PART III

Removing obstacles to job creation

CHAPTER III.1

Supporting skills development and matching in the EU ([1])

The present chapter analyses skills development and matching, a fundamental issue for the functioning of labour markets in the EU. It starts with an explanation of the concept and definitions behind 'skills' and with a presentation of the current economic backdrop. In Section 2 it then examines a number of problems around skill mismatches, monitoring and forecasting skill demand. Then, before concluding, it presents some policy recommendations: better education and training, Active Labour Market Policies (ALMPs) and recognition of skills and qualifications.

1. Skills in the EU – The economic context

Seven years after the beginning of the Great Recession, the European Union (EU) is still struggling to return to a sustainable growth path able to absorb the current high stocks of unemployment. This situation presents major concerns not only for the economic prospects but also for the long-term sustainability of the European social model.

One of the key issues that employment and social policies have to address is the preservation and development of human capital. The formation, maintenance, recognition and use of knowledge, skills and competence are crucial for the prosperity of individuals, for the competitiveness of firms, and for overall economic development, high employment and social cohesion in the EU. Countries with a highly qualified and skilled workforce also tend to have higher employment rates, skills proficiency and productivity. Policies to increase employability can also facilitate transnational mobility for workers and learners and contribute to meeting the requirements of supply and demand in the European labour market.

1.1. How to define and measure skills

The definition of skills varies widely in the literature. From a broad perspective, human capital can be defined as 'the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being' (OECD, 2001; EC–ESDE, 2014). This goes beyond earlier definitions that focused essentially on the 'productive value' of human capital (Mincer, 1958 and 1997).

The multifaceted nature of this concept implies that it spreads across several distinct domains. Green (2013) looks at the different uses of the concept, in economics, sociology and psychology, and proposes a functional concept of skills, according to which 'skills' have three key features: they are productive, expandable and social. Using skill is productive of value; skills are enhanced by training and development; and skills are socially determined.

Heckman and Kautz (2012) argue that an important dimension of skills relates to what they call 'soft skills', which they define as 'soft skills – personality traits, goals, motivations, and preferences that are valued in the labor market' ([2]). These are relevant for the labour market, in education and in many other life domains. Soft skills are important determinants of personal success, and programmes that enhance soft skills may have an important place in public policy.

The division between skills and attributes is blurred and some authors consider attributes as skills to emphasise that, as with knowledge and skills, they can be influenced and changed over the life-cycle by the external environment, including learning ([3]).

Even official definitions differ in the use they make of the terms 'skills' and 'competences'. The Recommendation of the European Parliament and of the Council on key competences for Lifelong Learning

([1]) By Bartek Lessaer, Paolo Pasimeni, Konstantinos Pouliakas, Mantas Sekmokas with contributions by Petrica Badea, Michael Horgan, John Hurley and Anneleen Vandeplas.

([2]) Heckmann and Kautz (2012) (p. 451).

([3]) Heckmann and Kautz (2013) recently introduced the concept of 'character skill' which captures personality traits, goals, motivations, and preferences. See also explanation of 'interactive skills' in Green (2013). Heckman and Kautz also note that such skills lie on a spectrum in terms of their ability to be changed. In particular, the preference parameter part of soft skills (time discounting, risk aversion, social preference and trust) show mixed evidence in terms of their stability, with a number of studies showing little change with age. See Almlund et al, 2011.

(LLL) ([4]) defines these key competences as 'a combination of knowledge, skills and attitudes appropriate to the context'. It stresses that these are necessary for personal fulfilment and development, social inclusion, active citizenship and employment and suggests they guarantee more flexibility in the labour force, allowing it to adapt more quickly to constant changes. The key competences are acquired by formal education and training and through a continuous process of developing and updating skills.

The Recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for Lifelong Learning ([5]) defines the concepts of knowledge, skills and competence. Knowledge is described as theoretical and/or factual; skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments); and competence is described in terms of responsibility and autonomy. In this context, 'skills' refers to the ability to apply knowledge to complete tasks and solve problems.

The main difference is that the first Recommendation uses 'skills' as a component of 'competence', while the second one puts the two concepts on the same level, together with 'knowledge'. Looking at this difference through the perspective of the labour market, the first approach implies a broader view of 'competences' as all those attributes which enable the individual to be active in the labour market, namely knowledge, skills and attitudes appropriate to the context. The second approach instead uses 'competences' rather as a behavioural concept which relates to the personality, prior experience and other psychological traits of the individuals. In this sense, 'skills' would be the ability to execute tasks, while 'competences' determine how well individuals actually perform those tasks ([6]) (see McClelland, 1973 or Boyatzis et al. 2015).

([4]) Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning [Official Journal L 394 of 30.12.2006], http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006H0962&from=EN

([5]) Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment ofthe European Qualifications Framework for lifelong learning [Official Journal C 111, 6.5.2008]. Annex 1, paragraph h, http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32008H0506(01)

([6]) Some HR managers say that people are hired based on their skills but are promoted or fired based on their competencies e.g. see: Goleman et al. 2013.

Box 1: Main sources

The **EU Labour Force Survey (EU-LFS)** ([1]), carried out by Eurostat and the national statistical institutes in all the EU Member States, collects information on a wide number of work-related topics, including employment/unemployment and participation in LLL broken down by different categories.

The OECD **Programme for International Student Assessment (PISA)** ([2]) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students. The most recently published results are from the assessment in 2012, which focused on reading, mathematics and science (with a focus on mathematics) as well as on creative problem-solving and financial literacy, and covered all the EU Member States. The 2015 assessment will focus on science.

The OECD **Survey of Adult Skills (PIAAC)** ([3]) provides evidence about the skills of Europe's working-age population. The data informs about the literacy, numeracy and problem-solving skills of the 16-65 year-olds and thus allows for looking into the long-term outcomes of educational provision in terms of the skills acquired or the relation between formal qualifications and skills levels. The 1st PIAAC round was carried out in 2008-2013 in 17 EU Member States ([4]). The 2nd round is being carried out in 2012-2016 in three other Member States (Greece, Lithuania and Slovenia).

The **European Working Conditions Survey (EWCS)** ([5]) by Eurofound explores quality of work issues and provides information on *inter alia* training and learning at work.

Cedefop's **European Skills and Jobs (ESJ)** survey ([6]), carried out in 2014 in all 28 EU Member States, collected information on the match of the skills of about 49 000 workers (adults aged 24-65) with the skill needs of their jobs ([7]).

The EU **Adult Education Survey (AES)** ([8]), carried out by Eurostat and national statistical offices every five years, collects information on a variety of aspects of individual participation in formal and non-formal education and training in the EU of adults aged 25-64. This includes the analysis of willingness to participate in learning, expected outcomes, types of learning undertaken, learning providers and financing of learning.

The EU **Continuing Vocational Training Survey (CVTS)** ([9]), carried out by Eurostat and national statistical offices every five years, collects information on training activities carried out and/or financed by companies working in the business economy for their employees. The data collected includes assessment of companies' HR practices, skills needs, the financial amounts invested in training, and barriers to training or reasons for not providing training for the employees.

([1]) http://ec.europa.eu/eurostat/web/lfs/overview

([2]) http://www.oecd.org/pisa/

([3]) http://www.oecd.org/site/piaac/

([4]) AT, BE (Flanders only), CZ, DK, EE, FI, FR, DE, IE, IT, NL, PL, SK, ES, SE, UK (England and Northern Ireland only).

([5]) To date, Eurofound has carried out five European Working Conditions Surveys (1991, 1995, 2000/2001, 2005 and 2010). The 6th survey to be carried out in 2015 will include all the 28 EU Member States The first results will be available at the end of 2015.

([6]) http://www.cedefop.europa.eu/en/news-and-press/news/cedefop-launches-european-skills-survey-eu-skills

([7]) It provides a first insight of the dynamics of qualification and skill mismatch in the EU, focusing on the interplay between changes in the (cognitive and non-cognitive) skills of employees in their jobs as well as the changing skill needs and complexities of their jobs. The survey also focuses on the role of European policies on initial (e.g. work-based learning) and continuing VET (e.g. formal, non-formal and informal training) and on workplace design for mitigating skill mismatch. For further information see Cedefop (2015b) and http://www.cedefop.europa.eu/en/events-and-projects/projects/analysing-skill-mismatch.

([8]) http://ec.europa.eu/eurostat/web/education-and-training/methodology

([9]) http://ec.europa.eu/eurostat/web/education-and-training/methodology

For the purposes of our analysis, however, we have chosen an operational definition, which allows us to quantify the concept of skills and conduct the analysis. Therefore, we focus on those elements which are measurable, thus restricting the focus of the definition. Measuring the quantity and quality of skills and their impact on employability and productivity, along with how skills are matched to skill needs in the labour market, is a complex task that relies on a number of sources, of which the main ones are presented in Box 1.

1.2. Why skills matter

1.2.1. The role of skills in competitiveness and productivity

Forming and developing relevant skills, activating existing skills and making effective use of them is crucial for productivity and international competitiveness, and for sustainable, inclusive economic growth (OECD, 2012; Schwab, 2014; Burgess, 2015; Wiederhold and Woessmann, 2015; Patt, 2015). At the individual level, skills are essential for social inclusion and are positively associated with better individual labour market outcomes ([7]).

In view of workforce shrinkage and increased global competition the pressure to generate higher productivity gains will be particularly strong in the EU over the next decades. Present demographic trends suggest that the 'demographic dividend', which sustained economic growth in past decades, is likely to reverse. Moreover, the shrinkage of the workforce will materialise at a time when global competition is expected to require more skilled workers in many industries which are under pressure to become more innovative and productive. The result may be fiercer global competition for talents, with skills becoming a decisive success factor in an increasingly globalised environment.

Workforce shrinking could reduce employment ([8]), leaving productivity growth as the only leverage to sustain economic growth. Higher employment growth would not suffice to compensate, although it could postpone the point in time when productivity becomes the only source of economic growth. This implies that the EU has to obtain much faster productivity growth in the near future than it has in the past, if the current productivity gap relative to the EU's main competitors ([9]) is to be closed.

The logical response to these challenges is to try to generate higher productivity gains by investing in skills. However, the search for productivity gains, by substituting labour with capital, risks generating jobless growth, reducing the national income share of workers relative to capital and putting further pressure on the labour demand side. In this respect, much of the existing evidence suggests that there has been a strong complementarity between capital and skills in today's globalised production chains ([10]). However, there are more recent concerns that such a relationship may be weakening – Brown, Lauder and Ashton (2011) discuss a process of 'digital Taylorism' occurring within many high-skill occupations driven by technical change. Moreover, others have predicted that new technologies, such as robotics, may in the future substitute for high-skilled work rather than complement it (Frey and Osborne, 2013; Brynjolfsson and McAfee, 2013). At the macro level, investment, growth and productivity rates and levels typically correlate with the share of higher skills in the labour force. Establishing the direction of causality can prove difficult and it might be that higher skill investment follows growth, investment and rising productivity (Bils and Klenow, 1998). Some channels for investment in higher skills have been shown to have causal effects on growth, particularly where such investment leads to greater innovation (Aghion et al. 2009; Aghion and Akcigit, 2015). However, the evidence is more mixed – for example, Holmes (2013) finds zero or negative relationships between long-run economic growth rates and the size of higher education sectors or the rate of their expansion, once other levels of education and capital investment had been controlled for.

