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NEW SKILLS FOR THE DIGITAL ECONOMY

MEASURING THE DEMAND AND SUPPLY OF ICT SKILLS AT WORK

2016 MINISTERIAL MEETING ON THE DIGITAL ECONOMY

TECHNICAL REPORT

2016 MINISTERIAL MEETING
THE DIGITAL ECONOMY:
INNOVATION, GROWTH
AND SOCIAL PROSPERITY

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FOREWORD

This report was prepared as a contribution to the background report of Panel 4.2 “Skills for a Digital World” of the OECD Ministerial Meeting on the Digital Economy, 21-23 June 2016, Cancún (Mexico). It presents new evidence on how the use of ICTs at work is changing the demand for three sets of ICT-related skills: generic skills, specialist skills and complementary skills. It also compares the demand for ICT generic skills with the supply of such skills.

The report was prepared by Vincenzo Spiezia, Elif Koksal-Oudot and Pierre Montagnier, OECD, for the Working Party on Measurement and Analysis of the Digital Economy (MADE). A voluntary contribution by Telecom Italia is gratefully acknowledged.

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NEW SKILLS FOR THE DIGITAL ECONOMY: MEASURING THE DEMAND AND SUPPLY OF ICT SKILLS AT WORK

EXECUTIVE SUMMARY

Increasing use of Information and Communication Technologies (ICTs) at work is raising the demand for new skills along three lines: ICT specialist skills to programme, develop applications and manage networks; ICT generic skills to use such technologies for professional purposes; ICT complementary skills to perform new tasks associated to the use of ICTs at work, e.g. communicate on social networks, brand products on e-commerce platforms or analyse big data.

This paper presents new evidence on how ICTs are changing the demand for these three sets of skills, based on the OECD Programme for the International Assessment of Adult Competencies (PIAAC). It also compares the demand for ICT generic skills with the supply of such skills.

The demand for ICT generic skills increased in a large majority of countries between 2011 and 2014. On average, the proportion of workers using communication and information search (CIS) or office productivity software (OPS) daily increased by 0.9 and 0.6 percentage points, respectively. Yet, the proportion of workers using ICTs at work daily differs significantly across countries in the PIIAC sample, ranging between 64% in Norway and 34% in the Slovak Republic for CIS and between 43% in the United Kingdom and 26% in Poland for OPS.

A significant number of workers using ICTs every day do not seem to have sufficient ICTs skills to use these technologies effectively, based on the results of the PIAAC assessment. The proportion of workers with insufficient ICT generic skills is, on average, 9.5% for CIS and over 40% for OPS. These findings show a significant mismatch between the demand and the supply of ICT generic skills.

The demand for ICT specialists has been growing fast over the last years but the available evidence on wage premia, vacancy rates and vacancy duration suggests that the potential shortage in ICT skills is not very large and limited to a small number of countries. However, available statistics are not fit to fully address these questions and the development of better measures is an important step for future work.

The diffusion of ICTs is also changing the way work is carried out, raising the demand for ICT-complementary skills. The paper shows a simple and replicable approach to identify work tasks complementary to ICTs and measure the demand for skills required to perform such tasks.

A major finding is that changes in tasks associated with increasing use of ICTs tend to be larger for people in low-skill occupations than for those in middle and high-skill occupation. On average, intensive use of ICT at work is associated with tasks that require more interaction with co-workers and clients, more problem solving as well as less physical work.

While the above results offer some new and interesting insights, there are various avenues for further analysis, including the identification of skills profiles, i.e. particular combinations of skills that are used together, and the use of national datasets with a richer set of information over time.

1. Introduction

Increasing use of ICTs at work is raising the demand for new skills. This is occurring along three lines. First, the production of ICT products and services – software, web pages, e-commerce, cloud, big data, etc. – requires *ICT specialist skills* to programme, develop applications and manage networks. Second, workers across an increasing range of occupations need to acquire *generic ICT skills* to be able to use such technologies in their daily work – access information online, use software, etc. Finally, the use of ICTs is changing the way work is carried out and raising the demand for *ICT complementary skills*, e.g. the capability to communicate on social networks, to brand products on e-commerce platforms, etc.

The attention of policy-makers and analysts has mainly focused on the first two sets of ICT skills, specialist and generic skills, while ICT complementary skills have received much less attention. Furthermore, the measurement of both the demand for and the supply of such skills seem short of the evidence base that is necessary to inform education and training policies.

The aim of this paper is to contribute to fill this gap. Section 2 provides new evidence on the use of ICT generic skills at work by linking data from the OECD Programme for the International Assessment of Adult Competencies (PIAAC) and the national Labour Force Surveys. Section 3 presents a set of measures of the demand for ICT specialists based on vacancies and wage data both from official statistics and online data sources. The complementarities between ICT and other skills at work are analysed in Section 4 based on the PIAAC survey and the US Occupational Information Network (O*NET). Section 5 compares the demand of ICT generic skills to the supply using results of the PIAAC proficiency assessment. Section 6 discusses the implications of the main findings and draws conclusions.

2. The demand for ICT generic skills

The aim of this section is to provide new evidence on the demand for ICT generic skills at work in selected OECD countries. The analysis is undertaken in two steps. The first step measures the frequency of ICT use in each occupation based on the PIAAC survey. The second step measures the demand for ICT generic skills at work by linking the ICT frequency by occupation to the share of employment in each occupation based on the Labour Force Surveys.

2.1. ICT-intensity by occupation

The PIAAC background questionnaire collects a range of information on the ICT use at work by asking how often the respondents:

- send/receive email (question g_q05a)
- find work-related information on the Internet (g_q05c)
- conduct transactions on the Internet (g_q05d)
- use spreadsheets (g_q05e)
- use word processors (g_q05f)
- use programming languages (g_q05g) or
- have real-time discussions (g_q05h)

Possible answers are: Never; Less than once a month; Less than once a week but at least once a month; At least once a week but not every day; and Every day.

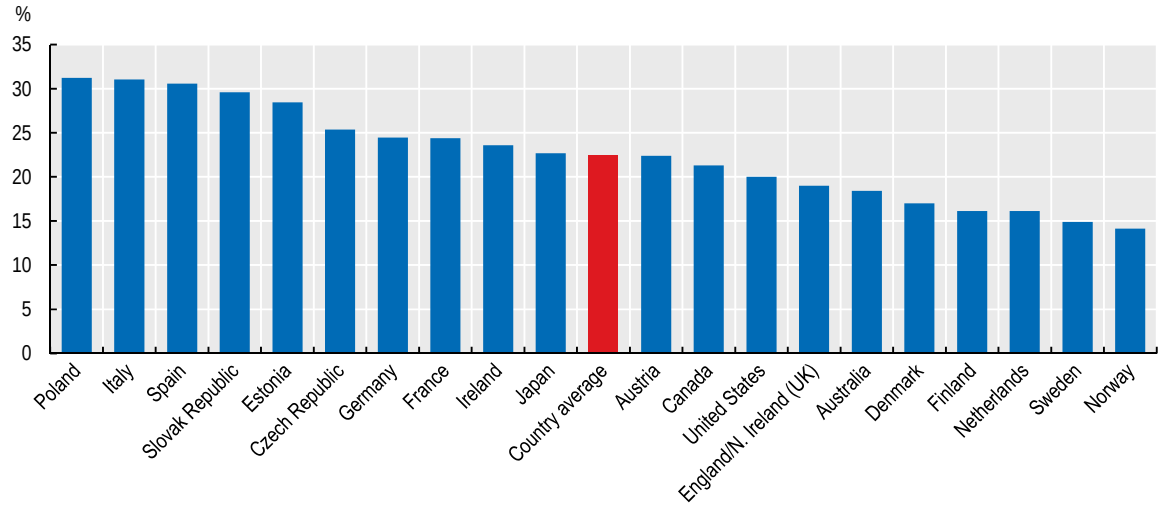
In the PIAAC survey, the questions about ICT use at work are only asked to people who report "having experience with computer in job".[1] As people with no experience with computer have not been included, the answers to these questions tend to overrate the frequency of ICT use at work. In addition, as

the distribution of those with no computer experience across occupations is unknown, the bias is not uniform: frequencies of ICT use may be overrated in some occupations and underrated in others.

Figure 1 shows that this bias is likely to be large. Almost a quarter (24.5%) of all (weighted) PIAAC respondents reported no computer experience at work while a very small percentage of individuals (0.07%) refused to answer or answered "do not know". The bias is larger in Poland, Italy and Spain while smaller in the Netherlands, Sweden and Norway. In order to correct for such a bias, the frequency of ICT use at work has been computed not as a percentage of the respondents to the ICT questions but as a percentage of all individuals.

Figure 1. Individuals with no experience with computer use, 2012

Weighted percentage of all individuals



Source: OECD, based on PIAAC Database, June 2015.

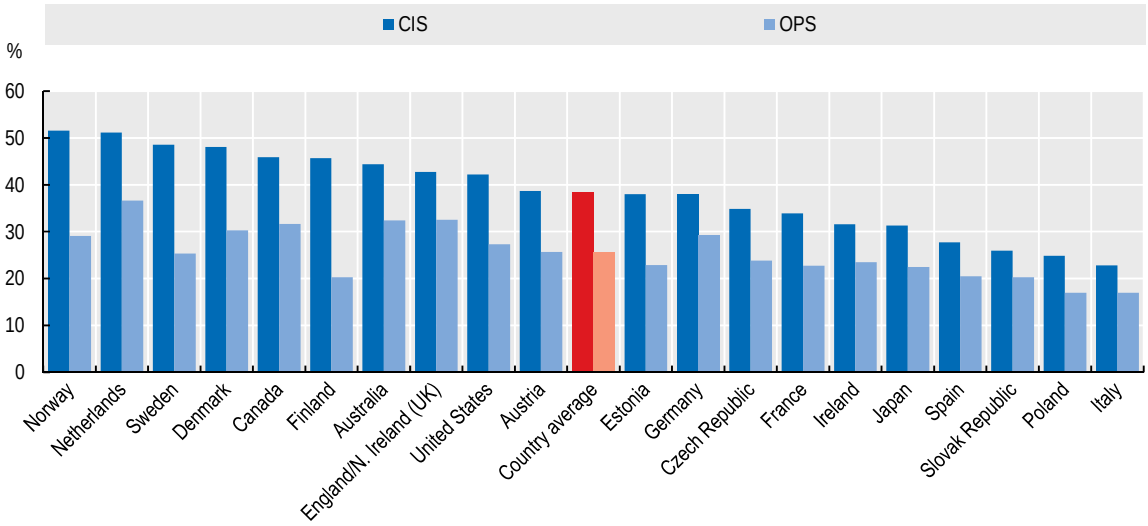
Some of the answers to the above questions have been grouped in two sets of tasks. The first set "use of communication and information search" (CIS) includes "send/receive email" and "find work-related information on the Internet"; the second set "use of office productivity software" (OPS) include "use word processors" and "use spreadsheets". Both CIS and OPS require ICT-generic skills but OPS involve a more sophisticated use of ICT and a higher level of ICT skills.

The remaining answers refer either to ICT-specialist skills (use programming languages) and will be examined in the following section, or are associated with specific tasks with a low frequency at work ("conduct transaction on the Internet" and "have real-time discussions").

Figure 2 shows the proportion of individuals using CIS and OPS every day by country across all occupations. The share of individuals who make use of CIS skills every day ranges between 51.5% in Norway and 22.8% in Italy. In a majority of countries less than 40% make daily use of Internet for sending e-mails or searching information for work-related purposes. The share of individuals using OPS daily ranges between 36.6% in the Netherlands and 17% in Italy and Poland. Not surprisingly, the frequency of daily users is systematically lower for CIS than OPS in all countries included in the PIAAC sample.

Figure 2. Daily users of Communication and Information Search (CIS) or Office Productivity Software (OPS) at work, 2012

Weighted proportion of all individuals



Source: OECD, based on PIAAC Database, January 2016.

In order to measure the intensity of ICT use by occupation, the proportion of individuals using ICTs daily has been computed for each occupation based on: *i)* their current occupation, if they are employed; or *ii)* their last occupation, if they have been unemployed for no more than one year. The latter condition permits to fully exploit the information available (i.e. the last occupation for those unemployed) while ensuring that the information on ICT use is not out-of-date (i.e. more than one year). Occupations are defined according to the International Standard Classification of Occupations (ISCO) 2008 at 3-digit level (127 occupations, excluding Armed Forces), except for Australia and Finland, where PIAAC data are available at 2 digits only (40 occupations, excluding Armed Forces).

Table 1 shows the top 20 CIS-intensive occupations across countries. Interestingly, 15 out of them (shown in italics) are not ICT specialist occupations. They include Administrators and Managers (ISCO-08 242, 121, 112 and 134); Sales and Business agents (122, 243); Mathematicians, actuaries and statisticians, Finance professionals and Associated professionals (212, 241 and 331); Scientists and Engineers (211 and 214) as well as University and higher education teachers (231), Legal professionals (261), Librarians, archivists and curators (262) and Legislators and senior officials (111).

Table 1. Top 20 CIS intensive occupation across countries, 2012

Proportion of countries where the occupation is among the top 20 CIS

Rank	Occupation	ISCO-08	Frequency
1	Information and communications technology service managers	133	94%
2	*Finance professionals*	241	94%
3	*Sales, marketing and development managers*	122	89%
4	Database and network professionals	252	89%
5	*Business services and administration managers*	121	78%
6	*Administration professionals*	242	78%
7	Software and applications developers and analysts	251	72%
8	*Legislators and senior officials*	111	67%
9	Electrotechnology engineers	215	67%
10	*Sales, marketing and public relations professionals*	243	67%
11	*Physical and earth science professionals*	211	61%
12	*Mathematicians, actuaries and statisticians*	212	61%
13	*Engineering professionals (excluding electrotechnology)*	214	61%
14	*Legal professionals*	261	61%
15	Information and communications technology operations and user support technicians	351	61%
16	*Librarians, archivists and curators*	262	56%
17	*University and higher education teachers*	231	50%
18	*Managing directors and chief executives*	112	44%
19	*Professional services managers*	134	44%
20	*Financial and mathematical associate professionals*	331	44%

Source: OECD, based on PIAAC Database, October 2015.

Table 2 shows the top 20 OPS-intensive occupations across countries. As with CIS-intensive occupations, most of the OPS-intensive ones are not ICT specialist occupations and generally include similar types of occupations such as Administrators and managers; Scientists and engineers; Mathematicians, actuaries and statisticians, and associated professionals with, in addition, Secretaries and numerical clerks (334, 412, 431); Social and religious professionals (263); Authors, journalists and linguists (264); Business services agents (333) and Regulatory government associate professionals (335).

Table 2. Top 20 OPS intensive occupation across countries, 2012

Proportion of countries where the occupation is among the top 20 OPS

Rank	Occupation	ISCO-08	Frequency
1	*Finance professionals*	241	100%
2	*Administration professionals*	242	94%
3	*Legal professionals*	261	94%
4	*Business services and administration managers*	121	89%
5	*Sales, marketing and development managers*	122	83%
6	*University and higher education teachers*	231	78%
7	*Administrative and specialised secretaries*	334	78%
8	*Physical and earth science professionals*	211	72%
9	*Authors, journalists and linguists*	264	72%
10	Information and communications technology service managers	133	67%
11	*Mathematicians, actuaries and statisticians*	212	67%
12	*Engineering professionals (excluding electrotechnology)*	214	61%
13	Database and network professionals	252	61%
14	*Regulatory government associate professionals*	335	56%
15	*Secretaries (general)*	412	56%
16	*Numerical clerks*	431	56%
17	*Professional services managers*	134	50%
18	*Social and religious professionals*	263	50%
19	*Financial and mathematical associate professionals*	331	50%
20	*Business services agents*	333	50%

Source: OECD, based on PIAAC Database, October 2015.

The top 20 ICT-intensive occupations for CIS and OPS skills by country are reported in Annexes A1 and A2 respectively. Interestingly, some occupations that are not commonly regarded as ICT-intensive figure among the top 20 in some countries. Paramedical practitioners figure among the top 20 ICT-intensive occupations for CIS use in the Czech Republic, Denmark, Estonia; Ships' deck crews and related workers in Ireland, the Netherlands and the United States. Similarly, Veterinarians figure among the top 20 ICT-intensive occupations for OPS use in Austria, the Czech Republic, Italy, Japan, the Netherlands, the Slovak Republic, Spain, and the United States; Medical doctors in Germany and Norway.

2.2. Labour demand in ICT-intensive occupations

Having ranked all occupations by their intensity of ICT use – both CIS and OPS – the next step of the analysis is to compute an economy-wide measure of ICT intensity at work. This is done by linking the ICT intensity by occupation to the share of employment in each occupation to assess the demand for ICT generic skills at work in a country.

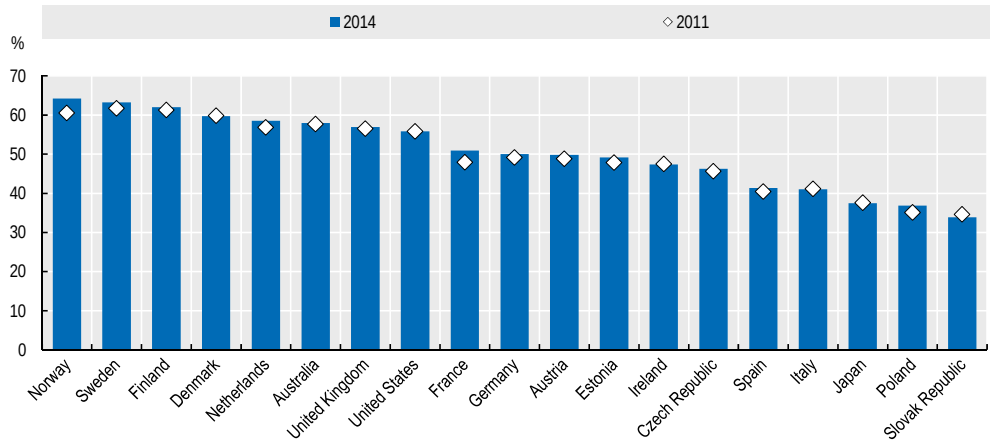
Employment shares in each occupation have been computed based on national Labour Force Surveys. For EU countries, employment data are drawn from the EU Labour Force Survey, where occupations are classified according to 3-digit ISCO-08 from 2011 on. In a number of other countries, however, national occupational classifications have been converted into ISCO-08. For the United States, employment by 3-digit ISCO-08 occupations has been estimated by the OECD from the US Bureau of Labor Statistics (BLS) Current Population Survey, based on the concordance table between the Standard Occupational Classification (SOC) System 2010 and ISCO-08 (for more information, see Eckardt and Squicciarini, *forthcoming*). For Australia, employment by 2-digit ISCO-08 occupations has been estimated from Australian Bureau of Statistics (ABS) data, based on the concordance between the Australian and New

Zealand Standard Classification of Occupations (ANZSCO) 2006 and ISCO-08 developed by Statistics New Zealand.

Figure 3a shows that the economy-wide CIS intensity at work varies significantly across countries. In 2014, the CIS intensity ranged between 64% of all occupations in Norway and 33% in the Slovak Republic. Between 2011 and 2014, the share of employment in CIS-intensive occupations was stable or increasing in most of countries except in Denmark, Ireland, Italy, Japan and the Slovak Republic, where there was a slight decrease. The increase was the most significant in Norway (3.7 percentage points), followed by France (2.9) and Poland (1.7).

Figure 3a. Demand for ICT generic skills (CIS) by country, 2011 and 2014

Share of employed individuals using CIS daily at work



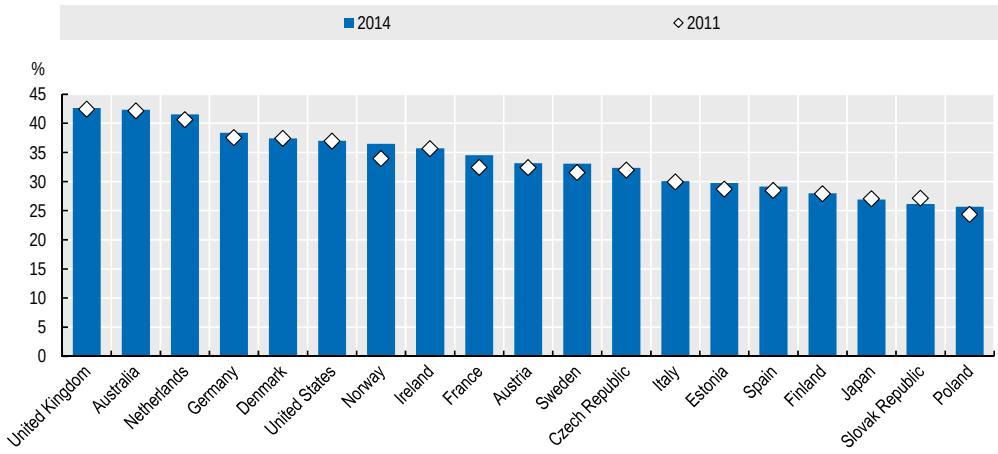
Note: 2011 refers to 2010 for Japan.

Source: OECD calculations based on PIAAC Database and national labour force surveys, January 2016.

Figure 3b shows the economy-wide OPS intensity at work in 2011 and 2014. The OPS intensity varies in 2014 between 42.6% of all occupations in the United Kingdom and 25.7% in Poland. Over the 2011-2014 years period, the share of employment in OPS-intensive occupations was either stable or increasing in most of countries except in the Slovak Republic and Japan, where it decreased. The most significant increase was observed in Norway (2.5 percentage points), France (2.0) followed by Sweden (1.5).

Figure 3b. Demand for ICT generic skills (OPS) by country, 2011 and 2014

Share of employed individuals using OPS daily at work



Note: 2011 refers to 2010 for Japan.

Source: OECD calculations based on PIAAC Database and national labour force surveys, January 2016.

3. ICT specialist skills

ICT specialists have been among the most dynamic occupations in recent years. “Software applications developers and analysts” and “ICT operators and user support technicians” are listed among the top ten growing occupations in EU26 from 2012Q2 to 2013Q2, with an increase of 156 300 and 64 500 employees, respectively (European Commission, 2014a). In Australia, the employment of ICT managers has increased by 29.7% from 2009 to 2013, according to the Australian Government (Australian Workforce and Productivity Agency, 2013). In the United States, the IT industry lost only 1% of its workforce during the recession and employment grew by 7.5% from 2009 to 2011 (BLS, 2013), exceeding its pre-recession level.

Several forecasts suggest that the demand for ICT professionals will grow even faster over the next years. According to BLS projections (Lacey and Wright, 2009), “Computer and mathematical occupations” in the United States “are expected to grow, as a group, more than twice as fast as the average for all occupations” in the United States. The Australian Workforce and Productivity Agency estimates that job openings for ICT occupations in Australia will reach 1.18 million in 2025, and that the increase is expected to be driven by new growth instead of replacement demand. A study commissioned by the Norwegian Ministry of Local Government and Modernisation predicts a shortage of ICT personnel by about 10,500 persons in Norway by 2030 (OECD, 2014a). The European Commission (2014b) forecasts the gap between demand and supply of ICT professionals in the EU27 to grow on average by 16.39% a year from 2013 to 2020.

These forecasts rely on a scenario-based approach which, by its very nature, is hard to validate. Yet, they raise some concerns about the ability of the labour market to provide an adequate supply of workers with the required skills. Indeed, a shortage of ICT specialists would require that countries adopt policies to develop these skills among workers as well as among new entrants in the labour market.

The aim of this section is to review available statistical evidence about the potential shortage of ICT specialists. If firms face difficulties to fill vacancies for ICT specialists, such a shortage should result in at least one of the following: *i)* an upward trend in the job vacancy rates for ICT specialists; *ii)* a longer duration of these vacancies; and *iii)* an increase in wages for ICT specialists.

Unfortunately, available statistics on job vacancies and on wages are not fit to address these issues thoroughly. Official statistics on job vacancies and on wages are mostly available at the level of industries, not occupations. More recently, information on the number and the duration of ICT vacancies have been computed based on vacancies published on the Internet (online vacancies). While online vacancies are useful to detect and measure trends in the labour market, they seem less appropriate to measure labour shortages due to their limited coverage and low international comparability.

The approach of this analysis, therefore, is to compose a picture of the demand for ICT specialists based on the different statistical sources available, each of which provides only a partial measurement of the issue. Bearing in mind these limitations, the evidence presented in this section confirms that the demand for ICT specialists is growing fast but it suggests that the potential shortage in ICT skills is limited to a small number of countries.

The analysis is organised as follows. Section 3.1 provides new evidence on the demand for ICT specialist skills at work by linking data from the OECD Programme for the International Assessment of Adult Competencies (PIAAC) and the national Labour Force Surveys. Section 3.2 and Section 3.3 review recent trends in, respectively, job vacancies and wages in the information industries, while Section 3.4 examines trends in online vacancies for ICT occupations and their duration. The findings from Employer surveys are summarised in Section 3.5.

3.1. The demand for ICT specialist skills

The frequency at which PIAAC respondents "use programing languages"[2] provides a measure of the demand for ICT specialist skills. Using the same methodology as the assessment of the ICT generic skills intensity, ICT specialist intensity at work is proxied by the share of individuals who reported using programing languages every day.

Table 3 shows the top 20 occupations with the highest ICT specialist-intensive index across countries. Interestingly, 13 out of the top 20 occupations (shown in italics) are not commonly classified as ICT occupations. They include University, higher and Vocational education teachers (ISCO-08 231 and 232); Scientists, Engineers and Architects (211, 214 and 216); Physical and engineering science technicians (311); Business services, administration and distribution managers (121, 132); Sales, marketing and public relations professionals (243) as well as Tellers, money collectors and related clerks (421), Client information workers (422), Blacksmiths, toolmakers and related trades workers (722) and Metal processing and finishing plant operators (812).

Table 3. Top 20 ICT specialist-intensive occupations across countries

Proportion of countries where the occupation is among the top 20

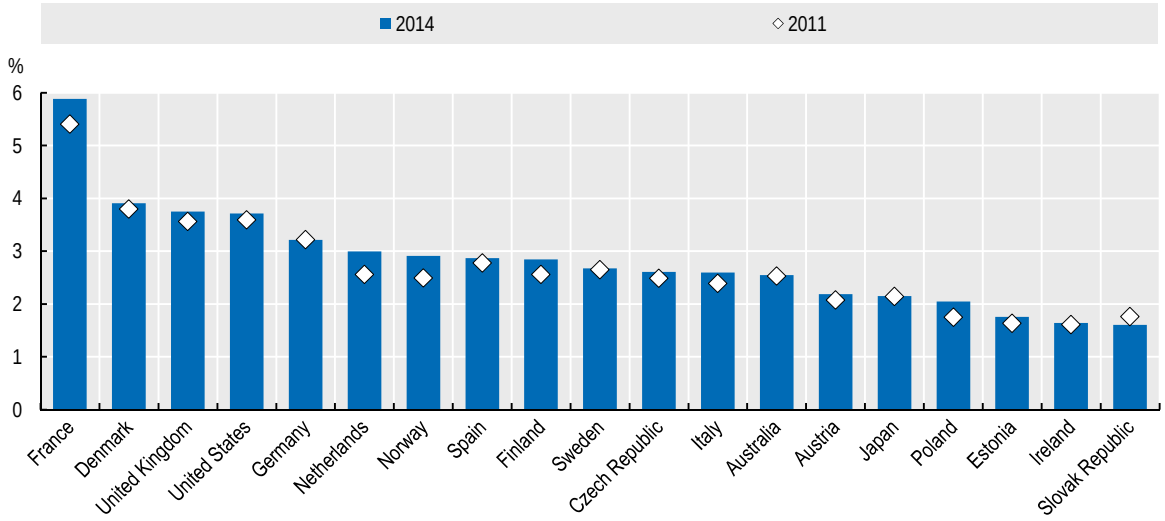
Rank	Occupation	ISCO-08	Frequency
1	Information and communications technology operations and user support	351	100%
2	Software and applications developers and analysts	251	94%
3	Information and communications technology service managers	133	78%
4	*University and higher education teachers*	231	78%
5	Database and network professionals	252	78%
6	*Engineering professionals (excluding electrotechnology)*	214	67%
7	Electrotechnology engineers	215	61%
8	*Blacksmiths, toolmakers and related trades workers*	722	56%
9	*Architects, planners, surveyors and designers*	216	50%
10	*Physical and earth science professionals*	211	44%
11	*Vocational education teachers*	232	44%
12	*Physical and engineering science technicians*	311	44%
13	*Tellers, money collectors and related clerks*	421	44%
14	*Metal processing and finishing plant operators*	812	44%
15	*Business services and administration managers*	121	39%
16	*Manufacturing, mining, construction, and distribution managers*	132	39%
17	*Sales, marketing and public relations professionals*	243	39%
18	Electronics and telecommunications installers and repairers	742	39%
19	Telecommunications and broadcasting technicians	352	33%
20	*Client information workers*	422	33%

Source: OECD, based on PIAAC Database, October 2015.

Figure 4 shows the economy-wide ICT specialist intensity in 2011 and 2014. The indicator is computed by weighting the ICT specialist intensity by occupation by the employment share of each occupation. It is a proxy of total demand for ICT specialist skills at work in a country.

Figure 3. Demand for ICT specialist skills by country, 2011 and 2014

Share of employed individuals using programming languages daily at work



Note: 2011 refers to 2010 for Japan.

Source: OECD, based on PIAAC Database and national labour force surveys, January 2016.

Cross country differences in the demand for ICT specialist skills are much narrower than for ICT generic skills. In 2014, the share of ICT specialists ranged between 5.9% in France and 1.6% in Ireland and the Slovak Republic with a majority of countries remaining around 3%.

Between 2011 and 2014, the share of employment in ICT specialist-intensive occupations increased in all countries except in the Slovak Republic (-0.15 percentage points). The ratios were rather stable with a relatively modest increase of 0.18 percentage points on average which was lower than the average increase observed for ICT generic skill intensity for CIS and OPS use (respectively 0.9 and 0.7 percentage points). The largest increase occurred in France followed by the Netherlands and Norway.

3.2. Job vacancies in the Information and Communication services: recent trends

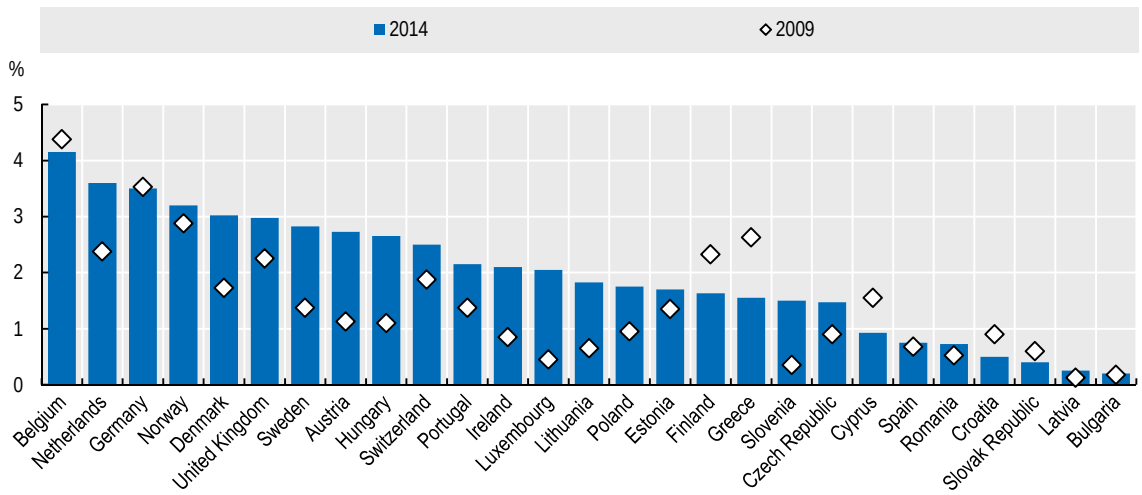
Job vacancy rates are the most commonly used measure of imbalances between demand and supply in the labour market. Vacancy rates for a given occupation are defined as the ratio of the number of vacancies to the number of unfilled and filled positions, i.e. vacancies plus employment, in that occupation. An increase in the job vacancy rate indicates that demand for the skills required in a given occupation is growing faster than its supply. If the required skills are available in the labour force, such an imbalance would disappear over time as higher employment opportunities and higher wages attract people from inactivity or from other occupations. On the contrary, an upward trend in vacancy rates signals that the required skills are not available in the labour force, i.e. a skill shortage.

