russian Federation) of those receiving training.

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

As a percentage of total employed persons



Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617605

How to measure training?

Firm-based training endows workers with the skills needed to perform on the job and to transition between jobs – especially in an era of fast technological change. In the absence of internationally agreed methodologies on how to measure investment in firm-based training, the OECD (Squicciarini et al., 2015) has developed a new methodology to estimate different types of training. These include formal training which consists of organised training conducted outside the work environment resulting in the attainment of a degree at an education institution, and on-the-job training which can take place both inside and outside a firm but does not typically lead to the attainment of a formal degree. Training figures are based on the number of employees in the OECD Programme for International Assessment of Adult Competencies (PIAAC) that reported having received training at least once in the year, for both public and private sectors. Numbers are weighted to obtain country-wide representativeness. Frequencies may hide differences in the length of the training period across individuals and countries.

Women in the workplace

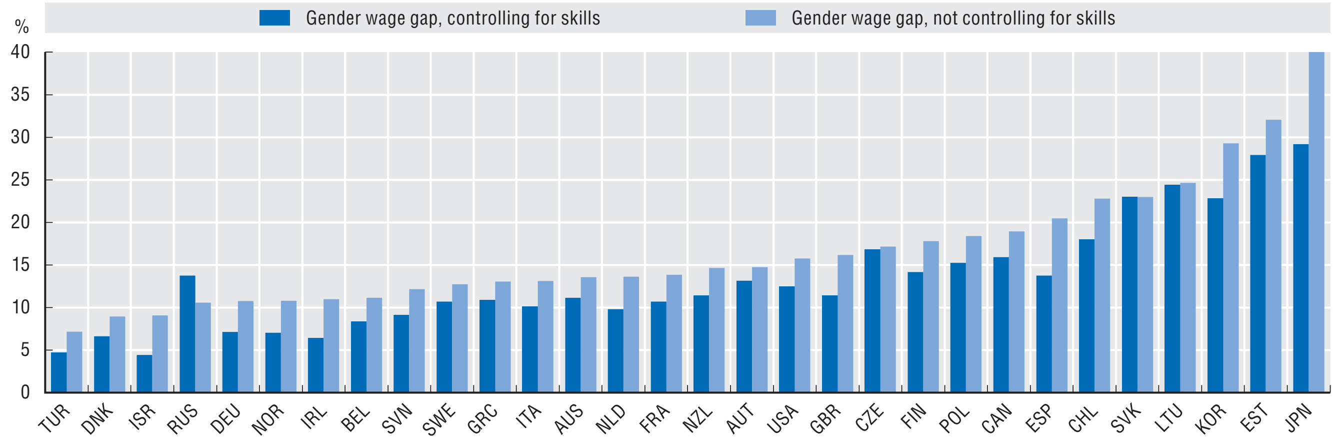
The speed, scale and scope of digital transformation are shaping all aspects of life including work. New and atypical work arrangements may lead to increased flexibility but at the cost of reduced job quality. The ways in which knowledge is generated and shared may help to overcome possible cultural or institutional barriers, but also create others. In a time of heightened uncertainty predictions are difficult to make; therefore, skills endowment and upgrading are key to navigating and benefitting from the digital transformation.

Women often earn significantly less than men, even after individual and job-related characteristics are taken into consideration. Skills partially explain the gender wage gap across countries. For example, men tend to have a relatively higher level of STEM-related skills which are positively rewarded by labour markets. The gender wage gap narrows if skills are taken into account, but differences remain and point to other sources of wage inequality, including firms' organisational choices about project responsibilities, and employees' tenure or even discrimination.

ICT skills play a significant role in explaining the gender wage gap. Estimates suggest that, other things being equal, returns on ICT tasks are larger for women than for men. Training women and endowing them with additional ICT skills may therefore contribute to increasing their wages and help to bridge the gender wage gap.

41. Gender wage gap by country, 2012 or 2015

Differences in hourly wages, in percentages (controlling vs. not controlling for various types of skills)

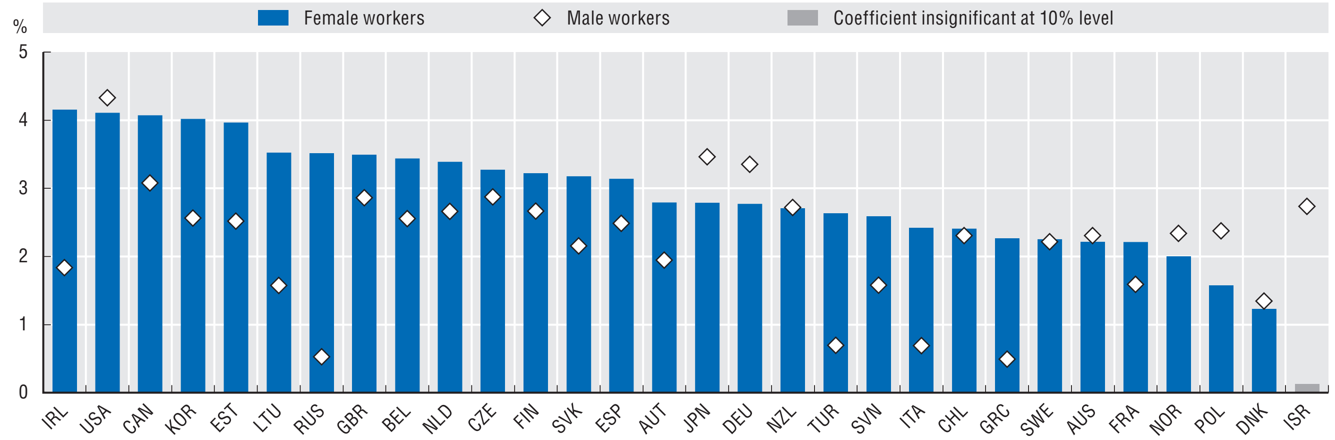


Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617624

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

Percentage change in hourly wages for 10% increase in ICT task intensity (at the country mean, by gender)



Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, September 2017. See chapter notes.

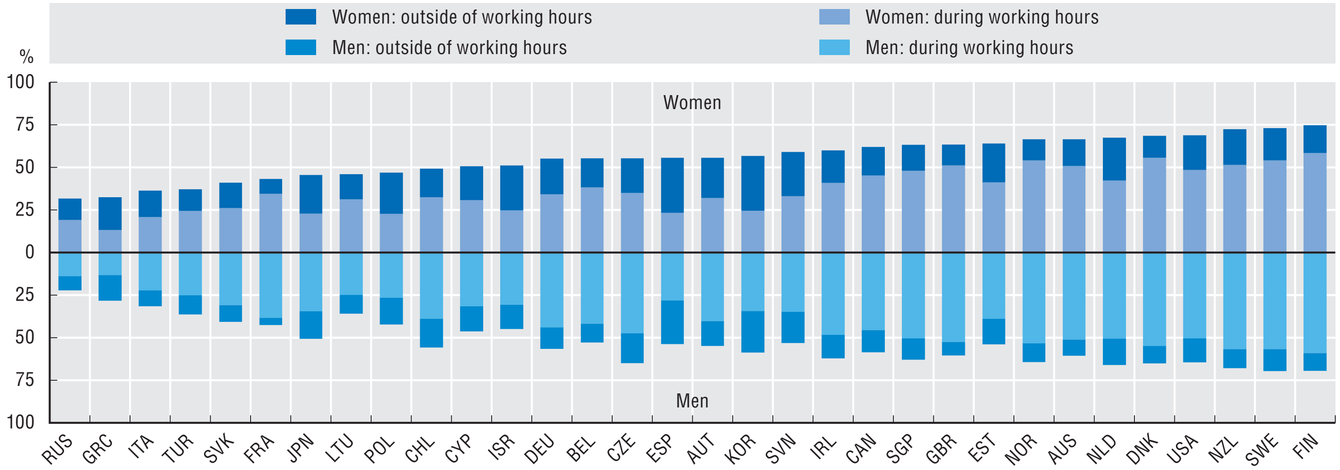
StatLink http://dx.doi.org/10.1787/888933617643

Women in the workplace

Training plays a key role in upskilling the workforce and thus augments an economy's human capital base. According to OECD research, a larger share of women participate in on-the-job training, but the proportion that undertakes training during working hours is significantly lower than that of men. However, this may depend on factors such as differences in the propensity of men and women to engage in part-time work or upskilling, employers' choices regarding whom to train and expected returns to firms from training.