The demand for skilled workers will continue to increase, if the EU is to ensure higher productivity gains (see Section 2.4). The Annual Growth Survey 2015 ([11]) stresses the need for a skilled work force in growing sectors such as the digital economy, green sectors and health. It places a particular emphasis on the need to upgrade vocational training and dual education systems, and LLL, and to improve the assessment of regional and sectoral skills needs.

1.2.2. Inequalities and job polarisation

Rising inequality is a major challenge for our societies and is notably linked to increasing polarisation in the labour market – that is, an increase in the employment share of higher-skill and lower-skill jobs and a decline in middle-skilled work (Beblavy and Veselkova, 2014). One of the main drivers of this tendency is the structural change promoted by technological progress, which tends to make skills of workers obsolete, particularly those needed to perform the tasks typically associated with middle-skilled work. In order to avoid that technological change ends up increasing inequalities it is important for skills to be kept up to date with the changing demands. The assumption here is that such skills, once produced, are employed in the labour market. However Keep and Mayhew (2010) identified weak demand for skills as a major obstacle between skill investment and an improvement in economic inequality and other social objectives.

Recent analyses (OECD, 2015, Employment Outlook) show that countries where skills are less equally distributed also have higher wage inequality and that putting skills to better use can help both maintaining them (EC, ESDE, 2014) and reducing wage inequality, by strengthening the links between workers' skills, productivity and wages (OECD, 2015). Investment in skills, then, turns out to be one of the key policies for addressing inequality and social inclusion. It is believed to be a powerful instrument for governments to use to reduce wage dispersion, but also to increase employment rates together with the increase in the share of women in employment (OECD, 2011, DWS).

In the EU as a whole, over the periods covered by the analysis going back to 1998, employment shifts have tended to be asymmetrically polarising, i.e. upgrading but with some evidence of polarisation, which becomes more apparent in recessions (see Chart 1). Employment polarisation sharpens during periods of net employment destruction.

([7]) OECD (2013b), Hanushek et al. (2013), Quintini (2014) and, Dinis da Costa et al. (2014).

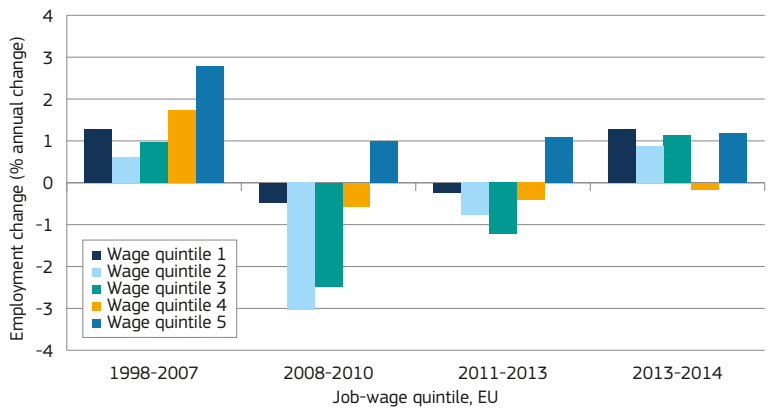
([8]) Under a low activity growth scenario the EU will see employment growth turn negative around 2021 (Chart 1, EC–ESDE 2014, Chapter 2).

([9]) van Ark et al. (2013).

([10]) Timmer et al. (2013); Krusell et al. (2000); DG EMPL's Labour Market Model incorporates the capital–skills–complementarity, see Berger et al. (2009), p. 3.

([11]) http://ec.europa.eu/europe2020/pdf/2015/ags2015_en.pdf

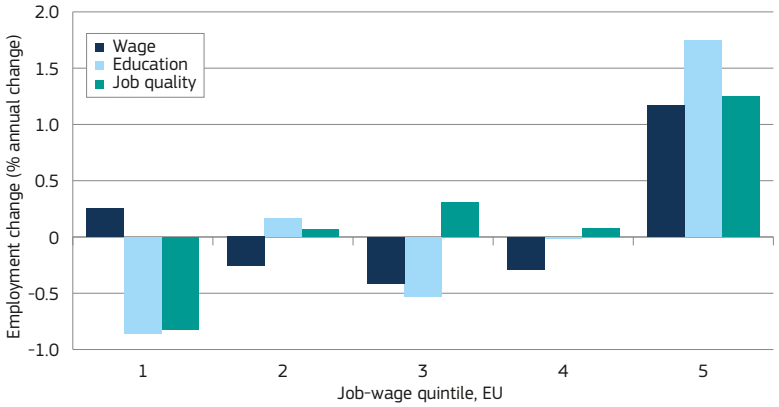
Chart 1: Employment change (% per annum), EU, by job–wage quintile



Reading note: EU-27 for 2008-2014 (HR not included), EU-23 for 1998-2007 (PL, RO, MT, BG missing). Quarter two employment data used for each year post-2008, annual data for 1998-2007. The changes do not add up to zero.

Sources: EU-LFS, Structure of Earning Survey (Eurofound calculations).

Chart 2: Annual employment change (%), EU 2011-2014, by job wage, education attainment and job quality quintiles



Reading note: Second quarter data in each year. Due to sample limitations, the third, multidimensional 'job quality' indicator derived from the Fifth European Working Conditions survey was not able to generate rank estimates for jobs accounting for c. 8% of employment. The education attainment according to ISCED.

Source: Eurofound 2015, http://www.eurofound.europa.eu/publications/report/2015/labour-market/upgrading-or-polarisation-long-term-and-global-shifts-in-the-employment-structure-european-jobs, p. 93. Data from: EU-LFS, Structure of Earning Survey, 5th EWCS (Eurofound calculations).

In the period of employment expansion prior to the financial crisis (1998-2007), employment grew across job–wage quintiles ([12]), but strongly skewed towards jobs in the top two quintiles.

In the phase of sharp employment contraction (2008-2010), this trend continued with the higher quintile still acknowledging positive growth. Heaviest job losses were experienced in the middle of the wage distribution while the lowest quintile experienced more modest losses.

This pattern persisted during 2011-2013 though employment contraction slowed down and the polarisation was correspondingly more muted.

In 2013-2014 job growth resumed on average in the EU-28 ([13]). While employment grew in the lowest and highest-paid jobs, the pattern is quite distinct from the asymmetrical polarisation of the earlier two periods. Perhaps the most interesting feature is that the largest share of net new employment created since 2013Q2 has been in the bottom three job–wage quintiles.

The debate about shifts in the employment structure in developed economies has largely been oriented around two main patterns of change: 'skill-biased technological change' in the case of upgrading and 'task-biased technological change' in the case of polarisation. With upgrading employment shifts, the patterns we expect to see are a more or less linear improvement in the employment structure with greatest employment growth in high-paid (or -skilled) jobs and weakest growth in low-paid (or -skilled) jobs with moderate growth in the middle. With polarisation, the main difference is that the relative positions in terms of employment dynamics of the middle and bottom of the job distribution would be swapped; employment growth is weakest in the middle and relatively stronger at both ends of the job distribution leading to a 'shrinking' or 'hollowing middle'.

The main explanation of the differences in the two accounts is the contention by exponents of 'task-biased technological change' that those jobs most vulnerable to technological displacement are routine jobs (clerical and manufacturing / production) which happen to predominate in the middle of the wage distribution in developed economies. Less-routine jobs are either less vulnerable to replacement by machines – for example, personal services – or are actively complemented by, and made more productive by new technology – such as knowledge-intensive professional services. These less-routine jobs tend to be more prevalent at either end of the wage distribution.

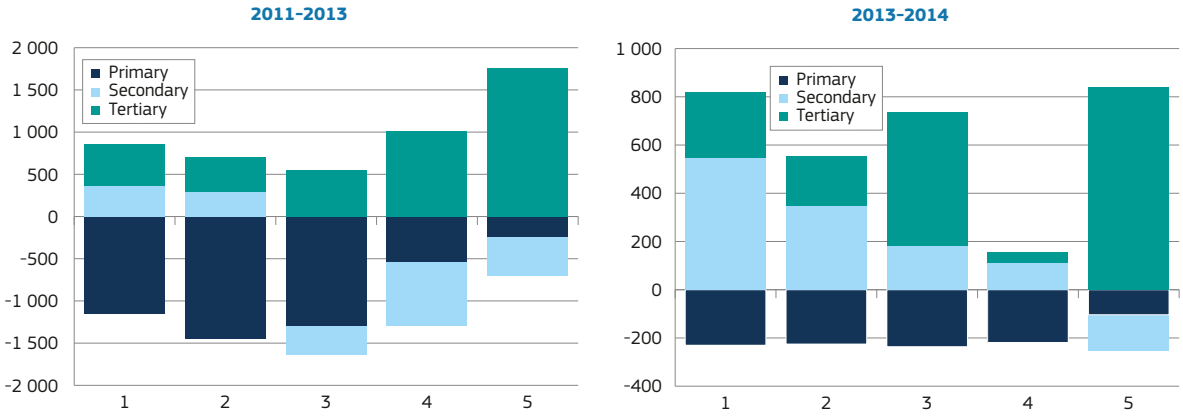
The most consistent finding of this type of jobs approach analysis is that there has been greater employment growth in well-paid jobs employing those with generally high education / training levels than in mid- or low-paid jobs. The shape of the observed employment shifts may depend on the criterion used: wages, education or a non-pecuniary job quality ranking (see Chart 2) ([14]).

([12]) Occupations are ranked by initial median wage and assigned to a quintile group on this basis, going from the top paying occupations in the 5th job–quintile group to the bottom paying occupations in the 1st job–quintile group. The figure shows the change in employment of each quintile over the time period.

([13]) According to Eurostat LFS data, the increase was just over 1.2 million. This however does not take account of a very significant break in the Romanian data in 2013-2014 apparently based on census revisions. We make an adjustment in this report to take account of the more likely real employment shifts in Romania. The practical impact of this is to reduce estimates of total employment in Romania prior to 2014 by c. 600000. This therefore raises our estimate of net employment growth in Romania and in the EU-28 as a whole.

([14]) The education ranking is based on the average achieved educational level of jobholders, using the ISCED-based highest achieved level of education variable (hatlev1d) in the EU-LFS. The job quality ranking is based on a multidimensional non-pecuniary job quality indicator based on answers to 38 questions in the 2010 European Working Conditions survey. For each indicator, jobs are assigned to quintiles in the start period (2011) based on the specific ranking criterion and weighted by employment to ensure that each quintile accounts for as close to possible 20% of employment as possible; the charts then show the shifts by quintile over the three-year period 2011-2014.

Chart 3: Employment shifts by job-wage quintile and educational attainment level, EU, 2011-2014



Reading note: 2nd quarter data in each year. The education attainment according to ISCED.