While the above argument applies to all IT occupations, official statistics only collect vacancy rates for Information and Communication services (activity J in the (International Standard Industrial Classification (ISIC) Rev. 4 and 51 in the North American Industry Classification System (NAICS) 2007). Their coverage, therefore, is narrower than ICT occupations for two reasons. First, ICT industries, i.e. manufacturing and services, employ about a half of all ICT occupations. Second, official statistics do not include job vacancies in ICT manufacturing industries.

Data for this section have been collected from many different sources. As primary data, official figures published online by national statistics offices have been used, together with the database of the International Labour Organization and Eurostat. Reports, articles and surveys about job vacancies, contributed as secondary sources to give a comprehensive overview about the perceived ICT skills shortage across member States. Data coverage spans from 2009 to 2014, with some exceptions for specific countries for which data were available only for a limited period of time within this window.

Figure 4. Average vacancy rates in ICT services, 2009 and 2014

Annual average of quarterly rates



Note: ISIC Rev.4, Sector J. The first year available is 2010 for Belgium, Denmark and Norway; 2011 for Germany; 2012 for Croatia and 2013 for Spain. The last year available is 2015 for the Czech Republic, Germany, Slovenia and the United Kingdom.

Note by 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 recognises 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".

Note by all the European Union Member States of the OECD and the European Union:
The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Source: OECD, based on Eurostat, Job vacancy statistics, January 2016.

Figure 5 reports yearly vacancy rates in Information and Communication Services in 2014 and 2008 (or the earliest available year) in Europe. The figure shows large cross-country differences in vacancy rates. In 2014, ICT vacancy rates ranged between 4.15% in Belgium and 0.3% in Latvia and Bulgaria. Vacancy rates were above 3% in the Netherlands, Germany, Norway and Denmark between 3 and 2% in United Kingdom, Sweden, Austria, Hungary, Switzerland, Portugal, Ireland and Luxembourg, and below in all other observed countries.

Changes over time show a mixed picture. In Austria, Denmark, Hungary, Ireland, Lithuania, Luxembourg, the Netherlands, Slovenia and Sweden ICT job vacancy rates grew significantly between 2009 and 2014. On the contrary, they decreased significantly in Finland and Greece.

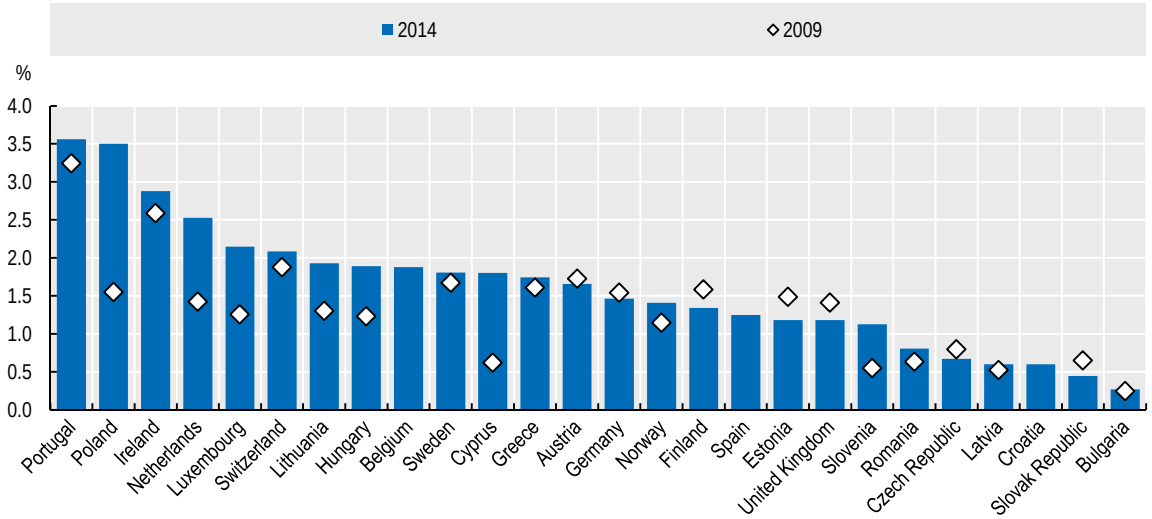
The observed differences in vacancies across countries and over time may be related to the business cycle. To control for the effects of the business cycle, Figure 6 plots the vacancy rates ratio between ICT services and the total business sector (ISIC Rev. 4, activities B to S) in 2009 (or the earliest available year) and 2014. Job vacancy rates in ICT services tend to be much higher than in the total business sectors. In

2014, the ratio between the two indicators exceeded 3.5 in Portugal and Poland, was no less than 2.5 in Ireland and the Netherlands and above 2 in Luxembourg and Switzerland. However, vacancy rates in ICT services were about the same as in the total business sector in Estonia, Slovenia and the United Kingdom and even lower in countries such as Latvia, Croatia, the Slovak Republic and Bulgaria. Therefore, the potential skills shortage in ICT services seems to be limited to a few countries.

The vacancy rate ratios grew in the majority of countries for which data are available, with the exception of the Austria, Germany, Finland, Estonia, the United Kingdom, the Czech Republic and the Slovak Republic. Therefore, in countries on the downturn of the cycle, vacancies rates decreased in ICT services less than in the rest of the economy while the opposite occurred in countries on the upturn. The increase in ICT vacancy rates was particularly large in Poland, the Netherlands and Cyprus[3].

Figure 5. Average vacancy rates in ICT services relative to the total business sector, 2009 and 2014

Annual average of quarterly rates



Note: ISIC Rev.4, Sector J. The first year available for Austria and Norway is 2010. For Cyprus, see note of Figure 5.

Source: OECD, based on Eurostat, Job vacancy statistics, January 2016.

3.3. Wages in ICT Services: recent trends

Labour shortages of specific skills should also result into an increase in real wages for the occupations using these skills intensively. If ICT skills are scarce in the labour market, firms have to pay higher real wages to attract workers with such skills.

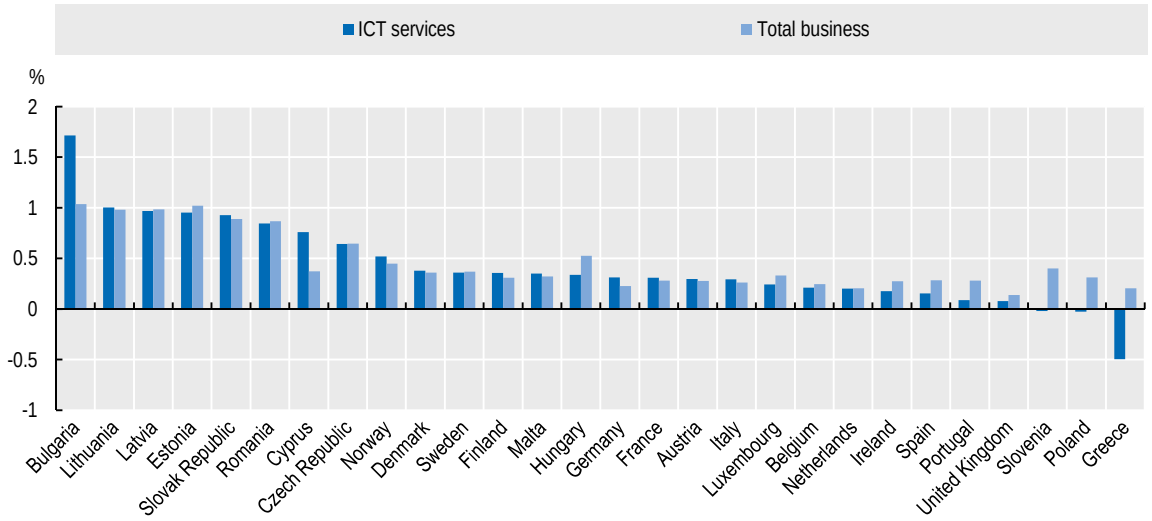
Changes in real wages, however, are not always a good measure for skills shortage. On the one hand, skill shortage may not translate immediately in higher wages due to adjustment lags, e.g. collective wage bargaining. On the other, wages may increase as a result of both industry-specific and economy-wide productivity shocks. Therefore, an increase in real wages may be regarded as a sign of skills shortage only if *i)* it is persistent over time, *ii)* it exceeds the increase in labour productivity[4] and *iii)* it is larger than in the other sectors of the economy.

Figure 7 compares the average growth rates of wages – relative to average labour productivity – in ICT services and the total business sector over 2000-15. In more than half of the 28 countries for which data are available, wages grew less in ICT services than in the total business sector. In the remaining countries, differences in wages growth were rather fairly limited, i.e. less than 1% a year. These trends

confirm that the demand for ICT specialists is growing fast but they suggest that the potential shortage in ICT skills is limited to a small number of countries, at least in Europe.

Figure 6. Changes in wages relative to labour productivity 2001-15

Annual averages



Note: For Cyprus, the Czech Republic, Finland, France, Ireland, Luxembourg, the Netherlands, Poland, the Slovak Republic and Spain, data refer to the 2011-14 period. For Cyprus, see note of Figure 5.

Source: OECD, based on Eurostat, Annual National Accounts Statistics, January 2016.

3.4. Trends in ICT occupations: evidence from online job vacancies

While official statistics on job vacancies are available at the level of industries, online vacancies provide such information by occupation. Recently, a number of private firms and a few national statistical offices have started to collect and to analyse online job postings in order to compile statistics on job vacancies. This section will rely mainly on proprietary data from Burning Glass and Jobfeed, two leading companies specialised in online vacancies.[5]

Online job vacancies have a big potential as a source of information on the characteristics of job offers, job seekers and the duration of job postings. They are able to track labour market movements in real time, providing high frequency data. Furthermore, they permit the analysis of shifts in job profiles based on a large range of job requirements on skills, education and experience.

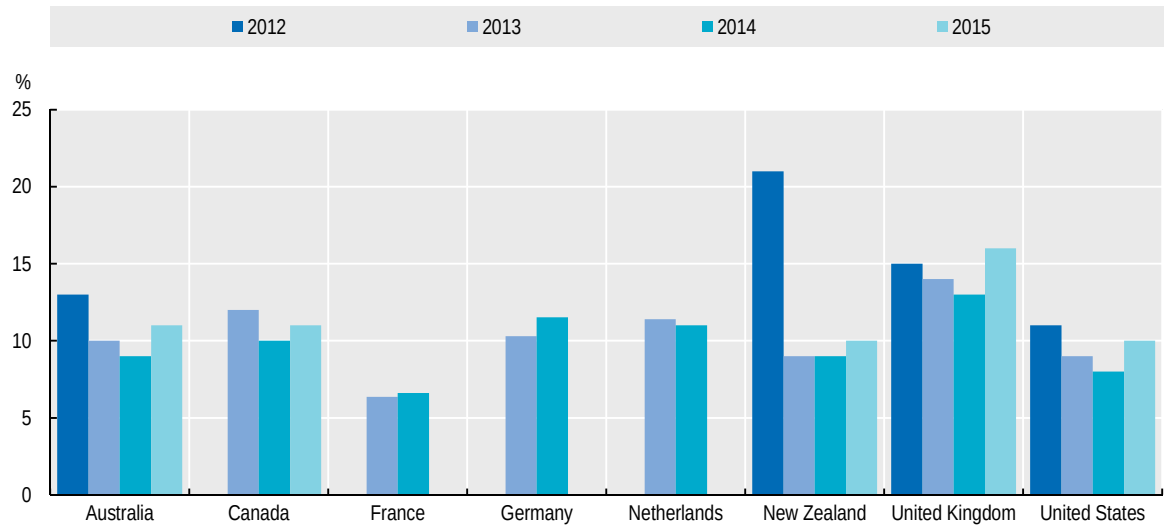
For the purpose of this paper, however, online vacancies seem to have some shortcomings that future developments in data collection and treatment may be able to overcome. First, the total number of online vacancies tend to be significantly lower (about 50%) than the number of vacancies from official sources[6]. Second, only a small share of online vacancies can be classified by industry, preventing a closer comparison with official data. Third, the classification of ICT occupations, which is a complex operation in itself, is not fully consistent across countries. Finally, coverage is limited to a few countries.

The fact that the classification of online vacancies does not always match national and international classifications of occupations, e.g. ISCO, US SOC, etc., makes it difficult to compute vacancy rates. In what follows, vacancy rates have been calculated using the number of ICT specialists, defined according to DSTI/ICCP/IIS(2013)6. As the numerator and the denominator are not defined in the same way, this statistic should be regarded as a proxy of the actual vacancy rates.

Figure 8 shows the job vacancies for ICT occupations as a proportion of all vacancies over 2012-2015. In 2014, ICT job postings accounted for between 13% (United Kingdom) and 7% (France) of all job postings. This share has decreased in Australia (-4 percentage points), New Zealand (-12), the United Kingdom (-2) and the United States (-3) in 2012-2014; it has increased in France (1) and Germany (2) as compared to 2012 while it has remained stable in the Netherlands. The first 5 months of 2015 show a faster increase in ICT job postings, although this may reflect seasonality to some extent.

Figure 7. ICT online job postings, 2012-15[a]

As a percentage of all online postings



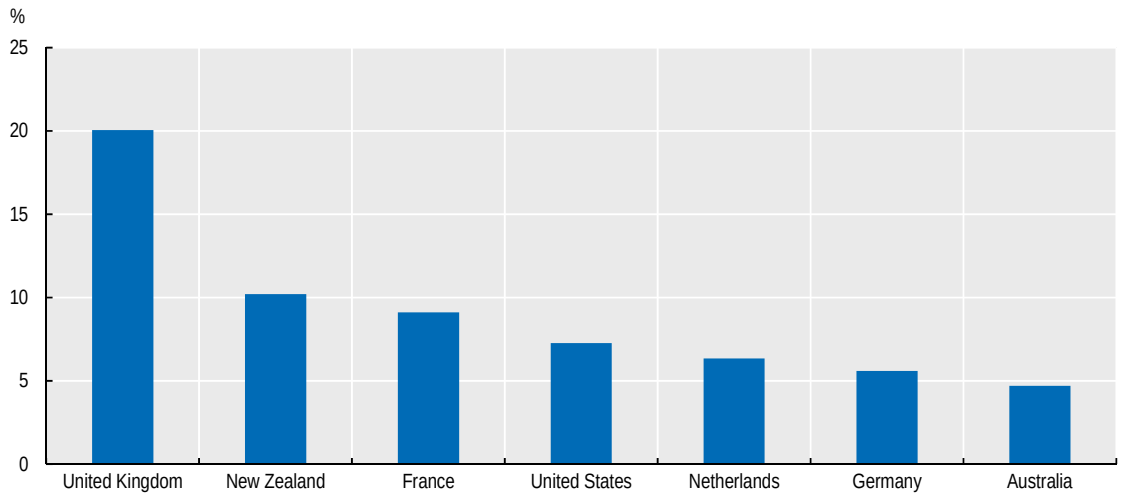
[a] 2015 refers to the period 01.01.2015-26.05.2015.

Source: OECD, based on Burning Glass and Jobfeed, May 2015.

Figure 9 shows the ICT online vacancy rates in 2013. ICT vacancy rates appear the highest in the United Kingdom (20.1%) while they range between 10.2% in New Zealand and 4.7% in Australia.

Figure 8. Vacancy rates for ICT occupations, 2013

Annual average quarterly rates



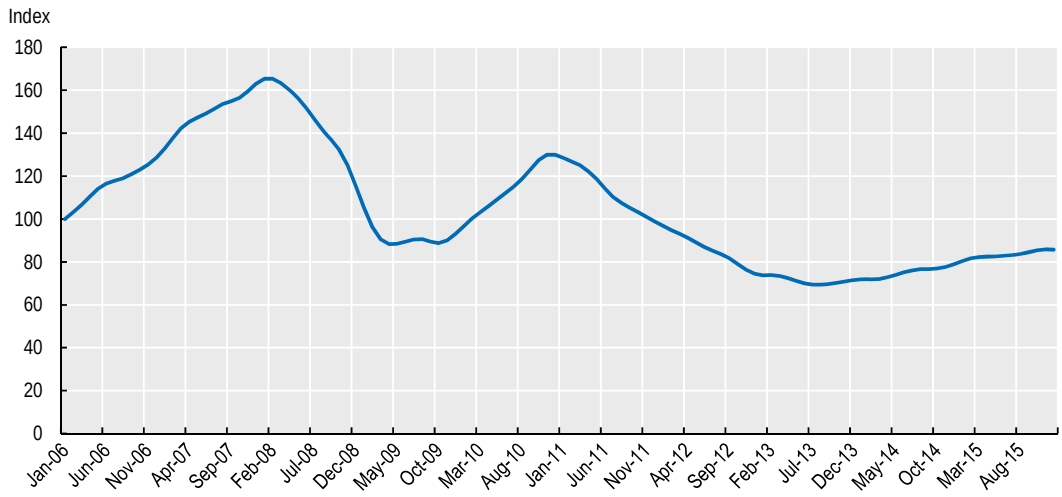
Source: OECD, based on Burning Glass and Jobfeed, May 2015.

In the United States, ICT vacancy rates can be computed for a longer period (2010-2014) and show an upward trend from 5.5% in 2010 to 7.3% in 2014.

As for Australia, the Australian Internet Vacancy Index computed by the Department of Employment shows a strong downward trend in online vacancies for ICT professionals. The index fell in the aftermath of the crisis and, despite a partial recovery in mid-2009, continued to decrease from 2010 on (Figure 10).

Figure 9. Online vacancies for ICT professionals in Australia, 2007-14

Australian Internet Vacancy Index, January 2006 = 100



Source: Data.gov.au, May 2015.

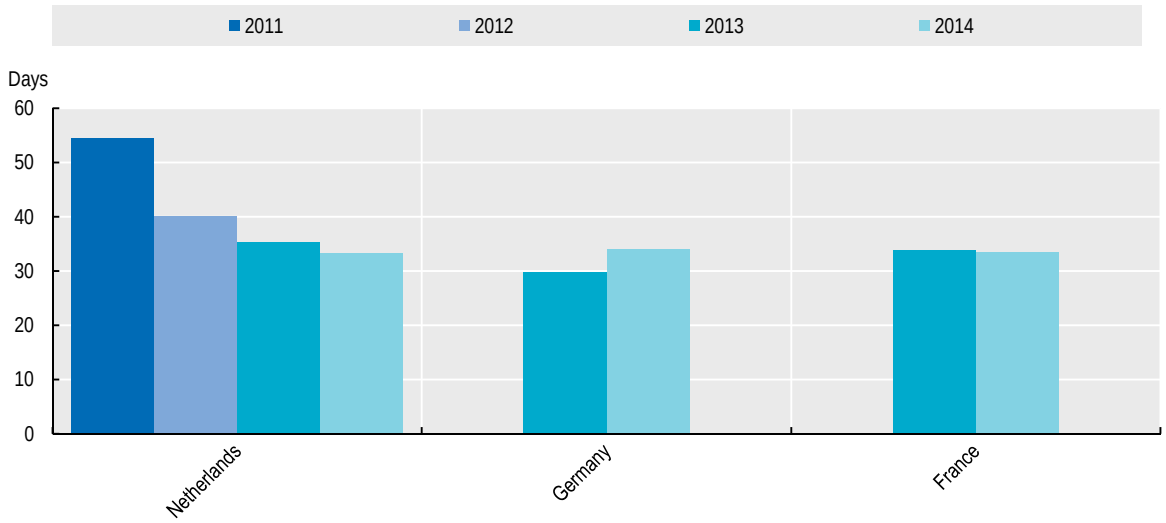
Vacancy duration, i.e. the time it takes for the vacancy to be filled, provides a further indicator of labour market imbalances. If ICT skills were scarcer than other skills, one would expect vacancy duration to be higher for ICT occupations.

Online vacancies permit the measurement of the time that a given vacancy remained posted on the Internet. However, the reasons for withdrawing a vacancy are unknown, i.e. the vacancy may have been filled or the firm cannot find a suitable candidate for that position. Although these two events are of different nature, in both cases longer duration is associated with higher difficulty to fill a position.

Figure 11 shows the mean duration of ICT online vacancies in France, Germany and the Netherlands over the period 2011-2014. In the Netherlands, the mean duration fell from 54.5 days in 2011 to 33.3 days in 2014. Between 2013 and 2014, the mean duration increased from 29.8 to 34 days in Germany while it remained almost unchanged in France.

Figure 11. ICT vacancy duration, 2011-14

Median number of days



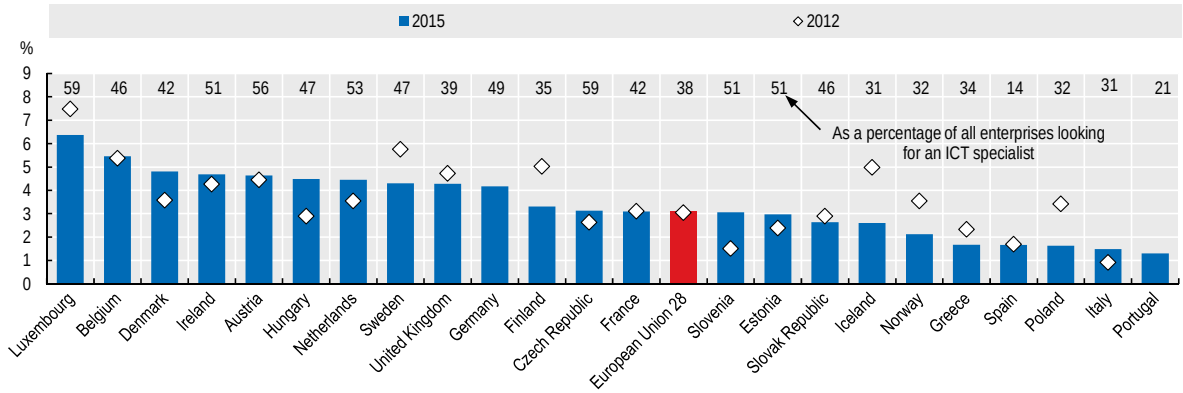
Source: OECD, based on Jobfeed, May 2015.

3.5. Evidence from the employer surveys

Employer surveys provide complementary information about potential skills shortages. In the European Union, 38% of enterprises looking for an ICT specialist reported having difficulties filling the vacancies (Figure 12). However, the percentage of enterprises reporting hard-to-fill vacancies for ICT specialists is much smaller – about 3% - and has not changed from 2012 to 2014. This share decreased or remained stable in most EU countries. The most significant increase (above 1 percentage point) was observed in Denmark, Hungary and Slovenia. In most countries, therefore, the potential shortage of ICT skills is small because only a small share of enterprises are looking for ICT specialists.

Figure 10. Enterprises that reported hard-to-fill vacancies for ICT specialists, 2012 and 2014

As a percentage of all enterprises and of those looking for an ICT specialist.



Source: OECD, based on Eurostat Information Society Statistics, October 2015.

The Australian Government carried out a similar study in 2014. On average, employers found it easy to recruit ICT professionals, with an increased competition among qualified candidates as compared to

previous years. Employers added that "there were few applicants with strong non-technical skills, like business acumen, project management and problem solving" and "they noticed increased demand for positions with emerging technologies (such as web-based applications)". Some enterprises "suggested there may be a potential skill gap for workers with web development, mobile applications and cloud computing experience in the future".

As for New Zealand, the Business Operations Survey (Statistics New Zealand, 2014) reports that 39% of the respondents did not have any difficulty obtaining computer skills from job applicants while only 6% of them did.[7]

Table 4 shows that "IT staff" are among the top 10 jobs that employers are having difficulty filling, according to the Talent Shortage Survey carried out on over 40 countries worldwide (ManpowerGroup, 2015). However, "IT staff" rank 9 out of 10, just above "Production/Machine operators" and well behind "Skilled Trade Workers", "Engineers", "Sales Representatives", "Technicians" and "Accounting & Finance Staff". Therefore, IT skills may be relative difficult to find but they do not seem the main source of skills shortage for firms.

Table 4. Top 10 jobs that employers are having difficulty filling

Rank	Job
1	Skilled Trade Workers
2	Sales Representatives
3	Engineers
4	Technicians
5	Drivers
6	Management/Executives
7	Accounting & Finance Staff
8	Secretaries, PAs, Administrative Assistants & Office Support Staff
9	IT Staff
10	Production/Machine operators

Source: Talent Shortage Survey (ManpowerGroup, 2015).

4. The demand for ICT complementary skills

The diffusion of ICT at the workplace is not only raising the demand for ICT specialist and generic skills. It is also changing the way work is carried out and raising the demand for *ICT complementary skills*. These are skills that are not related to the capability to use the technology effectively but to carry out the work within the new environment shaped by ICTs, i.e. a "technology-rich environment". For instance, higher frequency of information made available by ICTs calls for better capability to plan in advance and to adjust quickly. More horizontal work organisations enabled by ICTs i.e. more team work and less top-down management, call for more cooperation and stronger leadership. Wider diffusion of information among a larger number of workers increases the importance of management and coordination. The sales skills required in face-to-face commercial transaction are not the same as those involved in an anonymous e-commerce sale.

An implication of the above trends is that the set of skills required to perform the tasks involved in a certain occupation – the skills profile – are changing as a result of the diffusion of ICTs at work. While there is a general awareness that the education curricula have to evolve to adjust to these changes, little is known about what type of skills should become more important in the curricula. The aim of this section is to start to identify the skills that are likely to become more important in a working and business environment increasingly permeated by ICTs.

The analysis is organised as follows. Section 4.1 provides a brief overview of the recent economic literature on ICTs and skills. Section 4.2 examines what tasks are most frequently associated in occupations using ICTs more intensively, based on the PIAAC database. The findings of this section, which covers several countries in just one point in time, will be complemented in Section 4.3 by the examination of changes in tasks and in ICT intensity over time, based on the O*NET survey carried out in the United States.

4.1. ICT complementary skills: a brief review of the literature

A key finding of the large literature on innovation, productivity and growth is that effective use of ICTs requires changes in the firm organisation. Given the existence of complementarities among organisational practices, a range of organisational choices may have to be altered together for a particular technological advance to improve efficiency (Garicano, 2010).

Organisational change at the firm level has implications on the tasks that workers have to perform and the skills necessary to perform such tasks. Bresnahan, Brynjolfsson and Hitt (2002) provide firm-level evidence that IT-enabled organisational increases demand for high-skill workers, thus confirming the findings of earlier studies (Goldin and Katz 1999; Autor, Katz, and Krueger 1998). Caroli and Van Reenen (2001) find that organisational change has a stronger impact on productivity in firms with highly skilled workers, and that the complementarity between ICT and organisational innovation disappears when skills are taken into account. Arvanitis (2005) and Bartel et al. (2007) find that firms increase their demand for skilled workers when they invest in ICT. Pabilona and Zoghi (2013) provide evidence for ICT and skills complementarities by looking at productivity growth and wage premia. Finally, Hagsten and Sabadash (2014) present cross-country micro-level evidence from various European countries supporting the view that higher education complements the usage of ICT in the production process.

A more recent line of research has examined the complementarity between ICTs and tasks (see Autor, 2013 and 2014 for an overview). Levy and Murnane (1996) show that in the 1980's and 1990's computers reduced the time bank clerks spent on routine tasks, e.g. data transfer, data entry and computations, while increasing the time they spent on more difficult tasks, e.g. data rework, valuation, communication, and analysis. Autor, Levy, and Murnane (2003) analyse data from the US Dictionary of Occupational Titles (DOT), the ancestor of O*NET, to examine how tasks associated with different occupations have changed over time. They argue that computers substitute for workers in carrying simple cognitive and manual activities following explicit rules ("routine" tasks), while computers complement workers in carrying out problem-solving and complex communication activities ("non-routine" tasks). Non-routine tasks can either be associated with conceptual jobs, such as managerial and professional positions, at the top end of the wage distribution, or manual jobs, such as manual services, at the bottom end of the wage distribution.

A number of recent studies find evidence of declining demand for routine tasks in the United States and in Europe (Autor et al., 2006 and 2008; Goos et al., 2011; Van Reenen, 2011; Autor and Dorn, 2012; Hynninen et al., 2013; Michaels et al., 2013). Firpo, Fortin, and Lemieux (2011) find that technological change and de-unionization played a central role in job polarisation in the 1980s and 1990s but not in the following years.

Handel (2012) argues that there is no strong evidence of a general acceleration in skill upgrading in OECD countries following the diffusion of ICTs. He finds no evidence of within-occupation skill change in either the United States or the European countries in 1997-2009. Furthermore, his findings suggest that, contrary to the "routinization" hypothesis, craft skills and the frequency of repetitive physical tasks have declined over the same period.

On the basis of the German Qualification and Career Survey conducted over four waves, Spitz-Oener (2006) shows that most of the changes in skill requirements over time resulted from changes in tasks within occupations rather than in the occupational structure of employment. Her findings also underline that the increased prevalence of computer use within occupations is associated with increases in analytical and interactive task requirements.

Using the 1997, 2001 and 2006 British skills surveys which provide information on self-reported job requirements, Green et al. (2007) show that computing skills have recently become more complementary to an index of "influence skill" that they derive from the survey items on the importance of persuading or influencing others, instructing, training, or teaching people, making speeches or presentations, writing long reports, analysing complex problems in depth and planning the activities of others.

The soundness of the task approach is still a matter of debate. Green (2012) questions the assumptions in Autor, Levy, and Murnane (2003) and Spitz-Oener (2006) about the classification of tasks into routine and non-routine and argues that this may affect their results. Autor (2013) himself discusses the shortcomings of the current definitions of tasks, e.g. overlap among tasks' attributes, broad classification schemes that collapse distinctions among attributes, etc. and raises "the concern that the emerging task literature may be significantly inside the frontier of what is feasible in terms of precise terminology and consistent measurement. Addressing these shortcomings should therefore be a high priority on the research agenda". A recent study by Marcolin et al. (2016) develops a new country-specific measure of routine intensity based on individual-level information from (PIAAC).

4.2. What skills are complementary to ICTs? Evidence from PIAAC

The PIAAC survey collects information on the frequency at which respondents:

1. Perform a set of tasks at work;
2. Carry out activities that involve the use of cognitive skills.

Tasks performed at work are organised in the following groups:

- Co-operation:
  - Co-operating or collaborating with co-workers (question f_q01b)
- Horizontal interaction:
  - Sharing work-related information with co-workers (f_q02a)
  - Instructing, training or teaching people, individually or in groups (f_q02b)
  - Making speeches or giving presentations in front of five or more people (f_q02c)
- Client interaction:
  - Selling a product or a service (f_q02d)
  - Advising people (f_q02e)
- Self-direction:
  - Planning of own activities (f_q03a)
  - Organising own time (f_q03c)
- Managerial tasks:

  - Planning the activities of others (f_q03b)

- Influence:
  - Persuading or influencing people (f_q04a)
  - Negotiating with people inside or outside the organisation (f_q04b)

- Problem solving:
  - Problem solving in less than 5 minutes (f_q05a)
  - Thinking about a solution for a problem for at least 30 minutes (f_q05b)

- Physical tasks:
  - Working physically (f_q06b)
- Skilled manual tasks:
  - Using skill or accuracy with hands or fingers (f_q06c).

Individuals currently employed or unemployed for less than 12 months are asked how often they perform the above tasks. For instance, the question "How often does your current/last job usually involve sharing work-related information with co-workers" can be answered "Never"; "Less than once a month"; "Less than once a week but at least once a month"; "At least once a week but not every day"; and "Every day".

While the answers to the above questions are not a measure of the skills required in an occupation, the frequency at which the respondent performs certain tasks can be regarded as a proxy for the skills that he/her is expected to have to carry out his/her work. These answers, however, do not provide any measure of the level of skills held by the respondent. The survey, therefore, provides information on the demand for certain skills at work, based on the self-assessment of workers.

Two assumptions underpin the use of this approach (OECD, 2011). First, it is assumed that the individual is a well-informed person to report about the activities involved in the job he or she is doing. All jobs differ, even within quite narrowly categorised occupations, and one would normally expect the job-holder to know best. Nevertheless, this might not always be true, and where the job-holder has only been in a post for a short time, the assumption might be questioned. In the case of out-of-work respondents, the field trial has tested the reliability of respondents' ability to recall the activities of their most recent job in the previous months. No indications were found that there was a serious recall bias.

Second, it is assumed that the individual reports these activities in an unbiased way. This assumption might also be questioned: individuals might talk up their jobs to boost their self-esteem. However, it is held that they are less likely to do so when reporting their activities than reporting how good they are in the performance of these activities. To minimise bias, the general principle is to ask respondents to report actual behaviour, such as frequency of use and proportion of time spent on using different skills, rather than often-used alternatives such as the importance of these skills for the job.