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

As a percentage of total employees of a given gender in the economy



Source: OECD calculations based on the OECD Programme for International Assessment of Adult Competencies (PIAAC) Database, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617662

Investing in skills to close the gender wage gap

In the absence of internationally agreed measures for investment in training, the OECD proposes an experimental methodology to estimate investment in different types of training. *Formal training* refers to organised training undertaken outside the work environment that results in the attainment of a degree. *On-the-job training* may take place both inside and outside a firm but does not typically lead to a formal degree (Squicciarini et al., 2015). In order to assess which skills are relatively more rewarded in the labour markets, the OECD (Grundke et al., forthcoming) estimates returns on skills, analysing the extent to which work compensation in the form of salaries can be explained by the skill endowment of workers. Estimating returns on skills by gender can help identify the types of training more likely to reduce the associated wage gap. Estimates rely on indicators of cognitive skills such as literacy and numeracy, and skills that emerge from an analysis of tasks carried out by individuals on the job (for details see Grundke et al., 2017), as well as PIAAC data. The indicator of ICT tasks is based on job tasks that range from simple use of the Internet to the use of Word or Excel software or a programming language.

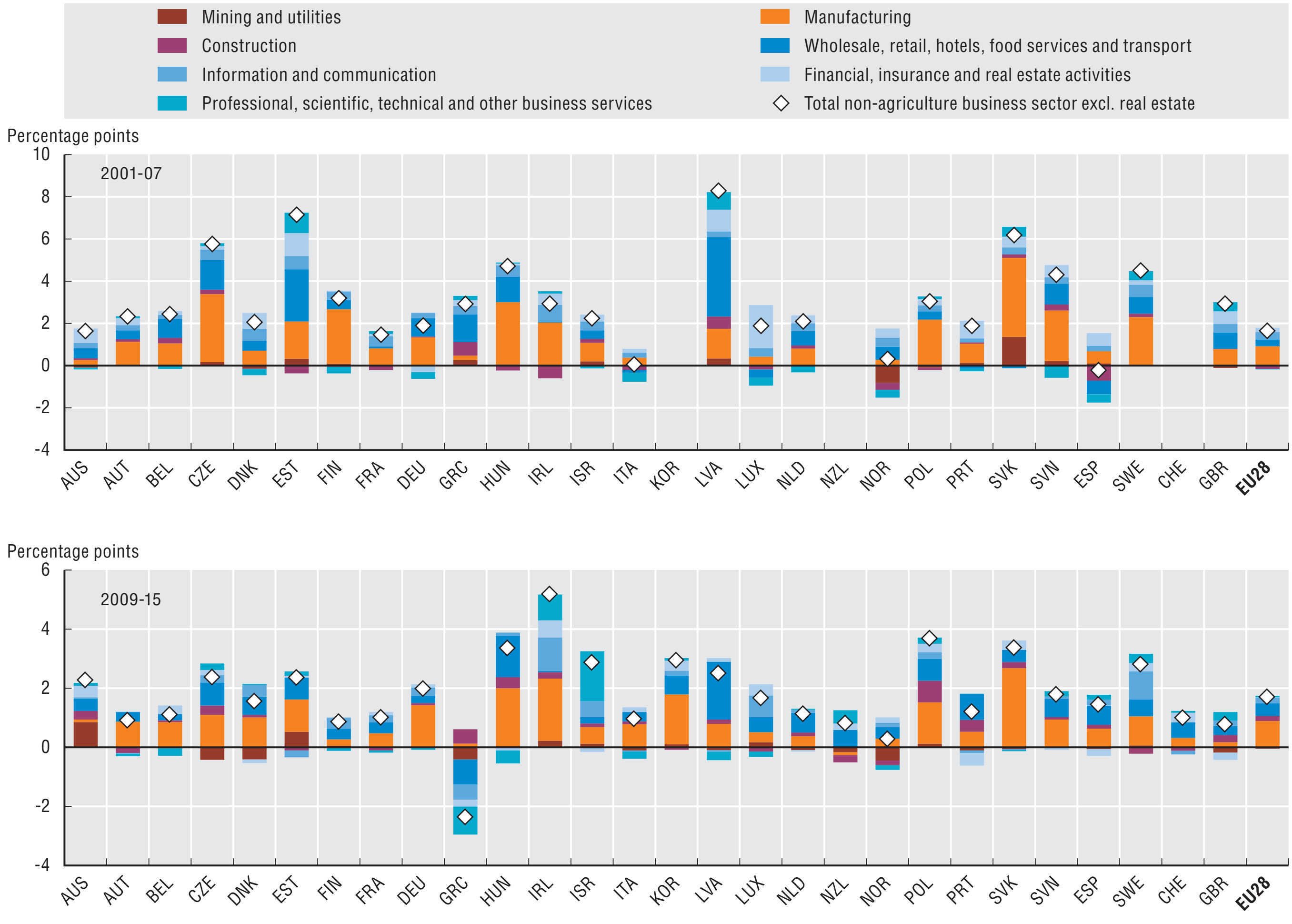
A corrigendum has been issued for this page. See: http://www.oecd.org/about/publishing/Corrigendum_OECD_STI_Scoreboard_2017.pdf

Sectoral productivity

Understanding the drivers of productivity growth at the total economy level requires an awareness of the contribution made by each industry. In the years up to the economic crisis (2001-07), productivity growth in most OECD countries was driven almost entirely by increased productivity in manufacturing and the increasing share of business services in overall activity. For most OECD countries for which data are available, labour productivity growth decreased following the onset of the financial crisis in 2008, with this decline spread broadly across sectors. The Czech Republic, Estonia, Finland, Greece, Latvia, the Slovak Republic, Slovenia and the United Kingdom experienced marked reductions (greater than 2%) in average productivity growth between 2009 and 2015 compared to the period 2001-07 with declines in manufacturing productivity growth particularly evident. However, some countries – such as Australia, Ireland, Israel, Italy, Poland and Spain – registered modest gains.

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

Contributions to average annual percentage change in the non-agriculture business sector



Source: OECD, Productivity Database, *www.oecd.org/std/productivity-stats*, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617681

Measuring labour productivity by sector

Labour productivity growth is defined as the rate of growth in real value added per hour worked. Differences in labour productivity growth across sectors may relate, for instance, to the intensity with which sectors use capital (including knowledge-based capital) and skilled labour in their production, the scope for product and process innovation, the degree of product standardisation, the scope for economies of scale and their involvement in global value chains. The comparability of productivity growth across industries and countries may be affected by problems in measuring real value added. For example, most countries assume no change in labour productivity for public administration activities; this sector is not included here. Real estate services are also excluded, as the output of this sector reflects mainly the imputation made for the dwelling services provided and consumed by home owners. In addition, sectors such as construction and several services (for example, hotels and restaurants) are characterised by a high degree of part-time work and self-employment, which can affect the quality of estimates of actual hours worked. See OECD (2017a) for more discussion of productivity measurement issues.