Source: EU-LFS, Structure of Earning Survey (Eurofound calculations).

There are some points of similarity between the three approaches. The top quintile is growing regardless of the approach, while job destruction is concentrated in the lower quintiles – in the middle for the wage-based distribution, and mainly in the 1st quintile for the education and job quality distribution. Both in terms of education and non-pecuniary job quality, the pattern has been one of occupational upgrading, with gains in the top quintile counterbalanced by declines in the bottom quintile ([15]).

1.2.3. Educational attainment and job polarisation

Supporting evidence shows that net employment growth has benefitted tertiary level education graduates, especially in the top quintile. However, even in the lowest quintiles, graduates account for most employment growth. This raises the problem of possible over-qualification.

During the recession, job destruction mostly affected those with lower-level qualifications. As aggregate employment growth returned in 2013-2014 and some labour markets began to tighten, the chances to secure employment increased for those with completed secondary education. This growth was not limited to the lowest quintile – though it was highest here – but included jobs in the middle and mid–upper quintiles.

The transformation of the workforce in terms of educational attainment over the most recent period of 3 years was significant (see Chart 3), reflecting older generations with lower levels of education leaving the labour market replaced by better-educated younger and core-age workers and also working-age less educated workers becoming unemployed and being unable to find work after the crisis ([16]). There were in 2014 over 6 million more graduates in employment in the EU compared to 3 years previously. The speed of this transformation appears to be most rapid during periods of net employment destruction which disproportionately affect low- and mid-skilled workers while favouring, in relative terms, graduates.

1.3. Where the EU stands

It is useful to briefly look at the state of play of the EU from a skills perspective, in order to understand how the EU performs in terms of skills compared to its world competitors, and where it needs to improve.

Looking at average PISA scores for the five key skills, the EU has an overall level of skills which is similar to countries like the United States, Canada and Australia, but lower than Japan and Korea, with differences among countries. There is a high correlation in the rankings of the different dimensions. For all five scores one can see a slightly skewed distribution of the averages with a tail toward the higher scores. The city of Shanghai, China outperforms other countries by a large amount in all four skills.

There is a great deal of variation when comparing the EU Member States for all the five skills tested by PISA. The differences between the best averages and the worst performers are quite high. All EU Member States score below the 7 Asian countries, but are more in line with Canada, Australia, New Zealand and the United States.

Chart 4 shows different paths in the evolution of PISA scores over the last three waves, in 2006, 2009 and 2012. The annualised change in score for the three main skills tested, mathematics, reading and science, shows a very different picture in the EU: while some Member States made constant progress on average for one or all the three scores, others registered a continuous decrease. As Chart 4 shows, the increase in three scores was registered by 'low performers' in the EU like Romania and Bulgaria, while good performers like the Netherlands and Finland decreased their scores. On the other hand, good performers like Germany and Poland increased while low performers like Sweden, decreased.

([15]) The main reason for the (modest) differences between the three measures is that a large proportion of jobs in the middle of the wage distribution have a relative wage premium (a higher relative position in terms of wages than education or non-pecuniary job quality attributes) and that these jobs have been responsible for a large share of overall job destruction during the crisis. For example, two of the largest-employing jobs in the EU are building / trades workers in construction and drivers / mobile plant operators in transport. Both are in the middle quintile (3) of the wage distribution but only the first or second quintile in terms of education or broader job quality. These archetypal blue-collar, male jobs have both shed employment throughout the period 2008-2014 and jobs like these contribute to explaining the differences between the three charts. Other important measures tend to show shifts in a more upgrading light, consistent with the predictions of skill-biased technological change (see Oesch, 2013). The jobs that have been disproportionately affected by employment loss during the crisis have been primarily blue-collar, mid-paying jobs that do not require high levels of formal education.

([16]) It is useful to remember the positive role that early childhood education and care (ECEC) plays as concerns children's educational attainment later in life, with positive consequences for the labour market participation, particularly for children from disadvantaged backgrounds. However, this goes beyond the scope of this analysis.

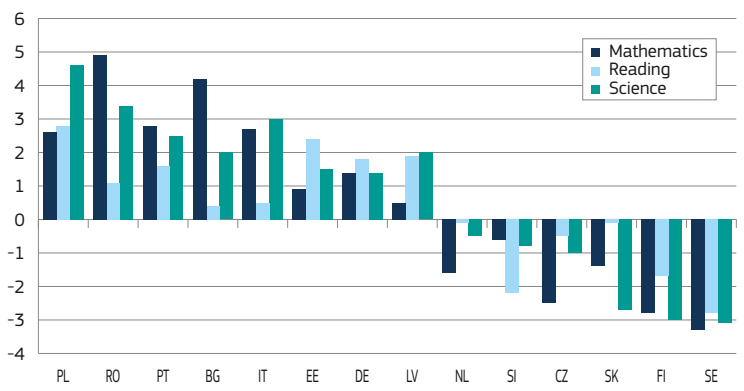
Table 1: PISA 2012 survey – the average scores for the five skills tested for EU Member States and 10 extra EU economies

	Mathematics	Reading	Science	Problem solving	Financial literacy
Shanghai-China	613	570	580	536	603
Singapore	573	542	551	562	
Hong Kong-China	561	545	555	540	
Chinese Taipei	560	523	523	534	
Korea	554	536	538	561	
Macao-China	538	509	521	540	
Japan	536	538	547	552	
Netherlands	523	511	522	511	
Estonia	521	516	541	515	529
Finland	519	524	545	523	
Poland	518	518	526	481	510
Canada	518	523	525	526	
Belgium	515	509	505	508	541
Germany	514	508	524	509	
Austria	506	490	506	506	
Australia	504	512	521	523	526
Ireland	501	523	522	498	
Slovenia	501	481	514	476	485
New Zealand	500	512	516		520
Denmark	500	496	498	497	
Czech Republic	499	493	508	509	513
France	495	505	499	511	486
United Kingdom	494	499	514	517	
OECD - average	**494**	**496**	**501**	**500**	**500**
Latvia	491	489	502		501
Luxembourg	490	488	491		
Portugal	487	488	489	494	
Italy	485	490	494	510	466
Spain	484	488	496	477	484
Slovak Republic	482	463	471	483	470
United States	481	498	497	508	492
Lithuania	479	477	496		
Sweden	478	483	485	491	
Hungary	477	488	494	459	
Croatia	471	485	491	466	480
Greece	453	477	467		
Romania	445	438	439		
Cyprus	440	449	438	445	
Bulgaria	439	436	446	402	

Reading notes: The table presents the scores for 10 non-EU countries and for the 28 EU Member States. Non-EU entities are seven Asian geographic regions; the other three are Canada, Australia and the United States. Countries are listed in descending order following the score in mathematics. The colour coding [dark green: ≥540], [light green: 510 – 540], [yellow: 480 – 510], [orange: 450 – 480] [red: <450].

Source: OECD, PISA 2012 – ranking.

Chart 4: Change in all three PISA scores, between 2006 and 2012



Source: OECD – PISA 2012 survey.

The Survey of Adult Skills (PIAAC) assesses the proficiency of adults from age 16 onwards in three basic skills: literacy, numeracy and problem solving in technology-rich environments. These skills are 'key information-processing competencies' that are relevant to adults in many social contexts and work situations, and necessary for fully integrating and participating in the labour market, education and training, and social and civic life. In addition, the survey collects a range of information on the reading- and numeracy-related activities of respondents, the use of information and communication technologies at work and in everyday life, and on a range of generic skills, such as collaborating with others and organising one's time, required of individuals in their work. Respondents are also asked whether their skills and qualifications match their work requirements and whether they have autonomy over key aspects of their work.

The table shows that for the EU Member States the three scores range from 288 in Finland to 250 in Italy for literacy, from 282 in Finland to 246 in Spain for numeracy and from 289 in Finland to 275 in Poland for problem solving. Again, as for the scores in PISA, there is a high level of correlation between the three scores; all countries tend to preserve the ranking in one score for the other two. Japan outperforms the rest of the participants in all three tests, while Finland is the top EU performer for all the three scores. In general, the 2012 survey shows that many EU Member States perform below the OECD average. Best performing countries include Japan and a few EU countries, including Finland and Belgium (Flanders only).

Many adults have satisfactory or good skills. However, on average, one in five adults in EU countries display a low level of skills in literacy and one in four have similarly low levels of skills in numeracy. When it comes to very high skills, only a handful of Member States are able to match the performance of the best non-EU countries, such as Japan or Australia. While in some countries it is mainly the older age groups that show very low skill levels, in others it seems that also younger groups perform rather poorly (e.g. in Cyprus and the United Kingdom). Moreover, the survey results confirm that proficiency is strongly related to parental education and to migrant status, but to a different extent across countries.

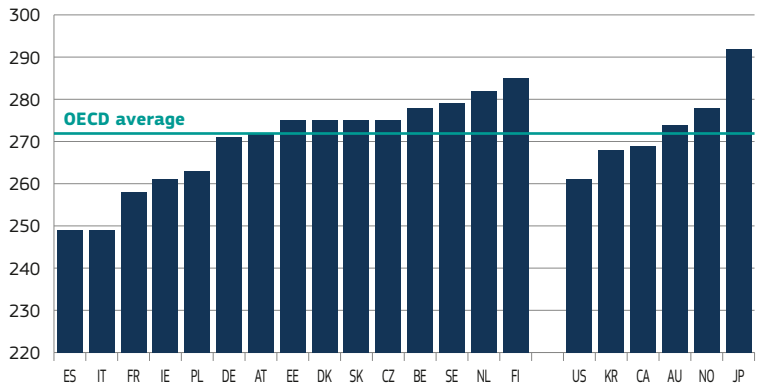
Table 2: PIAAC results on the three skills for 18 EU Member States, two EU geographical regions, four non-EU countries and the OECD average

	Literacy	Numeracy	Problem solving
Japan	296	288	294
Finland	288	282	289
Netherlands	284	280	286
Australia	280	268	289
Sweden	279	279	288
Estonia	276	273	278
Flanders (Belgium)	275	280	281
Czech Republic	274	276	283
Slovakia	274	276	281
Canada	273	265	282
OECD Average	273	269	283
Republic of Korea	273	263	283
England and N. Ireland (UK)	272	262	280
Denmark	271	278	283
Germany	270	272	283
United States	270	253	277
Austria	269	275	284
Poland	267	260	275
Ireland	267	256	277
France	262	254	
Spain	252	246	
Italy	250	247	

Reading note: Problem solving was not tested in France, Spain and Italy.

Source: PIAAC.

Chart 5: Average scores in literacy and numeracy among adults aged 27 and over, 2012



Source: PIAAC.

The average performance in the three scores decreases with the age group (see Table 8, Table 11 and Table 14 in the Annex of this chapter) having in general a maximum either for the 20-24 age group or for the 25-29 group in almost all countries. The average difference between the maximum and the minimum average scores for the 10 different age groups (from 16-19 to 60-64) in literacy ranges from under 2 points in Slovakia to more than 5 points in Finland. There is a similar picture for numeracy and problem solving, while the decrease linked to age is stronger for problem solving capacities.