Activities that require the use of cognitive skills are grouped in three sets:[8]

- Numeracy:
  - Calculate prices, costs or budgets; use or calculate fractions, decimals or percentages; use a calculator - either hand-held or computer based; prepare charts, graphs or tables; use simple

algebra or formulas; use more advanced math or statistics, e.g. such as calculus, complex algebra, trigonometry or use of regression techniques.

- Reading:
  - Directions or instructions; letters, memos or e-mails; articles in newspapers, magazines or newsletters; articles in professional journals or scholarly publications; books; manuals or reference materials; bills, invoices, bank statements or other financial statements; diagrams, maps or schematics.

- Writing:
  - Letters, memos or e-mails; articles for newspapers, magazines or newsletters; reports; fill in forms.

Respondents are asked to report the frequency at which they carry out each of the above-listed tasks at work. Possible answers to the above sets of questions are: 1. Never; 2. Less than once a month; 3. Less than once a week but at least once a month; 4. At least once a week but not every day; and 5. Every day.

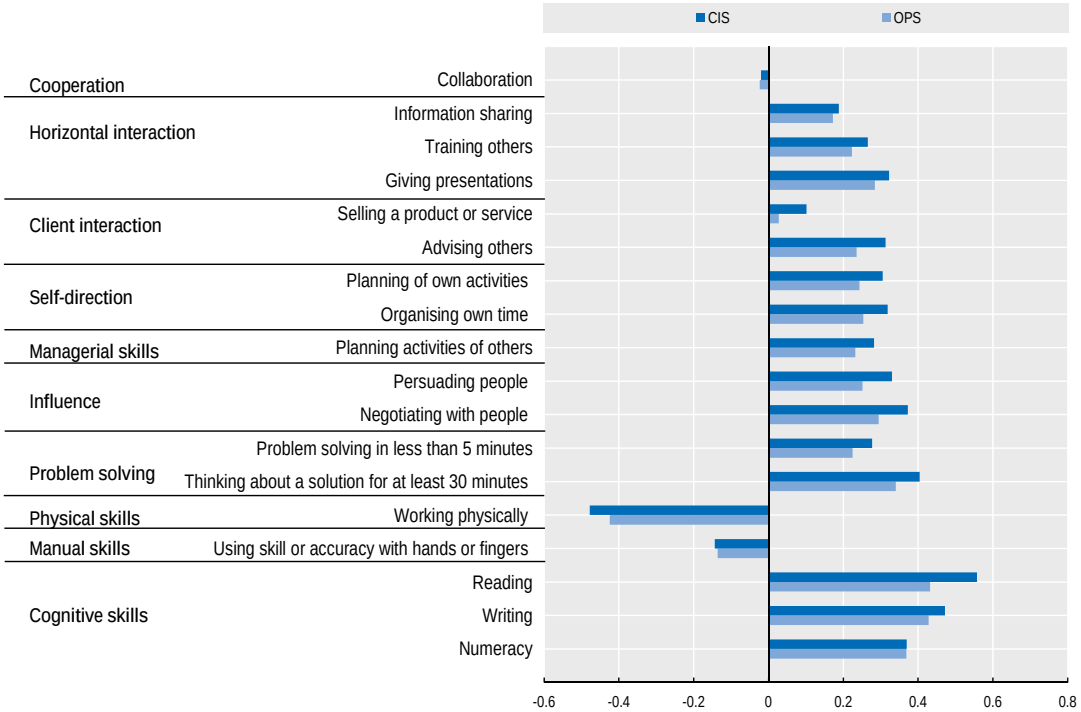
For each of these three groups of activities (numeracy, reading, writing), non-missing answers have been combined into a synthetic indicator. The resulting indexes are continuous variables, which should be interpreted as a measure of the intensity of these activities at work. For instance, individuals with a higher level of the numeracy index carry out more frequently activities that require the use of numeracy skills.

In order to identify ICT complementary skills, correlation coefficients were computed between the ICT intensity proxies based on communication and information search (CIS) and office productivity software (OPS) as analysed in Section 2.1 and: *i)* the frequency at which the above tasks are performed at work; and *ii)* the value of the intensity indexes for numeracy, reading and writing at work. A positive (negative) correlation between the ICT intensity and a given task/activity means that an individual using ICT more performs that task/activity more (less) often than an individual that does not use ICT. The sign of the correlation, therefore, can be interpreted as a measure of the degree of complementarity between ICT and other tasks/activities at work. In addition, the higher the value of the correlation coefficients, the stronger the complementarity between ICT and these tasks/activities.

Figure 13 reports the average correlation coefficients between ICT generic skills (CIS and OPS) and other tasks/activities across all occupations and countries. On average, intensive use of ICT at work is associated with tasks that require higher use of influence (Negotiating with people), problem solving (Thinking about a solution for at least 30 minutes) and horizontal interactions (Giving presentations) as well as less physical work (Working physically). Higher frequency of activities requiring Numeracy, Writing and Reading skills is also correlated to ICT, the highest correlation being with reading. Overall, average coefficients are slightly higher for the CIS skills than the OPS skills.

Figure 11. Pairwise correlation between ICT intensity and other tasks/activities frequency, 2012

Average across occupation and countries

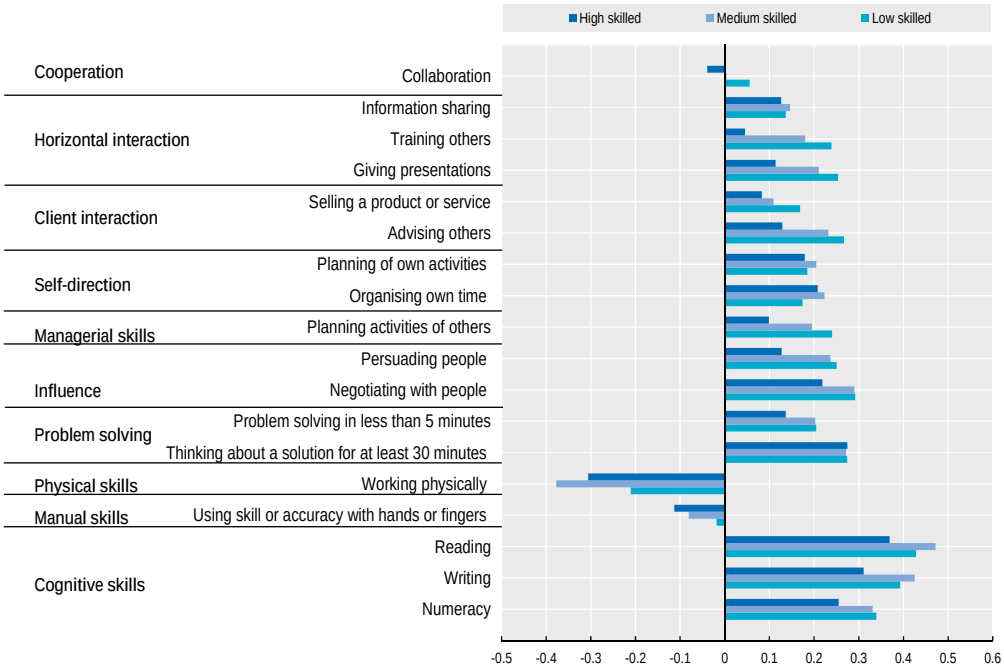


Source: OECD, based on PIAAC Database, October 2015.

In Figures 14a and 14b, the correlation coefficients between ICT and other tasks/activities are broken down by three skill levels: high, medium and low. The levels are based on the correspondence provided in ILO (2012) and reflect the typical skills of the individuals employed in the occupations belonging to each level.

Figure 14a. Pairwise correlations between ICT intensity (CIS) and other tasks/activities frequency - by skill level, 2012

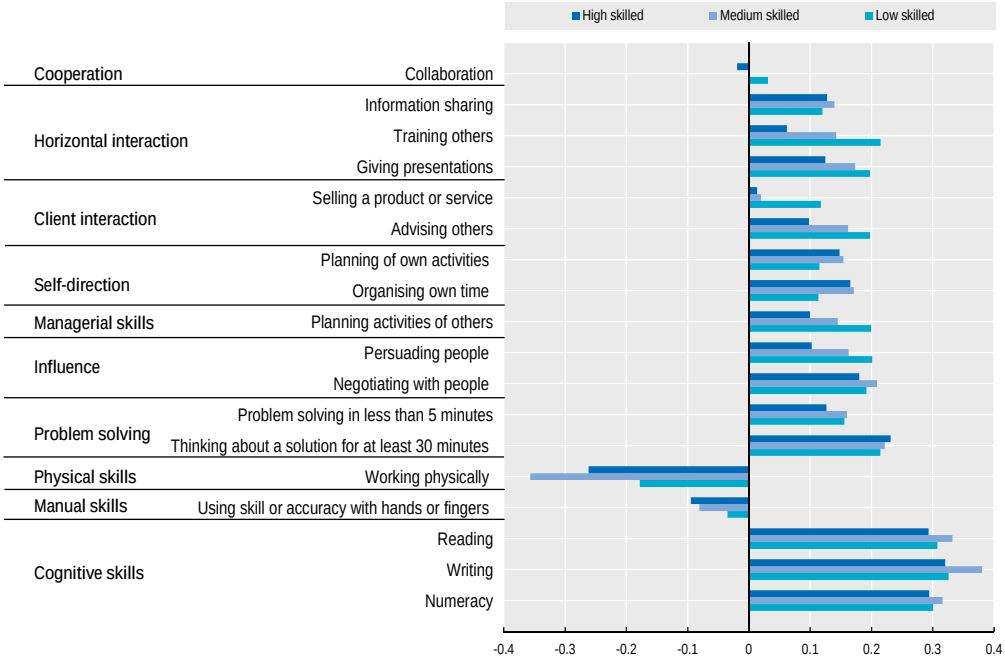
Average across countries



Source: OECD, based on PIAAC Database, October 2015.

Figure 14b. Pairwise correlations between ICT intensity (OPS) and other tasks/activities frequency - by skill level, 2012

Average across countries



Source: OECD, based on PIAAC Database, October 2015.

For most tasks, correlations to ICT tend to increase with the typical skill level of the occupation. This implies that differences in the task set associated with the use of ICTs would be larger for low-skilled occupations than for middle and high-skilled ones. In other words, the skill profile of a worker in a high-skilled occupation is likely to change little with the use of ICT. On the contrary, the skill profile of a worker in a low-skilled occupation would change more as the use of ICT at work increases.

For low-skilled occupations, differences are particularly large for Horizontal interactions (Giving presentations and Training others), Client interaction (Selling a product or a service and Advising others) and Managerial skills (Planning activities of others).

For medium-skilled occupations, differences in skills requirement are narrower than for low- skilled and larger than for high-skilled ones for most of the tasks considered. Exceptions include Information sharing, Self-direction, Reading and Writing skills which have higher correlations than for low-skilled occupations and Problem solving (Thinking about a solution for at least 30 minutes), which has lower correlations than for high-education occupations. For Physical work correlations are negative and higher than both low and high-skilled occupations.

The main difference for high-education occupations is only in Problem solving (Thinking about a solution for at least 30 minutes), where correlation with ICT is higher than for the other two educational levels. Results show a similar pattern both for CIS and OPS tasks however, overall coefficients remain slightly higher for CIS.

Tables 5a and 5b report the average correlation coefficients between ICT (CIS and OPS) and other tasks/activities by major occupation (1-digit ISCO-08) across countries. For sake of simplicity, the three highest correlation coefficients for each task/activity are highlighted.

For the CIS tasks, the occupations where ICT use is likely to have the largest effects on the tasks profiles are Service and sales workers, Elementary occupations, and Craft and related trade workers. For the OPS use, the occupations where ICT use is likely to have the largest effects on the tasks profiles are Service and sales workers, Skilled agriculture, forestry and fishery workers and Clerical support workers.

For Service and sales workers, both the CIS and OPS use are correlated to higher collaboration, Influence (Negotiating with people), Problem solving (all tasks), Reading and Writing tasks and lower Physical work.

In Elementary occupations, CIS and OPS use is correlated to higher Horizontal interaction (Training others), Client interaction (all tasks), Managerial skills, Influence (Persuading people) and Numeracy skills. Higher CIS and OPS use for Clerical support workers, is associated with higher frequency of Information sharing, Self-direction (all tasks) and Problem solving (all tasks) and Reading skills.

For Skilled agriculture, forestry and fishery workers, the correlation to CIS and OPS use is the highest for Influence (all tasks) and Client interaction (all tasks) and Numeracy skills and negative for the Physical skills. OPS use is also highly correlated to Horizontal interaction (Training others and Giving presentations).

For Professionals, correlations with the CIS complementary tasks are not high compared to other occupations whereas the OPS complementary tasks are significant for Horizontal interaction (Information sharing) and Self-direction.

Figures 15a and 15b report the correlation coefficients between ICT intensity (CIS and OPS), on the one hand, and Numeracy, Reading and Writing intensity by occupational groups and by country, on the other hand. For the CIS skills, while for high and medium-skilled occupations the correlation to reading is

the highest in most countries (panel a), the picture is less clear-cut for low-skilled occupations (panel c) for which no clear pattern emerges. Interestingly, in countries such as Austria, Estonia or France, low-skilled occupations are more correlated to the numeracy skills than reading or writing. As regards the OPS use, high- and medium-skilled occupations in most countries are strongly correlated with writing skills whereas low-skilled occupations appear to be mostly correlated with the numeracy skills. These figures suggest that the tasks content of common occupation groups varies across countries and ICT complementary skills may be country-specific to some extent.

Correlations between ICT intensity (CIS and OPS) and all tasks by country and by occupation (1-digit ISCO-08) are reported in Annexes C1 and C2.

Table 5a. Pairwise correlations between ICT intensity (CIS) and tasks/activities frequency - by occupation, 2012

ISCO-08 1 digit - Average across countries

CIS	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Managers	-0.015	0.158	0.135	0.218	-0.065	0.163	0.116	0.112	0.101	0.184	0.178	0.106	0.219	-0.299	-0.091	0.342	0.350	0.225
Professionals	-0.022	0.127	-0.020	0.046	0.100	0.080	0.146	0.185	0.067	0.074	0.179	0.102	0.256	-0.237	-0.094	0.323	0.277	0.242
Technicians and associate professionals	-0.068	0.108	0.055	0.106	0.100	0.144	0.193	0.226	0.077	0.134	0.240	0.169	0.290	-0.356	-0.110	0.406	0.321	0.265
Clerical support workers	0.053	0.189	0.149	0.136	0.056	0.201	0.238	0.246	0.135	0.186	0.228	0.245	0.294	-0.347	-0.011	0.443	0.378	0.253
Service and sales workers	0.060	0.137	0.221	0.230	0.090	0.212	0.192	0.187	0.220	0.234	0.296	0.207	0.290	-0.183	0.003	0.457	0.402	0.272
Skilled agricultural, forestry and fishery workers	0.048	0.110	0.177	0.226	0.217	0.227	0.171	0.150	0.266	0.268	0.298	0.187	0.232	-0.147	-0.033	0.398	0.383	0.358
Craft and related trades workers	-0.027	0.056	0.173	0.238	0.234	0.247	0.181	0.205	0.193	0.272	0.282	0.155	0.247	-0.270	-0.084	0.465	0.420	0.303
Plant and machine operators and assemblers	0.065	0.102	0.206	0.203	0.118	0.193	0.171	0.165	0.238	0.219	0.204	0.172	0.218	-0.084	0.024	0.363	0.304	0.272
Elementary occupations	0.056	0.137	0.239	0.254	0.168	0.267	0.185	0.174	0.240	0.250	0.292	0.205	0.274	-0.211	-0.018	0.428	0.393	0.339
Average	0.017	0.125	0.148	0.184	0.113	0.193	0.177	0.183	0.171	0.202	0.244	0.172	0.258	-0.237	-0.046	0.403	0.359	0.281
Variance * 100	0.245	0.140	0.695	0.506	0.806	0.324	0.113	0.160	0.589	0.431	0.246	0.220	0.094	0.825	0.242	0.260	0.238	0.194

Note: the three highest correlation coefficients for each task/activity are highlighted.

Source: OECD, based on PIAAC Database, October 2015.

Table 5b. Pairwise correlations between ICT intensity (OPS) and tasks/activities frequency - by occupation, 2012

ISCO-08 1 digit - Average across countries

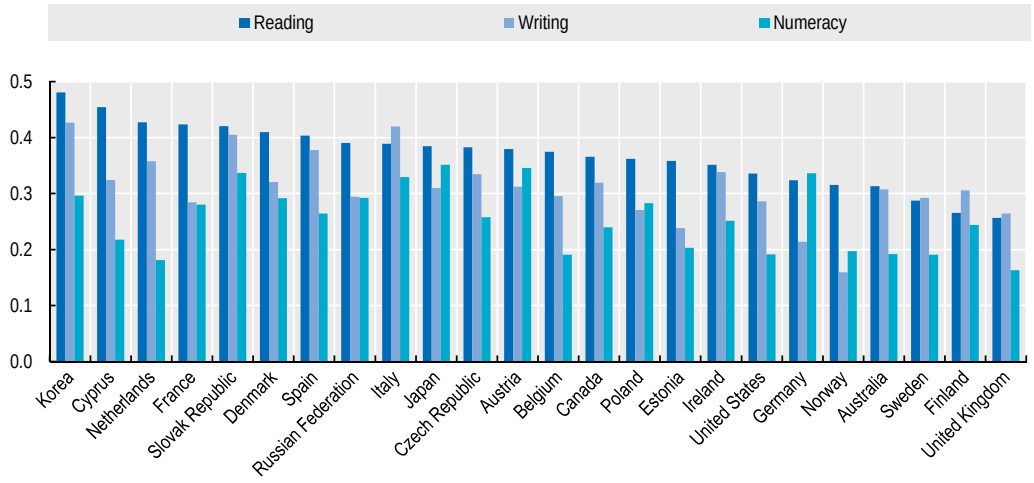
OPS	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Managers	0.015	0.149	0.146	0.205	-0.120	0.146	0.107	0.108	0.086	0.126	0.153	0.120	0.218	-0.272	-0.060	0.313	0.369	0.307
Professionals	-0.002	0.132	0.021	0.078	0.043	0.079	0.136	0.152	0.086	0.082	0.171	0.110	0.221	-0.207	-0.094	0.280	0.301	0.280
Technicians and associate professionals	-0.054	0.112	0.057	0.112	0.023	0.086	0.154	0.185	0.089	0.099	0.183	0.138	0.231	-0.297	-0.081	0.284	0.312	0.299
Clerical support workers	0.030	0.136	0.130	0.126	-0.028	0.112	0.213	0.225	0.127	0.119	0.164	0.183	0.239	-0.245	0.003	0.314	0.347	0.294
Service and sales workers	0.040	0.131	0.183	0.192	0.023	0.157	0.129	0.131	0.165	0.175	0.220	0.170	0.252	-0.177	-0.021	0.315	0.382	0.245
Skilled agricultural, forestry and fishery workers	0.078	0.103	0.173	0.266	0.123	0.198	0.078	0.062	0.164	0.222	0.229	0.130	0.174	-0.160	-0.024	0.236	0.320	0.309
Craft and related trades workers	0.000	0.076	0.138	0.204	0.111	0.176	0.123	0.124	0.143	0.197	0.196	0.116	0.174	-0.234	-0.079	0.286	0.331	0.282
Plant and machine operators and assemblers	0.099	0.098	0.172	0.180	0.051	0.158	0.111	0.086	0.192	0.161	0.117	0.120	0.143	-0.049	0.048	0.220	0.221	0.229
Elementary occupations	0.031	0.120	0.215	0.197	0.118	0.197	0.115	0.113	0.200	0.201	0.192	0.156	0.214	-0.178	-0.035	0.308	0.326	0.301
Average	0.026	0.117	0.137	0.173	0.038	0.146	0.130	0.132	0.139	0.154	0.180	0.138	0.207	-0.202	-0.038	0.284	0.323	0.283
Variance * 100	0.204	0.050	0.383	0.330	0.609	0.197	0.141	0.248	0.201	0.244	0.118	0.067	0.128	0.541	0.207	0.121	0.216	0.078

Note: the three highest correlation coefficients for each task/activity are highlighted.

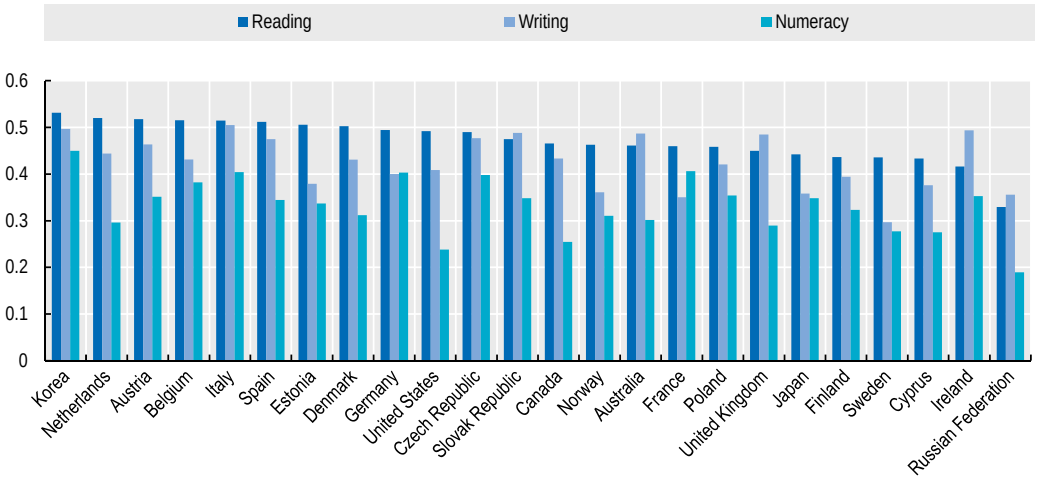
Source: OECD, based on PIAAC Database, October 2015.

Figure 15a. Pairwise correlation between ICT (CIS), numeracy, reading and writing, 2012

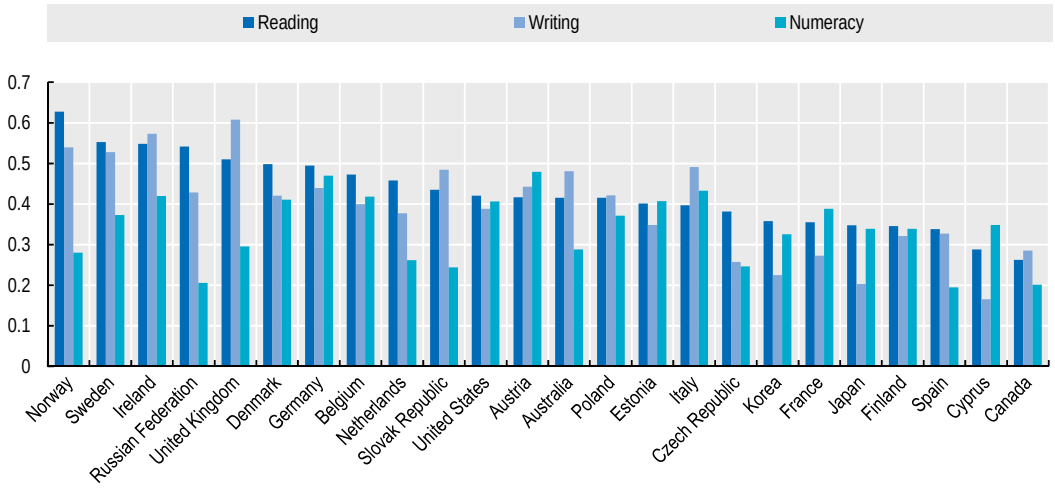
a) High-skilled occupations



b) Medium-skilled occupations



c) Low-skilled occupations

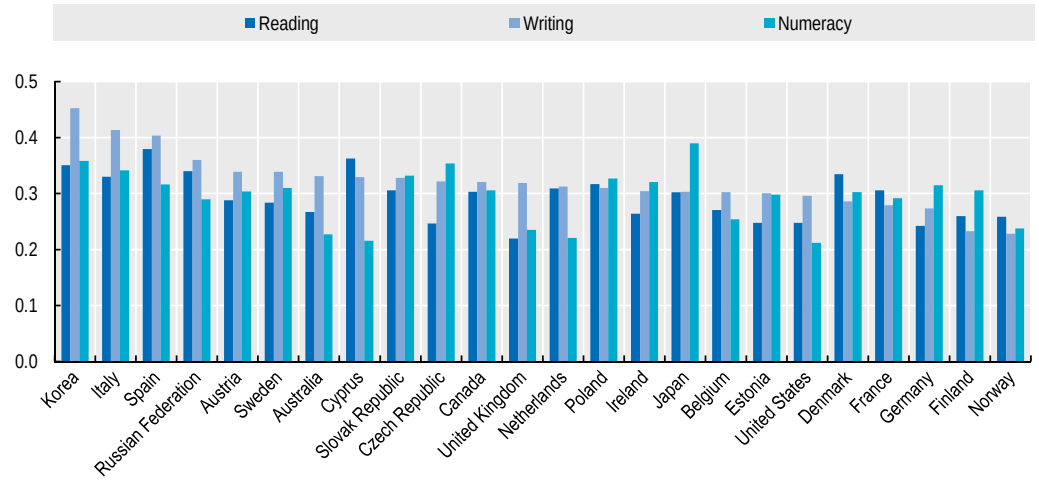


Note: For Cyprus, see note of Figure 5.

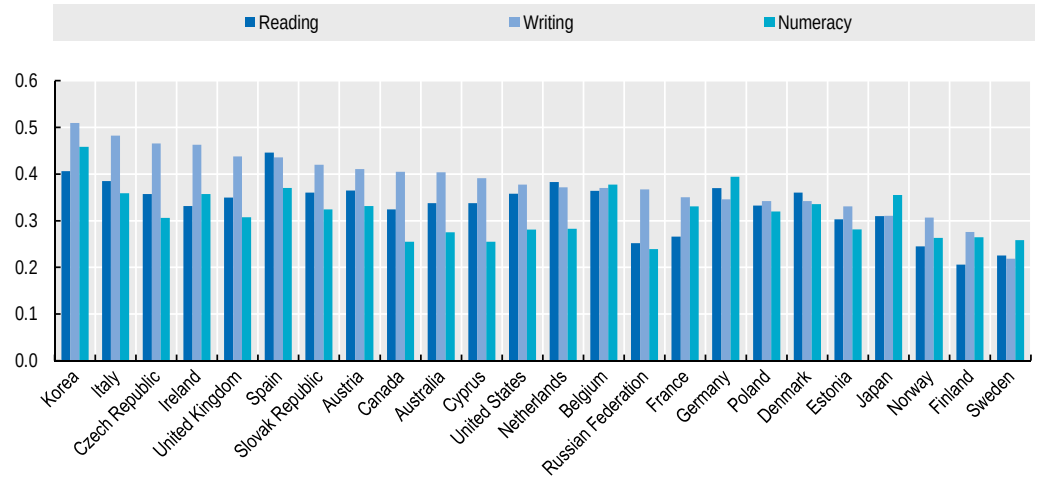
Source: OECD, based on PIAAC Database, October 2015.

Figure 15b. Pairwise correlation between ICT (OPS), numeracy, reading and writing, 2012

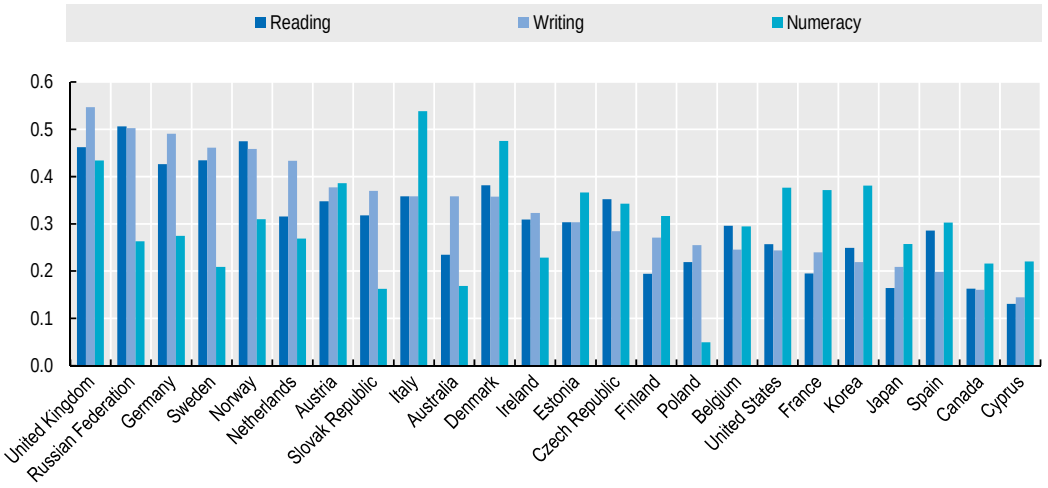
a) High-skilled occupations



b) Medium-skilled occupations



c) Low-skilled occupations



Note: For Cyprus, see note of Figure 5.

Source: OECD, based on PIAAC Database, October 2015.

*4.3. What skills are complementary to ICTs? Evidence from O*NET*

The Occupational Information Network (O*NET) is a project conducted by the US Department of Labor since 1998. The latest revision of the O*NET database (July 2014) covers about 1100 occupations defined on the basis of the US Standard Occupational Classification (SOC) system. Every occupation requires a different mix of knowledge, skills, and abilities, and is performed using a variety of activities and tasks. These distinguishing characteristics of an occupation are described by the O*NET Content Model, which defines the key features of an occupation as a standardised, measurable set of variables called "descriptors". These descriptors are organised into six major domains:

- Worker Characteristics
- Worker Requirements
- Experience Requirements
- Occupation-Specific Information
- Workforce Characteristics
- Occupational Requirements

Each descriptor in O*NET is associated with a scale, e.g. Importance, Level, and Extent of the activity.

This section focuses on one descriptor "Generalised Work Activities" and one scale "Importance". "Generalized Work Activities" consists of 41 work activities that are common across a very large number of occupations. They are performed in almost all job families and industries. The scale "Importance" indicates the degree of importance a particular descriptor is to the occupation. The scale has been standardized and ranges from 0 (Not Important) to 100 (Extremely Important).

The O*NET database was initially populated by data collected from occupation analysts; this information is updated by ongoing surveys of each occupation's worker population and occupation experts. This data is incorporated into new versions of the database on an annual schedule, to provide up-to-date information on occupations as they evolve over time. To date, 940 occupations have been comprehensively updated since the beginning of the survey in 1998. 509 of these occupations have more than one update.

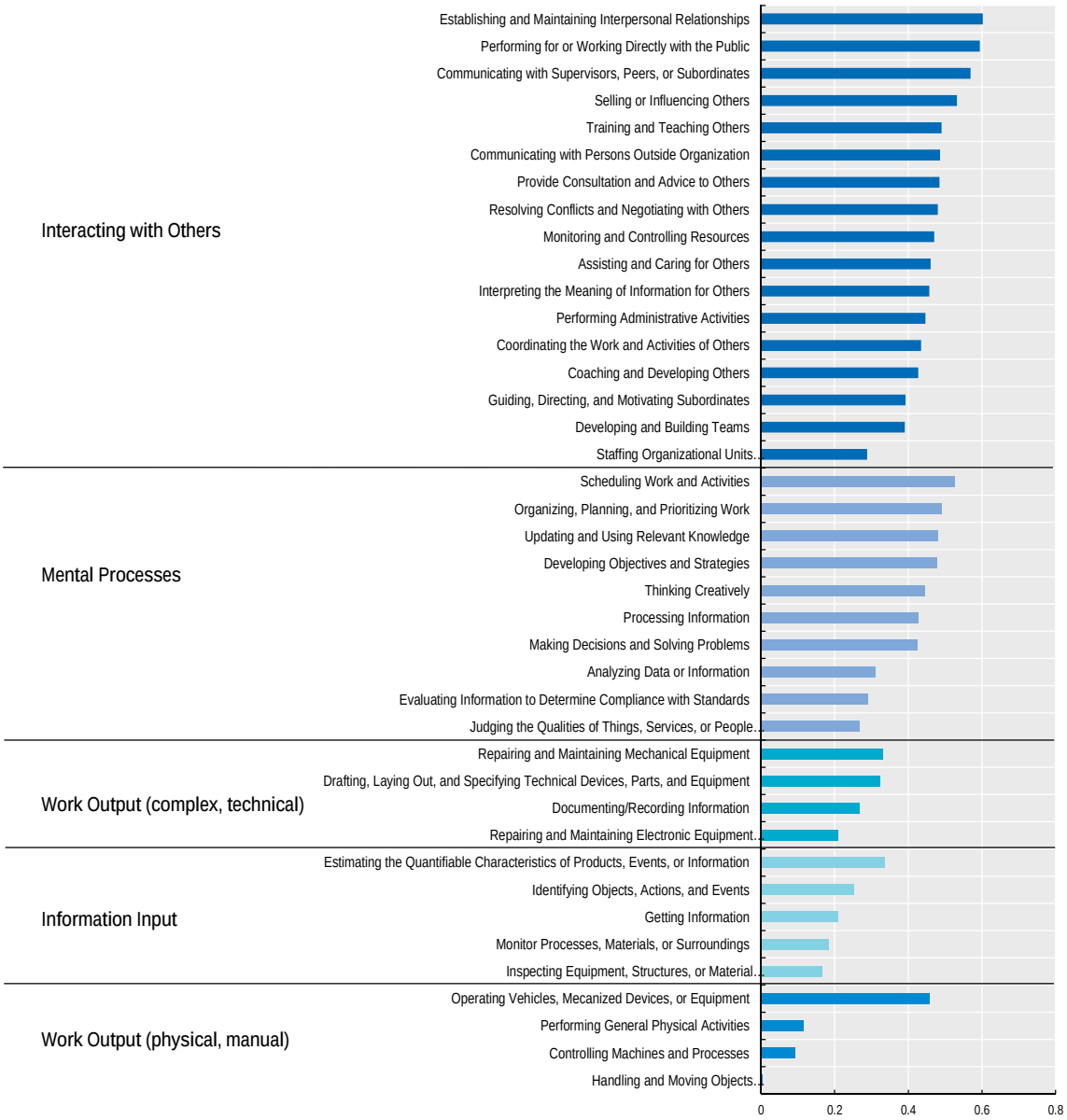
By linking these updates over time, one can examine how the set of work activities involved in each occupation have been changing. In particular, changes in the importance of the ICT use at work can be correlated to changes in the importance of the other 40 work activities. ICT use is measured by the importance of the work activity "Interacting with Computers.[9] A positive (negative) correlation means that in occupations where ICT has become more (less) important certain activities have also become more (less) important. The sign of the correlation, therefore, can be interpreted as a measure of the degree of complementarity between ICT and other activities at work. In addition, the higher the value of the correlation coefficients, the stronger the complementarity between ICT and these activities.