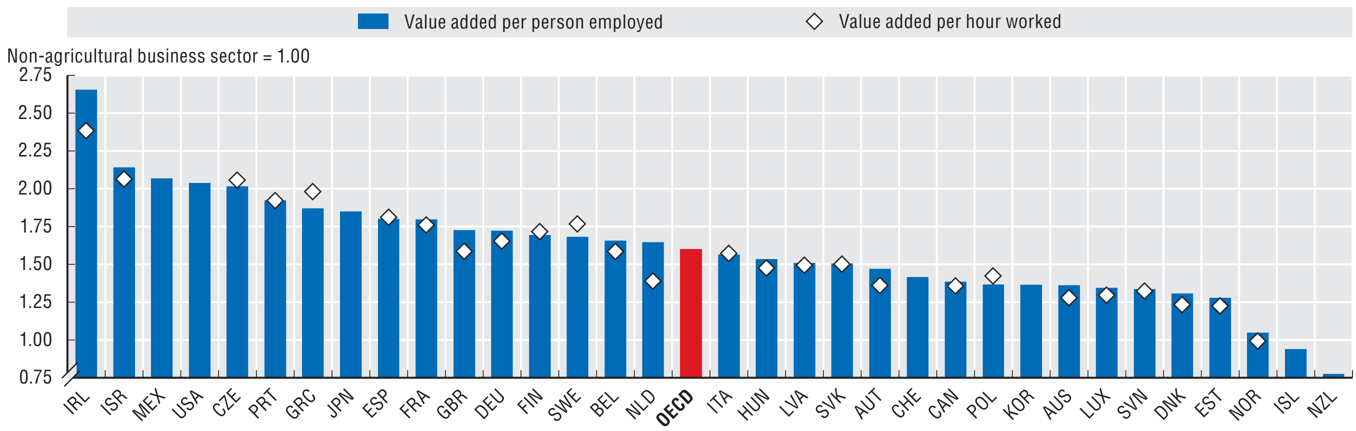
Sectoral productivity

For most OECD countries, the contribution of information industries to total labour productivity growth is relatively small. However, these sectors have significantly higher than average levels of labour productivity, reflecting their relative intensity in fixed (tangible) capital and knowledge-based capital. In 2015, across the OECD area, labour productivity in the information sector was, on average, 60% higher than other industries in the business sector. Ireland had the highest labour productivity level, driven in particular by high growth in the productivity of ICT services, and in part by the presence of several US multinational headquarters in the sector, with high value added but relatively few employees.

Labour productivity reflects changes in the use and efficiency of both fixed capital investment and knowledge-based capital (intangible assets). Estimates of multifactor productivity, by accounting for "measured" capital's contribution to GDP (including software and R&D that are capitalised in national accounts) capture the impact of "non-measured" intangible assets such as organisational capital or investment in firm-specific training. In general, total economy multifactor productivity in the six-year period following the economic crisis was significantly lower than in the two six-year periods (1995-2001 and 2001-07) preceding the crisis. Of the countries presented, only Denmark and Japan experienced higher multifactor productivity during 2009-15 than in the earlier six-year periods.

45. Labour productivity levels in the information industries, 2015

Relative to aggregate labour productivity of other industries in the non-agriculture business sector



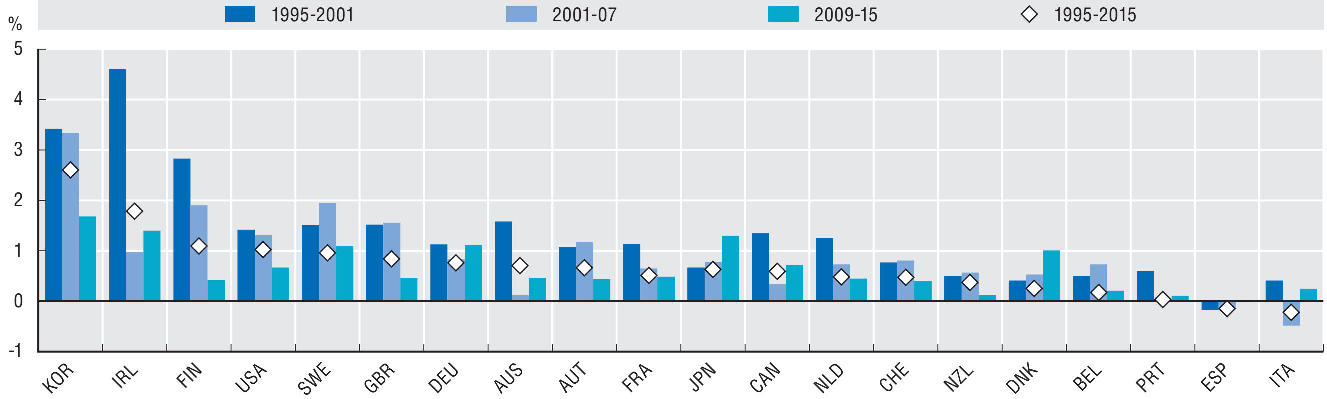
Note: While the preferred measure of labour productivity is value added per hour worked, limited availability of data on hours worked at a detailed level of industry means that value added per person employed is sometimes used as a substitute. Differences between the two measures reflect average hours worked per person. In this chart, higher relative value added per person employed reflects higher hours worked per person in the information industries. 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).

Source: OECD, Structural Analysis (STAN) Database, *http://oe.cd/stan*, and Annual National Accounts (SNA) Database, *www.oecd.org/std/na*, September 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617700

46. Multifactor productivity growth, 1995-2015

Total economy, percentage change at an annual rate



Source: OECD calculations based on OECD Productivity Database, *www.oecd.org/std/productivity-stats*, September 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617719

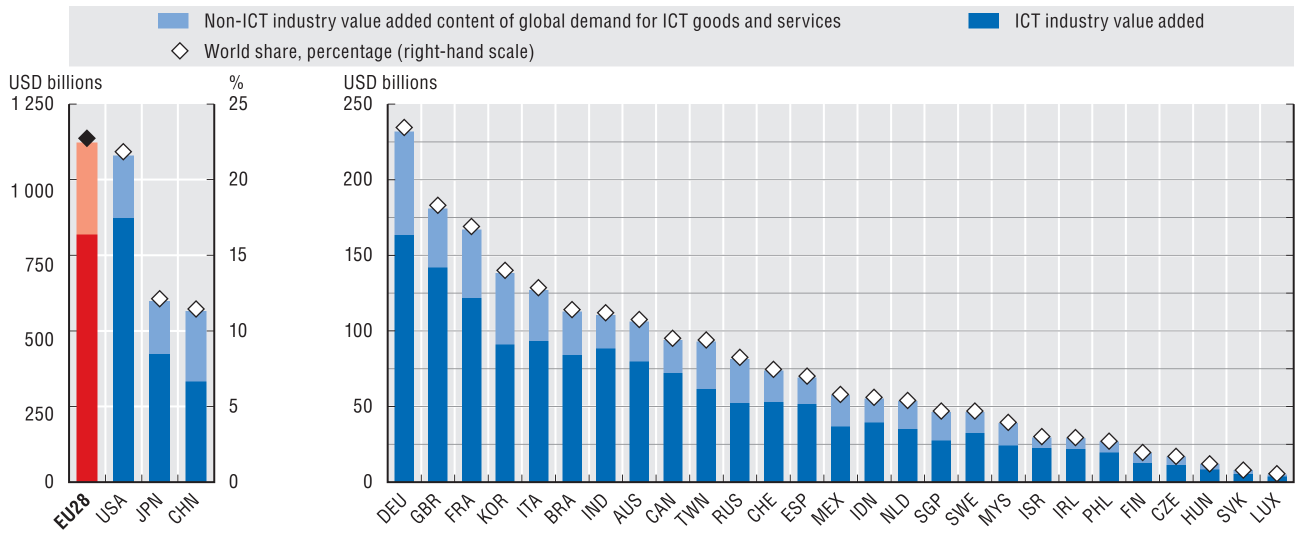
The extended ICT footprint

Measuring the value added generated by information and communication technology (ICT) industries only provides a partial view of the importance of ICT to a country's economy. In addition to final ICT products, the output from domestic ICT industries is also embodied (via intermediate products) in a wide range of goods and services meeting final demand (business capital investment, household and government consumption), both domestically and abroad. Similarly, the output from domestic non-ICT industries is present in many ICT goods and services consumed worldwide through domestic interconnections and participation in global value chains (GVCs). Global demand for ICT goods and services through international trade and investment can drive the activities of many upstream domestic non-ICT industries. Combining the value added generated by domestic ICT industries with the domestic non-ICT industry value added embodied in global demand for ICT goods and services could be a first step towards defining an extended ICT footprint, or "ICT-EF".