The survey also shows interesting variations depending on gender or socio-economic background (see Table 9, Table 12 and Table 15 in the Annex of this chapter). For the difference by gender, most of the countries show statistically significant differences for all three skills in favour of men, ranging from around a non-significant 2 points in Poland to 17 points in Germany for numeracy. Concerning the socio-economic background, in literacy for example, the average difference between adults with high and low-educated parents ranges from around 17 points in Cyprus to 57 points in Germany. Almost all of the EU Member States display a difference of more than 25 points.

2. THE CHALLENGE OF SKILL MISMATCHES

A smooth functioning of labour markets relies on a match between the skills possessed by the labour force and the skills requested by employers. When workers have either fewer or more skills than jobs require, skills mismatch occurs. Some mismatch is inevitable, as the labour market involves complex decisions by employers and workers and depends on many external factors. In particular, in a dynamic, continuously changing economy, there are always some unfilled positions even if some people remain unemployed; and there are always some individuals who are in a job that does not fully match their skills profile. However, high and persistent skills mismatch is costly for employers, workers and society at large. Skill mismatch has become more prominent in the crisis. However, it is primarily a structural issue and as such it already existed prior to the recent global economic slowdown.

2.1. Dimensions of skill mismatch

Skill mismatches encompass a range of different phenomena. One strand of the literature on this subject focuses on the divergence between the skills of individuals that are available for work (in its strictest sense: the unemployed) and the skills sought by employers (in its strictest sense: current vacancies). Usually this type of skills mismatch is studied along broad qualification levels, which hide a wide diversity of different field of training and specific skills profiles. Another approach focuses on occupational mismatches, i.e. whether job holders, are 'correctly matched' with their job's skill requirements.

Employers often report shortages for specific skills. Although some of these difficulties are related to absence genuine supply shortage of skills required in specific sectors, occupations and regions, they can often be explained by factors other than skills, such as uncompetitive wages, unattractive working conditions, poor recruitment policies and/or mismatch between the location of skills and jobs. This will be further explained in Section 2.2.

Another strand of literature on skills mismatches focuses on skills mismatch on-the-job, which means that an individual has different skills or qualifications than his/her job requires. Over the crisis period, many tertiary-educated workers (in particular recent graduates) were reported to accept non-graduate jobs. This led to additional concerns that these higher-qualified workers would crowd out less-qualified workers, who were correctly matched, and further aggravate the labour market situation of less-qualified workers which were already hit hardest by the crisis.

Flisi et al. (2014) offer a useful discussion of the dimensions of mismatch and the variables used in its measurement, specifically distinguishing between skills and qualifications. Skills are qualities possessed by individuals such as e.g. literacy, numeracy, problem solving, proficiency information processing, technological processes or abilities to perform manual tasks. Qualifications, on the other hand, refer to educational attainment and the competencies formally attested by education diplomas yet not necessarily demonstrated during tests ([17]).

A major challenge in measuring skill mismatch however concerns the complexity of determining what skills or education levels are really needed to perform a certain job. Measurement error may lead to misleading conclusions, and this has been especially the case in the literature on over-qualification. This topic will be further developed in Section 2.3.

2.2. Skill shortages

Skill shortages occur when there are not enough individuals with the required skills within the economy to fill existing vacancies under prevailing market wages and working conditions (and within a reasonable location) (Shah and Burke, 2003; Cedefop, 2010; Barnow et al., 2013). More refined definitions have been proposed to incorporate training lead times, dynamic interactions between skill demand and supply, the complexity of a vacancy, the time it takes for a shortage to clear in reaction to market signals and other important elements (Richardson, 2007). This definition assumes that the prevailing wages and working conditions are set appropriately to the conditions in the labour market and that the labour market is functioning efficiently and effectively. This rules out the situation where firms are, for one of a number of reasons, offering wages below the appropriate market clearing level. Genuine shortages usually occur when the last condition does not hold and there is some form of market failure (Booth and Snower, 1996). Market failures may be due to restricted access to capital markets, poaching externalities (Stevens, 1999) and coordination failures (Acemoglu, 2001), to name a few. In these cases, the prevailing wage offers will fail to lead to the optimal investment in skills. Other market imperfections may mean that skills are sub-optimally allocated – for example, if some firms engage in rent-seeking behaviour they are able to set a wage higher than could be offered in other firms or industries, even though the social value of those skills would be greater if employed in competitive, non-rent seeking markets.

Within skills shortages, there is a conceptual difference between qualitative skill shortages and quantitative labour shortages (Sattinger, 2013; Abraham, 2015; Kahn, 2015). Quantitative labour shortages point to an absolute lack of workers in the labour market ([18]) and arise when there is an overall increase in labour demand in an economy, as a result of economic growth or structural changes in an economy, without a commensurate increase in labour supply. For example, in the context of the ongoing adverse demographic evolution in many advanced economies (or, in some cases, because of emigration) a declining working-age population is anticipated (Peschner and Fotakis, 2014). Some specific age or skill groups are more likely to be characterised by low participation rates, accentuating labour shortages, such as workers in possession of medium- or low-skill levels or the elderly close to statutory retirement age (Cedefop, 2012). Or, also, low participation rates may be a response to the existing labour market and the actual wage levels being lower than the equilibrium level.

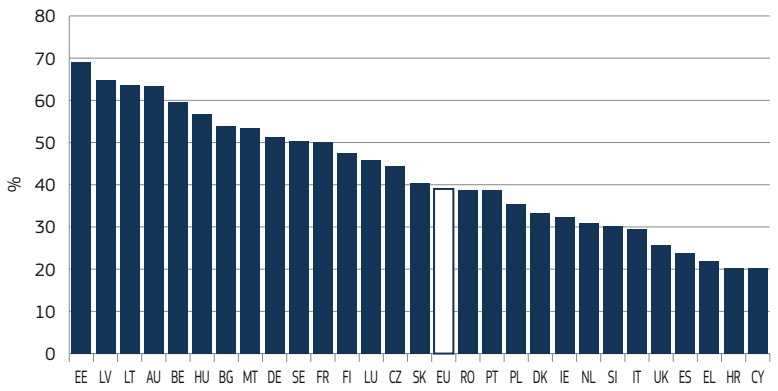
2.2.1. Incidence of skill shortages in Europe

In contrast to the quantitative differences, qualitative mismatch relates to the types

([17]) See e.g. http://www.cedefop.europa.eu/en/events-and-projects/projects/analysing-skill-mismatch for more recent work by CEDEFOP on skills mismatch.

([18]) To be more precise, when demand exceeds supply, this could also point to wages being lower than the equilibrium level. There are also potential market failure problems that might affect the supply side – for example, where demand exceeds supply in one market where workers could efficiently move into this market, but are prevented from doing so for some reasons.

Chart 6: Difficulties finding staff with required skills in European firms, 2013, EU-28



Reading note: Proportion of establishments replying affirmatively to the question 'Did your establishment encounter difficulties in finding staff with the required skills?'

Source: Third European Company Survey (2013), Eurofound 2013c.

of skills that have been invested in. A high share of EU firms report difficulties finding the right mix of skills – Chart 6. The 2008 financial and economic crisis has increased unemployment in the EU to unprecedented levels, yet a range of surveys frequently indicate that a significant share of employers have difficulties finding job candidates to fill their vacancies. The latest European Company Survey, in spring 2013, found that about 4 out of 10 (39%) firms in the EU had difficulties finding staff with the right skills. As is shown in Chart 6 these skill shortages vary markedly across EU Member States. Over 60% of establishments in Austria and the Baltic states have difficulties finding suitably skilled employees, compared to less than 25% in Croatia, Cyprus, Greece and Spain (Eurofound, 2013a) ([19]).

Genuine skill shortages constitute a barrier to innovation and labour productivity. They can lead to a loss of competitiveness as wage rates are bid up, especially if they predominantly affect growing or dynamic EU enterprises (UKCES, 2011; Healy et al., 2015). More than half of the global employers surveyed as part of the Manpower Talent surveys in 2014 stated that talent shortages significantly impact their ability to meet client needs. 40% said that shortages reduce their competitiveness and productivity (Manpower, 2014). Haskel and Martin (1996) have also estimated that skill shortages reduced annual productivity growth in the United Kingdom by 0.4 percentage points over the period 1983-1989. Bennett and McGuinness (2009) reported that output per worker was lower in high-tech Irish firms with hard-to-fill vacancies.

To the extent that skill shortages inhibit the productivity of companies, appropriate policy responses are required to enable the faster and more efficient matching of individuals with available job vacancies.

A first step is to identify and measure skill shortages correctly. The measurement, however, is hampered by the lack of comparable data. As a result, researchers and policy makers often rely on partial indicators, such as subjective assessments by employers on 'situations where there is a large share of difficult to fill vacancies due to an absence of applicants with the right knowledge, skills and competences' (UKCES, 2014). Such partial indicators may however mask a multitude of other factors. Next to 'genuine' skills shortages, common factors cited to explain employers' difficulties in filling vacancies include preference or job mismatch (e.g. individuals not willing to accept jobs or high labour turnover induced due to poor wage and working conditions), informational mismatch (e.g. limited dissemination of vacancies; poor job networks of individuals) and barriers to geographical mobility (European Commission, 2014b; de Beer et al., 2015). Hence, only part of the identified skill shortages can be attributed to 'genuine' skills shortages.

Challenges in meeting replacement needs of the labour market, mainly in jobs requiring medium and lower skills, are also often mentioned (Cedefop, 2012). The inability to meet replacement demand needs is typically attributed to the demanding job preferences of increasingly higher-educated cohorts of young European citizens, the lack of attractiveness of certain vocational education and training (VET) streams (Cedefop, 2014), as well as the poor image of specific sectors and occupations.

Those skill shortages that are 'genuine' may refer not only to technical competences, but also to generic or non-cognitive skills, or to work experience. About one third of employers in the Manpower Talent surveys attribute recruitment bottlenecks to the lack of technical competences (hard skills) of individuals, while 20-25% identify a lack of generic skills and of work experience as culprits (Manpower, 2014).

To devise the 'right' policy mix, it is critical for policy-makers and employers alike to be able to identify the underlying source of recruitment bottlenecks and to filter through a variety of different labour market signals (e.g. trends in vacancies, employment rates, wages, average hours worked, etc.) that point to the occurrence of emerging skill shortages.