Figure 16 shows the results of the correlation analysis. To facilitate the interpretation, activities have been grouped in five groups according to the O*NET classification:

- ***Information Input*** - Where and how are the information and data gained that are needed to perform this job?
- ***Mental Processes*** - What processing, planning, problem-solving, decision-making, and innovating activities are performed with job-relevant information?

- ***Interacting with Others*** - What interactions with other persons or supervisory activities occur while performing this job?
- ***Work Output (complex, technical)*** - What skilled activities using coordinated movements are done to perform this job?
- ***Work Output (physical, manual)*** - What activities using the body and hands are done to perform this job?

Figure 16. Correlations between changes in the importance of ICT and changes in the importance of all work activities



Source: OECD, based on O*NET Database, June 2015.

Table 6 shows a possible mapping between the task groups defined in the PIAAC database and the activity groups classified under O*NET.

Table 6. Mapping between PIAAC and O*NET task and activity groups

PIAAC		O*NET	
Broader group	**Tasks**	**Broader group**	**Activity**
		Information Output	Getting information Monitor processes, materials or surroundings Identifying objects, actions and events Inspecting equipment, structures or material Estimating the quantifiable characteristics of products, events or information
Problem solving	Problem solving in less than 5 minutes Thinking about a solution for at least 30 minutes	**Mental process**	Processing information Evaluating information to determine compliance with standards Analyzing data or information Making decisions and solving problems Judging the qualities of things, services or people Thinking creatively Updating and using relevant knowledge Developing objectives and strategies
Self-direction	Organising own time Planning of own activities		Scheduling work and activities Organizing, planning and prioritizing work
Physical skills (stama) **Manual skills**	Working physically Using skill or accuracy with hands or fingers	**Work output (physical, manual)**	Performing general physical activities Handling and moving objects Controlling machines and processes Operating vehicles, mechanized devices or equipment
		Work output (complex, technical)	Repairing and maintaining mechanical equipment Repairing and maintaining electronic equipment Drafting, laying out, and specifying technical devices, parts, and equipment Documenting/recording information
Cooperation	Collaboration	**Interacting with others**	Establishing and maintaining interpersonal relationships Assisting and caring for others Interpreting the meaning of information for others
Horizontal interaction	Information sharing Training others Giving presentations		Communicating with supervisors, peers or subordinates Training and teaching others
Client interaction	Selling a product or service Advising others		Selling or influencing others Provide consultation and advice to others Communicating with persons outside organization Performing for or working directly with the public
Managerial skills	Planning activities of others		Coordinating the work and activities of others Developing and building teams Guiding, directing and motivating subordinates Coaching and developing others
Influence	Negotiating with people Persuading people		Resolving conflicts and negotiating with others
			Performing administrative activities Staffing organizational units Monitoring and controlling resources

Source: OECD, based on PIAAC Database and O*NET Database, October 2015.

O*NET estimates show the strongest correlations between ICT and activities related to "Interacting with Others", in particular "Establishing and Maintaining Interpersonal Relationships" (correlation coefficient equal to 0.6), "Performing for or Working Directly with the Public" (0.59), "Communicating with Supervisors, Peers, or Subordinates" (0.67) and "Selling or Influencing Others" (0.53).

"Mental Processes" are the second group of activities with the highest correlation to ICTs: "Scheduling Work and Activities" (0.53), "Organizing, Planning, and Prioritizing Work" (0.49) as well as "Updating and Using Relevant Knowledge" and "Developing Objectives and Strategies" (0.48).

Interestingly, the correlation between ICT and the activity "Operating Vehicles, Mechanized Devices, or Equipment" (0.46) is positive and higher than for any activity in the group "Information Input". The other activities in the group "Work output (physical, material)", however, show the lowest correlations to ICTs.

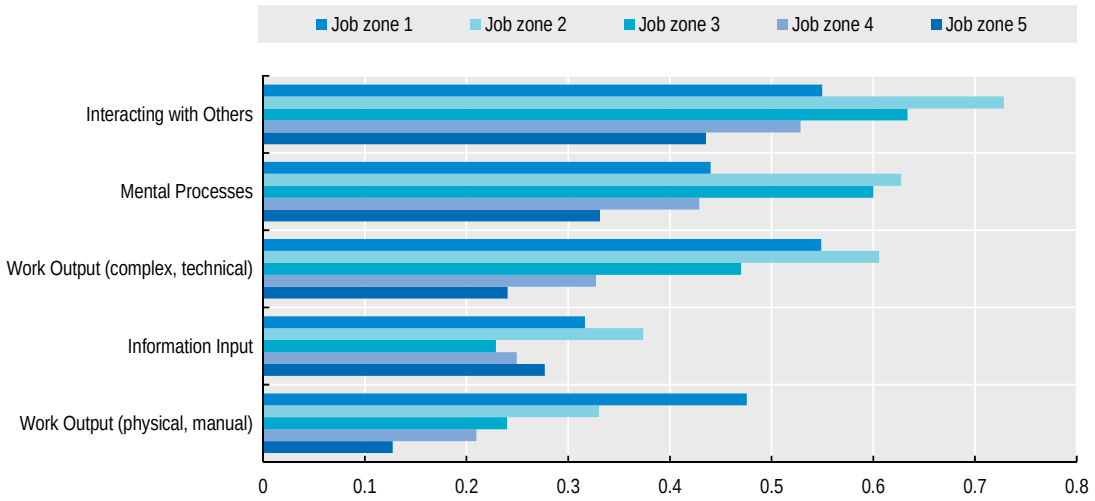
"Estimating the Quantifiable Characteristics of Products, Events, or Information" shows the highest correlation (0.34) within the group "Information Input" while "Repairing and Maintaining Mechanical

Equipment" (0.33) and "Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment" show the highest correlation within the group "Work Output (complex, technical)".

Figure 17 breaks down the above correlations by "job zones" defined by O*NET. The O*NET "job zones" classify occupations into five categories according to the typical level of skills required by the occupation, including work experience, education, and/or vocational training. Zone 1 denotes the lowest level of preparation and Zone 5 the highest level.

Figure 17. Correlations between changes in the importance of ICTs and changes in the importance of the activity groups

By typical skill level of occupations (job zone)



Source: OECD, based on O*NET Database, June 2015.

Consistent with the findings in Figure 17, the highest correlations are found between ICTs and activity group "Interacting with Others" and the lowest correlations between ICTs and "Work output (physical, material)" as well as with "Information Input". In addition, the correlations show a similar ranking across different job zones, i.e. skill levels. The one exception is job zone 1, i.e. the lowest skill level, where "Work Output (complex, technical)" and "Interacting with Others" are most equally correlated to ICTs. This suggests that, for low-skill occupations, increasing use ICT is associated with an upgrade in the skill content of the manual work.

The strength of the correlations tends to decrease with skill levels. This observation confirms the finding of the previous section based on PIAAC data that that changes in the tasks set associated with increasing use of ICTs tend to be larger for people in low-skilled occupations than for those in medium and high-skilled ones.

The overall results presented in this section on the basis of the PIAAC and O*NET data are also consistent with the findings of a recent study by Hammermann and Stettes (2016) using the 2014 German IW-Personalpanel data. Authors show that employees of highly digitised firms appear to have more communication and cooperation skills and more ability to plan, organise and act autonomously as compared that of less digitised firms. The study also forecasts an increase in such "social skills" requirements with the increase of digitisation in firms, especially among those that take an active part in the Fourth Industrial Revolution.

5. Measuring the supply of ICT generic skills through PRSTE performance

Having measured the demand for ICT generic skills (Section 2), the next step is to assess to what extent demand is matched by supply of such skills. The information available in the PIAAC performance evaluation, notably in the section Problem Solving in a Technology-Rich Environment (PSTRE), permits to undertake this assessment.

The PIAAC framework assesses key information-processing skills that are:

- Necessary for fully integrating and participating in the labour market, education and training, and social and civic life
- Highly transferable, in that they are relevant to many social contexts and work situations
- "Learnable" and, therefore, subject to the influence of policy

At the most fundamental level, literacy and numeracy constitute a foundation for developing higher-order cognitive skills, such as analytic reasoning, and are essential for gaining access to and understanding specific domains of knowledge. In addition, the capacity to manage information and solve problems in technology-rich environments (PSTRE) – that is, to access, evaluate, analyse and communicate information – is becoming as important as understanding and interpreting text based information and being able to handle mathematical content. The PSTRE ability has a greater importance with the ICT applications becoming one of the most crucial features in most workplaces, in education, and in everyday life.

In PIAAC, problem solving in technology-rich environments is defined as "using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks". The first cycle of the survey focuses on "the abilities to solve problems for personal, work and civic purposes by setting up appropriate goals and plans, and accessing and making use of information through computers and computer networks" (OECD, 2012).

The problem solving in a technology-rich environments domain covers the specific types of problems people deal with when using ICT. These problems share the following characteristics:

- The problem is primarily a consequence of the availability of new technologies.
- The solution to the problem requires the use of computer-based artefacts (applications, representational formats, computational procedures).
- The problems are related to technology-rich environments themselves (e.g. how to operate a computer, how to fix a settings problem, how to use an Internet browser).

Problem solving in technology-rich environments is a domain of competency that represents the intersection of what are sometimes described as "computer literacy" skills (i.e. the capacity to use ICT tools and applications) and the cognitive skills required to solve problems. Some basic knowledge regarding the use of ICT input devices (e.g. use of a keyboard and mouse and screen displays), file management tools, applications (word processing, e-mail), and graphic interfaces is essential for performing assessment tasks. However, the objective is not to test the use of ICT tools and applications in isolation, but rather to assess the capacity of adults to use these tools to access, process, evaluate and analyse information effectively.

Table 7 presents the different levels of problem solving in technology-rich environments assessment and the type of tasks completed successfully at each level of proficiency.

Table 7. Proficiency levels of Problem solving in technology-rich environments assessment (PRSTE)

Level	Score range	The type of tasks completed successfully at each level of proficiency
Below Level 1	**Below 241 points**	Tasks are based on well-defined problems involving the use of only one function within a generic interface to meet one explicit criterion without any categorical, inferential reasoning or transforming of information. Few steps are required and no sub goal has to be generated.
1	**241 to less than 291 points**	At this level, tasks typically require the use of widely available and familiar technology applications, such as **e-mail software or a web browser**. There is little or no navigation required accessing the information or commands required to solve the problem. The problem may be solved regardless of the respondent's awareness and use of specific tools and functions (e.g. a sort function). The tasks involve few steps and a minimal number of operators. At the cognitive level, the respondent can readily infer the goal from the task statement; problem resolution requires the respondent to apply explicit criteria; and there are few monitoring demands (e.g. the respondent does not have to check whether he or she has used the appropriate procedure or made progress towards the solution). Identifying contents and operators can be done through simple match. Only simple forms of reasoning, such as assigning items to categories, are required; there is no need to contrast or integrate information.
2	**291 to less than 341 points**	At this level, tasks typically require the use of **both generic and more specific technology applications**. For instance, the respondent may have to make use of a novel online form. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g. a **sort function**) can facilitate the resolution of the problem. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, though the criteria to be met are explicit. There are higher monitoring demands. Some unexpected outcomes or impasses may appear. The task may require evaluating the relevance of a set of items to discard distractors. Some integration and inferential reasoning may be needed.
3	**Equal to or higher than 341 points**	At this level, tasks typically require the use of both generic and more specific technology applications. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g. a sort function) is required to make progress towards the solution. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, and the criteria to be met may or may not be explicit. There are typically high monitoring demands. Unexpected outcomes and impasses are likely to occur. The task may require evaluating the relevance and reliability of information in order to discard distractors. Integration and inferential reasoning may be needed to a large extent.

Source: OECD (2013).

Based on the description of the PRSTE, it appears that the proficiency level required to effective use of ICTs can be set as follows:

Table 8. Mapping between PIAAC and O*NET task and activity groups

ICT use	Proficiency levels
CIS	Level 1 and above
OPS	Level 2 and above

Source: OECD, based on PIAAC Database, October 2015.

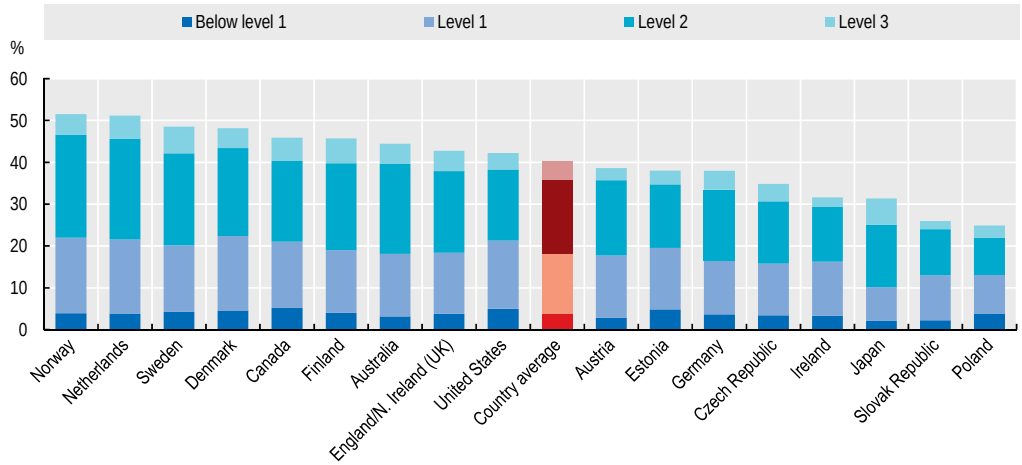
ICT skills related to "Communication and information-sharing (CIS)" tasks are mapped to the level 1 as individuals at this level of PSTRE proficiency are able to use e-mail software or a web browser. "Office programming software (OPS)"-related skills are mapped to the level 2 because individuals at this level are expected to use more specific technology tools or applications (e.g. a sort function). It was not possible to

map the tasks related to the ICT specialist skills as the PRSTE performance test does not allow distinguish specific programming skills among individuals at level 3.

Figures 18a and 18b provide the breakdown of the PRSTE proficiency levels within the population who use CIS and OPS, respectively, every day at work. The results show that between 7 and 15% of the population who report undertaking CIS every day do not actually have the skills required to carry out such tasks (below PRSTE level 1), the country average being at 9.5%. The gap is even more significant for the OPS tasks as 42% of the individuals do not have the skills required to carry out these tasks (PRSTE level 1 and below) although they report doing so every day. Therefore, a significant number of workers using ICTs every day do not seem to have sufficient ICTs skills to use these technologies effectively.

Figure 18a. Breakdown of individuals who use CIS every day by PSTRE levels, 2012

As a percentage of total population

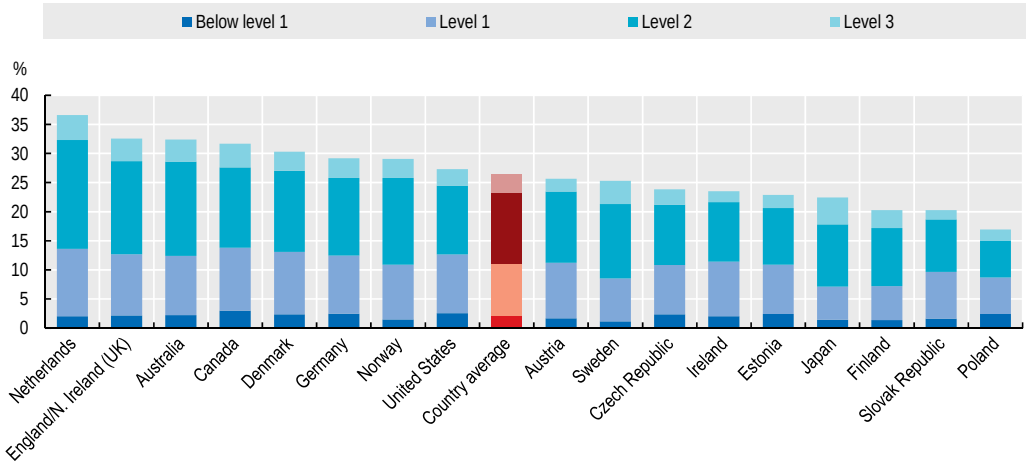


Note: PSTRE assessment data for France, Italy and Spain are not available and not included in the OECD total. Individuals in the following categories of the PSTRE assessment are excluded from the analysis: "No computer experience"; "Opted out of computer based assessment"; "Failed ICT core / Missing".

Source: OECD, based on PIAAC Database, January 2016.

Figure 18b. Breakdown of individuals who use OPS every day by PSTRE levels, 2012

As a percentage of total population



Note: PSTRE assessment data for France, Italy and Spain are not available and not included in the OECD total. Individuals in the following categories of the PSTRE assessment are excluded from the analysis: "No computer experience"; "Opted out of computer based assessment"; "Failed ICT core / Missing".

Source: OECD, based on PIAAC Database, January 2016.

6. Conclusions and directions for further work

This paper has presented new evidence on how the use of ICTs at work is changing the demand for three sets of ICT-related skills: *generic skills*, *specialist skills* and *complementary skills*. The demand for ICT generic skills has also been compared with the supply of such skills.

The demand for ICT generic skills, as measured by the CIS and OPS use at work, has experienced a modest increase in a large majority of countries between 2011 and 2014. On average, the CIS intensity has increased by 0.9 percentage points, the largest increase being in Norway (3.7 percentage points) followed by France (2.9 percentage points). The OPS intensity has increased 0.6 percentage points with the same countries showing the largest increases. Yet, the CIS and OPS intensities continue to differ significantly across countries in the PIIAC sample, ranging respectively between 64% in Norway and 34% of the working population in the Slovak Republic and between 43% in the United Kingdom and 26% in Poland.

The demand for ICT specialists has been growing fast over the last years but the available evidence on wage premia, vacancy rates and vacancy duration suggests that the potential shortage in ICT skills is not very large and limited to a small number of countries. However, available statistics do not permit to fully address these questions and the development of better measures – based on both official statistics and online vacancies – is an important step for future work.

The diffusion of ICTs is also changing the way work is carried out, raising the demand for ICT complementary skills. These are skills that are not related to the capability to use the technology effectively but to carry out the work in the "technology-rich environment" shaped by ICTs.

The paper has shown a simple and replicable approach to identify work tasks complementary to ICTs and measure the demand for skills required to perform such tasks. A major finding of the analysis is that changes in the tasks set associated to increasing use of ICTs tend to be larger for people in low-skilled occupations than for those in middle and high-skilled ones. On average, intensive use of ICT at work is associated with tasks that require more interaction with co-workers and clients, more problem solving as well as less physical work.

Based on the PIAAC performance evaluation, notably in relation to PSTRE, the paper has provided an assessment of the match between demand and supply of ICT generic skills. A significant number of workers using ICTs every day do not seem to have sufficient ICTs skills to use these technologies effectively. The proportion of workers with insufficient ICT generic skills is, on average, 9% for CIS and over 40% for OPS.

While the above results offer some new and interesting insights, there are various avenues for further analysis. First, the analysis is based on single or predefined combinations of skills or tasks, according to the setups of the original surveys. It is worthwhile to explore whether there is evidence in the data that particular combinations of skills are often used together, for example by means of a principal component analysis. It is possible that such combinations may be different across different skill groups as well. The ultimate interest would then be to see how these profiles of clusters of skills by skill group of workers relate to ICT skills.

For future research, it is worthwhile to complement the analysis of supply and demand for ICT skills via other national datasets that may collect a richer set of information over time. The German IAB/BIBB dataset and the British Skills Survey, for example, collect information on cross-sections of workers over one or two decades (Spitz-Oener, 2006; Felstead et al. 2007). In addition, the Dutch Skills Survey (Ter Weel and Kok, 2013) has information on the quality of the match between skills demand and supply, based on the workers' self-assessment, as well as on whether the required skills have been acquired in formal education or 'on the job'.

ANNEX A1. TOP 20 ICT-INTENSIVE CIS OCCUPATIONS BY COUNTRY, 2012

ICT intensity - CIS

Australia

	ISCO	
Information and communications technology professionals	25	99.4
Administrative and commercial managers	12	99.2
Science and engineering professionals	21	98.5
Chief executives, senior officials and legislators	11	98.5
Information and communications technicians	35	95.8
Business and administration professionals	24	95.8
Legal, social and cultural professionals	26	93.8
Business and administration associate professionals	33	91.6
General and keyboard clerks	41	87.7
Science and engineering associate professionals	31	86.1
Production and specialised services managers	13	85.4
Teaching professionals	23	85.3
Numerical and material recording clerks	43	85.2
Hospitality, retail and other services managers	14	79.0
Customer services clerks	42	78.6
Protective services workers	54	78.1
Health professionals	22	70.1
Health associate professionals	32	57.3
Electrical and electronic trades workers	74	56.0
Legal, social, cultural and related associate professionals	34	55.7

Austria

	ISCO	
Information and communications technology service managers	133	100.0
Retail and wholesale trade managers	142	100.0
Physical and earth science professionals	211	100.0
Mathematicians, actuaries and statisticians	212	100.0
Electrotechnology engineers	215	100.0
Veterinarians	225	100.0
Database and network professionals	252	100.0
Ship and aircraft controllers and technicians	315	100.0
Finance professionals	241	97.9
Sales, marketing and development managers	122	97.6
Architects, planners, surveyors and designers	216	97.3
Authors, journalists and linguists	264	97.2
Legal professionals	261	96.5
Software and applications developers and analysts	251	96.5
Business services and administration managers	121	96.3
Engineering professionals (excluding electrotechnology)	214	96.3
Financial and mathematical associate professionals	331	95.7
Regulatory government associate professionals	335	95.5
Sales, marketing and public relations professionals	243	95.3
Administration professionals	242	95.1

Canada

	ISCO	
Information and communications technology service managers	133	100.0
Mathematicians, actuaries and statisticians	212	100.0
Traditional and complementary medicine professionals	223	100.0
Traditional and complementary medicine associate professionals	323	100.0
Engineering professionals (excluding electrotechnology)	214	99.8
Database and network professionals	252	99.0
Finance professionals	241	99.0
Software and applications developers and analysts	251	98.1
Sales, marketing and development managers	122	97.9
Professional services managers	134	97.8
Business services and administration managers	121	97.3
Sales, marketing and public relations professionals	243	97.2
Architects, planners, surveyors and designers	216	96.9
Administration professionals	242	96.5
Managing directors and chief executives	112	95.0
Secondary education teachers	233	94.8
Electrotechnology engineers	215	94.7
Information and communications technology operations and user	351	94.5
Life science professionals	213	94.5
Legislators and senior officials	111	94.4

Czech Republic

	ISCO	
Legislators and senior officials	111	100.0
Business services and administration managers	121	100.0
Information and communications technology service managers	133	100.0
Professional services managers	134	100.0
Physical and earth science professionals	211	100.0
Mathematicians, actuaries and statisticians	212	100.0
Architects, planners, surveyors and designers	216	100.0
Paramedical practitioners	224	100.0
Veterinarians	225	100.0
Administration professionals	242	100.0
Sales, marketing and public relations professionals	243	100.0
Database and network professionals	252	100.0
Librarians, archivists and curators	262	100.0
Social and religious professionals	263	100.0
Traditional and complementary medicine associate professional	323	100.0
Veterinary technicians and assistants	324	100.0
Secretaries (general)	412	99.9
Finance professionals	241	99.6
Legal professionals	261	99.4
Telecommunications and broadcasting technicians	352	99.4

ICT intensity - CIS

Denmark

	ISCO	
Legislators and senior officials	**111**	100.0
Managing directors and chief executives	**112**	100.0
Sales, marketing and development managers	**122**	100.0
Production managers in agriculture, forestry and fisheries	**131**	100.0
Information and communications technology service managers	**133**	100.0
Retail and wholesale trade managers	**142**	100.0
Other services managers	**143**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Electrotechnology engineers	**215**	100.0
Paramedical practitioners	**224**	100.0
Legal professionals	**261**	100.0
Librarians, archivists and curators	**262**	100.0
Regulatory government associate professionals	**335**	100.0
Tellers, money collectors and related clerks	**421**	100.0
Street and market salespersons	**521**	100.0
Subsistence crop farmers	**631**	100.0
Professional services managers	**134**	99.4
Sales, marketing and public relations professionals	**243**	98.5
Secondary education teachers	**233**	98.5
Finance professionals	**241**	97.8

Estonia

	ISCO	
Mathematicians, actuaries and statisticians	**212**	100.0
Legislators and senior officials	**111**	100.0
Paramedical practitioners	**224**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Vocational education teachers	**232**	100.0
Database and network professionals	**252**	100.0
Sales, marketing and development managers	**122**	98.1
Regulatory government associate professionals	**335**	98.0
University and higher education teachers	**231**	97.1
Administration professionals	**242**	97.1
Information and communications technology service managers	**133**	96.8
Tellers, money collectors and related clerks	**421**	96.7
Legal professionals	**261**	96.5
Professional services managers	**134**	96.2
Finance professionals	**241**	94.1
Software and applications developers and analysts	**251**	93.3
Electrotechnology engineers	**215**	93.0
Business services and administration managers	**121**	92.6
Authors, journalists and linguists	**264**	92.4
Retail and wholesale trade managers	**142**	92.3

Finland

	ISCO	
Chief executives, senior officials and legislators	**11**	100.0
Administrative and commercial managers	**12**	100.0
Information and communications technology professionals	**25**	98.9
Information and communications technicians	**35**	97.8
Business and administration associate professionals	**33**	96.7
Production and specialised services managers	**13**	95.8
Health professionals	**22**	95.1
Business and administration professionals	**24**	95.0
Science and engineering professionals	**21**	94.9
Customer services clerks	**42**	90.8
Numerical and material recording clerks	**43**	90.6
General and keyboard clerks	**41**	89.9
Hospitality, retail and other services managers	**14**	89.0
Science and engineering associate professionals	**31**	88.0
Legal, social and cultural professionals	**26**	86.2
Teaching professionals	**23**	85.4
Health associate professionals	**32**	76.5
Protective services workers	**54**	75.0
Legal, social, cultural and related associate professionals	**34**	65.4
Sales workers	**52**	57.8

France

	ISCO	
Legislators and senior officials	**111**	100.0
Sales, marketing and development managers	**122**	100.0
Production managers in agriculture, forestry and fisheries	**131**	100.0
Information and communications technology service managers	**133**	100.0
Electrotechnology engineers	**215**	100.0
Veterinarians	**225**	100.0
Software and applications developers and analysts	**251**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Traditional and complementary medicine associate professionals	**323**	100.0
Financial and mathematical associate professionals	**331**	100.0
Manufacturing, mining, construction, and distribution managers	**132**	99.0
Engineering professionals (excluding electrotechnology)	**214**	98.3
Administration professionals	**242**	97.9
Legal professionals	**261**	96.0
Business services and administration managers	**121**	94.9
Professional services managers	**134**	94.6
University and higher education teachers	**231**	94.2
Sales, marketing and public relations professionals	**243**	94.1
Finance professionals	**241**	93.6

Germany

	ISCO	
Business services and administration managers	**121**	100.0
Sales, marketing and development managers	**122**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Administration professionals	**242**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Software and applications developers and analysts	**251**	100.0
Database and network professionals	**252**	100.0
Engineering professionals (excluding electrotechnology)	**214**	98.9
Manufacturing, mining, construction, and distribution managers	**132**	97.4
Finance professionals	**241**	96.9
Legal professionals	**261**	95.8
Sales and purchasing agents and brokers	**332**	95.1
Administrative and specialised secretaries	**334**	94.7
Architects, planners, surveyors and designers	**216**	93.5
Financial and mathematical associate professionals	**331**	92.2
Vocational education teachers	**232**	91.9
Regulatory government associate professionals	**335**	91.8
Numerical clerks	**431**	91.6
Information and communications technology operations and user	**351**	91.3

Ireland

	ISCO	
Legislators and senior officials	**111**	100.0
Managing directors and chief executives	**112**	100.0
Business services and administration managers	**121**	100.0
Sales, marketing and development managers	**122**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Vocational education teachers	**232**	100.0
Legal professionals	**261**	100.0
Librarians, archivists and curators	**262**	100.0
Life science technicians and related associate professionals	**314**	100.0
Financial and mathematical associate professionals	**331**	100.0
Business services agents	**333**	100.0
Keyboard operators	**413**	100.0
Ships' deck crews and related workers	**835**	100.0
General office clerks	**411**	97.3
Information and communications technology operations and use	**351**	96.2
Architects, planners, surveyors and designers	**216**	94.3
Finance professionals	**241**	93.9
Social and religious professionals	**263**	93.8

ICT intensity - CIS

Italy

	ISCO	
Legislators and senior officials	**111**	100.0
Managing directors and chief executives	**112**	100.0
Sales, marketing and development managers	**122**	100.0
Professional services managers	**134**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
University and higher education teachers	**231**	100.0
Software and applications developers and analysts	**251**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Process control technicians	**313**	100.0
Ship and aircraft controllers and technicians	**315**	100.0
Authors, journalists and linguists	**264**	98.4
Sales, marketing and public relations professionals	**243**	98.2
Finance professionals	**241**	98.2
Secretaries (general)	**412**	94.1
Financial and mathematical associate professionals	**331**	94.1
Administration professionals	**242**	93.5
Legal professionals	**261**	92.4
Business services agents	**333**	91.3
Information and communications technology operations and user support technicians	**351**	91.0

Japan

	ISCO	
Information and communications technology service managers	**133**	100.0
Retail and wholesale trade managers	**142**	100.0
Other services managers	**143**	100.0
Physical and earth science professionals	**211**	100.0
Life science professionals	**213**	100.0
Electrotechnology engineers	**215**	100.0
University and higher education teachers	**231**	100.0
Vocational education teachers	**232**	100.0
Database and network professionals	**252**	100.0
Secretaries (general)	**412**	100.0
Sales, marketing and development managers	**122**	98.0
Software and applications developers and analysts	**251**	97.4
Physical and engineering science technicians	**311**	96.7
Information and communications technology operations and use	**351**	96.6
Administration professionals	**242**	96.5
Managing directors and chief executives	**112**	92.6
Engineering professionals (excluding electrotechnology)	**214**	90.4
Finance professionals	**241**	89.5
Manufacturing, mining, construction, and distribution managers	**132**	88.6
Business services and administration managers	**121**	87.9