In 2011, the United States, Japan and China together accounted for about 45% of the world's extended ICT footprint. The European Union as a whole accounted for 23%, a share only marginally higher than that of the United States. Neglecting the value added generated in other sectors of the economy to meet global demand for ICT final goods and services can result in under-estimation of the role played by the "digital" economy. In OECD countries, 19% to 34% of the extended ICT footprint is accounted for by value added generated elsewhere, rising to 41% for China.

47. Extended ICT domestic value added footprint, 2011

USD billions and world share, percent



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, and Trade in Value Added (TiVA) database, *http://oe.cd/tiva*, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617738

ICT and the origin of value added

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). Due to data availability this definition represents an approximation of the more detailed ISIC Rev.3 definition given in OECD (2011).

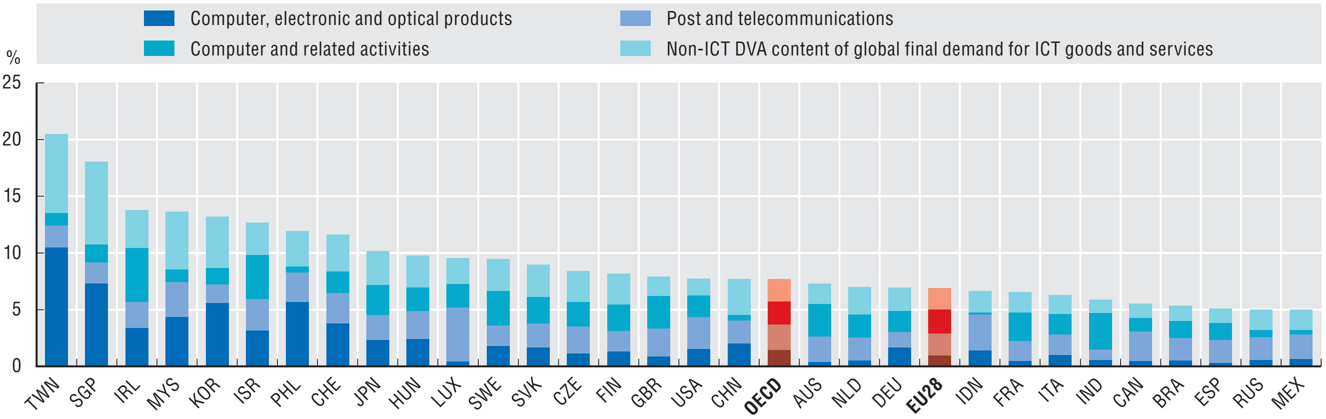
While ICT industry value added is generally available from official National Accounts (SNA) statistics, tracking the country and industry origins of value added embodied in final ICT goods and services requires the use of TiVA indicators, such as the "Origin of value added in final demand", based on the OECD's ICIO database. This provides estimates of inter-country, inter-industry flows of intermediate and final goods and services that allow for the development of a range of indicators to provide insights into countries' participation in the global economy. Such indicators are not otherwise apparent from conventional official statistics such as reported "gross" trade in goods and services and national Input-Output or Supply and Use tables.

The extended ICT footprint

The importance of the extended ICT footprint can be further illustrated by considering ICT-related domestic value added as a share of total economy value added (or GDP). East and Southeast Asian economies accounted for some of the highest shares in 2011. The ICT-EF measure reveals that ICT value added represented 20% of GDP in Chinese Taipei and 18% in Singapore, economies that are particularly reliant on the manufacture of ICT goods. Among OECD countries, Ireland, Israel, Japan, Korea and Switzerland all had shares over 10%, although, with the exception of Korea, the main contribution came from ICT service activities, as was the case for most other OECD countries. To determine how domestic demand generates ICT-related value added abroad, another dimension of ICT-EF can be considered. In particular, the combination of foreign ICT industry value added in final domestic demand for all goods and services, and the foreign non-ICT value added content of domestic demand for ICT goods and services, both of which are present due to importing activities. In the OECD area, on average, ICT-related foreign value added accounted for 2.4% of GDP in 2011.

48. ICT-related domestic value added, 2011

As a percentage of GDP



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, and Trade in Value Added (TiVA) database, *http://oe.cd/tiva*, July 2017. StatLink contains more data. See chapter notes.

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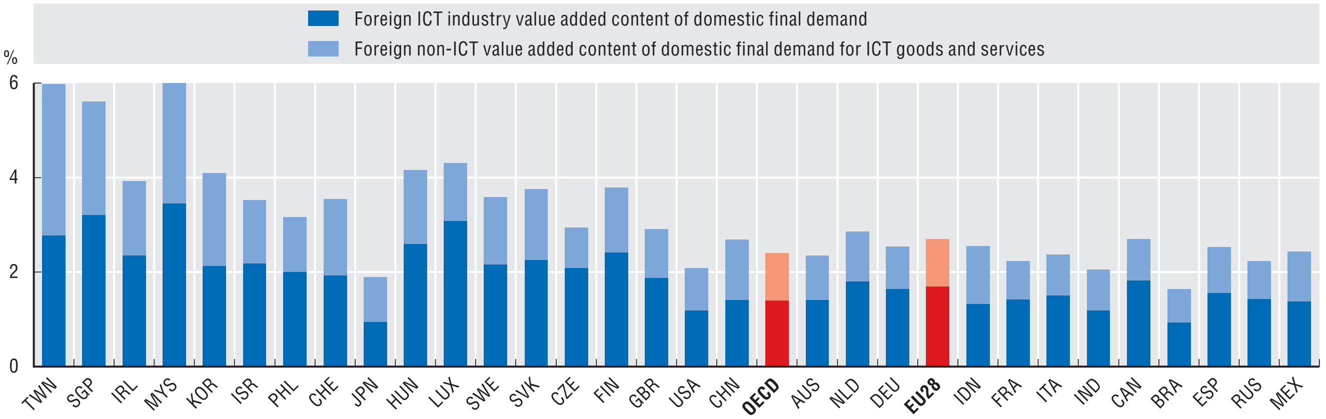
49. ICT-related foreign value added content of domestic final demand, 2011

As a percentage of GDP



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, and Trade in Value Added (TiVA) database, *http://oe.cd/tiva*, July 2017. StatLink contains more data. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617776