A recent analysis of available European data sources ([20]), undertaken by the European Centre for the Development of Vocational Training (Cedefop), confirms that only a subset of the total vacancy bottlenecks of firms can be genuinely attributed to skill deficits of job applicants (Cedefop, 2015a). Focusing on a selected sample of European firms that had recently recruited higher-education graduates, the analysis finds that about one third to a half of employers' total reported recruitment difficulties constitute genuine skill shortages. About 29% reflect the offer of uncompetitive starting salaries, while a smaller part (13%) is due to inefficient

([19]) Claims of skill shortages are also widespread in the public media and in the policy discourse, spurred by reports of manpower or consultancy firms. For example, the annual Manpower Talent surveys, undertaken by the company Manpower using a sample of over 37,000 employers from 42 countries in the world, regularly report that more than a third of employers experience difficulties in filling their jobs (Manpower, 2014). It is worth noting that such survey evidence should be treated with some caution – employers would of course always prefer to recruit from a larger pool of skilled workers willing to work at as low a wage as possible. These types of surveys may simply be picking up this attitude, rather than a genuine skill shortage caused by some form of market failure in the provision of suitably skilled workers.

([20]) The empirical findings described in this Section are based on an analysis of data from three European employer surveys, namely: the European Company survey, a representative survey of about 30 000 companies in 32 European countries; the 304 Flash Eurobarometer on *'Employers' perception of graduate employability'* (http://ec.europa.eu/public_opinion/flash/fl_304_en.pdf) which provides insights into the skill needs of about 7,000 recruiters of higher- education graduates in 2010; and the 196 Flash Eurobarometer survey (http://ec.europa.eu/public_opinion/flash/fl196_en.pdf), carried out in 2006, which focused on constraints to the growth of SMEs (including the lack of skilled labour).

human resource management by firms, which includes the fact that employers do not offer a competitive graduate training and development programme or that the hiring process is slow. Apart from masking an underlying inability of firms to offer the going pay rate for the skills sought, employers also frequently confound other significant constraints to the firm (e.g. lack of access to finance, administrative barriers) with perceptions of skill shortages.

Cedefop's analysis reveals that employers are more likely to experience difficulties filling their vacancies when the jobs offered are of poorer quality, such as when they provide a precarious employment contract or rely on atypical working hours and bad working conditions (Table 3). There is a significant positive association between employers' self-reported difficulties in filling jobs, particularly when concerning high-skilled posts within the firm, and their propensity to hire casual or temporary labour as part of their staff (e.g. temporary agency workers; staff with fixed-term contracts; freelancers).

Finally, the analysis shows that companies experiencing skill shortages are more likely to have expanded their staffing capacity (e.g. due to higher demand for their products and services) while recruitment difficulties are also correlated with the adoption of new methods of organising their work processes in the recent past. They are more likely to rely on high-performance workplace practices (HPWPs), while Cedefop (2015a) also shows that the prevalence of skill shortage is related to product market strategies that focus on the improvement of their products' quality (although the nature of the causality cannot be established with the data at hand). In this case skills shortages are more likely to reflect business success rather than the firm's fundamental inability to attract skilled labour (e.g. due to bad reputation or an undesirable location or other inefficient HR strategies) (UKCES, 2011; Healy et al., 2015).

Table 3: Determinants of probability of establishments facing difficulties in finding staff for skilled or low-skilled/unskilled jobs, EU-27, 2009

	High skilled jobs	Low skilled/unskilled jobs
Casual or atypical workforce	0.029***	0.008***
(temporary agency, freelances, fixed-term)	(0.005)	(0.003)
Variable pay (PRP, profit-sharing,	0.010**	–0.002
employee share ownership)	(0.004)	(0.003)
High performance workplace practices	0.016**	0.001
(time flexibility, teamwork, training, OSH committee)	(0.006)	(0.004)
Changes in establishment in last 3 years	0.022***	0.012***
(remuneration scheme, work processes, working time, restructuring measures)	(0.005)	(0.002)
Atypical hours (work on weekends, nights, shifts)	0.012***	0.013***
	(0.003)	(0.003)
	(0.018)	(0.006)
Public sector	–0.070***	–0.024**
	(0.021)	(0.012)
Composition of workforce		
Proportion of female employees	–0.085***	0.035***
	(0.022)	(0.013)
Proportion of employees who work in high-skilled jobs	0.019	–0.095***
	(0.019)	(0.018)
	(0.036)	(0.025)
Proportion of employees who worked overtime in past 12 months	0.080***	0.021**
	(0.020)	(0.010)
Proportion of employees covered by collective wage agreement	–0.007	–0.020***
	(0.020)	(0.006)
Change in size of establishment in past 3 years		
– Decreased	–0.065***	–0.006
	(0.023)	(0.008)
– Stayed about the same	–0.048***	0.001
(omitted: Increased)	(0.017)	(0.007)
N	18,975	18,808
Log-likelihood	–11881.64	–5812.5881
Pseudo R2	0.06	0.08

Reading note: Marginal effects of probit estimates at the variable mean for continuous variables and for discrete changes of categorical variables; Robust standard errors in parentheses, clustered for country in EU-27 sample; *** p<0.01, ** p<0.05, * p<0.1; Dependent variable in column (1): a dummy variable = 1 if the *establishment encounters any of the following problems related to personnel? Difficulties in finding staff for skilled jobs. Column (2): Difficulties in finding staff for low skilled/unskilled jobs.* Variables included in the regression are principal component factors constructed as follows (for further details see Cedefop, 2015a). Other control variables include: a single independent company or organisation; share of employees working part-time; size of establishment; industry dummies (NACE Rev.1.1); country dummies.

Source: Second European Company Survey; Cedefop estimations; Cedefop (2015a).

Skill shortages are also subject to cyclical fluctuations. After the onset of the crisis, skills shortages declined in the EU. This was an outcome of the declining average number of job vacancies in the EU economy, accompanied by the considerably greater supply of available workers per vacancy ([21]). As economic activity slowly rebounded in recent years, the downward trend of skill shortages has been slightly reversed since 2011, but the incidence of skills shortages remains below its pre-crisis level.

Several additional indicators and data sources tend to reveal that labour and skill shortages have been subdued, on average, during the recent period of slow growth. For instance, evidence from Cedefop's European Skills and Jobs (ESJ) Survey ([22]) (see Chart 8) shows that the chances of recent cohorts of job finders suffering from under-skilling (i.e. having lower skills than needed by their jobs) at the time of entry to their job have declined relative to previous cohorts. By contrast, a higher share of recent job finders and graduates, who have found employment in the post-crisis era, report that they are over-skilled for their jobs ([23]).

If shortages of skilled workers exist in a competitive economy, economic theory predicts that the wages of the currently employed should exhibit an increasing trend over time. However, with the exception of a few countries (e.g. Finland, Germany, the Netherlands, Belgium and Austria) the growth in the mean level of gross wages of the employed has been stagnant or has declined in the post-crisis period. Some have relied on the absence of evidence of rising pressure in the median wage to argue that this constitutes evidence that employers' claims of skill shortages are 'overblown' (Burtless, 2014). Nevertheless, other authors have cautioned that this line of reasoning is potentially simplistic and erroneous, given that it is not the skills of the median worker that are in short supply, but those of specific groups of workers employed in sectors where new technologies or structural economic changes pose greater demand for specialised and rapidly changing skills (e.g. nursing, information specialists, software analysts) (Bessen, 2014). Moreover, rising wages would not distinguish between genuine and other forms of mismatch – in the non-genuine cases, wages might just have been too low to fill vacancies – rising wages would then be expected to correct, but the initial situation was not one of mismatch. Similarly, focussing only on wages in broad occupational groups or in state/metropolitan areas also masks the intrinsic wage dispersion taking place *within* many occupations or geographical areas, particularly those affected mostly by information technologies. Furthermore, in many European Member States the determination of wages is not solely determined by free market forces (e.g. administrative pay scales, collective bargaining), which may also confound the automatic adjustment of wages that would be expected in the presence of skill shortages.

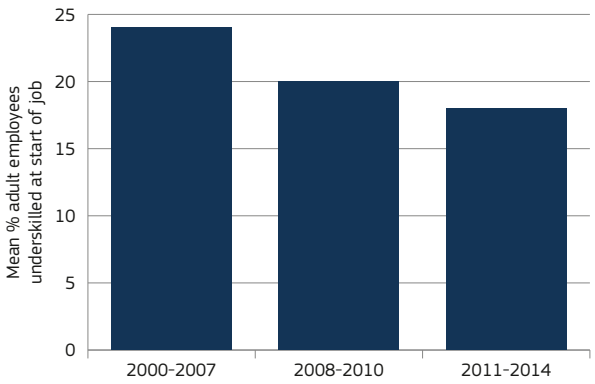
In the majority of EU countries, employers reported that difficulties in filling their vacancies fell during the period of the economic crisis (see Chart 9). Nevertheless, there are some countries, namely Austria, Germany, Greece, Hungary, Italy, Romania, Sweden and the United Kingdom, where firms experienced increasing challenges in finding suitable talent in the post-crisis era. By contrast, in some Member States (e.g. Belgium, the Czech Republic, Spain,

Chart 7: Shortage of skilled labour, 2000-2014, EU

Reading note: Responses to the question 'Skilled labour is readily available'.

Sources: IMD WCY (2014); Cedefop's analysis.

Chart 8: Average share of adult employees (aged 24-65) under-skilled at start of job by period of job entry, EU-28, 2014



Reading notes: Share of adult employees with positive response to question: 'When you started your job with your current employer, overall, how would you best describe your skills in relation to what was required to do your job at that time? Some of my skills were lower than required by my job and needed to be further developed'; The period of job entry is determined by answers to the question 'How many years in total have you been working for your current employer?'

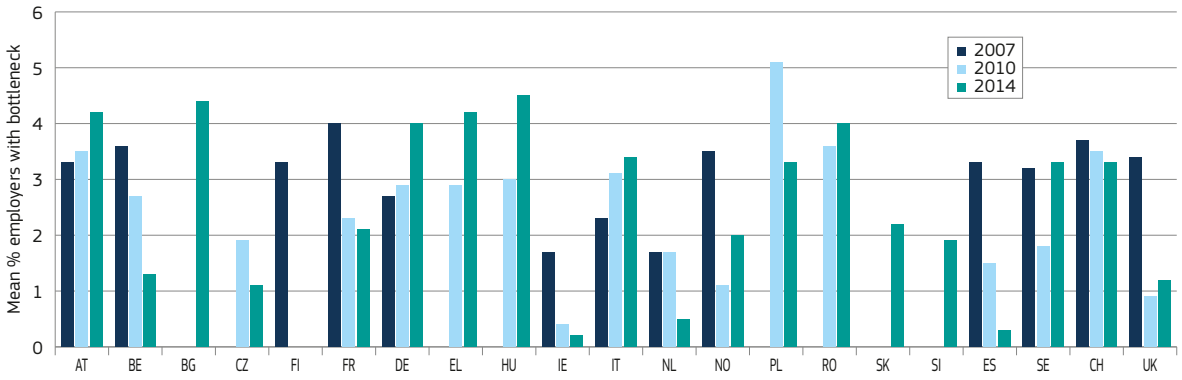
Source: European Skills and Jobs (ESJ) survey, Cedefop (2015b).

([21]) For example, there were about 142 unemployed individuals per vacancy in Greece in 2013. At the other end of the spectrum, 2.5 individuals corresponded to a given vacancy in Germany (European Commission, 2014d).