Netherlands

	ISCO	
Legislators and senior officials	**111**	100.0
Sales, marketing and development managers	**122**	100.0
Information and communications technology service managers	**133**	100.0
Other services managers	**143**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Electrotechnology engineers	**215**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Life science technicians and related associate professionals	**314**	100.0
Information and communications technology operations and user	**351**	100.0
Secretaries (general)	**412**	100.0
Ships' deck crews and related workers	**835**	100.0
Administration professionals	**242**	99.0
Finance professionals	**241**	98.5
Engineering professionals (excluding electrotechnology)	**214**	98.4
Software and applications developers and analysts	**251**	97.3
Financial and mathematical associate professionals	**331**	96.7
Business services and administration managers	**121**	95.5
Legal professionals	**261**	95.4

Norway

	ISCO	
Legislators and senior officials	**111**	100.0
Business services and administration managers	**121**	100.0
Production managers in agriculture, forestry and fisheries	**131**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Life science professionals	**213**	100.0
Electrotechnology engineers	**215**	100.0
University and higher education teachers	**231**	100.0
Finance professionals	**241**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Software and applications developers and analysts	**251**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Financial and mathematical associate professionals	**331**	100.0
Information and communications technology operations and use	**351**	100.0
Secretaries (general)	**412**	100.0
Other craft and related workers	**754**	100.0
Sales, marketing and development managers	**122**	98.6
Engineering professionals (excluding electrotechnology)	**214**	98.6
Social and religious professionals	**263**	98.4

Poland

	ISCO	
Legislators and senior officials	**111**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Database and network professionals	**252**	100.0
Traditional and complementary medicine associate professionals	**323**	100.0
Information and communications technology operations and user	**351**	98.7
Librarians, archivists and curators	**262**	98.0
Software and applications developers and analysts	**251**	97.8
Professional services managers	**134**	95.8
Administration professionals	**242**	95.7
Numerical clerks	**431**	94.1
Sales, marketing and development managers	**122**	94.1
Business services agents	**333**	91.5
University and higher education teachers	**231**	90.4
Financial and mathematical associate professionals	**331**	90.1
Engineering professionals (excluding electrotechnology)	**214**	90.0
Finance professionals	**241**	88.9
Authors, journalists and linguists	**264**	88.6

Slovak Republic

	ISCO	
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Nursing and midwifery professionals	**222**	100.0
Veterinarians	**225**	100.0
University and higher education teachers	**231**	100.0
Administration professionals	**242**	100.0
Ship and aircraft controllers and technicians	**315**	100.0
Business services agents	**333**	100.0
Telecommunications and broadcasting technicians	**352**	100.0
Database and network professionals	**252**	95.9
Sales, marketing and development managers	**122**	95.8
Finance professionals	**241**	95.1
Legislators and senior officials	**111**	94.4
Information and communications technology operations and use	**351**	94.4
Electrotechnology engineers	**215**	91.9
Information and communications technology service managers	**133**	91.5
Numerical clerks	**431**	90.1
General office clerks	**411**	89.9
Business services and administration managers	**121**	88.2
Social and religious professionals	**263**	88.0

ICT intensity - CIS

Spain

	ISCO	
Managing directors and chief executives	**112**	100.0
Business services and administration managers	**121**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Engineering professionals (excluding electrotechnology)	**214**	100.0
Electrotechnology engineers	**215**	100.0
Veterinarians	**225**	100.0
University and higher education teachers	**231**	100.0
Administration professionals	**242**	100.0
Software and applications developers and analysts	**251**	100.0
Life science technicians and related associate professionals	**314**	100.0
Veterinary technicians and assistants	**324**	100.0
Information and communications technology operations and user	**351**	100.0
Telecommunications and broadcasting technicians	**352**	100.0
Keyboard operators	**413**	100.0
Chemical and photographic products plant and machine operators	**813**	100.0
Finance professionals	**241**	97.2
Database and network professionals	**252**	95.9
Numerical clerks	**431**	95.6
Authors, journalists and linguists	**264**	95.4

Sweden

	ISCO	
Managing directors and chief executives	**112**	100.0
Business services and administration managers	**121**	100.0
Sales, marketing and development managers	**122**	100.0
Manufacturing, mining, construction, and distribution managers	**132**	100.0
Information and communications technology service managers	**133**	100.0
Other services managers	**143**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Electrotechnology engineers	**215**	100.0
Medical doctors	**221**	100.0
Veterinarians	**225**	100.0
Finance professionals	**241**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Social and religious professionals	**263**	100.0
Life science technicians and related associate professionals	**314**	100.0
Telecommunications and broadcasting technicians	**352**	100.0
General office clerks	**411**	100.0
Numerical clerks	**431**	100.0
Other craft and related workers	**754**	100.0

England/N. Ireland (UK)

	ISCO	
Administration professionals	**242**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Process control technicians	**313**	100.0
Life science technicians and related associate professionals	**314**	100.0
Ship and aircraft controllers and technicians	**315**	100.0
Administrative and specialised secretaries	**334**	100.0
Sales, marketing and development managers	**122**	99.9
Software and applications developers and analysts	**251**	99.9
Finance professionals	**241**	99.7
Medical doctors	**221**	98.9
Information and communications technology service managers	**133**	98.7
Information and communications technology operations and user	**351**	98.0
Production managers in agriculture, forestry and fisheries	**131**	97.9
Managing directors and chief executives	**112**	96.9
Business services and administration managers	**121**	96.7
Engineering professionals (excluding electrotechnology)	**214**	96.2
Legal professionals	**261**	96.1
Architects, planners, surveyors and designers	**216**	95.6

United States

	ISCO	
Legislators and senior officials	**111**	100.0
Information and communications technology service managers	**133**	100.0
Life science professionals	**213**	100.0
Engineering professionals (excluding electrotechnology)	**214**	100.0
Electrotechnology engineers	**215**	100.0
Veterinarians	**225**	100.0
Sales, marketing and public relations professionals	**243**	100.0
Authors, journalists and linguists	**264**	100.0
Keyboard operators	**413**	100.0
Ships' deck crews and related workers	**835**	100.0
Sales, marketing and development managers	**122**	99.1
Secondary education teachers	**233**	98.4
University and higher education teachers	**231**	98.3
Legal professionals	**261**	98.0
Software and applications developers and analysts	**251**	97.8
Professional services managers	**134**	96.5
Physical and engineering science technicians	**311**	95.8
Administration professionals	**242**	95.3
Database and network professionals	**252**	94.7
Administrative and specialised secretaries	**334**	93.4

Note: Australia and Finland available at 2-digit level only.

Source: OECD, based on PIAAC Database, October 2015.

ANNEX A2. TOP 20 ICT-INTENSIVE OPS OCCUPATIONS BY COUNTRY, 2012

ICT intensity - OPS

Australia

	ISCO	
Health professionals	22	81.6
Teaching professionals	23	80.6
Business and administration professionals	24	78.2
Information and communications technology professionals	25	75.1
Legal, social and cultural professionals	26	74.0
Science and engineering associate professionals	31	71.9
Health associate professionals	32	68.6
Business and administration associate professionals	33	68.4
Legal, social, cultural and related associate professionals	34	68.2
Information and communications technicians	35	66.7
General and keyboard clerks	41	64.2
Customer services clerks	42	63.2
Numerical and material recording clerks	43	62.3
Other clerical support workers	44	56.5
Personal service workers	51	42.8
Sales workers	52	41.8
Personal care workers	53	41.4
Protective services workers	54	38.8
Market-oriented skilled agricultural workers	61	35.6
Market-oriented skilled forestry, fishery and hunting workers	62	34.1

Austria

	ISCO	
Mathematicians, actuaries and statisticians	212	100.0
Veterinarians	225	100.0
Ship and aircraft controllers and technicians	315	100.0
Business services and administration managers	121	86.0
Electrotechnology engineers	215	84.9
Regulatory government associate professionals	335	84.0
Sales, marketing and development managers	122	80.3
Authors, journalists and linguists	264	79.7
Finance professionals	241	78.2
Financial and mathematical associate professionals	331	76.7
Database and network professionals	252	75.9
Social and religious professionals	263	74.9
Secretaries (general)	412	74.0
Legal professionals	261	73.4
Information and communications technology operations and user support technicians	351	73.3
Life science professionals	213	73.0
University and higher education teachers	231	71.6
Administration professionals	242	70.0
Manufacturing, mining, construction, and distribution managers	132	69.9
Administrative and specialised secretaries	334	69.8

Canada

	ISCO	
Mathematicians, actuaries and statisticians	212	100.0
Authors, journalists and linguists	264	90.2
Sales, marketing and public relations professionals	243	83.8
Sales, marketing and development managers	122	82.6
Business services and administration managers	121	81.6
Administration professionals	242	81.2
Finance professionals	241	81.2
Information and communications technology service managers	133	80.8
Engineering professionals (excluding electrotechnology)	214	79.1
Numerical clerks	431	77.2
Administrative and specialised secretaries	334	76.6
Professional services managers	134	76.5
Physical and earth science professionals	211	76.5
Managing directors and chief executives	112	76.2
University and higher education teachers	231	75.5
Database and network professionals	252	75.2
Legislators and senior officials	111	74.7
Electrotechnology engineers	215	74.6
Legal professionals	261	73.0
Regulatory government associate professionals	335	72.5

Czech Republic

	ISCO	
Legislators and senior officials	111	100.0
Mathematicians, actuaries and statisticians	212	100.0
Electrotechnology engineers	215	100.0
Veterinarians	225	100.0
Database and network professionals	252	100.0
Social and religious professionals	263	99.0
Professional services managers	134	94.9
Information and communications technology service managers	133	92.3
Business services and administration managers	121	88.5
Administrative and specialised secretaries	334	88.2
Paramedical practitioners	224	87.1
Legal professionals	261	86.6
Physical and earth science professionals	211	85.0
Business services agents	333	81.3
Secretaries (general)	412	80.6
Ship and aircraft controllers and technicians	315	80.4
Sales, marketing and development managers	122	78.8
Finance professionals	241	78.7
Administration professionals	242	75.7
General office clerks	411	75.7

ICT intensity - OPS

Denmark

	ISCO	
Production managers in agriculture, forestry and fisheries	**131**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Street and market salespersons	**521**	100.0
Legal professionals	**261**	96.4
Information and communications technology service managers	**133**	91.9
Secondary education teachers	**233**	88.7
Regulatory government associate professionals	**335**	87.8
University and higher education teachers	**231**	87.7
Managing directors and chief executives	**112**	87.2
Finance professionals	**241**	85.8
Administration professionals	**242**	85.0
Authors, journalists and linguists	**264**	84.7
Business services and administration managers	**121**	84.1
Professional services managers	**134**	81.6
Administrative and specialised secretaries	**334**	80.9
Database and network professionals	**252**	80.7
Business services agents	**333**	79.6
Sales, marketing and public relations professionals	**243**	79.5
Keyboard operators	**413**	79.4
Numerical clerks	**431**	79.4

Estonia

	ISCO	
Mathematicians, actuaries and statisticians	**212**	100.0
Legal professionals	**261**	90.6
Professional services managers	**134**	82.4
Authors, journalists and linguists	**264**	80.9
Legislators and senior officials	**111**	80.6
Sales, marketing and public relations professionals	**243**	79.5
Administration professionals	**242**	78.5
Sales, marketing and development managers	**122**	77.3
Physical and earth science professionals	**211**	75.2
Business services and administration managers	**121**	71.1
Physical and engineering science technicians	**311**	69.2
Keyboard operators	**413**	68.3
Finance professionals	**241**	66.8
Administrative and specialised secretaries	**334**	65.7
Social and religious professionals	**263**	61.5
Numerical clerks	**431**	61.2
Database and network professionals	**252**	58.6
University and higher education teachers	**231**	57.5
Life science technicians and related associate professionals	**314**	57.0
Financial and mathematical associate professionals	**331**	56.6

Finland

	ISCO	
Production and specialised services managers	**13**	74.4
Hospitality, retail and other services managers	**14**	65.2
Science and engineering professionals	**21**	57.8
Health professionals	**22**	56.7
Teaching professionals	**23**	56.4
Business and administration professionals	**24**	53.8
Information and communications technology professionals	**25**	53.8
Legal, social and cultural professionals	**26**	52.3
Science and engineering associate professionals	**31**	51.8
Health associate professionals	**32**	51.3
Business and administration associate professionals	**33**	50.1
Legal, social, cultural and related associate professionals	**34**	47.0
Information and communications technicians	**35**	44.2
General and keyboard clerks	**41**	43.0
Customer services clerks	**42**	41.8
Numerical and material recording clerks	**43**	31.0
Other clerical support workers	**44**	30.8
Personal service workers	**51**	26.7
Sales workers	**52**	22.9
Personal care workers	**53**	19.3

France

	ISCO	
Production managers in agriculture, forestry and fisheries	**131**	100.0
Keyboard operators	**413**	100.0
Electrotechnology engineers	**215**	90.2
Sales, marketing and development managers	**122**	88.8
Finance professionals	**241**	85.9
Business services and administration managers	**121**	85.7
University and higher education teachers	**231**	85.6
Legal professionals	**261**	85.2
Engineering professionals (excluding electrotechnology)	**214**	81.2
Life science professionals	**213**	80.5
Administrative and specialised secretaries	**334**	80.1
Manufacturing, mining, construction, and distribution managers	**132**	80.0
Authors, journalists and linguists	**264**	78.5
Database and network professionals	**252**	76.7
Financial and mathematical associate professionals	**331**	75.6
Administration professionals	**242**	74.8
Information and communications technology service managers	**133**	74.1
Numerical clerks	**431**	73.4
Vocational education teachers	**232**	73.1
Legislators and senior officials	**111**	72.8

Germany

	ISCO	
Finance professionals	**241**	92.3
Sales, marketing and development managers	**122**	88.5
Legal professionals	**261**	86.4
Administrative and specialised secretaries	**334**	85.9
Secretaries (general)	**412**	85.2
Business services and administration managers	**121**	83.3
Engineering professionals (excluding electrotechnology)	**214**	80.5
Regulatory government associate professionals	**335**	79.9
Professional services managers	**134**	79.4
Financial and mathematical associate professionals	**331**	78.9
Manufacturing, mining, construction, and distribution managers	**132**	78.9
Process control technicians	**313**	77.7
Numerical clerks	**431**	75.5
Authors, journalists and linguists	**264**	75.4
Information and communications technology operations and user support technicians	**351**	75.0
Social and religious professionals	**263**	74.8
General office clerks	**411**	74.5
Business services agents	**333**	73.8
Medical doctors	**221**	73.2
Sales, marketing and public relations professionals	**243**	72.3

Ireland

	ISCO	
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Business services agents	**333**	100.0
General office clerks	**411**	97.3
Sales, marketing and development managers	**122**	95.7
Financial and mathematical associate professionals	**331**	95.2
Business services and administration managers	**121**	93.1
Vocational education teachers	**232**	92.9
Finance professionals	**241**	90.7
Information and communications technology service managers	**133**	87.8
University and higher education teachers	**231**	86.4
Administration professionals	**242**	85.5
Managing directors and chief executives	**112**	81.9
Secretaries (general)	**412**	80.6
Numerical clerks	**431**	79.6
Legal, social and religious associate professionals	**341**	79.6
Administrative and specialised secretaries	**334**	78.0
Information and communications technology operations and user support technicians	**351**	76.7
Other clerical support workers	**441**	76.2
Engineering professionals (excluding electrotechnology)	**214**	74.8

ICT intensity - OPS

Italy

	ISCO	
Sales, marketing and development managers	**122**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Librarians, archivists and curators	**262**	100.0
Ship and aircraft controllers and technicians	**315**	100.0
Finance professionals	**241**	93.3
Authors, journalists and linguists	**264**	93.2
Legal professionals	**261**	89.4
University and higher education teachers	**231**	89.1
Financial and mathematical associate professionals	**331**	84.1
Business services agents	**333**	82.4
Engineering professionals (excluding electrotechnology)	**214**	82.2
Software and applications developers and analysts	**251**	81.6
Physical and earth science professionals	**211**	80.3
Sales, marketing and public relations professionals	**243**	80.0
Legal, social and religious associate professionals	**341**	78.5
Administrative and specialised secretaries	**334**	77.7
Administration professionals	**242**	75.4
Sales and purchasing agents and brokers	**332**	75.3
Veterinarians	**225**	75.3
Telecommunications and broadcasting technicians	**352**	74.3

Japan

	ISCO	
Retail and wholesale trade managers	**142**	100.0
Physical and earth science professionals	**211**	100.0
Life science professionals	**213**	100.0
Electrotechnology engineers	**215**	100.0
Legal professionals	**261**	86.9
Information and communications technology service managers	**133**	85.8
University and higher education teachers	**231**	85.5
Manufacturing, mining, construction, and distribution managers	**132**	81.9
Veterinary technicians and assistants	**324**	77.7
Software and applications developers and analysts	**251**	74.0
Business services and administration managers	**121**	70.3
Other services managers	**143**	69.4
Administration professionals	**242**	68.1
Finance professionals	**241**	67.4
Professional services managers	**134**	67.2
Information and communications technology operations and user support technicians	**351**	66.6
Engineering professionals (excluding electrotechnology)	**214**	65.0
Authors, journalists and linguists	**264**	64.7
Life science technicians and related associate professionals	**314**	63.7
Sales, marketing and development managers	**122**	62.6

Netherlands

	ISCO	
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Veterinarians	**225**	100.0
Ships' deck crews and related workers	**835**	100.0
Legal professionals	**261**	95.4
Finance professionals	**241**	92.2
Sales, marketing and development managers	**122**	90.0
Administration professionals	**242**	88.8
Financial and mathematical associate professionals	**331**	86.9
Administrative and specialised secretaries	**334**	86.3
Secretaries (general)	**412**	85.5
Legislators and senior officials	**111**	84.6
Information and communications technology service managers	**133**	81.8
Business services and administration managers	**121**	81.5
Database and network professionals	**252**	80.9
University and higher education teachers	**231**	80.8
Social and religious professionals	**263**	80.8
Physical and engineering science technicians	**311**	79.8
Numerical clerks	**431**	79.4
Regulatory government associate professionals	**335**	78.3

Norway

	ISCO	
Physical and earth science professionals	**211**	100.0
Database and network professionals	**252**	100.0
Librarians, archivists and curators	**262**	100.0
Food processing and related trades workers	**751**	100.0
University and higher education teachers	**231**	92.3
Business services and administration managers	**121**	83.9
Social and religious professionals	**263**	83.6
Legal professionals	**261**	82.7
Sales, marketing and development managers	**122**	82.1
Finance professionals	**241**	81.0
Authors, journalists and linguists	**264**	79.7
Professional services managers	**134**	76.9
Vocational education teachers	**232**	76.2
Administrative and specialised secretaries	**334**	74.8
Information and communications technology service managers	**133**	72.7
Administration professionals	**242**	71.1
Sales and purchasing agents and brokers	**332**	70.6
Engineering professionals (excluding electrotechnology)	**214**	69.5
Business services agents	**333**	68.3
Medical doctors	**221**	65.3

Poland

	ISCO	
Legislators and senior officials	**111**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Legal professionals	**261**	90.5
Administration professionals	**242**	84.6
Professional services managers	**134**	84.0
Keyboard operators	**413**	83.6
Social and religious professionals	**263**	83.5
University and higher education teachers	**231**	81.3
Engineering professionals (excluding electrotechnology)	**214**	77.7
Sales, marketing and public relations professionals	**243**	77.4
Regulatory government associate professionals	**335**	76.8
Information and communications technology operations and user support technicians	**351**	75.5
Financial and mathematical associate professionals	**331**	73.7
Legal, social and religious associate professionals	**341**	72.9
Business services and administration managers	**121**	72.8
Sales, marketing and development managers	**122**	71.9
Authors, journalists and linguists	**264**	71.7
Business services agents	**333**	69.7
Finance professionals	**241**	67.3

Slovak Republic

	ISCO	
Mathematicians, actuaries and statisticians	**212**	100.0
Veterinarians	**225**	100.0
University and higher education teachers	**231**	100.0
Administration professionals	**242**	100.0
Legal, social and religious associate professionals	**341**	100.0
Keyboard operators	**413**	94.0
Secretaries (general)	**412**	85.9
Physical and earth science professionals	**211**	85.9
Business services agents	**333**	84.4
Legal professionals	**261**	84.2
Information and communications technology operations and user support technicians	**351**	81.8
Librarians, archivists and curators	**262**	81.3
Database and network professionals	**252**	79.5
Finance professionals	**241**	79.3
Numerical clerks	**431**	77.7
Administrative and specialised secretaries	**334**	74.4
General office clerks	**411**	72.0
Regulatory government associate professionals	**335**	71.3
Electrotechnology engineers	**215**	68.2
Sales and purchasing agents and brokers	**332**	68.1

ICT intensity - OPS

Spain

	ISCO	
Business services and administration managers	**121**	100.0
Information and communications technology service managers	**133**	100.0
Physical and earth science professionals	**211**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Veterinarians	**225**	100.0
Life science technicians and related associate professionals	**314**	100.0
Telecommunications and broadcasting technicians	**352**	100.0
Secretaries (general)	**412**	91.3
Finance professionals	**241**	91.3
Legislators and senior officials	**111**	90.8
Authors, journalists and linguists	**264**	90.7
Life science professionals	**213**	90.3
Administration professionals	**242**	86.9
Legal professionals	**261**	84.9
Information and communications technology operations and user	**351**	84.5
Numerical clerks	**431**	84.3
Regulatory government associate professionals	**335**	82.6
Engineering professionals (excluding electrotechnology)	**214**	82.5
Legal, social and religious associate professionals	**341**	80.8
Managing directors and chief executives	**112**	80.2

Sweden

	ISCO	
Information and communications technology service managers	**133**	100.0
Mathematicians, actuaries and statisticians	**212**	100.0
Legal professionals	**261**	94.8
Finance professionals	**241**	88.3
Administration professionals	**242**	81.6
Sales, marketing and development managers	**122**	79.9
Business services and administration managers	**121**	79.1
Secretaries (general)	**412**	78.8
Librarians, archivists and curators	**262**	76.1
Social and religious professionals	**263**	75.5
Database and network professionals	**252**	74.6
Electrotechnology engineers	**215**	73.3
Administrative and specialised secretaries	**334**	71.8
University and higher education teachers	**231**	69.7
Managing directors and chief executives	**112**	69.3
Physical and engineering science technicians	**311**	69.1
Manufacturing, mining, construction, and distribution managers	**132**	68.9
Vocational education teachers	**232**	67.9
Engineering professionals (excluding electrotechnology)	**214**	67.2
Physical and earth science professionals	**211**	66.6

England/N. Ireland (UK)

	ISCO	
Process control technicians	**313**	100.0
Ship and aircraft controllers and technicians	**315**	100.0
Administrative and specialised secretaries	**334**	100.0
Legal professionals	**261**	95.9
Authors, journalists and linguists	**264**	95.5
Finance professionals	**241**	94.0
Business services agents	**333**	91.2
Librarians, archivists and curators	**262**	90.1
Regulatory government associate professionals	**335**	89.0
Physical and earth science professionals	**211**	88.8
Sales, marketing and development managers	**122**	86.9
Keyboard operators	**413**	86.9
Information and communications technology service managers	**133**	85.7
Secretaries (general)	**412**	85.7
Information and communications technology operations and user	**351**	84.8
Database and network professionals	**252**	83.9
Numerical clerks	**431**	83.8
Administration professionals	**242**	81.9
Business services and administration managers	**121**	80.7
Financial and mathematical associate professionals	**331**	78.8

United States

	ISCO	
Ships' deck crews and related workers	**835**	100.0
Veterinary technicians and assistants	**324**	89.2
Information and communications technology service managers	**133**	82.9
Administration professionals	**242**	82.2
University and higher education teachers	**231**	81.6
Legislators and senior officials	**111**	80.9
Sales, marketing and public relations professionals	**243**	78.9
Finance professionals	**241**	78.7
Authors, journalists and linguists	**264**	78.7
Sales, marketing and development managers	**122**	75.6
Social and religious professionals	**263**	75.5
Legal professionals	**261**	74.1
Business services and administration managers	**121**	73.8
Engineering professionals (excluding electrotechnology)	**214**	73.6
Information and communications technology operations and user support technicians	**351**	73.4
Secondary education teachers	**233**	73.3
Regulatory government associate professionals	**335**	72.7
Professional services managers	**134**	72.5
Secretaries (general)	**412**	72.0
Life science professionals	**213**	71.8

Note: Australia and Finland available at 2-digit level only.

Source: OECD, based on PIAAC Database, October 2015.

ANNEX B. TOP 20 ICT SPECIALIST-INTENSIVE OCCUPATIONS BY COUNTRY, 2012

ICT specialist intensity

Australia

	ISCO	
Information and communications technology professionals	**25**	48.1
Information and communications technicians	**35**	32.8
Science and engineering professionals	**21**	6.6
General and keyboard clerks	**41**	5.2
Legal, social, cultural and related associate professionals	**34**	5.2
Business and administration associate professionals	**33**	3.4
Metal, machinery and related trades workers	**72**	3.3
Electrical and electronic trades workers	**74**	2.9
Administrative and commercial managers	**12**	2.4
Chief executives, senior officials and legislators	**11**	2.1
Customer services clerks	**42**	1.9
Production and specialised services managers	**13**	1.8
Business and administration professionals	**24**	1.7
Legal, social and cultural professionals	**26**	1.5
Hospitality, retail and other services managers	**14**	1.3
Personal care workers	**53**	1.2
Sales workers	**52**	1.0
Drivers and mobile plant operators	**83**	0.9
Teaching professionals	**23**	0.9
Numerical and material recording clerks	**43**	0.9

Austria

	ISCO	
Software and applications developers and analysts	**251**	64.6
Database and network professionals	**252**	36.0
University and higher education teachers	**231**	26.9
Handicraft workers	**731**	17.9
Information and communications technology operations and user support technicians	**351**	15.3
Physical and earth science professionals	**211**	13.7
Blacksmiths, toolmakers and related trades workers	**722**	9.8
Electrotechnology engineers	**215**	8.4
Telecommunications and broadcasting technicians	**352**	7.6
Physical and engineering science technicians	**311**	5.9
Sales, marketing and public relations professionals	**243**	5.5
Cashiers and ticket clerks	**523**	4.7
Professional services managers	**134**	4.4
Sheet and structural metal workers, moulders and welders, and related workers	**721**	4.2
Medical doctors	**221**	4.0
Manufacturing, mining, construction, and distribution managers	**132**	3.7
Electrical equipment installers and repairers	**741**	3.7
Creative and performing artists	**265**	3.5
Hotel and restaurant managers	**141**	3.3
Protective services workers	**541**	3.2

Canada

	ISCO	
Software and applications developers and analysts	**251**	57.7
Mathematicians, actuaries and statisticians	**212**	37.8
Database and network professionals	**252**	30.2
Electrotechnology engineers	**215**	26.0
Architects, planners, surveyors and designers	**216**	14.8
Information and communications technology service managers	**133**	14.3
Blacksmiths, toolmakers and related trades workers	**722**	14.3
University and higher education teachers	**231**	12.3
Chemical and photographic products plant and machine operators	**813**	10.3
Managing directors and chief executives	**112**	7.9
Authors, journalists and linguists	**264**	7.3
Information and communications technology operations and user	**351**	7.2
Librarians, archivists and curators	**262**	6.7
Physical and earth science professionals	**211**	6.4
Physical and engineering science technicians	**311**	6.2
General office clerks	**411**	5.8
Client information workers	**422**	5.6
Finance professionals	**241**	5.6
Vocational education teachers	**232**	4.6
Sales, marketing and public relations professionals	**243**	4.1

Czech Republic

	ISCO	
Software and applications developers and analysts	**251**	83.5
Other health associate professionals	**325**	31.8
Electronics and telecommunications installers and repairers	**742**	29.5
Legislators and senior officials	**111**	24.5
Information and communications technology operations and user support technicians	**351**	24.1
Blacksmiths, toolmakers and related trades workers	**722**	13.8
Engineering professionals (excluding electrotechnology)	**214**	11.7
Administrative and specialised secretaries	**334**	10.2
Retail and wholesale trade managers	**142**	9.9
Information and communications technology service managers	**133**	9.0
Metal processing and finishing plant operators	**812**	7.1
Business services and administration managers	**121**	5.8
Sales, marketing and development managers	**122**	5.7
Travel attendants, conductors and guides	**511**	5.3
Authors, journalists and linguists	**264**	5.1
Architects, planners, surveyors and designers	**216**	4.0
Machinery mechanics and repairers	**723**	3.8
Professional services managers	**134**	3.5
University and higher education teachers	**231**	3.1
Other craft and related workers	**754**	2.5

ICT specialist intensity

Denmark

	ISCO	
Mathematicians, actuaries and statisticians	**212**	59.5
Software and applications developers and analysts	**251**	47.0
Information and communications technology operations and user	**351**	27.1
Metal processing and finishing plant operators	**812**	26.3
Telecommunications and broadcasting technicians	**352**	22.0
Handicraft workers	**731**	21.7
Database and network professionals	**252**	20.4
Sheet and structural metal workers, moulders and welders, and related workers	**721**	12.2
Assemblers	**821**	12.1
Engineering professionals (excluding electrotechnology)	**214**	11.8
Electrotechnology engineers	**215**	11.1
Car, van and motorcycle drivers	**832**	11.0
Tellers, money collectors and related clerks	**421**	10.8
University and higher education teachers	**231**	10.7
Other services managers	**143**	9.5
Process control technicians	**313**	9.3
Vocational education teachers	**232**	8.4
Sales, marketing and public relations professionals	**243**	7.8
Material-recording and transport clerks	**432**	6.8
Machinery mechanics and repairers	**723**	6.7

Estonia

	ISCO	
Software and applications developers and analysts	**251**	55.8
Database and network professionals	**252**	28.9
Physical and earth science professionals	**211**	22.5
Mathematicians, actuaries and statisticians	**212**	17.0
Information and communications technology service managers	**133**	14.5
Metal processing and finishing plant operators	**812**	14.2
Information and communications technology operations and user support technicians	**351**	11.2
Electrotechnology engineers	**215**	10.5
Production managers in agriculture, forestry and fisheries	**131**	7.5
University and higher education teachers	**231**	7.1
Blacksmiths, toolmakers and related trades workers	**722**	4.1
Hotel and restaurant managers	**141**	4.0
Telecommunications and broadcasting technicians	**352**	3.7
Retail and wholesale trade managers	**142**	3.6
Administrative and specialised secretaries	**334**	3.4
Creative and performing artists	**265**	3.0
Business services and administration managers	**121**	2.8
Other health professionals	**226**	2.8
Finance professionals	**241**	2.0
Client information workers	**422**	1.8

Finland

	ISCO	
Information and communications technology professionals	**25**	38.5
Information and communications technicians	**35**	29.0
Science and engineering professionals	**21**	11.8
Metal, machinery and related trades workers	**72**	3.7
Electrical and electronic trades workers	**74**	3.5
Chief executives, senior officials and legislators	**11**	2.6
Other clerical support workers	**44**	2.4
Science and engineering associate professionals	**31**	2.3
Numerical and material recording clerks	**43**	2.1
Production and specialised services managers	**13**	1.8
Food processing, wood working, garment and other craft and related trades workers	**75**	1.8
Customer services clerks	**42**	1.2
Stationary plant and machine operators	**81**	1.1
Teaching professionals	**23**	0.9
General and keyboard clerks	**41**	0.9
Health associate professionals	**32**	0.7
Business and administration professionals	**24**	0.6
Personal care workers	**53**	0.4
Business and administration associate professionals	**33**	0.4
Sales workers	**52**	0.3

France

	ISCO	
Keyboard operators	**413**	100.0
Software and applications developers and analysts	**251**	62.7
Information and communications technology operations and user support technicians	**351**	56.2
Database and network professionals	**252**	55.2
Information and communications technology service managers	**133**	38.9
Rubber, plastic and paper products machine operators	**814**	24.0
Wood processing and papermaking plant operators	**817**	22.9
Locomotive engine drivers and related workers	**831**	18.4
Electronics and telecommunications installers and repairers	**742**	17.6
Telecommunications and broadcasting technicians	**352**	16.9
Tellers, money collectors and related clerks	**421**	15.9
Engineering professionals (excluding electrotechnology)	**214**	14.9
University and higher education teachers	**231**	14.6
Printing trades workers	**732**	13.1
Manufacturing, mining, construction, and distribution managers	**132**	13.1
Medical and pharmaceutical technicians	**321**	11.9
Sales, marketing and public relations professionals	**243**	11.9
Textile, fur and leather products machine operators	**815**	11.8
Administrative and specialised secretaries	**334**	10.6
Business services and administration managers	**121**	10.4