Measuring ICT footprints further

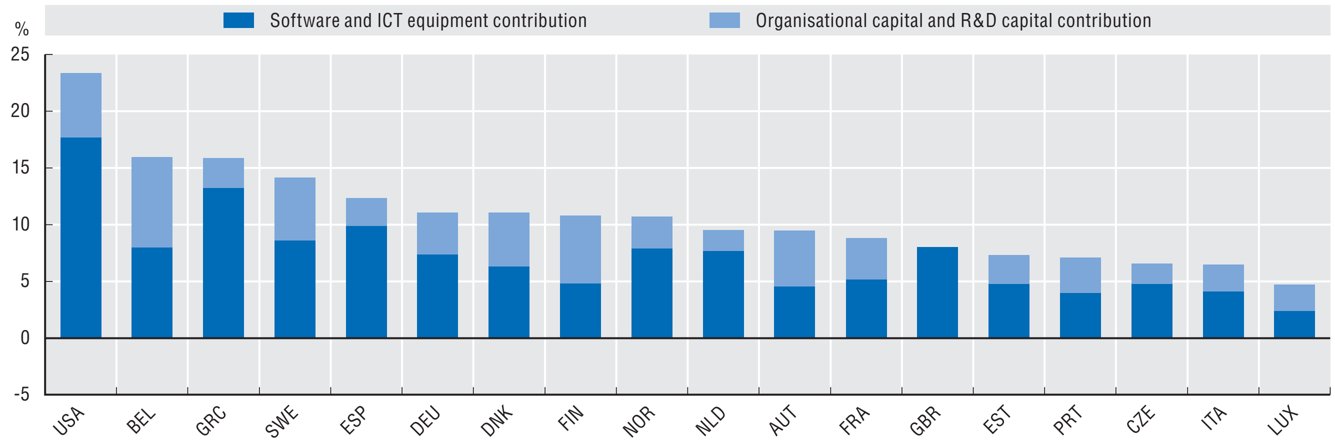
Due to ongoing development of the OECD's ICIO, the concept of extended ICT footprints can be further examined and improvements made to measurement. Notably, the use of an ISIC Rev.4-based industry list and, hence, a "refined" definition of ICT industries and ICIO tables for the years after 2011 to provide more timely indicators. Estimates of capital flow matrices, currently absent from the ICIO infrastructure, could also allow for the inclusion of non-ICT content of capital investment by ICT industries, such as the machinery and equipment used for manufacturing ICT parts and components. This would increase the size of ICT-EF. The ICT content of capital goods is already implicit in the analysis presented here.

Knowledge-based capital

Producing new and better products entails investing not only in research and development (R&D), but also in complementary assets such as software, design, human capital and firms' organisational capabilities (OC) – in short, knowledge-based capital (KBC). New OECD estimates for 2000-14 (Haines et al., forthcoming) reveal that selected KBC and tangible capital accounted on average for 6% and 14%, respectively, of labour productivity growth. The contribution of software and ICT equipment combined ranged between 2% (Luxembourg) and 18% (the United States) of labour productivity growth, whereas OC and R&D reached up to 8% (Belgium). The considered KBC assets also appear to have contributed indirectly to labour productivity growth; due to the positive relationship between KBC and multifactor productivity (MFP) (i.e. economies experiencing relatively higher MFP growth also exhibit higher KBC contribution). Factors that may explain these observed patterns include the industrial structure of economies and the extent to which investment in KBC generates knowledge spillovers and returns to scale.

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

Growth accounting estimates as a percentage of labour productivity growth, market sector

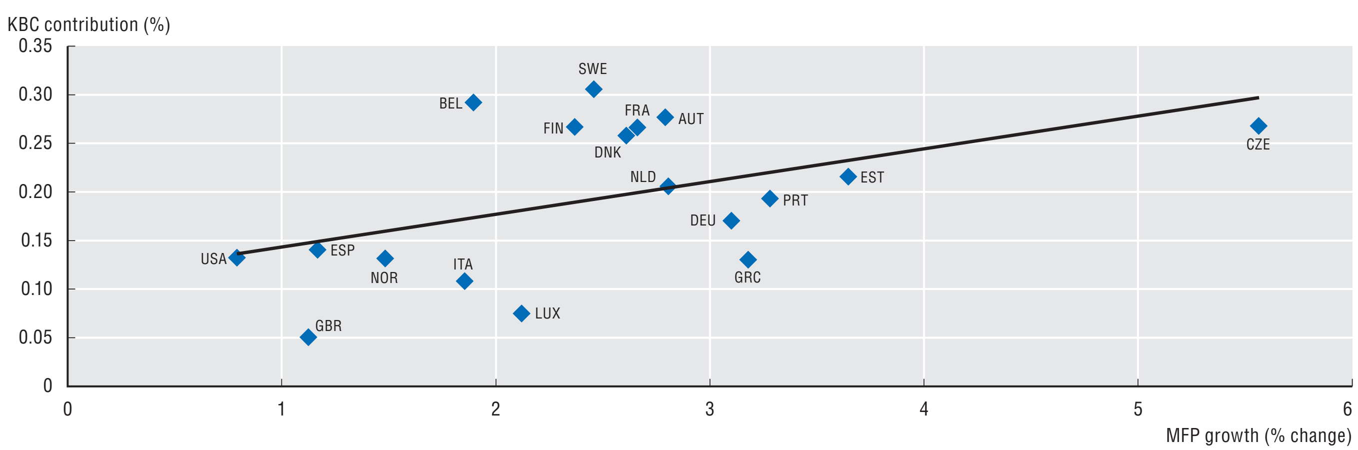


Source: OECD calculations based on ANBERD Database, Annual National Accounts Database, the OECD Programme for International Assessment of Adult Competencies (PIAAC), EUKLEMS, INTAN-Invest and the U.S. Bureau of Economic Analysis (BEA) Satellite Accounts, June 2017. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933617795

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

Growth accounting estimates, business sector



Source: OECD calculations based on data from OECD ANBERD, the OECD System of National Accounts (SNA), the OECD Programme for International Assessment of Adult Competencies (PIAAC), EUKLEMS, INTAN-Invest, www.intan-invest.net, U.S. BEA Satellite Accounts and the PIAAC Skills Survey. See chapter notes.

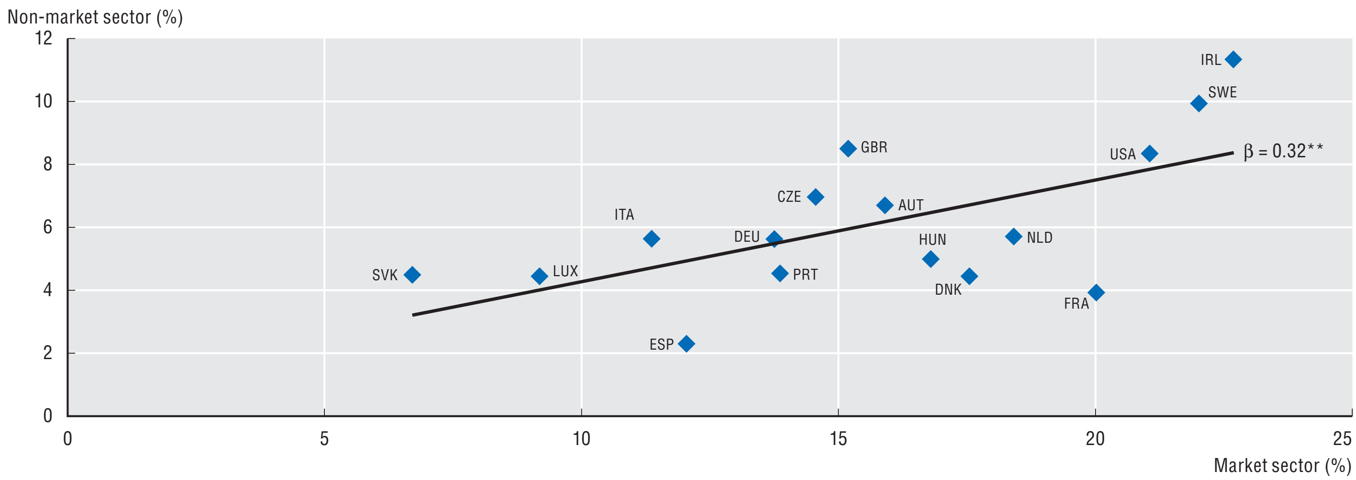
StatLink http://dx.doi.org/10.1787/888933617814

Knowledge-based capital

Growth accounting estimates usually focus on the market sector only, given that measuring productivity in the non-market sector can prove controversial. However, initial measurement of KBC in the non-market sector, produced in the context of the SPINTAN network, shows that investment in market and non-market sectors goes hand in hand across the countries considered. Hence, the contribution of KBC to economic growth might be even higher than suggested by market sector-based analysis if investment in KBC by the public sector were to be taken into account.