([22]) The ESJ is a new European survey, carried out in 2014 in all 28 EU Member States, that collects information on the match of the skills of about 49,000 EU workers (adults aged 24-65) with the skill needs of their jobs. It provides a first insight of the dynamics of qualification and skill mismatch in the EU, focusing on the interplay between changes in the (cognitive and non-cognitive) skills of employees in their jobs as well as the changing skill needs and complexities of their jobs. The survey also focuses on the role of European policies on initial (e.g. work-based learning) and continuing VET (e.g. formal, non-formal and informal training) and on workplace design for mitigating skill mismatch. The survey findings will be published in 2015. For more information, see http://www.cedefop.europa.eu/en/news-and-press/news/cedefop-launches-european-skills-survey-eu-skills

([23]) It must be borne in mind, though, that this comparison may be subject to compositional bias, given that it is likely to be the most skilled of the unemployed who have found a job in the post-crisis period while the least skilled of the graduates and job finders who entered into employment in the pre-crisis era will have been the first to be laid off as a result of the fall in economic activity.

Chart 9: Vacancy bottlenecks of employers, 2007-2014, EU-19 + CH + NO



Reading note: Share of employers reporting difficulty filling jobs i.e. a vacancy bottleneck.

Sources: Manpower Talent surveys (2007, 2010, 2014); For some countries (e.g. HU, SI, SK, BG, FI, CZ) the survey took place after 2010. Cedefop's analysis.

Table 4: Trend towards shortages of skilled labour, 2011-2014, EU-18 + Norway

	Increasing unemployment	No significant change in unemployment	Decreasing unemployment
Increasing bottlenecks	AT	–	HU
No significant change in bottlenecks	EL, FR, IT, NO	BG, PL, RO, SE, SK	DE, UK
Decreasing bottlenecks	BE, NL, SI	CZ, ES	IE

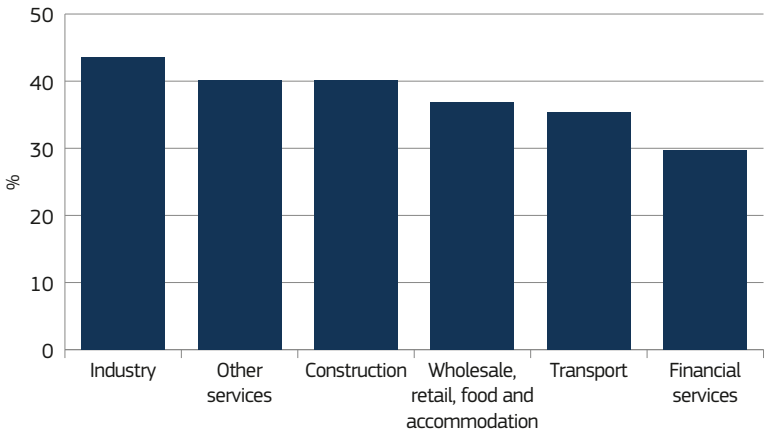
Reading note: An increasing or decreasing bottleneck is identified on the basis of the significance of a time trend of employers' stated difficulties in filling jobs and of annual unemployment rates in the specified time period. For some countries (e.g. HU, SI, SK, BG, CZ) the Manpower Talent survey took place after 2010, so even though there is no information prior to 2010 (as shown in Chart 9) a time series of data is available between 2011-2014. Data is only available for 18 EU Member States and Norway.

Sources: Manpower Talent surveys; Eurostat [variable: une_rt_a]; Cedefop's analysis.

Ireland), employers have continued to find it increasingly easier to fill their jobs even after 2010.

Data indicate that Hungary, in particular, but also Germany and the United Kingdom have seen a falling trend in unemployment rates in the post-crisis period (2011-2014) in tandem with increasing or unchanged difficulties faced by employers in finding talent. This reflects the increased difficulty in finding the skills set desired by employers within the shrinking pool of job applicants, but could also mean widening gaps between the skill supply and demand even after tightening labour market conditions are taken into account. In Austria, as well as Greece, France, Italy and Norway, rising or stable bottlenecks have coincided with an increasing trend towards higher unemployment. On the other hand, companies in Belgium, the Netherlands and Slovenia have, overall, found it easier to fill their vacancies, presumably due to an increasing supply of readily available skilled labour in the job market. Only in Ireland are signs of a healthy recovery evident, since a larger availability of jobs has been accompanied by a greater easiness by firms to fill their open job posts with the existing labour.

Chart 10: Difficulty of EU firms finding employees with required skills by broad industry, 2013, EU-28

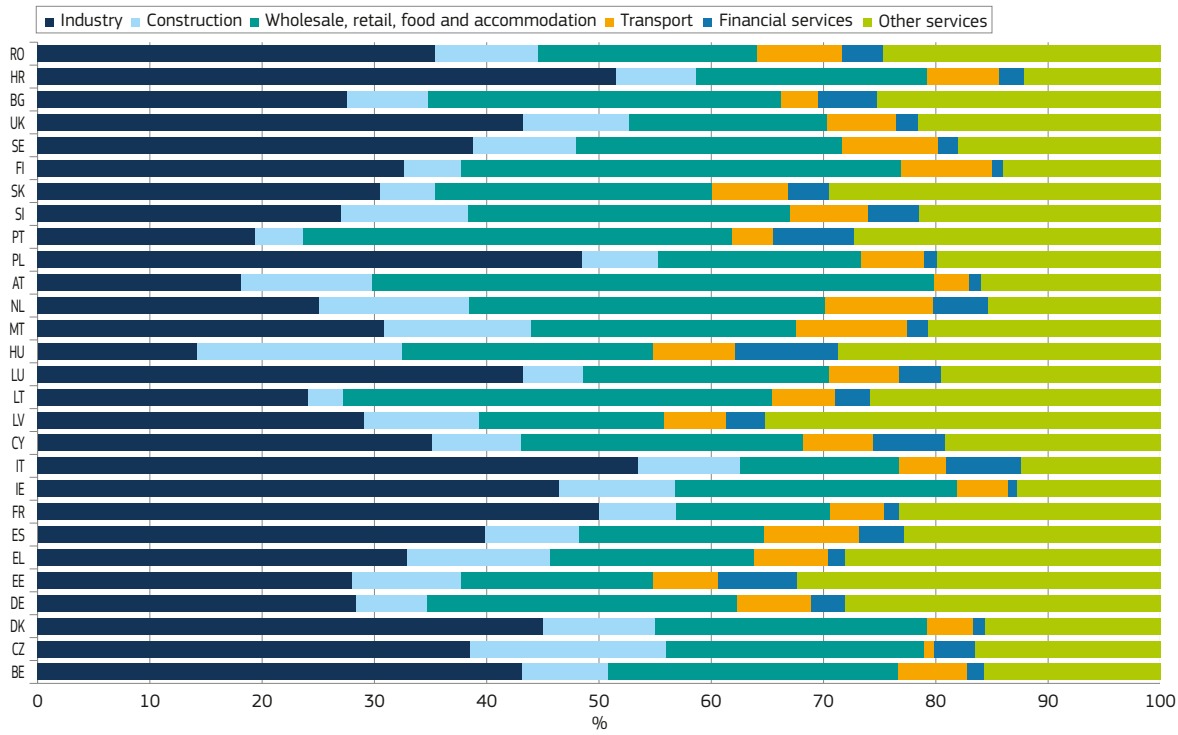


Source: Third European Company Survey (2013); data provided to Cedefop by Eurofound.

Specific skill shortages exist in particular sectors and occupations in EU Member States. Throughout Europe there is some consistency when it comes to sectors or occupational groups with vacancy bottlenecks and, possibly, skill shortages. For instance, difficulties finding workers with the required skills are most widely reported by EU employers (in excess of 40 %) in the manufacturing and healthcare sectors and are least common (though still quite high) in financial services (less than 30 %), Chart 10 ([24]).

([24]) Similar evidence is often cited in labour markets outside of the EU. For example, in a recent survey of manufacturing establishments in the US, more than 75 % of manufacturers reported a moderate or severe shortage in highly skilled manufacturing human resources (Accenture and Manufacturing Institute, 2014). While in Australia, Healy et al. (2015) find that about 10 % of establishments were affected in total by skill shortages in 2004/5, ranging from as high as 17 % in the Construction sector to as low as 4 % in Property and business services.

Chart 11: Distribution of skill shortages by broad economic sector and country, EU-28, 2013



Sources: Third European Company Survey (2013) Eurofound 2013c; Cedefop's calculations based on Eurofound data.

In the manufacturing sector, in particular, the shift to greener technologies has generated a significant need for specific engineering skills (e.g. electric engineering of hybrid cars, manipulation of light materials, product design) or for specific occupations (e.g. energy auditors, photovoltaic installers, insulation workers, environmental engineers, sheet metal workers) (Cedefop, 2011). The Green Employment Initiative (COM(2014) 446) identified a number of actions to allow skills policies to play an active role in supporting employment and job creation in the green economy. If a company lacks the skills to improve its resource efficiency, it will be trapped in using existing methods. Education and training systems are being used to enhance the supply of green skills within the workforce ([25]). In most EU Member States which promote skills in this area, the support focuses on the company level ([26]). Key success factors for building resource efficiency related skills and capacity within a company are found to be engaging at the personal level with company members; employing experienced trainers who have practical knowledge of company processes; targeting teaching contents and materials to specific sectors, regions or types of companies; linking skills development with other support measures to support resource efficiency in businesses; and providing financial support through EU funding programs (e.g. European Social Fund, European Structural and Investment Fund).

In addition, the ICT sector is generally confronted by a lack of professionals in possession of highly technical skills, in areas such as ICT security and cloud computing (e.g. software analysts, Java and mobile apps programmers) (European Commission, 2012a). In particular, a growing shortage of ICT professionals and experts in Europe has been predicted, namely an estimated shortfall of as many as 900 000 professionals by 2020, which has facilitated the institution by the European Commission of the so-called 'Grand Coalition for Digital Jobs' ([27]).

Chart 11 illustrates that recruitment bottlenecks vary considerably across different industries within EU Member States, reflecting their diversity in terms of economic structure, responsiveness of education and training systems, employer commitment to talent management and the economic cycle. In the Czech Republic, Poland, Slovenia and Italy more than half of all establishments with hiring difficulties can be found in the Manufacturing sector. Luxembourg and Croatia have pronounced difficulties in Construction, while Cyprus, Greece and Ireland experience a disproportionate share of perceived skill shortages (relative to other EU Member States) in the Wholesale and retail trade sector. Latvia and Lithuania have greater domestic bottlenecks in the Transport sector.

Skill shortages are also often an issue of concern in particular occupational groups within industries. Based on a number of indicators of labour market pressure, such as the ratio of vacancies or of recruitments to unemployment, the European Commission's Recruitment and Vacancy Report (European Commission, 2014a) has identified occupations which are susceptible to labour market bottlenecks. Examples of sectors and occupations where employment demand has been consistently strong include mainly high-skilled vocational professionals in the ICT (e.g. software and applications developers), health (e.g. personal care workers in health services, nursing and midwifery professionals, medical doctors), engineering (e.g. mining, manufacturing and construction supervisors, process control technicians) and teaching.