Germany

	ISCO	
Software and applications developers and analysts	**251**	71.3
Physical and earth science professionals	**211**	56.9
Information and communications technology operations and user	**351**	34.5
Blacksmiths, toolmakers and related trades workers	**722**	30.4
Vocational education teachers	**232**	24.3
Electrotechnology engineers	**215**	23.5
Telecommunications and broadcasting technicians	**352**	15.5
University and higher education teachers	**231**	14.0
Metal processing and finishing plant operators	**812**	13.2
Keyboard operators	**413**	12.8
Printing trades workers	**732**	12.2
Information and communications technology service managers	**133**	10.4
Physical and engineering science technicians	**311**	8.9
Architects, planners, surveyors and designers	**216**	7.5
Mining, manufacturing and construction supervisors	**312**	7.2
Database and network professionals	**252**	6.3
Rubber, plastic and paper products machine operators	**814**	6.1
Electronics and telecommunications installers and repairers	**742**	5.9
Other craft and related workers	**754**	5.3
Client information workers	**422**	5.3

Ireland

	ISCO	
Printing trades workers	**732**	24.3
Information and communications technology operations and user support technicians	**351**	23.2
Electronics and telecommunications installers and repairers	**742**	15.1
Sales, marketing and development managers	**122**	12.1
Information and communications technology service managers	**133**	10.6
Sales and purchasing agents and brokers	**332**	10.0
Vocational education teachers	**232**	9.9
Retail and wholesale trade managers	**142**	9.8
Handicraft workers	**731**	8.0
Medical doctors	**221**	7.9
Electrotechnology engineers	**215**	7.2
Legal, social and religious associate professionals	**341**	6.3
Finance professionals	**241**	4.6
Engineering professionals (excluding electrotechnology)	**214**	4.1
Mining and construction labourers	**931**	4.1
Tellers, money collectors and related clerks	**421**	4.0
Administration professionals	**242**	3.3
Business services and administration managers	**121**	3.0
Architects, planners, surveyors and designers	**216**	2.8
Machinery mechanics and repairers	**723**	2.7

ICT specialist intensity

Italy

	ISCO	
Software and applications developers and analysts	**251**	80.9
Process control technicians	**313**	27.5
Printing trades workers	**732**	23.7
Information and communications technology operations and user support technicians	**351**	22.2
Electrotechnology engineers	**215**	20.9
Database and network professionals	**252**	13.9
Sales, marketing and public relations professionals	**243**	12.9
Physical and earth science professionals	**211**	11.5
Vocational education teachers	**232**	10.2
Authors, journalists and linguists	**264**	10.0
Administration professionals	**242**	9.2
Architects, planners, surveyors and designers	**216**	7.7
Manufacturing, mining, construction, and distribution managers	**132**	7.5
Engineering professionals (excluding electrotechnology)	**214**	6.6
Tellers, money collectors and related clerks	**421**	6.5
Sales and purchasing agents and brokers	**332**	6.2
Legal professionals	**261**	5.8
Financial and mathematical associate professionals	**331**	5.5
Secondary education teachers	**233**	4.8
General office clerks	**411**	4.0

Japan

	ISCO	
Software and applications developers and analysts	**251**	57.0
Database and network professionals	**252**	45.9
Legislators and senior officials	**111**	44.7
Financial and mathematical associate professionals	**331**	33.1
Information and communications technology service managers	**133**	24.3
University and higher education teachers	**231**	15.5
Life science technicians and related associate professionals	**314**	13.1
Engineering professionals (excluding electrotechnology)	**214**	12.5
Sales, marketing and public relations professionals	**243**	12.2
Printing trades workers	**732**	12.1
Architects, planners, surveyors and designers	**216**	11.7
Information and communications technology operations and user support technicians	**351**	10.4
Handicraft workers	**731**	7.8
Physical and engineering science technicians	**311**	7.4
Regulatory government associate professionals	**335**	5.7
Other stationary plant and machine operators	**818**	4.9
Manufacturing, mining, construction, and distribution managers	**132**	4.8
Metal processing and finishing plant operators	**812**	4.3
Assemblers	**821**	4.1
Business services and administration managers	**121**	3.8

Netherlands

	ISCO	
Software and applications developers and analysts	**251**	57.3
Electrotechnology engineers	**215**	26.5
Database and network professionals	**252**	25.3
Engineering professionals (excluding electrotechnology)	**214**	18.4
Information and communications technology service managers	**133**	18.0
Electronics and telecommunications installers and repairers	**742**	17.8
Architects, planners, surveyors and designers	**216**	16.4
Ship and aircraft controllers and technicians	**315**	14.9
Artistic, cultural and culinary associate professionals	**343**	13.6
Blacksmiths, toolmakers and related trades workers	**722**	12.0
Information and communications technology operations and user	**351**	11.3
Wood treaters, cabinet-makers and related trades workers	**752**	11.1
Life science professionals	**213**	9.8
Process control technicians	**313**	9.0
Medical and pharmaceutical technicians	**321**	7.9
Business services and administration managers	**121**	6.6
Other services managers	**143**	6.3
Retail and wholesale trade managers	**142**	5.6
Managing directors and chief executives	**112**	5.1
Administration professionals	**242**	4.3

Norway

	ISCO	
Software and applications developers and analysts	**251**	60.1
Mining, manufacturing and construction supervisors	**312**	38.6
Life science professionals	**213**	32.1
Metal processing and finishing plant operators	**812**	21.1
Information and communications technology operations and user support technicians	**351**	18.3
Information and communications technology service managers	**133**	16.3
Business services agents	**333**	12.4
Regulatory government associate professionals	**335**	11.7
Client information workers	**422**	10.5
Chemical and photographic products plant and machine operators	**813**	9.4
Physical and engineering science technicians	**311**	6.8
Other elementary workers	**962**	5.7
Retail and wholesale trade managers	**142**	5.6
Food and related products machine operators	**816**	4.8
Manufacturing, mining, construction, and distribution managers	**132**	4.3
Car, van and motorcycle drivers	**832**	3.6
Machinery mechanics and repairers	**723**	3.4
University and higher education teachers	**231**	3.1
Waiters and bartenders	**513**	3.0
Engineering professionals (excluding electrotechnology)	**214**	2.9

Poland

	ISCO	
Mathematicians, actuaries and statisticians	**212**	100.0
Software and applications developers and analysts	**251**	59.4
Information and communications technology service managers	**133**	29.5
Information and communications technology operations and user support technicians	**351**	29.3
Other craft and related workers	**754**	21.1
Business services agents	**333**	11.8
Vocational education teachers	**232**	10.6
University and higher education teachers	**231**	10.2
Client information workers	**422**	9.5
Database and network professionals	**252**	8.9
Sales, marketing and development managers	**122**	7.6
Keyboard operators	**413**	7.5
Blacksmiths, toolmakers and related trades workers	**722**	6.8
Other sales workers	**524**	6.4
Engineering professionals (excluding electrotechnology)	**214**	5.5
General office clerks	**411**	5.1
Sales and purchasing agents and brokers	**332**	5.1
Manufacturing, mining, construction, and distribution managers	**132**	4.5
Rubber, plastic and paper products machine operators	**814**	4.1
Machinery mechanics and repairers	**723**	3.0

Slovak Republic

	ISCO	
Software and applications developers and analysts	**251**	55.9
Information and communications technology operations and user support technicians	**351**	20.7
Database and network professionals	**252**	17.9
University and higher education teachers	**231**	17.8
Engineering professionals (excluding electrotechnology)	**214**	16.3
Physical and earth science professionals	**211**	14.1
Information and communications technology service managers	**133**	12.4
Secondary education teachers	**233**	11.6
Electrotechnology engineers	**215**	8.6
Tellers, money collectors and related clerks	**421**	8.2
Legislators and senior officials	**111**	8.0
Administrative and specialised secretaries	**334**	7.4
Managing directors and chief executives	**112**	5.4
Machinery mechanics and repairers	**723**	5.2
Metal processing and finishing plant operators	**812**	4.4
Mining, manufacturing and construction supervisors	**312**	3.9
Other clerical support workers	**441**	3.8
Business services agents	**333**	3.6
Financial and mathematical associate professionals	**331**	3.4
Other stationary plant and machine operators	**818**	2.9

ICT specialist intensity

Spain

	ISCO	
Software and applications developers and analysts	**251**	86.8
Mathematicians, actuaries and statisticians	**212**	53.7
Engineering professionals (excluding electrotechnology)	**214**	48.5
Information and communications technology operations and user support technicians	**351**	38.4
Handicraft workers	**731**	22.3
Metal processing and finishing plant operators	**812**	16.8
Physical and engineering science technicians	**311**	15.3
Other craft and related workers	**754**	14.9
Printing trades workers	**732**	13.7
Finance professionals	**241**	12.9
Information and communications technology service managers	**133**	12.7
Database and network professionals	**252**	12.1
Tellers, money collectors and related clerks	**421**	10.7
Medical and pharmaceutical technicians	**321**	8.6
Sales, marketing and development managers	**122**	8.0
University and higher education teachers	**231**	6.9
General office clerks	**411**	6.8
Secondary education teachers	**233**	6.2
Medical doctors	**221**	5.9
Sheet and structural metal workers, moulders and welders, and related workers	**721**	5.8

Sweden

	ISCO	
Software and applications developers and analysts	**251**	56.4
Telecommunications and broadcasting technicians	**352**	24.6
Electrotechnology engineers	**215**	19.5
Blacksmiths, toolmakers and related trades workers	**722**	18.6
Handicraft workers	**731**	15.1
Physical and earth science professionals	**211**	14.6
Information and communications technology operations and user support technicians	**351**	11.1
Electronics and telecommunications installers and repairers	**742**	9.4
Life science professionals	**213**	8.5
Vocational education teachers	**232**	7.7
Assemblers	**821**	7.6
University and higher education teachers	**231**	7.3
Physical and engineering science technicians	**311**	5.2
Building finishers and related trades workers	**712**	4.7
Architects, planners, surveyors and designers	**216**	4.4
Professional services managers	**134**	4.1
Finance professionals	**241**	3.7
Building and housekeeping supervisors	**515**	3.2
Other sales workers	**524**	2.5
Secondary education teachers	**233**	2.5

England/N. Ireland (UK)

	ISCO	
Software and applications developers and analysts	**251**	55.7
Information and communications technology operations and user support technicians	**351**	30.2
Information and communications technology service managers	**133**	26.7
Architects, planners, surveyors and designers	**216**	19.0
Electronics and telecommunications installers and repairers	**742**	18.5
Database and network professionals	**252**	16.1
Sales, marketing and public relations professionals	**243**	16.0
Blacksmiths, toolmakers and related trades workers	**722**	15.6
Medical and pharmaceutical technicians	**321**	11.5
Physical and earth science professionals	**211**	9.1
Administration professionals	**242**	8.6
Artistic, cultural and culinary associate professionals	**343**	8.0
Client information workers	**422**	6.9
Business services and administration managers	**121**	6.3
Physical and engineering science technicians	**311**	5.0
University and higher education teachers	**231**	4.3
Manufacturing, mining, construction, and distribution managers	**132**	4.0
Tellers, money collectors and related clerks	**421**	3.5
Life science professionals	**213**	3.4
Financial and mathematical associate professionals	**331**	3.3

United States

	ISCO	
Software and applications developers and analysts	**251**	49.4
Information and communications technology service managers	**133**	40.0
Database and network professionals	**252**	39.3
Information and communications technology operations and user support technicians	**351**	32.2
Vocational education teachers	**232**	16.0
Electrotechnology engineers	**215**	14.5
Blacksmiths, toolmakers and related trades workers	**722**	14.1
Other services managers	**143**	11.0
Tellers, money collectors and related clerks	**421**	10.0
Other craft and related workers	**754**	8.8
General office clerks	**411**	8.5
Other health associate professionals	**325**	7.9
Market gardeners and crop growers	**611**	7.7
Administration professionals	**242**	7.5
Engineering professionals (excluding electrotechnology)	**214**	7.2
Keyboard operators	**413**	6.9
Sheet and structural metal workers, moulders and welders, and related workers	**721**	6.7
Electrical equipment installers and repairers	**741**	5.9
Other clerical support workers	**441**	5.7
Process control technicians	**313**	5.5

Note: Australia and Finland available at 2-digit level only.

Source: OECD, based on PIAAC Database, October 2015.

ANNEX C1. PIAAC-BASED PAIRWISE CORRELATION TABLES AT THE 1-DIGIT ISCO GROUPS (CIS), 2012

ISCO1 Managers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.043	0.210	0.114	0.235	-0.072	0.171	0.224	0.094	0.085	0.196	0.233	0.125	0.248	-0.296	-0.105	0.296	0.424	0.130
Austria	-0.092	0.149	0.110	0.199	0.002	0.288	0.190	0.099	0.081	0.364	0.365	0.207	0.409	-0.483	-0.175	0.415	0.470	0.404
Belgium	0.024	0.237	0.126	0.208	-0.129	0.167	0.124	0.014	0.196	0.146	0.183	0.125	0.238	-0.370	-0.212	0.369	0.385	0.249
Canada	-0.078	0.075	0.097	0.272	-0.117	0.143	0.198	0.125	0.105	0.239	0.225	0.169	0.369	-0.380	-0.135	0.385	0.314	0.295
Cyprus	0.148	0.363	0.239	0.171	-0.076	0.312	0.099	0.188	0.068	0.216	0.201	0.209	0.189	-0.425	-0.178	0.490	0.595	0.238
Czech Republic	0.055	0.110	0.080	0.090	-0.289	0.067	-0.072	0.160	0.320	0.149	0.018	-0.104	0.249	-0.195	-0.042	0.423	0.357	0.173
Denmark	-0.034	-0.011	0.081	0.299	-0.098	0.048	0.094	0.061	-0.050	0.196	0.133	0.119	0.354	-0.160	-0.075	0.421	0.305	0.168
Estonia	0.016	0.174	0.116	0.160	0.032	0.191	0.101	0.118	0.077	0.122	0.139	0.070	0.159	-0.249	-0.003	0.279	0.235	0.225
Finland	-0.106	-0.026	-0.074	0.005	-0.101	0.005	-0.090	-0.072	-0.090	-0.060	-0.064	-0.098	-0.105	-0.406	-0.181	0.003	0.204	0.024
France	-0.130	-0.048	0.044	0.142	-0.100	-0.049	0.141	0.039	0.051	0.051	0.180	0.069	0.198	-0.102	-0.169	0.157	0.161	0.084
Germany	-0.066	-0.054	-0.032	0.085	-0.138	0.034	-0.100	0.016	-0.164	0.104	-0.037	-0.001	0.115	-0.218	-0.171	0.096	0.089	0.123
Ireland	-0.110	0.179	0.077	0.346	-0.035	0.284	0.232	0.203	0.084	0.175	0.200	0.166	0.208	-0.369	0.029	0.420	0.466	0.304
Italy	0.105	0.399	0.331	0.369	-0.040	0.500	0.317	0.371	0.396	0.291	0.514	0.114	0.240	-0.287	-0.211	0.656	0.637	0.499
Japan	0.138	0.168	0.204	0.210	0.129	0.237	0.092	0.132	0.092	0.264	0.318	0.077	0.134	-0.117	0.045	0.239	0.243	0.249
Korea	-0.029	0.134	0.253	0.234	-0.116	0.178	0.132	0.104	0.145	0.273	0.296	-0.008	0.103	-0.207	0.291	0.522	0.461	0.371
Netherlands	-0.033	0.094	0.132	0.313	0.028	0.245	0.263	0.313	0.054	0.141	0.208	0.211	0.305	-0.311	-0.138	0.354	0.368	0.186
Norway	0.195	0.242	0.236	0.166	-0.027	0.091	0.119	-0.059	0.141	0.134	-0.009	0.067	0.166	-0.309	-0.089	0.146	0.193	0.017
Poland	-0.108	0.083	0.169	0.175	-0.046	0.039	0.132	0.146	-0.032	0.163	0.146	0.296	0.263	-0.232	-0.093	0.429	0.357	0.241
Russian Federation	-0.150	0.063	-0.010	0.208	-0.006	-0.030	0.155	0.158	0.135	0.099	0.130	-0.100	0.105	-0.406	-0.188	0.461	0.279	0.264
Slovak Republic	0.051	0.266	0.227	0.256	-0.097	0.229	0.143	0.056	0.175	0.297	0.257	0.145	0.249	-0.512	-0.082	0.462	0.517	0.318
Spain	-0.168	0.284	0.245	0.328	-0.133	0.122	0.021	0.088	0.218	0.311	0.255	0.148	0.232	-0.310	-0.168	0.451	0.482	0.304
Sweden	0.021	0.204	0.221	0.319	0.015	0.291	0.020	0.081	0.082	0.209	0.122	0.144	0.202	-0.163	-0.023	0.163	0.185	0.086
United Kingdom	-0.037	0.220	0.063	0.179	-0.060	0.146	0.126	0.074	0.014	0.140	0.085	0.164	0.215	-0.300	-0.015	0.201	0.275	0.192
United States	-0.021	0.268	0.198	0.270	-0.090	0.210	0.131	0.185	0.232	0.191	0.181	0.229	0.416	-0.366	-0.091	0.360	0.397	0.262

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO2 Professionals	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	-0.046	0.076	0.019	0.144	0.090	-0.016	0.180	0.245	0.037	0.065	0.030	0.079	0.163	-0.210	0.040	0.264	0.157	0.164
Austria	-0.006	0.070	0.005	-0.042	0.154	0.162	0.087	0.246	0.092	0.043	0.230	0.087	0.284	-0.322	-0.182	0.322	0.316	0.351
Belgium	-0.081	0.109	-0.033	0.117	0.089	0.113	0.157	0.126	0.142	0.101	0.119	0.046	0.233	-0.341	-0.215	0.353	0.237	0.164
Canada	-0.038	0.147	-0.030	0.109	0.104	0.076	0.175	0.214	-0.021	0.044	0.122	0.103	0.290	-0.307	-0.043	0.293	0.266	0.228
Cyprus	0.016	0.100	0.042	0.066	0.095	0.035	0.029	0.072	0.140	0.124	0.182	0.129	0.243	-0.226	-0.044	0.474	0.246	0.221
Czech Republic	-0.090	0.115	-0.079	-0.011	0.142	-0.132	0.012	0.025	0.031	-0.033	0.169	-0.007	0.317	-0.322	-0.162	0.310	0.289	0.262
Denmark	-0.109	0.104	0.062	0.142	0.137	0.162	0.219	0.268	0.092	0.106	0.165	0.090	0.236	-0.350	-0.123	0.418	0.308	0.308
Estonia	-0.009	0.154	0.075	0.050	0.065	0.112	0.195	0.238	0.071	0.054	0.129	0.154	0.252	-0.149	-0.051	0.301	0.231	0.226
Finland	-0.067	0.090	0.012	0.134	0.109	0.130	0.089	0.166	0.060	0.083	0.128	0.049	0.121	-0.285	-0.183	0.252	0.301	0.198
France	0.030	0.193	-0.086	-0.048	0.078	-0.003	0.115	0.142	0.012	0.098	0.121	0.072	0.168	-0.256	-0.272	0.238	0.226	0.205
Germany	0.079	0.165	-0.178	-0.117	0.094	0.094	0.055	0.270	0.046	0.053	0.218	0.025	0.307	-0.168	-0.135	0.258	0.249	0.307
Ireland	-0.014	0.100	0.011	0.163	0.104	0.073	0.256	0.247	0.036	0.043	0.138	0.174	0.285	-0.302	-0.137	0.304	0.251	0.254
Italy	0.042	0.115	-0.172	-0.173	0.256	0.123	0.190	0.225	0.121	0.163	0.458	0.206	0.383	-0.241	-0.050	0.407	0.413	0.356
Japan	-0.174	0.075	0.118	0.175	0.176	0.032	0.077	0.160	0.130	0.063	0.300	0.125	0.245	-0.268	-0.089	0.398	0.267	0.340
Korea	0.042	0.262	0.026	0.123	0.015	0.156	0.158	0.209	0.151	0.212	0.298	0.187	0.382	-0.063	0.174	0.413	0.410	0.225
Netherlands	-0.080	0.171	0.061	0.176	0.054	0.149	0.203	0.181	0.101	0.147	0.174	0.268	0.331	-0.217	-0.091	0.396	0.298	0.151
Norway	-0.136	0.098	0.046	0.086	0.033	0.046	0.216	0.237	0.000	0.070	0.093	0.058	0.233	-0.274	-0.159	0.303	0.216	0.178
Poland	0.062	0.102	-0.055	-0.085	0.160	0.036	0.175	0.150	0.078	0.003	0.297	0.073	0.274	-0.228	-0.031	0.295	0.200	0.300
Russian Federation	0.030	0.121	0.070	0.113	0.082	0.028	0.131	0.099	0.130	0.077	0.205	0.055	0.164	-0.207	-0.148	0.415	0.363	0.291
Slovak Republic	0.140	0.082	-0.145	-0.126	0.106	0.127	0.137	0.195	0.016	0.084	0.241	0.139	0.325	-0.195	0.031	0.360	0.380	0.349
Spain	0.005	0.135	-0.121	0.011	0.128	0.153	0.096	0.101	0.055	0.009	0.172	0.089	0.193	-0.147	-0.125	0.264	0.263	0.205
Sweden	-0.180	0.085	-0.083	0.066	0.060	0.067	0.173	0.198	0.060	0.020	0.096	0.002	0.201	-0.293	-0.171	0.272	0.286	0.161
United Kingdom	0.045	0.218	-0.047	-0.008	0.048	0.084	0.163	0.205	0.025	0.127	0.126	0.155	0.275	-0.142	-0.001	0.193	0.242	0.185
United States	0.002	0.152	-0.008	0.043	0.032	0.112	0.224	0.231	0.003	0.027	0.092	0.081	0.232	-0.186	-0.095	0.256	0.227	0.191

ISCO3 Technicians and associate professionals	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.049	0.064	-0.016	0.071	0.001	0.100	0.290	0.269	0.111	0.176	0.223	0.067	0.366	-0.368	-0.034	0.364	0.407	0.262
Austria	-0.175	0.042	0.041	0.104	0.135	0.042	0.154	0.223	0.110	0.054	0.343	0.121	0.283	-0.432	-0.157	0.398	0.268	0.324
Belgium	-0.098	0.062	0.065	0.156	0.118	0.243	0.338	0.411	0.150	0.174	0.240	0.231	0.331	-0.417	-0.184	0.411	0.342	0.161
Canada	-0.061	0.140	0.020	0.073	0.035	0.120	0.123	0.141	0.043	0.107	0.151	0.190	0.318	-0.382	-0.084	0.386	0.354	0.235
Cyprus	-0.026	0.144	0.123	0.095	0.140	0.073	0.112	0.163	-0.051	0.202	0.296	0.138	0.187	-0.389	-0.006	0.425	0.338	0.205
Czech Republic	-0.005	0.077	0.068	0.086	0.112	0.177	0.111	0.108	0.076	0.100	0.238	0.112	0.239	-0.226	-0.066	0.476	0.377	0.261
Denmark	-0.057	0.055	0.111	0.148	0.160	0.168	0.246	0.243	0.104	0.156	0.282	0.182	0.285	-0.379	-0.123	0.388	0.336	0.256
Estonia	0.002	0.177	0.121	0.102	0.153	0.181	0.153	0.122	0.102	0.125	0.292	0.177	0.199	-0.241	-0.059	0.416	0.224	0.142
Finland	-0.014	0.143	-0.033	0.002	0.135	0.046	0.095	0.161	-0.009	0.061	0.218	0.129	0.232	-0.220	-0.087	0.272	0.316	0.280
France	-0.130	0.025	-0.017	0.124	0.230	0.208	0.317	0.315	0.050	0.215	0.322	0.085	0.315	-0.486	-0.422	0.484	0.299	0.330
Germany	-0.078	0.058	0.054	0.139	0.105	0.146	0.092	0.356	0.043	0.107	0.334	0.132	0.316	-0.455	-0.239	0.353	0.196	0.350
Ireland	-0.084	0.121	0.072	0.222	0.005	0.273	0.195	0.193	0.141	0.211	0.242	0.168	0.384	-0.483	-0.105	0.421	0.413	0.227
Italy	-0.060	0.034	-0.030	0.056	0.130	0.143	0.218	0.284	0.105	0.152	0.198	0.214	0.276	-0.345	-0.114	0.448	0.385	0.257
Japan	-0.032	0.154	0.151	0.247	0.036	0.180	0.275	0.272	0.181	0.147	0.306	0.263	0.327	-0.219	-0.103	0.392	0.342	0.341
Korea	-0.117	0.297	0.172	0.226	-0.040	0.187	0.195	0.242	0.118	0.218	0.290	0.262	0.426	-0.334	0.209	0.512	0.428	0.403
Netherlands	-0.133	0.229	0.095	0.063	0.041	0.129	0.231	0.348	0.149	0.155	0.223	0.277	0.322	-0.355	-0.103	0.467	0.422	0.224
Norway	-0.079	0.101	0.064	0.046	0.083	0.090	0.167	0.288	-0.004	0.062	0.152	0.051	0.222	-0.363	-0.211	0.369	0.080	0.239
Poland	-0.089	-0.037	0.135	0.050	0.098	0.095	0.148	0.133	0.014	0.027	0.181	0.172	0.234	-0.472	-0.175	0.454	0.331	0.234
Russian Federation	-0.058	0.119	-0.030	0.049	0.062	0.112	0.248	0.181	-0.020	0.114	0.148	0.209	0.264	-0.199	-0.095	0.322	0.136	0.297
Slovak Republic	-0.114	0.035	0.072	0.109	0.180	0.201	0.222	0.190	0.046	0.162	0.214	0.204	0.278	-0.361	-0.102	0.440	0.370	0.370
Spain	-0.080	0.147	0.085	0.138	0.254	0.261	0.253	0.285	0.247	0.194	0.403	0.226	0.350	-0.367	-0.259	0.511	0.464	0.432
Sweden	-0.092	0.174	0.072	0.047	0.084	0.131	0.186	0.188	0.111	0.089	0.145	0.193	0.246	-0.311	-0.134	0.348	0.312	0.234
United Kingdom	-0.029	0.090	-0.052	0.107	0.053	0.024	0.151	0.147	0.026	0.099	0.099	0.088	0.320	-0.385	-0.034	0.339	0.283	0.136
United States	-0.063	0.152	-0.019	0.089	0.094	0.135	0.122	0.164	0.007	0.105	0.208	0.160	0.247	-0.354	0.048	0.349	0.283	0.154

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO4 Clerical support workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.152	0.386	0.206	0.140	0.074	0.356	0.280	0.388	0.149	0.178	0.300	0.387	0.387	-0.109	0.194	0.420	0.433	0.140
Austria	0.034	0.268	0.158	0.156	0.210	0.279	0.274	0.237	0.202	0.200	0.261	0.279	0.325	-0.391	0.007	0.484	0.345	0.284
Belgium	-0.058	0.112	0.052	0.180	0.174	0.280	0.318	0.283	0.173	0.277	0.285	0.238	0.310	-0.565	-0.199	0.540	0.435	0.309
Canada	0.044	0.127	0.098	0.054	0.014	0.203	0.212	0.197	0.148	0.118	0.211	0.221	0.291	-0.361	-0.058	0.393	0.377	0.181
Cyprus	0.032	0.121	0.208	0.185	0.021	0.127	0.094	0.130	0.055	0.255	0.222	0.223	0.193	-0.253	0.098	0.461	0.373	0.215
Czech Republic	-0.002	0.041	0.198	0.096	-0.109	-0.023	0.148	0.261	0.153	-0.060	0.063	-0.036	0.173	-0.308	-0.121	0.430	0.418	0.280
Denmark	0.254	0.268	0.244	0.217	0.152	0.313	0.329	0.209	0.203	0.362	0.295	0.401	0.412	-0.326	0.075	0.552	0.472	0.195
Estonia	-0.024	0.083	0.143	0.082	0.322	0.310	0.133	0.141	0.024	0.217	0.275	0.340	0.316	-0.381	0.191	0.580	0.359	0.350
Finland	0.020	0.187	0.194	0.192	0.129	0.306	0.334	0.199	0.100	0.202	0.298	0.227	0.270	-0.471	-0.088	0.457	0.404	0.279
France	0.126	0.289	0.123	0.155	-0.047	0.060	0.393	0.376	0.168	0.145	0.167	0.244	0.299	-0.226	-0.107	0.388	0.282	0.271
Germany	0.048	0.170	0.140	0.165	0.145	0.237	0.172	0.261	0.188	0.209	0.267	0.233	0.336	-0.468	-0.055	0.456	0.359	0.261
Ireland	-0.050	0.200	0.003	0.079	-0.063	0.098	0.121	0.142	-0.040	0.075	0.139	0.135	0.136	-0.428	0.090	0.403	0.307	0.163
Italy	0.006	0.178	0.118	0.092	0.098	0.087	0.365	0.299	0.175	0.190	0.193	0.211	0.312	-0.484	-0.146	0.469	0.434	0.232
Japan	0.002	0.137	0.136	0.239	-0.010	0.217	0.255	0.250	0.186	0.173	0.258	0.238	0.250	-0.116	0.048	0.410	0.328	0.233
Korea	0.070	0.267	0.190	0.168	-0.003	0.177	0.242	0.258	0.126	0.207	0.223	0.248	0.309	-0.128	0.273	0.374	0.468	0.358
Netherlands	0.097	0.302	0.142	0.163	0.128	0.310	0.310	0.349	0.276	0.290	0.269	0.306	0.342	-0.517	-0.055	0.504	0.380	0.205
Norway	-0.052	0.217	0.123	0.073	0.200	0.119	0.326	0.247	0.116	0.225	0.247	0.204	0.306	-0.330	-0.226	0.458	0.355	0.205
Poland	0.024	0.130	0.113	0.179	-0.031	0.159	0.188	0.296	0.059	0.099	0.200	0.208	0.226	-0.422	-0.143	0.467	0.416	0.334
Russian Federation	0.363	0.161	0.281	0.199	0.043	0.267	0.280	0.286	0.146	0.284	0.276	0.409	0.308	-0.221	0.090	0.499	0.365	0.211
Slovak Republic	0.100	0.162	0.067	0.021	-0.091	0.039	0.294	0.252	0.084	0.025	0.166	0.195	0.241	-0.528	-0.009	0.432	0.406	0.345
Spain	-0.039	0.131	0.133	0.126	0.158	0.313	0.350	0.363	0.209	0.230	0.294	0.294	0.315	-0.498	-0.305	0.428	0.430	0.273
Sweden	-0.011	0.117	0.278	0.133	-0.145	0.218	0.106	0.084	0.103	0.215	0.251	0.184	0.333	-0.449	-0.127	0.396	0.270	0.377
United Kingdom	0.048	0.239	0.173	0.175	-0.078	0.192	0.252	0.337	0.174	0.192	0.197	0.253	0.390	-0.213	0.101	0.267	0.423	0.203
United States	0.098	0.231	0.051	0.004	0.042	0.177	-0.055	0.053	0.052	0.164	0.117	0.249	0.269	-0.124	0.218	0.363	0.237	0.178