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

Correlation of intensities, investment over gross value added



Source: OECD calculations based on Annual National Accounts Database, *www.oecd.org/std/ana*, INTAN-Invest data, *www.intan-invest.net*, and SPINTAN data, *www.spintan.net*, May 2017. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617833*

What is meant by "KBC-augmented" and "growth accounting"?

Knowledge-based capital (KBC) or "intangible assets", as they are often called, refer to assets that lack a physical nature. The value of KBC stems from its knowledge content and its capacity to add value to other assets. Corrado et al. (2009) list assets such as software and databases, scientific and non-scientific R&D, copyrights, designs, brand equity and marketing research, firm-specific training and organisational know-how among KBC. The international statistical community has recently recognised software, R&D, entertainment, literary and artistic originals, and mineral explorations as capital assets, and includes them within the System of National Accounts (SNA), 2008 Revision. Recent methodological advances have further proposed ways to measure other KBC assets, including design, brands, firm-specific training and organisational capital. While a consensus has yet to be reached on aspects such as prices and depreciation rates for these assets, the methodologies in question derive capital estimates from information reported as intermediate expenditures in National Accounts. Capitalising these assets therefore imposes an adjustment to the value added and labour productivity measures used in the growth accounting analysis (here called "KBC-augmented"). Such an adjustment is implemented with respect to the organisational capital investment in particular, which is estimated based on Le Mouel et al. (2016). Estimates about KBC investment in the non-market sector are sourced from the SPINTAN network.

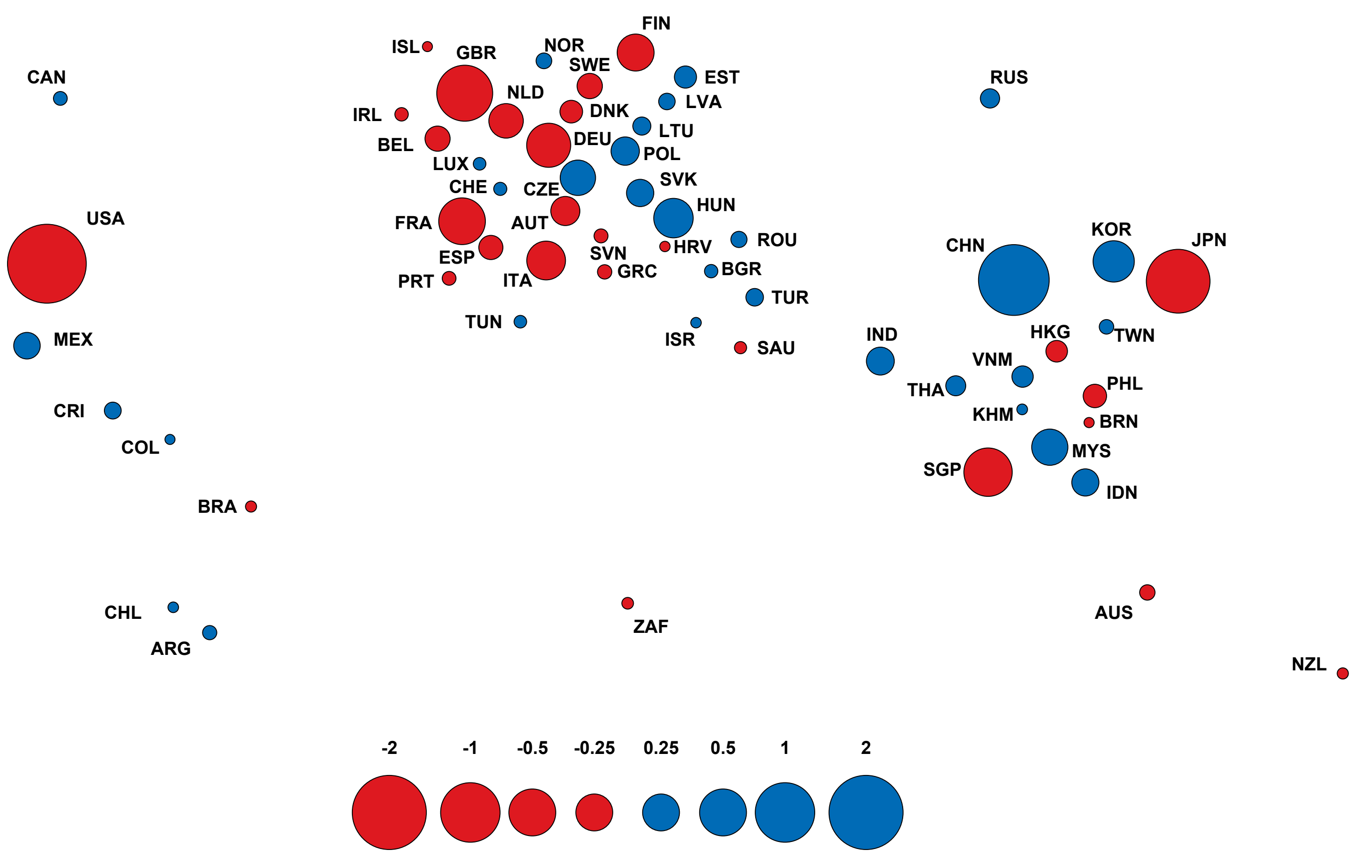
According to classical economic theory, growth can be achieved by increasing the amount of inputs or by improving the efficiency with which these inputs are used in production. Under a number of assumptions such as perfectly competitive markets and constant returns to scale in production, the growth accounting methodology separates the contributions of inputs accumulation and MFP to GDP or to labour productivity growth. Further details about the methodology and the solutions provided to the data constraints encountered can be found in Haines et al. (forthcoming).

ICT global production networks

Global production networks are complex webs consisting of flows of knowledge, goods and service inputs, combined at various stages of production. Firms and industries positioned at the centre of global value chains (GVCs) have access to a greater variety of foreign inputs, compared to those at the periphery. Hence, productivity gains are likely to be generated from positioning as well as participation in GVCs. Profound changes in the core/periphery structure of GVCs have taken place over recent decades, particularly in ICT sectors. In 1995, computing and electronics manufacturing value chains were organised around a handful of central hubs in high-income economies, notably Japan and the United States. However, the period 1995-2011 saw an almost universal and substantial decline in importance among these traditional centres of manufacturing (represented by the red circles in the Figure). Conversely, many Asian and Central and Eastern European countries witnessed large increases in centrality, especially in China, as well as the Czech Republic, Hungary, Korea and Malaysia (represented by the blue circles in the Figure). By 2011, global production of ICT electronics no longer centred around a few high-income economies and was shifting towards a more even distribution.