([25]) EU Skills Panorama (2014) Environmental awareness skills Analytical Highlight: http://skillspanorama.cedefop.europa.eu/sites/default/files/EUSP_AH_Environmental_0.pdf

([26]) Ecologic (2015) A framework for Member States to support business in improving its resource efficiency: http://www.ecologic.eu/node/12726

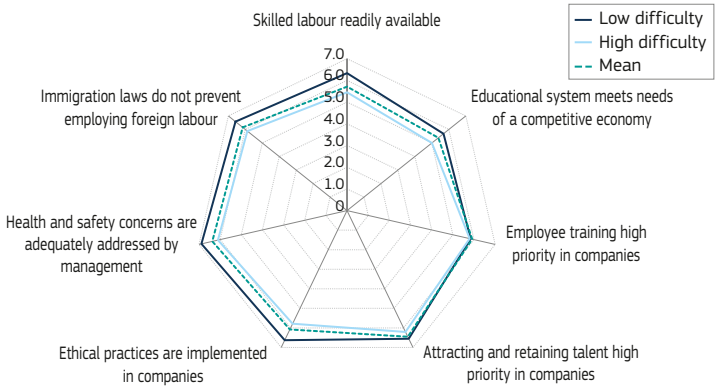
([27]) https://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs

A further recent overview of bottleneck occupations across all EU Member States, carried out by the European Commission, has found that bottleneck vacancies do not only occur in high-skilled occupations but are also prevalent in skilled and low-skilled manual occupations (European Commission, 2014b). The top three bottleneck occupational groups, identified by the study, were metal, machinery and trade related workers, science and engineering professionals and ICT professionals. However, when analysed in detail, specific occupations experiencing shortages differ between Member States.

There are many factors influencing the incidence of bottleneck vacancies. Chart 12 shows results from employer surveys suggesting that bottleneck vacancies occur less often in those countries where business executives believe that the education system meets the needs of a competitive economy (e.g. Finland, Denmark, Switzerland) and countries with a higher (perceived) availability of skilled labour. They occur more often in countries where the education and training system is believed to be less responsive to economic needs (e.g. Bulgaria, Romania, Croatia, Hungary) (Cedefop, 2015a) ([28]).

However, talent shortages can also diverge depending on the variation in the commitment of employers to the talent management process (e.g. whether a significant investment is made in attracting and retaining talent within the firm) and, crucially, their provision of jobs characterised by good working conditions (e.g. adequate health and safety, ethical practices, etc.). In particular, enterprises in the Northern European countries such as Finland, Sweden, Denmark, the Netherlands and Ireland tend to exhibit a stronger orientation towards talent management practices relative to their counterparts in Central and Eastern Europe (e.g. Bulgaria, Romania, Croatia, Hungary) and experience significantly smaller skill shortages than the latter. In Greece, Spain, Portugal and Poland below-average skill shortages are experienced

Chart 12: Differences between European countries with high and low difficulties filling job vacancies, 2006-2014



Reading note: The responses to the statements are measured using a 0-10 index, where 0 is the lowest possible level of agreement to the statement and 10 is the highest; countries are grouped according to whether their average recruitment difficulty in a given year is higher or lower than the 75th or 25th percentile of the distribution of recruitment difficulties among 21 European countries.

Sources: Cedefop (2015a) based on Manpower Talent surveys (2006-2014); IMD WCY.

in spite of a low commitment of firms to human resource development and the management process (Cedefop, 2015a).

Chart 12 also highlights that the policy context governing and shaping a country's favourable attitudes and orientations towards the immigration of foreign skilled labour is an additional important factor that may account for recent cross-country differences in bottlenecks, as it is positively correlated with a smaller incidence of recruitment difficulties by domestic companies (also see OECD, 2014).

2.2.2. Understanding determinants of skill shortages between countries

A country-level empirical analysis can help investigate the determinants of the average talent shortages experienced by employers in different EU labour markets, by using two separate macro-economic data sources (Mane and Pouliakas, 2015). In particular, we obtain information on the mean recruitment difficulties of firms over 8 years (2006-2013), collected as part of the respective annual waves of the Manpower Talent surveys. We merge this information with a number of macro-economic variables (e.g. GDP, unemployment, active population, educational attainment rates, etc.) drawn from Eurostat at the level of each country. Information on the availability (or not) of skilled labour in different countries, and on other supplementary variables, is also obtained from the IMD World Competitiveness Yearbook (WCY) and Online Database. The IMD WCY is a survey of about 4 300 business executives conducted in several countries across the world. The purpose of the survey is to construct an overall international ranking of the competitiveness of different economies.

The statistical information obtained from these separate sources was merged into one master longitudinal dataset (i.e. repeated observations of variables for the same country over time). The total database comprises of a panel of 21 European countries observed over an average of 6.3 years during the period 2006-2013, given that information on the difficulty in filling jobs from the Manpower Talent surveys is only available from 2006 onwards ([29]). Alternatively, the panel includes 28 EU Member States over the period 2000-2013 when a measure of skill shortages based on the IMD WCY survey is used instead.

The empirical investigation uses longitudinal statistical models to explore the contribution of different macro-economic aggregates to the overall variance in talent shortages observed between and within different countries. To estimate parsimonious regression models, a principal components analysis was performed using several of the correlated items in the IMD WCY survey (for a similar analysis see European Commission, 2012a, 2014c). Three principal components with

([28]) The insignificant difference between firms with high– and low difficulties filling jobs depending onto whether employee training is a priority in companies, could be explained by the fact that vocational training is more likely to be employed as a tool by those employers faced with high skill shortages in the first place. Alternatively, it might be the case that attitudes towards training by firms are independent of hiring difficulties, given that most firms place a high priority on training regardless of their skill shortages.

([29]) The 21 European countries in the Manpower sample are 19 EU Member States: Austria, Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom plus Norway and Switzerland.

eigenvalues above 1.0 ([30]) were found to account for 77 % of the total variation in the survey items of interest.

First, a novel measure of skill shortages at the country level has been constructed as a principal components factor that weighs heavily on the following items: (i) skilled labour is readily available; (ii) finance skills are readily available; (iii) qualified engineers are available in the labour market; (iv) information technology skills are readily available; and (v) health problems do not have a significant impact on companies. This measure provides a summary of the availability of skills in the respective economies. Reversing the scale (i.e. skills are not readily available) leads to a variable that is used in the analysis as a proxy for (perceived) skill shortages.

A second factor obtained from the principal components analysis is comprised of factor loadings that capture differences in terms of the ability of firms to commit to the skill formation process and to a high quality of working conditions. Specifically, the second factor weighs more heavily on the following items: (i) employee training is a priority in companies; (ii) ethical practices are implemented in companies; (iii) social responsibility of business leaders is high; (iii) health and safety concerns are adequately addressed by management; and (iv) workers' motivation in companies is high.

Finally, a third factor is a summary measure of the degree of leniency of labour market regulations, described mainly by the extent to which: (i) labour regulations (hiring, firing, minimum wages, etc.) do not hinder business; (ii) unemployment legislation provides incentives to look for work; and (iii) labour relations are generally productive.

Furthermore, it is assumed that the variation in the incidence of skill bottlenecks observed across different countries can be explained by the following key macroeconomic factors: (i) GDP per capita; (ii) the structure of the economy, proxied by the share of the industrial sector in GDP; and (iii) the rate of unemployment.

([30]) The eigenvalue of each factor measures the variance in all the survey items included in the principal component analysis which can be accounted for by that factor alone. An eigenvalue of 1.0 indicates where a factor explains just as much variance as a single survey item would on its own. Factors which have eigenvalues below 1.0 are less informative than if each survey item is were not combined using factor analysis. This is known as the Kaiser criterion.

In order to examine further whether the above factors exert a statistically significant influence on the variance of skill shortages, we thus estimate the following model:

$$s_{ct} = \alpha_{ct} + \beta_1 GDP_{ct} + \beta_2 IND_{ct} + \beta_3 U_{ct} + \beta_4 LF_{ct} + \beta_5 FIRM_{ct} + \beta_6 REG_{ct} + \beta_7 T_t + \varepsilon_c + u_{ct}$$

where the incidence of skill shortages, *s*, in a given country (*c*) and year (*t*) is assumed to be a linear function of the two other principal component factors, as well as the other controls used in the previous analysis. The model also includes time dummies (*T*), which capture the impact of any residual country-specific changes in talent shortages that took place across the respective time period. The model is then estimated using both random and fixed effects.

Unobserved heterogeneity in the model is given by the summation of country-specific time-invariant factors, ε, and another random error term, *u*. As is standard, a fixed-effects regression identifies the impact of within-country deviations in the determinants (e.g. $\ddot{U} = (U_{ct} - \overline{U}_c)$) on the within-country variance in talent shortages ($\ddot{s} = (s_{ct} - \overline{s}_c)$). This allows for the identification of the effect of a given regressor on the dependent variable that is purged of any confounding influences of other country-specific factors that remain constant (or change very slowly) across time (e.g. the institutional environment).

After taking into account other important factors that vary between the countries (e.g. levels of national income or regulatory environment), higher unemployment rates are found to be associated with a significantly lower hiring difficulty by employers, the latter derived by the Manpower Talent surveys (Table 5). Specifically, for every 1 % increase in the rate of unemployment since 2006, the average recruitment bottleneck of firms has declined by 0.8 percentage points in the sample and time period examined. The empirical evidence therefore confirms that, overall, during the recent period of economic turmoil, talent shortages in the European economy became less pronounced, given that employers were confronted with a significantly larger supply of available skilled workers per job vacancy. Once this was accounted for, Table 5 also shows that in countries where skills were not readily available, filling vacancies was more difficult. A 1 unit increase in the skills shortage factor increased the average bottleneck by 0.04 percentage points. The empirical findings of columns (2) and (3) in the table, which are based on panel regressions models that use the measure of skill shortages derived from the IMD WCY, further confirm the significance of macro-economic forces that are correlated with a smaller deficiency of skills in EU economies. They also confirm that skill shortages are also more prevalent in economies where strong industrial sectors account for a larger share of employment. Furthermore, a smaller incidence of skill shortages is observed in EU countries in which firms are characterised by greater commitment to talent management and the offer of good work. Economies in which skilled labour is not readily available are also less likely to have lenient employment regulations.

2.2.3. Employers' crucial role

Faced with an inability to fill existing vacancies with suitable labour, employers may respond in a number of ways. Firstly, it is likely that wages will rise in order to attract more skilled labour, particularly in the case where skill shortages were the result of firms offering too low a wage given the prevailing market conditions. At the same time, firms may look for alternatives to skilled labour, for example by investing in technology and capital to substitute for labour. However, there are several frictions that may impede the fast response of the wage mechanism. Firms may be wary of wage inflation and rising staffing costs across the board or may wish to avoid pay inequity that can spur demotivation among their workforce (Bewley, 1999; Pouliakas and Theodossiou, 2013). There may also be significant time lags and 'menu costs' associated with firms having to undertake significant adjustments to their remuneration policy (Arrow and Capron, 1959). For the above reasons, many firms prefer to rely on alternative strategies to combat skill shortages than to raise their relative pay rates (Haskel and Holt, 1999).