ISCO5 Service and sales workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.052	0.120	0.143	0.210	-0.024	0.149	0.169	0.199	0.171	0.156	0.296	0.207	0.326	-0.212	-0.006	0.455	0.492	0.268
Austria	0.003	0.136	0.288	0.242	0.055	0.135	0.149	0.139	0.221	0.147	0.331	0.243	0.308	-0.239	-0.020	0.529	0.405	0.275
Belgium	0.066	0.187	0.295	0.272	0.206	0.302	0.291	0.294	0.339	0.391	0.427	0.319	0.409	-0.180	-0.131	0.507	0.462	0.395
Canada	0.040	0.115	0.275	0.263	0.075	0.226	0.244	0.213	0.307	0.279	0.356	0.264	0.409	-0.147	-0.046	0.492	0.456	0.244
Cyprus	0.016	0.080	0.100	0.115	0.044	0.187	0.050	-0.022	0.046	0.249	0.232	0.140	0.181	-0.122	0.107	0.381	0.434	0.260
Czech Republic	-0.001	0.121	0.161	0.231	0.133	0.269	0.211	0.232	0.139	0.231	0.300	0.267	0.277	-0.333	0.030	0.486	0.446	0.298
Denmark	0.168	0.192	0.275	0.279	0.069	0.291	0.300	0.231	0.301	0.323	0.321	0.190	0.305	-0.100	0.050	0.467	0.457	0.274
Estonia	0.020	0.130	0.181	0.240	0.094	0.148	0.088	0.094	0.198	0.159	0.191	0.198	0.273	-0.223	-0.092	0.505	0.382	0.225
Finland	-0.016	0.154	0.187	0.181	0.130	0.204	0.085	0.106	0.188	0.152	0.244	0.132	0.259	-0.252	-0.052	0.417	0.341	0.321
France	0.204	0.222	0.195	0.216	0.231	0.283	0.161	0.144	0.225	0.328	0.358	0.267	0.310	-0.090	-0.064	0.448	0.356	0.424
Germany	0.071	0.197	0.225	0.215	0.067	0.204	0.194	0.214	0.256	0.233	0.270	0.241	0.330	-0.176	-0.063	0.497	0.429	0.382
Ireland	0.115	0.163	0.231	0.340	0.071	0.241	0.226	0.262	0.204	0.210	0.364	0.239	0.346	-0.262	0.051	0.407	0.411	0.288
Italy	0.107	0.153	0.150	0.129	0.220	0.192	0.157	0.155	0.189	0.266	0.306	0.229	0.324	-0.246	-0.084	0.455	0.445	0.397
Japan	-0.073	0.018	0.250	0.270	0.140	0.230	0.299	0.244	0.275	0.292	0.396	0.253	0.331	-0.126	0.069	0.447	0.328	0.397
Korea	0.041	0.206	0.328	0.343	0.099	0.311	0.238	0.216	0.270	0.289	0.278	0.199	0.283	-0.170	0.354	0.538	0.438	0.400
Netherlands	0.017	0.225	0.232	0.254	-0.036	0.156	0.189	0.216	0.213	0.286	0.360	0.272	0.358	-0.196	0.093	0.508	0.461	0.193
Norway	-0.075	0.101	0.178	0.129	0.097	0.232	0.194	0.197	0.202	0.167	0.309	0.188	0.235	-0.178	-0.023	0.447	0.326	0.283
Poland	0.081	0.068	0.225	0.207	0.117	0.145	0.201	0.224	0.311	0.258	0.361	0.211	0.347	-0.295	-0.043	0.423	0.369	0.199
Russian Federation	0.013	0.022	0.105	0.107	0.100	0.126	0.116	0.094	0.095	0.160	0.208	0.052	0.075	-0.143	-0.038	0.288	0.203	0.055
Slovak Republic	0.154	0.109	0.349	0.234	0.054	0.201	0.184	0.199	0.169	0.187	0.230	0.145	0.181	-0.139	-0.001	0.440	0.465	0.204
Spain	0.186	0.201	0.273	0.364	0.083	0.221	0.142	0.152	0.244	0.190	0.225	0.121	0.246	-0.194	-0.189	0.461	0.456	0.113
Sweden	0.091	0.075	0.180	0.193	0.075	0.197	0.173	0.183	0.232	0.175	0.251	0.116	0.199	-0.100	-0.064	0.384	0.234	0.202
United Kingdom	0.073	0.137	0.220	0.252	-0.086	0.140	0.285	0.264	0.267	0.239	0.278	0.225	0.359	-0.189	0.093	0.463	0.454	0.151
United States	0.092	0.155	0.251	0.234	0.152	0.299	0.268	0.229	0.213	0.248	0.210	0.258	0.297	-0.084	0.135	0.526	0.395	0.270

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO6 Skilled agricultural, forestry and fishery workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.079	0.106	0.190	0.305	0.327	0.165	0.320	0.264	0.439	0.278	0.398	0.214	0.235	-0.109	-0.007	0.448	0.414	0.439
Austria	-0.021	0.047	0.128	0.458	0.307	0.253	0.132	0.125	0.288	0.244	0.190	0.070	0.122	-0.059	0.049	0.417	0.344	0.359
Belgium	-0.104	0.016	0.121	0.037	0.196	0.014	0.120	0.199	-0.081	0.039	0.022	0.127	0.279	-0.108	-0.190	0.205	0.101	0.199
Canada	0.112	0.028	0.046	0.115	0.205	0.111	0.210	0.158	0.173	0.212	0.186	0.212	0.178	0.017	-0.002	0.395	0.325	0.366
Cyprus	-0.035	-0.215	0.165	-0.044	-0.084	0.128	-0.016	0.089	0.179	0.058	0.102	0.120	0.257	0.066	-0.263	0.139	0.293	0.056
Czech Republic	0.199	-0.111	0.094	0.056	0.003	-0.151	0.144	0.075	0.431	0.495	0.239	0.253	0.385	0.012	-0.614	0.418	0.270	0.079
Denmark	0.119	0.031	0.270	0.286	0.349	0.294	0.328	0.288	0.371	0.334	0.448	0.136	0.522	-0.046	0.064	0.593	0.574	0.516
Estonia	-0.017	0.129	0.223	0.368	0.293	0.149	0.244	0.290	0.270	0.343	0.435	0.398	0.278	-0.175	-0.006	0.490	0.526	0.394
Finland	-0.156	0.181	0.242	0.165	0.435	0.401	0.264	0.160	0.366	0.357	0.351	0.191	0.187	-0.226	0.134	0.472	0.364	0.361
France	-0.162	-0.068	-0.156	-0.018	0.313	0.164	0.231	0.316	0.196	0.324	0.358	0.251	0.185	-0.192	-0.007	0.375	0.280	0.453
Germany	-0.143	0.265	0.016	0.222	0.316	0.073	0.185	0.209	0.337	0.409	0.397	0.130	0.204	0.026	0.163	0.329	0.276	0.437
Ireland	0.057	0.139	0.180	0.151	0.015	0.196	-0.033	-0.012	0.184	0.300	0.162	0.011	0.120	-0.212	-0.028	0.272	0.288	0.242
Italy	0.336	0.255	0.277	0.262	0.099	0.178	0.173	0.172	0.256	0.359	0.321	0.287	0.112	0.009	0.110	0.516	0.394	0.518
Japan	-0.014	-0.092	0.053	0.094	0.260	-0.028	0.083	0.053	0.011	-0.032	0.095	0.041	0.201	-0.100	-0.057	0.257	-0.058	0.227
Korea	0.059	0.147	0.172	0.209	0.062	0.146	0.117	0.200	0.213	0.190	0.122	0.266	0.208	0.004	0.208	0.279	0.458	0.422
Netherlands	-0.192	-0.054	0.229	0.162	0.240	0.420	0.348	0.377	0.252	0.238	0.556	0.516	0.414	-0.456	-0.126	0.532	0.404	0.488
Norway	0.084	0.238	-0.059	0.105	0.362	0.241	0.355	0.292	0.342	0.381	0.473	0.050	0.296	0.008	-0.084	0.414	0.429	0.452
Poland	0.097	0.072	0.083	0.210	0.089	0.319	0.099	0.074	0.127	0.328	0.376	0.040	0.212	-0.199	-0.055	0.301	0.482	0.322
Russian Federation	0.187	0.315	0.346	0.483	0.253	0.352	0.121	-0.418	0.312	0.355	0.365	-0.189	-0.090	-0.266	0.124	0.655	0.729	0.185
Slovak Republic	0.207	0.181	0.715	0.317	-0.094	0.601	0.134	0.187	0.496	-0.093	-0.108	0.262	0.135	-0.727	-0.008	0.424	0.397	0.403
Spain	0.131	0.137	-0.004	0.018	0.071	0.150	0.136	0.123	-0.052	0.052	0.243	0.101	-0.004	-0.041	-0.062	0.291	0.214	0.194
Sweden	-0.096	0.283	0.287	0.372	0.283	0.306	0.102	-0.029	0.336	0.332	0.352	0.257	0.283	-0.382	-0.283	0.408	0.559	0.510
United Kingdom	0.721	0.465	0.549	0.624	0.427	0.508	0.146	0.180	0.666	0.470	0.518	0.390	0.459	-0.409	0.110	0.569	0.520	0.478
United States	-0.307	0.148	0.088	0.459	0.482	0.454	0.168	0.223	0.275	0.471	0.554	0.357	0.380	0.028	0.051	0.347	0.619	0.484

ISCO7 Craft and related trades workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.097	0.104	0.205	0.270	0.212	0.302	0.112	0.207	0.264	0.264	0.305	0.161	0.245	-0.310	-0.092	0.491	0.483	0.293
Austria	-0.160	0.093	0.299	0.361	0.266	0.331	0.208	0.234	0.321	0.401	0.416	0.164	0.286	-0.450	-0.326	0.487	0.525	0.287
Belgium	-0.128	-0.005	0.136	0.230	0.272	0.300	0.354	0.297	0.288	0.347	0.402	0.237	0.285	-0.253	-0.098	0.536	0.400	0.359
Canada	-0.014	0.002	0.107	0.213	0.240	0.267	0.154	0.180	0.150	0.244	0.284	0.115	0.320	-0.283	-0.148	0.486	0.474	0.233
Cyprus	-0.201	-0.132	0.015	0.037	0.122	0.001	0.008	0.195	-0.008	0.148	0.120	0.093	0.151	-0.240	0.041	0.382	0.089	0.221
Czech Republic	0.000	-0.164	0.187	0.283	0.338	0.225	0.192	0.204	0.192	0.298	0.296	0.107	0.266	-0.262	-0.029	0.463	0.449	0.412
Denmark	-0.068	0.045	0.142	0.273	0.345	0.263	0.226	0.139	0.289	0.282	0.367	0.072	0.215	-0.337	-0.135	0.494	0.423	0.323
Estonia	-0.049	0.052	0.191	0.213	0.333	0.261	0.153	0.137	0.187	0.256	0.256	0.180	0.180	-0.166	-0.002	0.430	0.389	0.324
Finland	0.138	0.084	0.208	0.239	0.353	0.315	0.066	0.204	0.170	0.293	0.248	0.097	0.183	-0.170	-0.136	0.469	0.451	0.275
France	0.050	0.015	0.177	0.288	0.430	0.368	0.332	0.288	0.340	0.399	0.437	0.231	0.352	-0.106	-0.090	0.527	0.399	0.447
Germany	-0.106	0.034	0.140	0.321	0.213	0.271	0.115	0.226	0.229	0.243	0.309	0.193	0.322	-0.339	-0.100	0.470	0.306	0.309
Ireland	-0.018	0.194	0.253	0.357	0.017	0.265	0.062	0.135	0.219	0.230	0.187	0.130	0.303	-0.358	-0.226	0.468	0.534	0.341
Italy	0.035	-0.003	0.167	0.190	0.244	0.192	0.124	0.104	0.226	0.392	0.414	0.195	0.183	-0.118	-0.006	0.450	0.439	0.354
Japan	-0.032	0.127	0.234	0.312	0.156	0.281	0.245	0.251	0.147	0.309	0.423	0.216	0.372	-0.266	-0.122	0.483	0.470	0.392
Korea	-0.041	0.165	0.269	0.270	0.223	0.187	0.275	0.320	0.158	0.337	0.220	0.182	0.268	-0.197	0.135	0.525	0.478	0.323
Netherlands	-0.079	0.165	0.186	0.170	0.276	0.263	0.244	0.272	0.158	0.224	0.257	0.158	0.197	-0.226	0.027	0.481	0.481	0.340
Norway	-0.049	0.013	0.193	0.302	0.206	0.226	0.258	0.231	0.241	0.269	0.243	0.162	0.244	-0.406	-0.171	0.492	0.415	0.318
Poland	0.019	0.020	0.131	0.187	0.354	0.260	0.149	0.141	0.072	0.242	0.191	0.132	0.188	-0.354	-0.054	0.469	0.368	0.293
Russian Federation	0.063	0.146	0.086	0.025	0.022	0.090	0.020	0.018	0.057	0.085	0.145	0.051	0.008	-0.402	-0.160	0.264	0.452	0.117
Slovak Republic	-0.012	0.061	0.155	0.247	0.059	0.173	0.186	0.151	0.142	0.195	0.182	0.059	0.239	-0.320	-0.003	0.348	0.366	0.190
Spain	-0.006	0.110	0.204	0.254	0.237	0.322	0.259	0.189	0.288	0.382	0.316	0.234	0.307	-0.160	0.022	0.483	0.347	0.378
Sweden	-0.078	0.062	0.108	0.230	0.341	0.223	0.174	0.237	0.151	0.208	0.240	0.102	0.225	-0.159	-0.071	0.487	0.348	0.366
United Kingdom	0.036	0.073	0.151	0.269	0.108	0.294	0.190	0.276	0.198	0.277	0.320	0.318	0.398	-0.359	-0.162	0.511	0.554	0.263
United States	-0.036	0.082	0.200	0.166	0.255	0.242	0.248	0.277	0.162	0.198	0.188	0.126	0.191	-0.231	-0.113	0.464	0.437	0.120

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO8 Plant and machine operators and assemblers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.019	0.050	0.104	0.109	0.268	0.267	0.282	0.227	0.301	0.294	0.314	0.171	0.305	0.020	0.130	0.357	0.299	0.291
Austria	0.095	0.041	0.282	0.377	0.145	0.192	0.104	0.026	0.235	0.189	0.236	0.193	0.110	-0.262	-0.181	0.367	0.314	0.303
Belgium	0.159	0.032	0.224	0.313	0.190	0.145	0.190	0.192	0.292	0.242	0.246	0.331	0.356	-0.217	-0.043	0.415	0.354	0.406
Canada	0.043	0.159	0.213	0.244	0.089	0.259	0.198	0.167	0.238	0.269	0.248	0.217	0.324	-0.070	0.021	0.378	0.305	0.330
Cyprus	#N/A	0.037	-0.110	-0.064	0.300	0.090	0.210	0.200	0.086	0.256	0.061	0.117	0.125	0.093	0.087	0.417	0.040	0.294
Czech Republic	-0.071	0.104	0.302	0.143	0.188	0.195	0.165	0.166	0.301	0.347	0.335	0.220	0.324	-0.046	0.006	0.307	0.179	0.262
Denmark	0.054	0.141	0.120	0.288	0.098	0.186	0.187	0.126	0.157	0.175	0.299	0.208	0.202	-0.205	0.021	0.400	0.347	0.160
Estonia	-0.040	0.039	0.149	0.086	0.192	0.177	0.129	0.158	0.216	0.172	0.228	0.112	0.150	0.003	-0.002	0.348	0.164	0.199
Finland	0.083	0.058	0.146	0.151	0.078	0.122	0.198	0.230	0.206	0.210	0.056	0.145	0.251	-0.042	0.100	0.290	0.330	0.246
France	0.121	0.080	0.353	0.195	0.201	0.203	0.172	0.181	0.409	0.254	0.254	0.141	0.176	-0.084	-0.049	0.347	0.128	0.258
Germany	0.073	0.087	0.310	0.262	-0.047	0.063	0.177	0.177	0.225	0.225	0.158	0.077	0.131	-0.041	0.090	0.288	0.315	0.338
Ireland	0.133	0.272	0.441	0.350	0.060	0.316	0.195	0.198	0.393	0.379	0.254	0.372	0.405	0.036	-0.024	0.357	0.464	0.434
Italy	-0.043	-0.060	0.046	0.068	0.163	0.154	0.134	0.101	0.094	0.124	0.206	0.092	0.146	-0.036	0.017	0.235	0.212	0.212
Japan	0.101	0.192	0.163	0.270	-0.022	0.299	0.246	0.125	0.253	0.202	0.257	0.144	0.309	-0.043	0.086	0.397	0.305	0.223
Korea	0.063	0.170	0.291	0.212	0.049	0.203	0.124	0.066	0.194	0.177	0.204	0.192	0.174	-0.195	0.185	0.375	0.242	0.237
Netherlands	0.017	0.225	0.179	0.320	0.150	0.208	0.295	0.305	0.146	0.084	0.157	0.280	0.236	-0.140	-0.059	0.395	0.514	0.319
Norway	0.159	0.120	0.351	0.335	0.193	0.314	0.226	0.234	0.442	0.462	0.150	0.148	0.225	-0.148	0.060	0.567	0.458	0.257
Poland	-0.088	0.047	0.102	0.106	0.096	0.121	0.131	0.153	0.200	0.173	0.338	0.059	0.248	-0.329	0.010	0.344	0.193	0.398
Russian Federation	0.116	0.129	0.275	0.197	-0.048	0.070	-0.008	0.082	0.151	0.076	0.074	0.098	0.110	-0.200	0.141	0.209	0.315	0.073
Slovak Republic	-0.015	0.020	0.073	0.104	0.195	0.311	0.127	0.169	0.196	0.151	0.091	0.066	0.072	-0.066	0.018	0.358	0.313	0.215
Spain	0.132	0.121	0.268	0.170	0.078	0.109	0.213	0.159	0.256	0.167	0.152	0.173	0.105	0.003	0.032	0.394	0.426	0.356
Sweden	0.198	0.158	0.336	0.276	0.039	0.212	0.141	0.128	0.108	0.134	0.128	0.254	0.242	-0.052	-0.020	0.432	0.295	0.077
United Kingdom	0.173	0.115	0.182	0.268	0.054	0.211	0.158	0.218	0.311	0.278	0.225	0.123	0.220	-0.105	-0.059	0.330	0.362	0.320
United States	0.021	0.120	0.145	0.090	0.119	0.203	0.112	0.173	0.292	0.217	0.216	0.193	0.298	0.106	0.015	0.403	0.412	0.324

ISCO9 Elementary occupations	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.056	0.027	0.137	0.232	0.183	0.281	0.274	0.260	0.310	0.275	0.314	0.166	0.195	-0.268	-0.048	0.416	0.480	0.288
Austria	0.110	0.136	0.399	0.308	0.151	0.286	0.201	0.079	0.411	0.219	0.312	0.256	0.303	-0.161	0.011	0.417	0.442	0.479
Belgium	0.122	0.111	0.223	0.429	0.270	0.243	0.233	0.197	0.222	0.320	0.367	0.287	0.321	-0.116	0.048	0.473	0.400	0.418
Canada	-0.046	0.041	0.093	0.096	0.056	0.104	0.147	0.134	0.161	0.092	0.122	0.090	0.189	-0.010	0.017	0.263	0.285	0.201
Cyprus	-0.131	-0.085	0.127	0.015	0.002	0.107	0.034	0.015	0.023	0.078	0.055	-0.052	0.013	-0.288	-0.056	0.288	0.165	0.348
Czech Republic	-0.057	0.112	0.135	0.177	0.478	0.216	0.104	0.047	0.012	0.123	0.485	0.196	0.314	-0.122	0.013	0.381	0.257	0.246
Denmark	0.093	0.149	0.274	0.274	0.154	0.211	0.195	0.188	0.256	0.315	0.368	0.207	0.411	-0.094	0.019	0.498	0.420	0.411
Estonia	0.074	0.195	0.314	0.217	0.184	0.225	0.071	0.094	0.236	0.224	0.278	0.209	0.188	-0.250	0.019	0.401	0.348	0.407
Finland	0.022	0.147	0.249	0.137	0.027	0.169	0.160	0.215	0.169	0.086	0.195	0.239	0.255	0.057	0.036	0.345	0.321	0.339
France	0.174	0.227	0.196	0.199	0.245	0.256	0.186	0.193	0.310	0.276	0.276	0.268	0.260	-0.130	-0.080	0.355	0.272	0.388
Germany	-0.033	0.119	0.201	0.327	0.226	0.430	0.171	0.121	0.158	0.263	0.247	0.198	0.470	-0.344	-0.060	0.495	0.439	0.470
Ireland	0.118	0.213	0.387	0.349	0.068	0.302	0.253	0.240	0.401	0.351	0.377	0.252	0.323	-0.311	0.000	0.548	0.573	0.420
Italy	0.052	0.185	0.260	0.035	0.237	0.303	0.192	0.199	0.311	0.352	0.424	0.234	0.162	-0.155	0.001	0.397	0.491	0.433
Japan	0.024	0.049	0.194	0.234	0.020	0.197	0.220	0.206	0.074	0.197	0.253	0.037	0.198	-0.025	0.082	0.347	0.203	0.339
Korea	0.078	0.136	0.166	0.200	0.117	0.148	0.078	0.129	0.168	0.122	0.129	0.185	0.159	0.005	0.308	0.358	0.225	0.326
Netherlands	0.043	0.211	0.254	0.260	0.189	0.297	0.246	0.216	0.265	0.266	0.369	0.294	0.363	-0.213	-0.016	0.458	0.377	0.261
Norway	0.037	0.247	0.320	0.488	0.111	0.419	0.300	0.383	0.359	0.429	0.380	0.370	0.508	-0.541	-0.210	0.628	0.539	0.280
Poland	0.046	0.089	0.230	0.338	0.161	0.234	0.139	0.150	0.353	0.283	0.253	0.153	0.184	-0.277	-0.112	0.415	0.421	0.371
Russian Federation	0.174	0.204	0.311	0.441	0.239	0.401	0.229	0.168	0.295	0.360	0.319	0.176	0.348	-0.568	-0.178	0.542	0.428	0.206
Slovak Republic	-0.040	0.081	0.140	0.266	0.250	0.264	0.229	0.152	0.071	0.171	0.343	0.169	0.158	-0.272	-0.016	0.435	0.484	0.244
Spain	0.109	0.139	0.121	0.092	0.193	0.218	0.076	0.076	0.122	0.052	0.052	0.128	0.197	-0.194	-0.058	0.338	0.327	0.195
Sweden	0.142	0.253	0.498	0.473	0.171	0.355	0.259	0.256	0.394	0.453	0.446	0.344	0.407	-0.412	-0.285	0.553	0.528	0.372
United Kingdom	0.125	0.219	0.347	0.356	0.085	0.427	0.249	0.282	0.376	0.440	0.345	0.331	0.498	-0.340	0.146	0.510	0.608	0.295
United States	0.042	0.070	0.163	0.145	0.221	0.310	0.193	0.176	0.311	0.261	0.288	0.176	0.148	-0.027	-0.026	0.421	0.388	0.407

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5..

Source: OECD, based on PIAAC Database, October 2015.

ANNEX C2. PIAAC-BASED PAIRWISE CORRELATION TABLES AT THE 1-DIGIT ISCO GROUPS (OPS), 2012

ISCO1 Managers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.049	0.195	0.079	0.248	-0.060	0.129	0.143	0.135	0.032	0.147	0.198	0.126	0.227	-0.236	-0.009	0.277	0.412	0.258
Austria	-0.097	0.166	0.090	0.135	-0.093	0.073	0.132	0.047	0.082	0.192	0.268	0.221	0.313	-0.264	-0.148	0.308	0.352	0.344
Belgium	0.070	0.253	0.207	0.240	-0.172	0.104	0.159	0.074	0.199	0.077	0.112	0.100	0.295	-0.326	-0.162	0.272	0.313	0.259
Canada	-0.026	0.085	0.058	0.196	-0.115	0.125	0.148	0.108	0.086	0.185	0.199	0.196	0.334	-0.320	-0.125	0.357	0.335	0.334
Cyprus	0.142	0.274	0.268	0.239	-0.210	0.208	0.174	0.166	0.151	0.146	0.062	0.319	0.219	-0.351	-0.013	0.448	0.563	0.294
Czech Republic	0.078	0.050	0.178	0.254	-0.256	0.125	-0.077	0.086	0.187	0.147	0.194	0.069	0.244	-0.240	0.080	0.368	0.486	0.390
Denmark	0.073	0.099	0.091	0.153	-0.052	0.162	0.182	0.164	0.070	0.171	0.148	0.211	0.268	-0.139	-0.057	0.276	0.332	0.297
Estonia	0.049	0.207	0.142	0.271	-0.083	0.192	0.145	0.091	0.116	0.231	0.240	0.186	0.224	-0.251	-0.021	0.323	0.310	0.315
Finland	-0.050	0.095	0.030	0.037	-0.112	0.021	0.053	-0.028	0.068	0.001	0.110	0.151	0.131	-0.324	-0.152	0.175	0.239	0.229
France	0.019	-0.013	0.061	0.186	-0.056	0.012	0.167	0.139	0.107	0.043	0.069	0.024	0.208	-0.057	-0.110	0.172	0.197	0.182
Germany	0.011	0.097	0.130	0.036	-0.036	0.239	0.070	0.175	-0.142	0.195	0.096	0.141	0.215	-0.072	0.046	0.188	0.282	0.352
Ireland	-0.095	0.179	0.182	0.391	-0.092	0.271	0.207	0.241	0.162	0.214	0.166	0.164	0.225	-0.463	-0.027	0.338	0.471	0.404
Italy	0.150	0.248	0.292	0.190	0.031	0.382	0.194	0.133	0.174	0.240	0.324	-0.086	0.157	-0.280	-0.215	0.520	0.541	0.475
Japan	0.031	0.147	0.055	0.110	0.002	0.121	-0.019	-0.006	-0.031	-0.034	0.076	0.014	0.009	-0.103	0.046	0.200	0.253	0.341
Korea	0.174	0.119	0.165	0.211	-0.167	0.105	0.168	0.089	0.111	0.180	0.185	-0.042	0.107	-0.186	0.391	0.424	0.482	0.431
Netherlands	-0.170	0.136	0.143	0.343	-0.163	0.116	0.061	0.165	-0.056	0.064	0.151	0.205	0.323	-0.398	-0.136	0.266	0.351	0.259
Norway	0.166	0.187	0.131	0.270	-0.207	0.141	0.011	0.081	0.107	0.112	0.011	0.191	0.275	-0.384	-0.240	0.246	0.307	0.266
Poland	0.141	0.131	0.227	0.153	-0.131	0.090	0.039	0.044	0.039	0.130	0.211	0.235	0.298	-0.354	-0.097	0.314	0.340	0.321
Russian Federation	-0.163	0.037	0.045	-0.066	-0.132	0.032	0.081	0.074	-0.014	-0.134	0.032	-0.073	0.167	-0.241	-0.051	0.357	0.386	0.112
Slovak Republic	-0.022	0.240	0.257	0.238	-0.123	0.254	0.107	0.038	0.122	0.191	0.175	0.002	0.122	-0.343	-0.028	0.393	0.412	0.382
Spain	-0.058	0.175	0.171	0.366	-0.244	0.062	0.115	0.140	0.243	0.185	0.206	0.120	0.203	-0.317	-0.213	0.490	0.470	0.327
Sweden	-0.108	0.123	0.289	0.241	-0.148	0.253	0.035	0.145	0.048	0.169	0.182	0.170	0.228	-0.225	-0.038	0.341	0.333	0.288
United Kingdom	0.013	0.162	0.151	0.244	-0.070	0.113	0.255	0.194	0.140	0.073	0.165	0.074	0.159	-0.305	-0.078	0.206	0.369	0.219
United States	-0.024	0.180	0.064	0.236	-0.190	0.180	0.026	0.111	0.068	0.103	0.094	0.174	0.293	-0.350	-0.084	0.242	0.326	0.289

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO2 Professionals	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	-0.007	0.099	0.070	0.122	0.070	0.067	0.218	0.236	0.107	0.103	0.076	0.108	0.142	-0.114	-0.002	0.266	0.222	0.217
Austria	0.006	0.104	0.075	0.033	0.099	0.168	0.083	0.129	0.055	0.068	0.208	0.056	0.237	-0.282	-0.134	0.299	0.367	0.293
Belgium	0.004	0.079	-0.001	0.099	0.007	0.060	0.185	0.135	0.140	0.089	0.075	0.048	0.190	-0.241	-0.159	0.267	0.252	0.229
Canada	-0.001	0.149	0.018	0.134	0.043	0.058	0.138	0.157	0.015	0.044	0.125	0.069	0.255	-0.288	-0.043	0.277	0.283	0.283
Cyprus	0.054	0.073	0.062	0.036	0.095	0.058	-0.018	0.052	0.138	0.143	0.188	0.187	0.213	-0.245	0.024	0.380	0.263	0.243
Czech Republic	0.066	0.166	0.029	0.029	0.016	0.013	0.115	0.150	0.209	0.101	0.235	0.174	0.220	-0.158	0.053	0.270	0.315	0.274
Denmark	-0.093	0.060	0.040	0.159	0.118	0.137	0.212	0.218	0.111	0.110	0.200	0.065	0.236	-0.289	-0.100	0.357	0.274	0.306
Estonia	0.061	0.208	0.057	0.032	0.056	0.039	0.071	0.103	-0.010	0.045	0.148	0.109	0.210	-0.173	-0.095	0.160	0.294	0.277
Finland	0.024	0.114	0.006	0.064	0.032	0.014	0.042	0.086	0.018	-0.039	0.022	0.056	0.165	-0.212	-0.159	0.254	0.281	0.258
France	-0.043	0.182	0.046	0.051	0.010	0.003	0.076	0.109	0.041	0.069	0.073	0.146	0.128	-0.163	-0.239	0.224	0.243	0.238
Germany	0.008	0.139	-0.055	0.054	0.045	0.159	0.160	0.190	0.107	0.153	0.218	0.080	0.250	-0.155	-0.018	0.192	0.357	0.266
Ireland	-0.016	0.115	0.009	0.135	0.050	0.054	0.176	0.193	-0.011	0.003	0.142	0.130	0.241	-0.336	-0.132	0.241	0.221	0.323
Italy	0.013	0.106	-0.101	-0.069	0.171	0.078	0.165	0.227	0.081	0.127	0.349	0.141	0.324	-0.208	-0.086	0.345	0.436	0.337
Japan	-0.116	0.134	0.111	0.207	0.033	0.112	0.125	0.168	0.123	0.101	0.225	0.162	0.310	-0.146	-0.140	0.316	0.275	0.393
Korea	-0.001	0.243	0.037	0.157	-0.038	0.129	0.111	0.111	0.137	0.138	0.192	0.221	0.309	-0.032	0.200	0.314	0.411	0.344
Netherlands	-0.023	0.152	0.040	0.133	-0.010	0.140	0.205	0.195	0.099	0.145	0.153	0.183	0.276	-0.241	-0.163	0.255	0.275	0.206
Norway	-0.040	0.118	0.066	0.131	-0.022	0.079	0.164	0.209	0.115	0.099	0.103	0.041	0.174	-0.236	-0.157	0.260	0.233	0.178
Poland	0.024	0.108	0.017	-0.003	0.061	0.039	0.172	0.151	0.134	0.107	0.294	0.074	0.239	-0.238	-0.052	0.308	0.262	0.332
Russian Federation	-0.025	0.130	0.059	0.117	0.002	0.048	0.101	0.027	0.137	0.029	0.242	0.036	0.155	-0.206	-0.202	0.396	0.427	0.333
Slovak Republic	0.157	0.131	-0.071	-0.053	0.042	0.112	0.156	0.153	0.014	0.062	0.220	0.104	0.218	-0.168	-0.056	0.312	0.316	0.326
Spain	0.026	0.104	-0.046	0.023	0.118	0.147	0.042	0.054	0.059	0.017	0.214	0.153	0.202	-0.172	-0.203	0.312	0.331	0.313
Sweden	-0.163	0.073	-0.018	0.118	0.028	0.012	0.157	0.142	0.100	0.024	0.102	0.047	0.244	-0.326	-0.258	0.319	0.355	0.312
United Kingdom	0.074	0.241	0.021	0.084	-0.028	0.097	0.187	0.230	0.077	0.152	0.211	0.181	0.195	-0.196	-0.086	0.178	0.308	0.241
United States	-0.028	0.138	0.025	0.089	0.029	0.080	0.229	0.220	0.077	0.072	0.090	0.058	0.179	-0.131	-0.050	0.215	0.229	0.210