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

Centrality measured as total foreign centrality



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, July 2017. StatLink contains more data. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617852*

How to read these figures

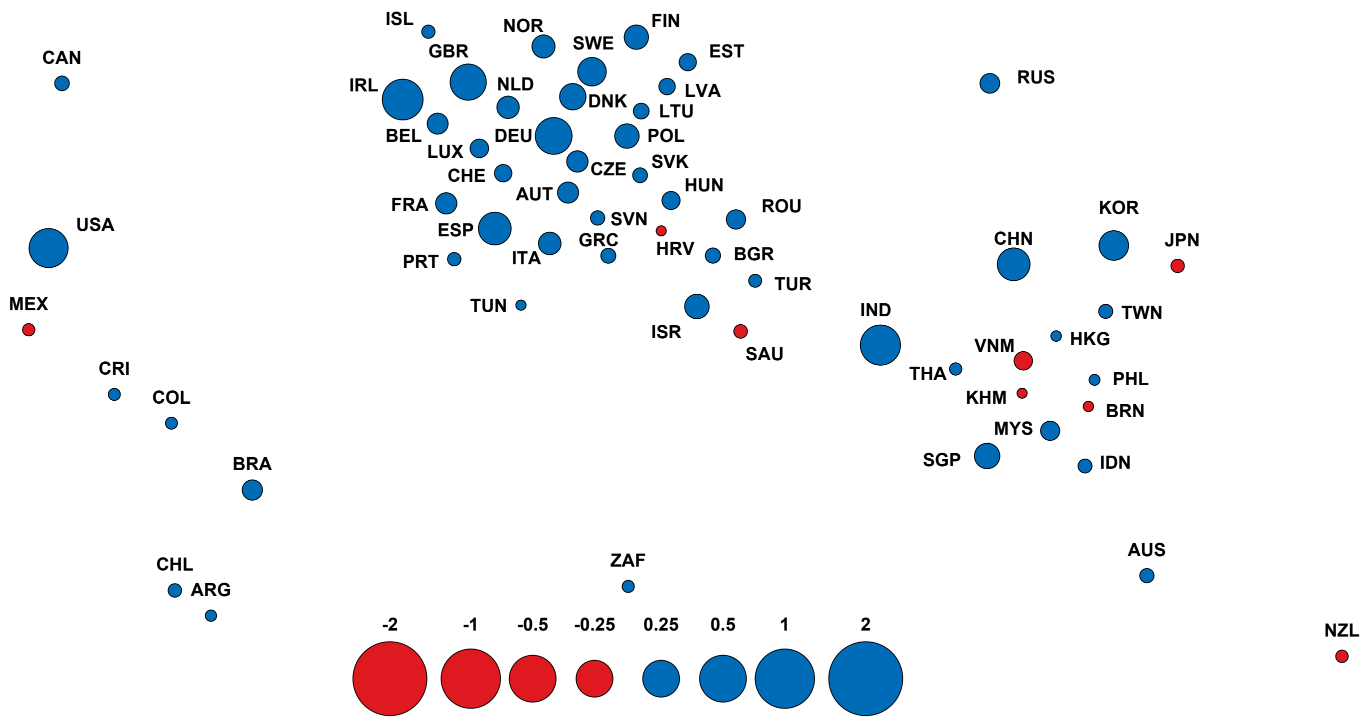
Economies are placed according to their geographical location. The size of the nodes reflects the magnitude of the change (in levels) of total foreign centrality over the period 1995-2011. As reflected in the key, these changes are graphed using a log scale for readability. Blue coloured nodes reflect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

ICT global production networks

Changes in the structure of global production networks are linked to a dramatic rise in the role of IT services. From a low starting point in 1995, the reliance of global production networks on IT services increased for almost every economy over the period 1995-2011 (represented by the blue circles in Figure 54). The increasing influence of IT services was particularly noticeable in countries that experienced the largest declines in computing and electronics manufacturing centrality, namely Germany, the United Kingdom and the United States. However, these changes to IT services were somewhat smaller in magnitude than the overall extent of the relocation of computing and electronics manufacturing. The rising importance of IT services does not only follow the restructuring of high-income economies, but extends to include a broad range of economies, such as Ireland, Korea and Spain, as well as many emerging economies, especially China, India and Singapore.

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

Centrality measured as total foreign centrality



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, July 2017. StatLink contains more data. See chapter notes.

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What does "centrality" mean and how is calculated?

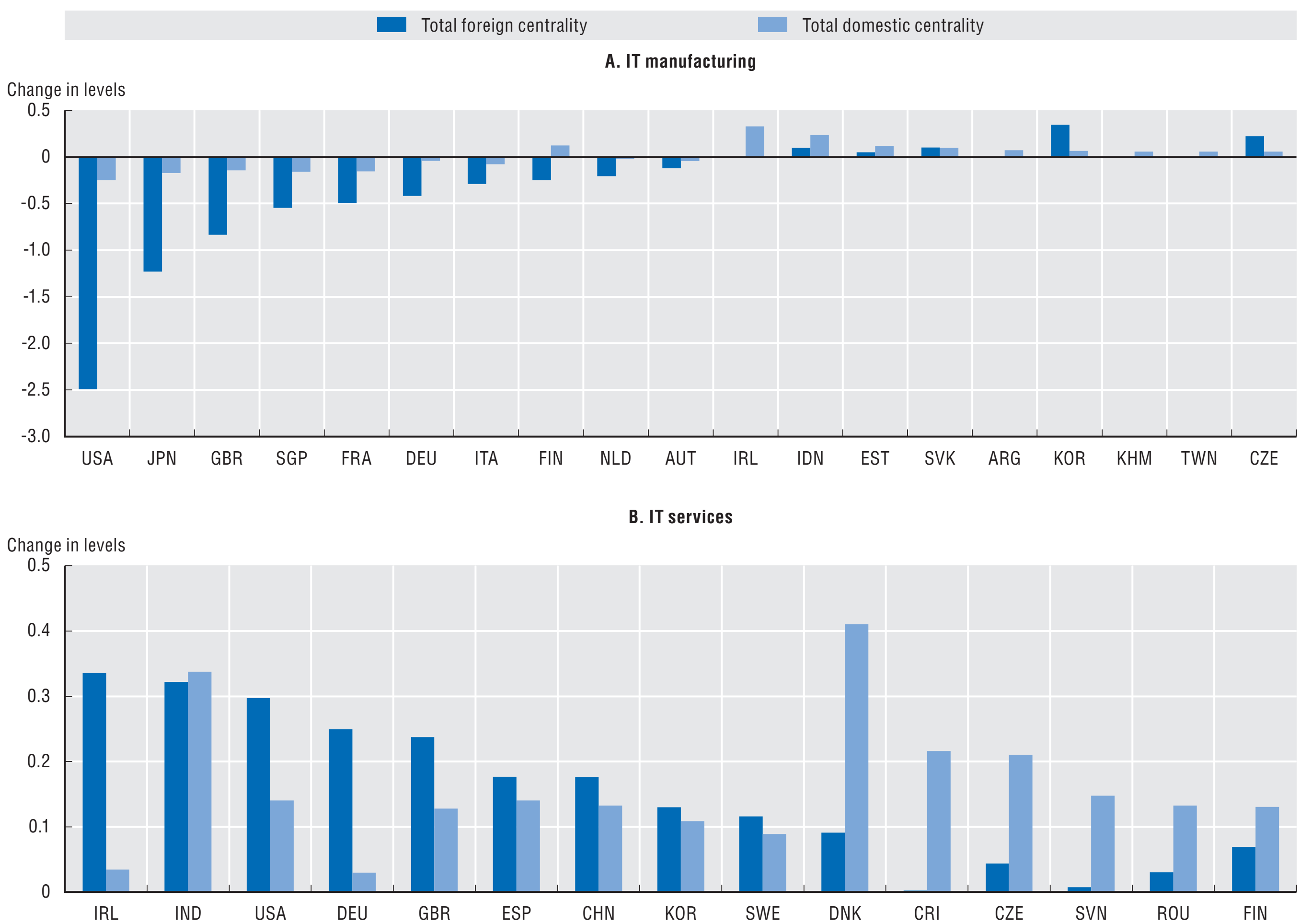
Centrality is a measure of influence or connectivity within the global production network. Central sectors reflect those that are highly connected (both directly and indirectly) and influential within global production networks.. Conversely, peripheral sectors exhibit weak linkages to other sectors and countries and so are less influential. This measure is calculated as a PageRank version of Bonacich-Katz eigenvector centralities using the network of input flows between countries and industries detailed in the OECD Inter-Country Input-Output (ICIO) Database, 2015 edition. 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. Thus, countries and industries are considered central if highly connected to other countries and industries both directly and indirectly as a result of trading with highly central trade partners. 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 centrality due to (direct and indirect) linkages to foreign sectors, while domestic centrality relates to (direct and indirect) linkages to domestic sectors. *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". See Criscuolo and Timmis (forthcoming).

ICT hubs

Centrality is a measure reflecting influence relative to all other country-industries in the network. It can be observed within both international and domestic production networks. The relative positioning (centrality) of an industry within a global or domestic production network is likely to differ. The substantial reorganisation of IT manufacturing global production networks has often accompanied broadly similar changes domestically. Many of the high-income economies that have witnessed large declines in their influence in global IT manufacturing production networks (e.g. Japan, the United Kingdom and the United States) have also almost universally experienced a decline in the influence of this industry within their domestic production networks. However, the changes observed in domestic centrality are generally of a lesser magnitude than those linked to foreign centrality. In contrast, several Eastern European and Asian economies have experienced an increase in their centrality for IT manufacturing both in terms of global and domestic production networks (Panel A). However, the relationship here is somewhat weaker, with Indonesia, for example, experiencing much faster increases in domestic centrality than foreign centrality, while Korea has experienced the reverse.

Similarly, changes observed for IT services in terms of centrality within global production networks are often mirrored in domestic production networks. IT services industries in Ireland, India, the United States and several other economies have become increasingly central to global production, as reflected in their increased foreign centrality (Panel B). For many of these same economies, IT services have also become more influential in domestic production networks, and in some cases increasing domestic influence exceeds globally observed changes, for example, in the Czech Republic, Denmark and India.

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



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, July 2017. StatLink contains more data. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617890*

How to read these figures

The bars represent the change (in levels) of total foreign and domestic centrality over the period 1995-2011. The Panel A represents changes in IT manufacturing ("Computer, electronic and optical products") and the Panel B represents IT services ("Computer and related activities").

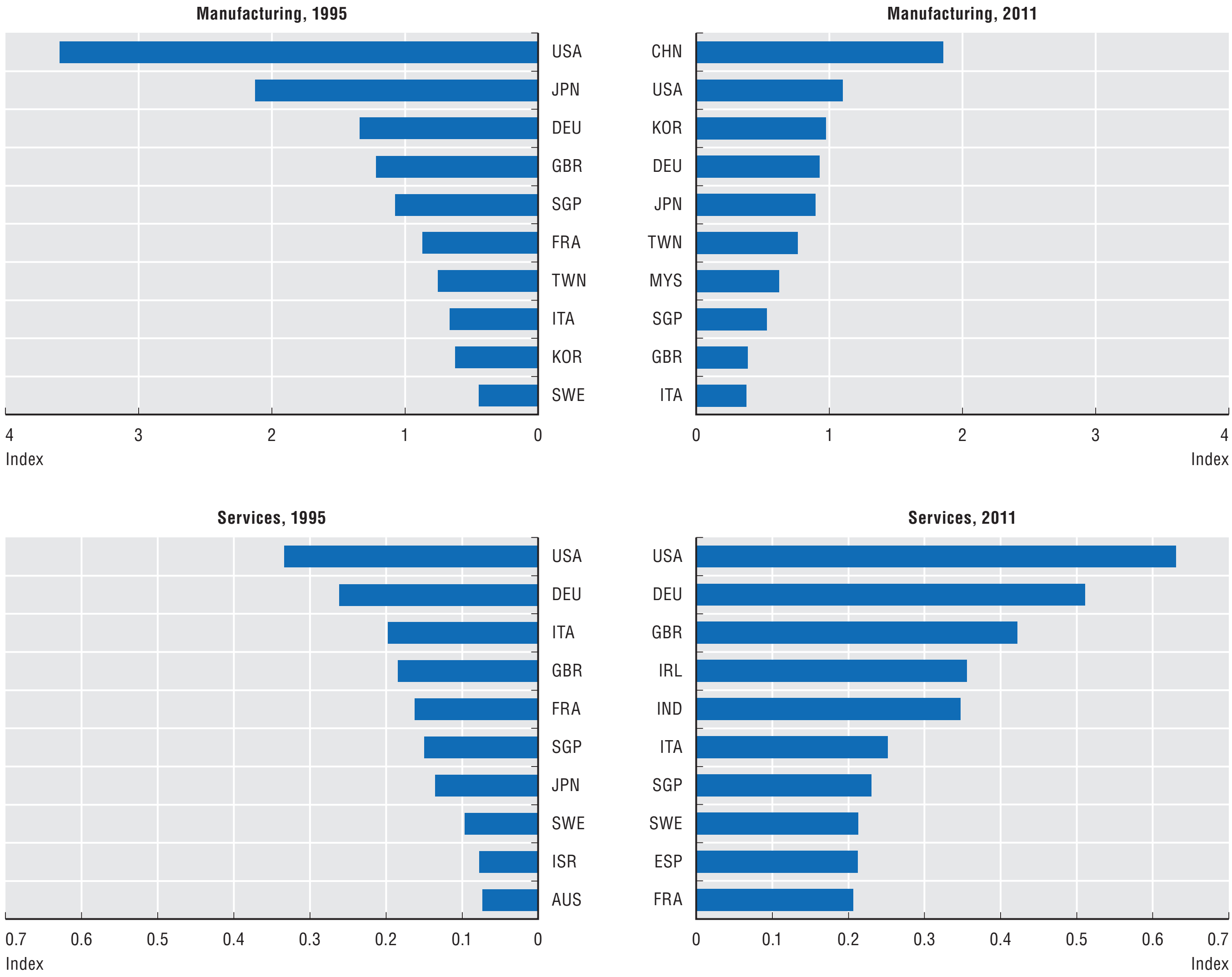
ICT hubs

Over the period 1995-2011, IT manufacturing shifted away from a few high-income hubs, with Asian economies gaining influence as central hubs. In 1995, global production centred largely around Japan and the United States (Figure 56, upper panel). The influence of these central hubs declined by 2011 with a shift eastwards in global production. Out of the top ten most central hubs in 1995, only Chinese Taipei and Korea were more influential in 2011. Extensive reorganisation of production saw emerging economies that were relatively peripheral in 1995 become key hubs by 2011. For example, China (20th in 1995) replaced the United States as the most "central" country-industry in 2011.

In contrast, IT services have almost universally gained "centrality". In 1995, IT services were not particularly influential for global production (Figure 56, lower panel). Even central countries such as Germany and the United States had a low "centrality" compared to IT manufacturing. Over the period 1995-2011, IT services became relatively more influential globally. This is also true of many economies that were most central at the start of the period. For example, the United States, Germany and the United Kingdom remained in the top four most central economies for IT services throughout 1995-2011. The same period also witnessed the emergence of several new central hubs, such as India and Ireland.

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

Centrality measured as total foreign centrality



Source: OECD, Inter-Country Input-Output (ICIO) Database, *http://oe.cd/icio*, July 2017. See chapter notes.

StatLink *http://dx.doi.org/10.1787/888933617909*

How to read these figures

The bars represent total foreign centrality for those 10 economies with the highest level of total foreign centrality in 1995 (the left-hand figures) and 2011 (the right-hand figures). The upper panel represents IT manufacturing ("Computer, electronic and optical products") and the lower panel represents IT services ("Computer and related activities").

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.

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.

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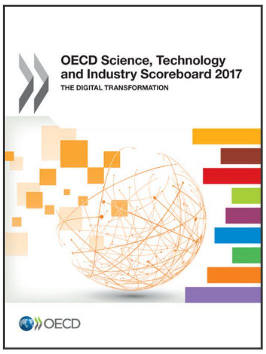

From:

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), “Growth, jobs and the digital transformation”, in *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/sti_scoreboard-2017-5-en