ISCO3 Technicians and associate professionals	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.095	0.121	0.045	0.096	-0.011	0.112	0.245	0.211	0.140	0.146	0.205	0.096	0.257	-0.243	0.005	0.254	0.416	0.222
Austria	-0.097	0.048	0.034	0.092	0.016	0.021	0.098	0.164	0.094	0.061	0.188	0.158	0.258	-0.357	-0.138	0.257	0.310	0.293
Belgium	-0.050	0.076	0.084	0.149	0.042	0.145	0.275	0.260	0.161	0.162	0.156	0.114	0.186	-0.322	-0.177	0.287	0.365	0.264
Canada	-0.052	0.102	0.000	0.089	-0.002	0.052	0.132	0.152	0.061	0.050	0.123	0.131	0.251	-0.342	-0.069	0.267	0.332	0.309
Cyprus	-0.009	0.127	0.001	0.040	0.019	0.035	0.077	0.117	-0.008	0.163	0.242	0.134	0.144	-0.345	-0.040	0.293	0.343	0.155
Czech Republic	-0.049	0.150	-0.005	0.034	-0.041	0.043	0.066	0.106	0.066	0.186	0.141	0.068	0.129	-0.195	-0.090	0.205	0.248	0.355
Denmark	0.010	0.145	0.154	0.147	0.003	0.114	0.232	0.229	0.120	0.162	0.224	0.152	0.212	-0.309	-0.101	0.285	0.274	0.254
Estonia	-0.049	0.212	0.131	0.115	0.122	0.127	0.173	0.180	0.135	0.060	0.272	0.121	0.209	-0.185	-0.047	0.281	0.288	0.304
Finland	-0.054	0.073	0.020	0.110	0.090	-0.031	0.095	0.136	0.039	-0.003	0.124	0.079	0.213	-0.171	-0.071	0.208	0.188	0.347
France	-0.052	0.067	0.032	0.154	0.107	0.122	0.249	0.230	0.112	0.154	0.232	0.131	0.266	-0.365	-0.375	0.298	0.279	0.325
Germany	-0.075	0.005	0.057	0.115	0.107	0.128	0.053	0.246	0.019	0.060	0.236	0.069	0.202	-0.345	-0.163	0.270	0.195	0.331
Ireland	-0.139	0.137	0.094	0.169	-0.016	0.200	0.143	0.238	0.134	0.138	0.162	0.104	0.262	-0.534	-0.063	0.288	0.350	0.275
Italy	-0.097	-0.012	0.030	0.105	0.130	0.053	0.121	0.179	0.153	0.087	0.248	0.232	0.278	-0.312	-0.080	0.382	0.368	0.318
Japan	0.020	0.164	0.121	0.210	0.002	0.167	0.152	0.194	0.089	0.105	0.183	0.214	0.247	-0.174	-0.072	0.285	0.312	0.369
Korea	-0.126	0.255	0.124	0.098	-0.185	0.081	0.173	0.168	0.155	0.115	0.213	0.151	0.316	-0.272	0.312	0.350	0.482	0.380
Netherlands	-0.152	0.136	0.105	0.136	0.080	0.116	0.275	0.309	0.144	0.151	0.212	0.232	0.318	-0.390	-0.169	0.383	0.335	0.222
Norway	-0.021	0.100	0.114	0.103	0.073	0.097	0.203	0.209	0.082	0.106	0.170	0.101	0.212	-0.233	-0.160	0.241	0.189	0.295
Poland	0.031	0.121	0.126	0.078	-0.095	-0.011	0.096	0.117	0.088	0.025	0.048	0.206	0.212	-0.339	-0.028	0.349	0.362	0.352
Russian Federation	-0.067	0.194	0.057	0.126	-0.076	0.143	0.109	0.166	0.072	0.128	0.210	0.140	0.299	-0.325	-0.096	0.234	0.162	0.374
Slovak Republic	-0.051	0.035	0.051	0.097	0.112	0.147	0.185	0.177	0.026	0.143	0.196	0.154	0.200	-0.324	-0.034	0.270	0.284	0.352
Spain	-0.046	0.111	0.022	0.102	0.077	0.098	0.147	0.183	0.205	0.093	0.305	0.146	0.312	-0.250	-0.202	0.398	0.471	0.411
Sweden	-0.065	0.110	0.083	0.150	-0.064	0.060	0.115	0.134	0.059	0.046	0.089	0.146	0.191	-0.200	-0.090	0.209	0.300	0.295
United Kingdom	-0.099	0.101	-0.130	0.028	0.096	-0.036	0.190	0.180	-0.004	-0.007	0.045	0.060	0.157	-0.321	0.030	0.264	0.295	0.249
United States	-0.101	0.115	0.022	0.146	-0.032	0.092	0.087	0.167	-0.018	0.036	0.157	0.167	0.202	-0.270	-0.017	0.258	0.338	0.134

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO4 Clerical support workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.048	0.287	0.130	0.074	0.012	0.308	0.228	0.266	0.143	0.125	0.207	0.279	0.289	-0.120	0.209	0.342	0.351	0.214
Austria	0.070	0.226	0.138	0.118	-0.016	0.126	0.213	0.162	0.164	0.095	0.195	0.192	0.248	-0.209	0.010	0.316	0.390	0.275
Belgium	-0.022	0.135	0.094	0.061	0.097	0.200	0.347	0.411	0.099	0.243	0.230	0.205	0.199	-0.312	-0.107	0.409	0.386	0.313
Canada	0.035	0.151	0.094	0.149	-0.146	0.103	0.206	0.179	0.104	0.028	0.047	0.216	0.276	-0.311	-0.026	0.260	0.352	0.195
Cyprus	0.039	0.106	0.141	0.070	-0.161	0.012	0.076	0.047	0.016	0.016	0.021	0.126	0.188	-0.278	0.089	0.310	0.349	0.181
Czech Republic	0.011	0.119	0.144	0.054	-0.106	0.110	0.226	0.224	0.211	0.082	0.090	0.105	0.323	-0.234	-0.017	0.347	0.449	0.307
Denmark	0.219	0.170	0.187	0.229	0.079	0.188	0.201	0.149	0.175	0.254	0.235	0.318	0.267	-0.281	0.017	0.363	0.394	0.303
Estonia	0.009	0.103	0.140	0.166	0.086	0.129	0.196	0.175	0.213	0.150	0.221	0.259	0.231	-0.185	0.135	0.361	0.337	0.296
Finland	-0.033	0.125	0.168	0.199	0.131	0.215	0.303	0.221	0.123	0.178	0.243	0.202	0.213	-0.261	-0.054	0.269	0.361	0.311
France	-0.025	0.106	0.085	0.055	-0.199	-0.070	0.278	0.293	0.174	0.064	0.086	0.162	0.202	-0.188	-0.072	0.228	0.312	0.264
Germany	0.003	0.080	0.107	0.150	0.014	0.093	0.153	0.251	0.116	0.096	0.156	0.126	0.147	-0.332	-0.057	0.324	0.281	0.275
Ireland	-0.036	0.176	0.107	0.174	-0.155	0.063	0.117	0.129	0.046	0.053	0.126	0.122	0.257	-0.231	0.111	0.304	0.363	0.183
Italy	-0.028	0.036	0.162	0.115	0.023	0.031	0.159	0.210	0.130	0.097	0.201	0.103	0.296	-0.317	0.028	0.284	0.352	0.346
Japan	0.030	0.099	0.129	0.172	-0.064	0.079	0.191	0.181	0.142	0.123	0.230	0.191	0.184	-0.125	-0.034	0.308	0.344	0.378
Korea	-0.021	0.214	0.133	0.127	0.007	0.207	0.238	0.225	0.105	0.229	0.193	0.224	0.252	-0.140	0.215	0.249	0.458	0.420
Netherlands	0.031	0.292	0.107	0.125	0.014	0.187	0.372	0.419	0.246	0.205	0.178	0.187	0.231	-0.345	0.002	0.370	0.367	0.202
Norway	-0.117	0.009	0.095	0.182	0.047	0.035	0.223	0.301	0.080	0.085	0.184	0.056	0.193	-0.273	-0.133	0.195	0.226	0.305
Poland	0.122	0.114	0.140	0.296	-0.085	0.091	0.233	0.257	0.066	0.075	0.179	0.194	0.189	-0.287	-0.042	0.376	0.323	0.352
Russian Federation	0.363	0.115	0.257	0.133	0.092	0.129	0.237	0.254	0.047	0.178	0.166	0.334	0.171	-0.159	0.097	0.438	0.307	0.347
Slovak Republic	0.000	0.005	-0.082	-0.115	-0.207	-0.005	0.173	0.236	-0.033	0.024	0.193	0.104	0.133	-0.452	0.004	0.292	0.373	0.328
Spain	-0.065	0.056	0.168	0.158	0.097	0.190	0.321	0.309	0.250	0.139	0.187	0.195	0.235	-0.400	-0.290	0.424	0.353	0.299
Sweden	-0.021	0.145	0.200	0.194	-0.086	0.058	0.074	0.135	0.160	0.180	0.181	0.179	0.389	-0.217	-0.201	0.246	0.259	0.462
United Kingdom	0.086	0.209	0.132	0.097	-0.197	0.079	0.283	0.230	0.164	0.053	0.083	0.135	0.321	-0.249	0.001	0.221	0.343	0.228
United States	0.011	0.181	0.142	0.053	0.057	0.124	0.056	0.131	0.109	0.081	0.105	0.193	0.291	0.024	0.179	0.299	0.308	0.267

ISCO5 Service and sales workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.037	0.111	0.087	0.137	-0.053	0.105	0.174	0.188	0.152	0.123	0.196	0.150	0.276	-0.150	0.031	0.297	0.367	0.186
Austria	-0.041	0.065	0.190	0.172	-0.006	0.065	0.084	0.087	0.170	0.070	0.272	0.171	0.224	-0.225	-0.010	0.363	0.415	0.223
Belgium	-0.064	0.102	0.280	0.267	0.057	0.168	0.217	0.190	0.260	0.258	0.284	0.221	0.296	-0.262	-0.223	0.290	0.364	0.394
Canada	0.027	0.113	0.219	0.258	0.043	0.167	0.132	0.113	0.208	0.191	0.276	0.189	0.301	-0.111	-0.023	0.321	0.433	0.209
Cyprus	0.067	0.135	0.115	0.173	0.009	0.141	0.013	-0.042	0.046	0.156	0.179	0.122	0.152	-0.165	0.001	0.331	0.445	0.260
Czech Republic	0.050	0.183	0.121	0.121	0.007	0.203	0.100	0.138	0.146	0.212	0.254	0.153	0.316	-0.250	-0.059	0.292	0.500	0.151
Denmark	0.082	0.082	0.164	0.166	0.072	0.190	0.152	0.159	0.168	0.186	0.254	0.106	0.222	-0.139	-0.039	0.351	0.376	0.233
Estonia	0.021	0.114	0.191	0.124	0.024	0.131	0.114	0.120	0.201	0.146	0.217	0.226	0.260	-0.124	-0.022	0.340	0.387	0.267
Finland	0.008	0.097	0.109	0.072	0.094	0.114	0.028	0.032	0.088	0.070	0.140	0.067	0.198	-0.115	-0.067	0.178	0.216	0.218
France	0.147	0.124	0.127	0.172	0.105	0.203	0.099	0.113	0.161	0.240	0.283	0.226	0.258	-0.146	-0.109	0.305	0.361	0.348
Germany	0.058	0.197	0.208	0.175	0.006	0.146	0.147	0.138	0.202	0.155	0.229	0.186	0.271	-0.265	-0.078	0.377	0.393	0.352
Ireland	0.104	0.142	0.171	0.315	-0.016	0.154	0.165	0.202	0.140	0.150	0.279	0.222	0.363	-0.261	-0.013	0.344	0.409	0.364
Italy	0.133	0.158	0.207	0.130	0.057	0.128	0.055	0.089	0.121	0.200	0.186	0.148	0.176	-0.258	-0.041	0.283	0.471	0.258
Japan	-0.101	0.087	0.173	0.308	0.011	0.188	0.241	0.171	0.243	0.227	0.250	0.198	0.262	-0.071	0.012	0.300	0.273	0.299
Korea	0.012	0.198	0.263	0.258	0.020	0.218	0.177	0.157	0.210	0.207	0.225	0.216	0.260	-0.138	0.328	0.390	0.493	0.379
Netherlands	0.011	0.200	0.178	0.261	-0.065	0.108	0.176	0.213	0.161	0.199	0.261	0.269	0.358	-0.268	-0.027	0.367	0.380	0.210
Norway	0.028	0.091	0.127	0.127	0.013	0.169	0.118	0.149	0.164	0.166	0.208	0.174	0.182	-0.152	-0.009	0.242	0.328	0.195
Poland	0.006	0.087	0.221	0.175	0.068	0.151	0.122	0.142	0.153	0.161	0.292	0.216	0.317	-0.260	-0.030	0.323	0.305	0.209
Russian Federation	0.003	0.177	0.135	0.199	0.093	0.164	0.141	0.139	0.135	0.246	0.167	0.116	0.177	-0.097	0.004	0.194	0.364	0.115
Slovak Republic	0.110	0.118	0.256	0.056	-0.038	0.087	0.109	0.168	0.064	0.137	0.096	0.093	0.138	-0.213	-0.058	0.289	0.331	0.210
Spain	0.191	0.243	0.299	0.312	-0.020	0.184	0.058	0.068	0.238	0.166	0.192	0.150	0.248	-0.191	-0.167	0.386	0.507	0.146
Sweden	-0.020	0.041	0.116	0.151	0.057	0.166	0.085	0.091	0.138	0.161	0.101	0.101	0.195	-0.112	-0.032	0.220	0.191	0.175
United Kingdom	0.082	0.155	0.274	0.274	-0.063	0.171	0.224	0.196	0.248	0.210	0.268	0.203	0.340	-0.164	0.078	0.383	0.432	0.171
United States	0.003	0.114	0.150	0.209	0.088	0.240	0.157	0.127	0.147	0.164	0.160	0.150	0.257	-0.108	0.055	0.383	0.421	0.320

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO6 Skilled agricultural, forestry and fishery workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	-0.045	0.018	0.116	0.201	0.150	0.084	0.166	0.139	0.381	0.311	0.213	0.095	0.101	-0.172	-0.152	0.123	0.248	0.202
Austria	0.116	0.031	0.034	0.378	0.185	0.157	0.077	0.088	0.156	0.131	0.126	0.127	0.068	-0.019	0.061	0.213	0.182	0.329
Belgium	-0.104	0.197	0.458	-0.079	0.048	0.437	-0.131	0.136	0.248	0.369	0.368	0.276	0.328	-0.454	-0.242	0.173	0.373	0.520
Canada	0.064	0.117	0.084	0.161	0.108	0.195	0.104	0.087	0.181	0.165	0.220	0.136	0.163	-0.031	0.030	0.358	0.410	0.269
Cyprus	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Czech Republic	0.197	0.093	0.103	-0.014	0.113	0.161	0.050	0.024	0.198	0.258	0.215	0.097	0.075	-0.135	-0.142	0.206	0.207	0.208
Denmark	0.136	-0.094	-0.058	0.110	0.196	0.304	0.086	0.075	-0.006	0.036	0.190	0.051	0.268	-0.034	-0.185	0.296	0.301	0.394
Estonia	-0.072	-0.041	0.085	0.329	0.072	0.152	0.029	0.066	0.155	0.167	0.158	0.056	0.120	-0.018	-0.004	0.047	0.008	0.138
Finland	0.137	0.134	0.091	0.284	0.079	0.169	0.118	0.106	0.099	0.073	0.108	0.128	0.037	-0.022	0.069	0.087	0.249	0.193
France	0.078	-0.023	-0.067	0.018	0.084	0.096	0.108	0.108	0.152	0.125	0.090	0.044	0.099	-0.186	-0.134	0.061	0.168	0.198
Germany	0.032	0.226	-0.005	0.196	0.135	0.213	0.094	0.127	0.098	0.201	0.194	0.008	0.071	-0.071	0.120	0.157	0.264	0.351
Ireland	0.049	0.090	0.075	0.110	-0.045	0.000	0.060	0.060	0.042	0.086	0.054	-0.025	0.050	-0.089	0.062	0.097	0.140	0.209
Italy	0.284	0.185	0.244	0.342	0.115	0.113	0.139	0.143	0.305	0.214	0.194	0.239	0.070	-0.021	0.091	0.449	0.416	0.405
Japan	-0.202	-0.111	-0.006	0.251	-0.080	-0.019	0.114	0.073	-0.054	0.019	0.094	0.164	0.003	-0.034	0.048	0.206	0.075	0.022
Korea	0.080	0.146	0.058	0.177	-0.100	0.049	-0.008	0.007	0.106	0.145	0.044	0.187	0.235	-0.241	0.278	0.213	0.334	0.466
Netherlands	-0.111	-0.085	0.201	0.275	0.196	0.414	0.160	0.142	0.139	0.325	0.361	0.315	0.453	-0.732	-0.234	0.335	0.506	0.227
Norway	0.234	0.077	0.183	0.326	0.098	0.138	-0.088	-0.120	-0.066	-0.003	0.008	0.094	0.066	-0.067	-0.082	0.131	0.277	0.056
Poland	0.088	0.104	0.318	0.575	0.121	0.219	0.004	0.019	0.140	0.234	0.197	0.112	0.169	-0.104	-0.082	0.102	0.272	0.089
Russian Federation	0.225	0.348	0.365	0.515	0.273	0.346	0.115	-0.450	0.308	0.337	0.399	-0.192	-0.101	-0.285	0.118	0.642	0.748	0.140
Slovak Republic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Spain	-0.053	0.202	0.072	-0.045	0.172	0.186	0.125	0.113	-0.037	0.200	0.418	0.094	0.072	-0.066	-0.103	0.242	0.264	0.431
Sweden	-0.049	0.145	0.396	0.342	0.200	0.114	0.158	0.097	0.335	0.505	0.502	0.225	0.446	-0.284	-0.163	0.435	0.529	0.405
United Kingdom	0.625	0.360	0.727	0.813	0.264	0.524	0.184	0.131	0.576	0.574	0.526	0.415	0.676	-0.554	0.027	0.526	0.699	0.792
United States	0.014	0.143	0.339	0.578	0.320	0.312	0.062	0.189	0.157	0.419	0.368	0.212	0.362	0.107	0.087	0.090	0.378	0.753

ISCO7 Craft and related trades workers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.145	0.148	0.160	0.343	0.052	0.239	0.144	0.185	0.217	0.261	0.279	0.080	0.169	-0.290	-0.116	0.359	0.439	0.320
Austria	-0.114	0.003	0.120	0.244	0.117	0.094	0.114	0.110	0.195	0.250	0.210	0.077	0.176	-0.285	-0.232	0.298	0.311	0.330
Belgium	-0.038	0.071	0.123	0.262	0.137	0.217	0.187	0.099	0.218	0.171	0.246	0.148	0.190	-0.235	-0.061	0.369	0.360	0.327
Canada	-0.003	0.005	0.114	0.297	0.095	0.208	0.133	0.130	0.175	0.234	0.264	0.073	0.249	-0.325	-0.188	0.349	0.399	0.315
Cyprus	-0.092	0.038	0.083	-0.029	0.076	0.101	-0.013	0.123	0.113	0.194	0.160	0.082	0.062	-0.081	0.003	0.174	0.203	0.225
Czech Republic	-0.146	0.008	0.199	0.179	0.029	0.181	0.031	0.069	0.109	0.229	0.135	0.098	0.184	-0.349	-0.029	0.255	0.355	0.269
Denmark	0.017	-0.011	0.029	0.232	0.292	0.177	0.139	0.112	0.127	0.226	0.332	0.094	0.206	-0.273	-0.134	0.348	0.309	0.379
Estonia	-0.026	0.085	0.107	0.077	0.101	0.174	0.107	0.090	0.102	0.145	0.078	0.102	0.002	-0.228	-0.038	0.242	0.247	0.223
Finland	-0.021	-0.007	0.083	0.063	0.165	0.159	0.071	0.075	0.010	0.058	0.089	0.090	0.054	-0.148	-0.186	0.144	0.254	0.182
France	0.000	0.088	0.156	0.218	0.212	0.248	0.217	0.199	0.186	0.237	0.255	0.199	0.204	-0.142	-0.077	0.283	0.333	0.347
Germany	-0.052	0.006	0.139	0.307	0.167	0.209	0.105	0.167	0.181	0.182	0.204	0.138	0.286	-0.200	-0.003	0.287	0.268	0.343
Ireland	0.029	0.172	0.172	0.332	-0.022	0.168	0.091	0.178	0.184	0.186	0.199	0.140	0.233	-0.361	-0.117	0.364	0.443	0.387
Italy	0.084	-0.017	0.105	0.226	0.117	0.183	0.137	0.051	0.116	0.247	0.279	0.151	0.229	-0.090	-0.007	0.351	0.469	0.244
Japan	-0.015	0.112	0.203	0.206	0.015	0.222	0.214	0.149	0.036	0.232	0.295	0.176	0.306	-0.208	-0.083	0.324	0.345	0.374
Korea	-0.003	0.151	0.151	0.196	0.158	0.135	0.177	0.216	0.104	0.221	0.128	0.149	0.276	-0.182	0.144	0.383	0.379	0.308
Netherlands	0.061	0.171	0.240	0.191	0.144	0.227	0.139	0.128	0.170	0.253	0.204	0.235	0.236	-0.296	-0.007	0.380	0.453	0.264
Norway	-0.064	0.057	0.044	0.218	0.174	0.120	0.080	0.149	0.218	0.177	0.136	0.081	0.130	-0.430	-0.281	0.267	0.282	0.279
Poland	-0.003	0.061	0.124	0.147	0.146	0.114	0.073	0.102	0.063	0.121	0.120	0.127	0.129	-0.310	0.007	0.274	0.278	0.285
Russian Federation	0.049	0.106	0.178	0.064	0.158	0.163	0.116	0.122	0.248	0.175	0.227	0.108	0.094	-0.112	-0.060	0.156	0.205	0.169
Slovak Republic	0.036	0.101	0.234	0.326	0.010	0.166	0.255	0.215	0.176	0.243	0.200	0.109	0.169	-0.323	-0.007	0.258	0.367	0.212
Spain	0.042	0.080	0.222	0.210	0.167	0.278	0.183	0.109	0.271	0.258	0.237	0.101	0.224	-0.101	-0.007	0.332	0.327	0.400
Sweden	0.064	0.144	0.122	0.146	0.020	0.124	0.037	0.056	0.080	0.084	0.031	0.026	0.079	0.040	-0.025	0.077	0.179	0.142
United Kingdom	-0.025	0.130	0.137	0.275	0.068	0.238	0.101	0.045	0.079	0.184	0.201	0.110	0.208	-0.391	-0.136	0.247	0.431	0.230
United States	0.081	0.131	0.070	0.160	0.059	0.080	0.109	0.095	0.050	0.167	0.184	0.081	0.080	-0.305	-0.252	0.334	0.318	0.215

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: For Cyprus, see note of Figure 5.

ISCO8 Plant and machine operators and assemblers	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.133	0.100	0.140	0.163	0.225	0.230	0.202	0.152	0.308	0.235	0.265	0.082	0.170	0.025	0.124	0.276	0.243	0.254
Austria	0.192	0.148	0.239	0.441	0.213	0.262	0.136	-0.056	0.351	0.300	0.190	0.175	0.236	-0.207	-0.077	0.234	0.178	0.188
Belgium	0.155	0.125	0.170	0.338	0.073	0.183	0.081	0.060	0.183	0.167	0.114	0.238	0.212	-0.186	0.016	0.305	0.261	0.303
Canada	0.065	0.133	0.109	0.288	0.078	0.191	0.151	0.109	0.221	0.116	0.116	0.167	0.293	-0.117	0.035	0.294	0.322	0.369
Cyprus	#N/A	-0.043	-0.084	-0.048	0.228	0.189	0.160	0.152	-0.081	0.194	-0.026	0.048	-0.042	0.071	0.066	0.365	0.040	0.282
Czech Republic	0.081	0.133	0.370	0.189	-0.008	0.085	0.081	0.011	0.245	0.131	0.181	0.112	0.134	0.066	0.143	0.235	0.113	0.053
Denmark	0.069	0.039	0.128	0.059	-0.035	0.157	0.070	0.073	0.093	0.156	0.173	0.123	0.173	-0.069	-0.036	0.289	0.277	0.195
Estonia	0.015	0.049	0.035	0.014	-0.029	0.123	0.110	0.132	0.111	0.058	0.084	0.048	0.014	-0.069	0.031	0.088	0.150	0.104
Finland	0.144	0.136	0.151	0.188	0.064	0.187	0.071	0.152	0.092	0.097	0.104	0.076	0.196	-0.003	0.024	0.152	0.260	0.150
France	0.162	0.123	0.091	0.151	-0.008	0.057	0.082	0.123	0.336	0.150	0.146	0.122	0.106	-0.049	-0.038	0.134	0.178	0.212
Germany	0.099	0.151	0.254	0.219	0.033	0.193	0.100	0.049	0.203	0.204	0.045	0.100	0.011	-0.061	0.017	0.160	0.182	0.275
Ireland	0.010	0.128	0.155	0.189	0.109	0.146	0.054	0.091	0.106	0.218	0.045	0.251	0.269	-0.041	-0.011	0.166	0.273	0.289
Italy	0.046	0.007	0.166	0.066	0.108	0.160	0.121	0.021	0.161	0.144	0.169	0.084	0.065	-0.032	0.040	0.177	0.220	0.299
Japan	0.206	0.098	0.180	0.236	-0.058	0.195	0.222	0.067	0.304	0.193	0.146	0.100	0.305	0.088	0.105	0.237	0.245	0.269
Korea	0.137	0.154	0.248	0.217	-0.029	0.178	0.128	0.117	0.156	0.152	0.109	0.175	0.126	-0.158	0.170	0.276	0.369	0.319
Netherlands	0.084	0.144	0.206	0.372	-0.070	0.124	0.140	0.166	0.095	0.052	0.050	0.106	0.078	-0.058	0.070	0.180	0.353	0.203
Norway	0.106	0.019	0.255	0.261	0.115	0.144	0.115	0.095	0.241	0.204	0.091	0.214	0.179	-0.104	0.042	0.322	0.408	0.295
Poland	0.023	0.106	0.090	0.014	-0.010	0.047	0.073	0.085	0.093	0.179	0.233	0.052	0.172	-0.057	0.056	0.202	0.105	0.217
Russian Federation	-0.017	0.100	0.315	0.264	0.000	0.203	0.058	0.037	0.139	0.134	0.108	0.045	-0.024	-0.078	0.123	0.096	0.108	0.051
Slovak Republic	0.088	0.026	0.149	0.025	0.127	0.133	0.008	0.063	0.199	0.104	0.071	0.008	0.151	-0.116	0.068	0.253	0.246	0.137
Spain	0.153	0.085	0.311	0.210	0.095	0.215	0.119	0.058	0.270	0.072	0.031	0.108	0.102	-0.029	0.087	0.214	0.029	0.378
Sweden	0.112	0.112	0.172	0.131	-0.097	0.069	0.104	-0.056	0.159	0.166	0.044	0.188	0.136	-0.005	0.054	0.125	0.190	0.052
United Kingdom	0.193	0.243	0.237	0.278	-0.060	0.184	0.177	0.172	0.346	0.247	0.171	0.104	0.191	-0.029	0.018	0.270	0.379	0.351
United States	0.028	0.048	0.030	0.047	0.150	0.139	0.102	0.200	0.283	0.183	0.147	0.159	0.182	0.041	0.015	0.224	0.176	0.255

ISCO9 Elementary occupations	Cooperation	Horizontal interaction			Client interaction		Self-direction		Managerial skills	Influence		Problem solving		Physical skills (stama)	Manual skills	Derived variables		
	Collaboration F_Q01b	Information sharing F_Q02a	Training others F_Q02b	Giving presentations F_Q02c	Selling a product or service F_Q02d	Advising others F_Q02e	Planning of own activities F_Q03a	Organising own time F_Q03c	Planning activities of others F_Q03b	Persuading people F_Q04a	Negotiating with people F_Q04b	Problem solving in less than 5 minutes F_Q05a	Thinking about a solution for at least 30 minutes F_Q05b	Working physically F_Q06b	Using skill or accuracy with hands or fingers F_Q06c	Readwork	Writwork	Numwork
Australia	0.055	0.068	0.152	0.231	0.081	0.242	0.183	0.159	0.202	0.168	0.209	0.107	0.109	-0.349	-0.126	0.235	0.358	0.169
Austria	0.057	0.179	0.252	0.081	0.197	0.276	0.212	0.096	0.290	0.285	0.259	0.182	0.258	-0.132	0.099	0.348	0.377	0.386
Belgium	0.093	0.135	0.146	0.230	0.197	0.192	0.049	0.048	0.053	0.181	0.156	0.172	0.178	-0.117	0.064	0.296	0.246	0.295
Canada	0.002	0.029	0.087	0.037	0.013	0.046	0.013	0.053	0.083	0.056	0.073	0.003	0.057	0.005	0.030	0.163	0.161	0.216
Cyprus	-0.181	-0.169	-0.058	-0.046	0.135	-0.067	-0.141	-0.178	-0.074	0.141	0.065	-0.133	-0.012	-0.172	-0.040	0.131	0.145	0.220
Czech Republic	0.049	0.008	0.156	0.167	0.154	0.096	0.062	0.096	0.041	0.180	0.234	0.102	0.270	-0.146	-0.119	0.352	0.284	0.343
Denmark	0.046	0.079	0.169	0.213	0.082	0.132	0.076	0.049	0.164	0.187	0.200	0.171	0.280	-0.129	-0.025	0.381	0.358	0.476
Estonia	0.028	0.136	0.198	0.218	0.114	0.172	0.101	0.081	0.257	0.132	0.167	0.156	0.149	-0.259	0.006	0.303	0.303	0.366
Finland	0.042	0.085	0.176	0.179	-0.104	0.085	0.127	0.098	0.204	0.129	0.123	0.197	0.250	-0.028	-0.079	0.195	0.271	0.317
France	0.152	0.186	0.154	0.215	0.073	0.185	0.092	0.109	0.314	0.218	0.179	0.187	0.171	-0.188	-0.110	0.195	0.240	0.372
Germany	0.029	0.170	0.303	0.269	0.209	0.353	0.117	0.107	0.210	0.262	0.270	0.260	0.462	-0.278	-0.036	0.427	0.491	0.275
Ireland	0.044	0.077	0.267	0.298	0.083	0.237	0.172	0.173	0.181	0.274	0.291	0.163	0.237	-0.218	0.079	0.309	0.323	0.229
Italy	0.020	0.206	0.388	-0.013	0.147	0.192	0.113	0.166	0.256	0.314	0.216	0.144	0.228	-0.094	-0.018	0.358	0.358	0.539
Japan	0.047	0.118	0.174	0.105	0.035	0.014	0.027	0.149	0.010	0.021	0.150	0.161	0.266	0.105	-0.081	0.164	0.209	0.257
Korea	0.057	0.171	0.181	0.131	0.051	0.100	0.064	0.085	0.198	0.132	0.054	0.163	0.092	-0.003	0.221	0.249	0.219	0.381
Netherlands	0.070	0.220	0.460	0.283	0.188	0.253	0.247	0.199	0.530	0.284	0.270	0.280	0.211	-0.160	-0.082	0.316	0.434	0.269
Norway	-0.036	0.208	0.296	0.428	0.012	0.339	0.200	0.269	0.292	0.316	0.259	0.270	0.434	-0.469	-0.282	0.475	0.459	0.310
Poland	0.062	0.156	0.254	0.462	0.194	0.288	0.169	0.127	0.325	0.256	0.160	0.132	0.143	-0.043	-0.070	0.219	0.255	0.049
Russian Federation	-0.020	0.244	0.301	0.225	0.326	0.387	0.231	0.182	0.213	0.334	0.266	0.189	0.253	-0.409	-0.066	0.507	0.503	0.263
Slovak Republic	-0.101	0.017	0.118	0.113	0.183	0.168	0.151	0.101	0.040	0.009	0.251	0.075	0.096	-0.185	-0.073	0.318	0.370	0.163
Spain	0.097	0.083	0.067	0.063	0.210	0.235	0.056	0.048	0.119	0.135	0.011	0.077	0.142	-0.128	0.019	0.286	0.199	0.303
Sweden	0.101	0.222	0.400	0.374	0.018	0.322	0.200	0.209	0.327	0.354	0.368	0.309	0.386	-0.567	-0.250	0.435	0.461	0.209
United Kingdom	0.115	0.186	0.327	0.401	0.085	0.305	0.175	0.193	0.361	0.329	0.230	0.252	0.371	-0.229	0.050	0.462	0.547	0.434
United States	-0.082	0.062	0.186	0.073	0.137	0.186	0.062	0.107	0.192	0.129	0.145	0.122	0.115	-0.086	0.051	0.257	0.244	0.376

The colour coding reflects the significance of the coefficients. Dark yellow indicates strong negative coefficients and dark green indicates strong positive coefficients.

Note: See note of Figure 5.

Source: OECD, based on PIAAC Database, October 2015.

NOTES

1. Question g_q04.

2. Question g_q05g.

3. See note of Figure 5.

4. The relevant productivity measure is marginal labour productivity, which is not observable, while this paper looks at average labour productivity, which is observable. These two productivity measures are perfectly correlated only under specific production functions, *e.g.* a Cobb-Douglas.

5. We would like to thank Burning Glass and Jobfeed for the use of their data sets. In particular, we would like to thank Matt Sigelman, Davor Miskulin, Will Markow and Hal Bonella (Burning Glass); Jakub Zavrel and Bauke Visser (Jobfeed).

6. Brown and Souto-Otero (2016) have compared vacancy rates data in the UK based on Burning Glass and the labour force survey. Burning Glass rates are significantly higher for Professional occupations (11.5 percentage points) and Associate professional & technical (8.3) while they are lower for Elementary occupations (-7.1) and Caring, leisure & other services (-5.3).

7. However, only 0.8% of surveyed businesses were in the Information sector. The remaining did not have open vacancies or did not require computer skills.

8. A fourth group is use of ICT, which was already discussed in Section 2.1.

9. Variable 4.A.3.b.1 in the O*NET Data Dictionary.

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