For example, difficulties in recruitment faced by employers may be tackled via the adoption of an alternative mix of human resource policies (Cedefop, 2015a). Such a strategy should rely on the offer of better and more stable jobs to skilled applicants, hiring individuals on the basis of their 'potential' rather than on accumulated prior work experience, as well as sourcing relatively unexploited talent (e.g. females, older workers), which tends to be overseen despite the fact that it may possess the skills needed for the advertised jobs (Manpower, 2014). Employers could also

Table 5: Determinants of difficulties filling jobs/finding skills faced by employers, 2000-2013

	Difficulty filling jobs	***Skills not readily available in economy*** (I)	
	Fixed effects	*Random effects*	*Fixed effects*
Unemployment rate	–0.80**	–10.11***	–7.61***
	(0.392)	(1.952)	(2.350)
Skills not readily available in economy (I)	0.04***		
	(0.010)		
Firms' commitment to good work (I)	–0.01	–0.31***	–0.24***
	(0.012)	(0.057)	(0.068)
Leniency of regulations (I)	0.02	–0.32***	–0.36***
	(0.013)	(0.065)	(0.069)
GDP per capita	–0.00	–0.01*	–0.01*
	(0.001)	(0.006)	(0.007)
Share of industry in employment	–0.26	10.35***	16.21***
	(0.474)	(2.659)	(4.515)
Time dummies	√ (2006–2013)	√ (2000–2013)	√ (2000–2013)
Constant	0.58***	–1.89**	–3.69***
	(0.171)	(0.905)	(1.354)
N	132	358	358
R-squared	0.24 (within)	0.52 (overall)	0.47 (within)
Wald chi2	4.69***	311.65***	15.0***
Corr(u_i, X)	–0.26	0	–0.29
No. of countries	21	28	28

Reading note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; (I) = principal components index (derived as explained in the main text).

Source: Cedefop (2015a), based on data from the Manpower Talent surveys (Difficulty filling jobs) and IMD WCY (Skills not readily available).

provide more training themselves. They can change the content and skill intensity of the jobs offered to better match the profiles of individuals available on the labour market (Pouliakas and Russo, 2015). Enterprises can further alleviate skill shortages by strengthening their talent pipeline both from the outside market (e.g. via participation in local employer associations) and by investing further in the workforce inside the firm (via promotions and job rotations).

Of course, where skills shortages are the result of a significant market failure, some of these options may not be available or may be second-best, which would then necessitate greater State intervention. For a significant number of enterprises, particularly smaller-sized, unfilled vacancies may be a consequence of their inability to offer a competitive starting salary or because they face other business constraints (e.g. lack of access to credit, administrative hurdles). Policies to alleviate labour market monopsony and to ease the bargaining power of a few dominant firms in a market (e.g. wage subsidies; removal of barriers to firm entry) may therefore improve efficiency in the allocation of skilled labour (Kahn, 2015). In general, tackling imperfections in labour, credit and product markets can remove the distortionary incentives to train in areas of skill shortage by firms as well as individuals (Almeida et al., 2012).

2.3. Skills mismatch on-the-job

Another topic that has received ample attention in the context of skills mismatch is the possibility that workers have different skills or qualifications from what is required by their jobs. Over the crisis period, there has been high concern about over-qualification, especially in the case where tertiary graduates end up in positions that do not require a tertiary degree.

The evidence on the extent and the effects of over-qualification however remains subject to discussion (Allen and van der Velden, 2011). For example, while Battu et al. (1999) and Dolton and Vignoles (2000) show that over-qualified graduates have lower earnings compared to others with the same qualifications, Chevalier and Lindley (2009) find that the wage penalty declines if one controls for ability; and Büchel (2002) and Mahy et al. (2015) argue that over-qualification among employees has a positive impact on productivity.

Measuring skills mismatch on-the-job implies a correct identification of the education level that is required for a job, which has proved to be challenging. Three major approaches have been taken in the literature: a subjective approach, an objective approach and an empirical one (see Box 2 and Tijdens and van Klaveren, 2012). This Section reflects on these different approaches and analyses the divergence in results arising when applying three different indicators (based on LFS 2013). It reveals a number of limitations in the extent to which these indicators can contribute to a better understanding of the phenomenon of skills mismatch on-the-job.

The analysis focuses on over-qualification, as this issue has received most attention from researchers and policy-makers, but in principle, a similar analysis could be carried out on under-qualification. First, we present the results of using the empirical indicator for over-qualification, which counts an individual as over-qualified if his/her level of education is higher than the modal level of education of all individuals in the same occupation and country ([31]). Then we present the results of two variants of the objective indicator for over-qualification. The first one considers an individual as over-qualified if he/she has a tertiary degree but works in an occupation sometimes considered as not requiring a tertiary degree ([32]). The second one takes a more narrow approach, only considering those high-skilled individuals who are in elementary

([31]) Based on ISCO2 digits occupation (derived from variable ISCO3D). This approach is similar to EDU1 by Flisi et al. (2014).

([32]) Within ISCO 1-digit codes 4-9.

Box 2: Measurement of skills mismatch on-the-job

Three major approaches have been taken in the literature:

- the subjective approach ('worker self-assessment'), where workers ask themselves what the education level required for their job would be;
- the objective approach ('job analysis' or 'systematic job evaluation'), where job market experts are asked to identify the education requirement based on a job description (e.g. Rumberger, 1987; McGoldrick and Robst, 1996);
- the empirical approach ('realised matches'), where the required education level is derived from the observed education levels of workers in a certain job (e.g. Verdugo and Verdugo, 1989; Kiker et al., 1997; European Commission, 2012a: 360).

Each of these methodologies has constraints. Hartog and Jonker (1997) argue that individuals are inclined to overstate the educational requirements for their job, and that this 'social desirability' effect may bias the subjective measure downwards. Nevertheless, in practice the subjective measure usually leads to higher instead of lower reported levels of over-qualification than other measures (McGuinness, 2006). From an operational perspective, the main drawback of using the subjective measure is that it relies on data from specific surveys which are not carried out on a frequent basis.

The objective approach is conceptually preferable to the subjective and the empirical approach (Flisi et al. 2014). Its major drawback however is that it is only relevant if it relies on a high-quality taxonomy of job skills requirements, notably one that is up to date and sufficiently country-specific. For example, United States studies can rely on a dynamic database (the Occupational Information Network) which is continuously updated (Mariani, 1999). For cross-European analyses, no such dictionary exists as yet. Development of the European Skills, Competences, Qualifications and Occupations (ESCO) classification is in progress. A first draft is expected by the end of 2016 at the earliest.

In the absence of a reliable dictionary, researchers have used simplified strategies to assess the incidence of over-qualification. One strategy often applied uses a very simple taxonomy that is fixed across time and across countries and crosses ISCO 1-digit job categories with ISCED 1-digit education categories. ISCO categories 1-3 are considered 'high-skilled' occupations, requiring a tertiary degree. ISCO categories 4-8 are considered as 'medium-skilled' occupations, requiring an upper secondary qualification; and finally ISCO category 9 is considered as low-skilled, not requiring upper secondary education. This classification was proposed by ILO (2007).

This approach is also used in European Commission (2012: 360). It may be more appropriate to think about these as 'high- skill jobs' rather than 'tertiary- graduate jobs' as historically these groups have employed a majority of workers without degrees. Recognising this, Elias and Purcell (2013) categorise many occupations within these groups found in the UK as non-graduate, particular those in the equivalent of ISCO groups 1 and 3.

Nevertheless, as technological progress exerts upward pressure on educational requirements for specific occupations, education requirements are likely to vary across countries as well as over time (see e.g. Livingstone, 1999:74). If one fails to account for rising skills requirements, the measure for over-qualification will be upward biased. On the other hand, Elias and Purcell (2013) categorise many occupations within ISCO groups 1-3 as non-graduate for the United Kingdom. Hence, in general, an approach that relies on a very simple dictionary has major limitations.

Finally, the empirical approach is relatively easy to apply and draws on frequently collected data. An example of an often applied empirical measure identifies the qualification requirement for a particular occupation as the modal level of education empirically observed in that occupation (usually at the ISCO 2-digit level). This approach has however been criticised most of all, due to its on-the-job skills mismatch indicators, since it allows job skills requirements to be endogenously related to the extent of over-qualification in an occupation (Verhaest and Omey, 2006a; Cedefop, 2010: 67).

Both the objective and the empirical method suffer from measurement error if different jobs (with different education requirements) are clustered together in occupational categories; which usually is the case if one relies on ISCO 1- or 2-digit classifications.

Hence, each of these indicators presents major shortcomings. What is even more worrying, is that the extent of over-qualification varies strongly across different measures and the correlation between different measures is low (Verhaest and Omey, 2006b). This seriously calls into question the usefulness of these measures for policy-makers.

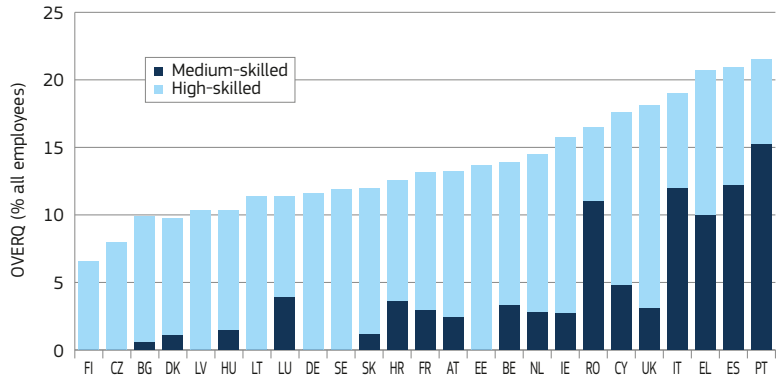
jobs as mismatched ([33]). This category of jobs concerns sales and services elementary occupations and labourers in agriculture, mining, construction, manufacturing and transport.

The empirical approach suggests that across the EU 15.5 % of the workers are over-qualified, with levels ranging from 6.5 % in Finland to 21.5 % in Portugal (Chart 13). In particular, Southern European countries present a high level of over-qualification, with as worst performers Portugal, Spain, Greece and Italy, but also the United Kingdom. Interestingly, these are not only individuals with a tertiary degree: they include individuals with upper secondary education that are in occupations dominated by low-skilled individuals. In fact, in Spain, Portugal, Italy and Romania the majority are medium-skilled (MS) ([34]) working in occupations dominated by low-skilled individuals.

([33]) ISCO 1-digit code 9.

([34]) Throughout this Section we will refer to individuals with tertiary education as high-skilled (HS), with only upper secondary education as medium–skilled (MS) and with less than upper –secondary education as low-skilled (LS).

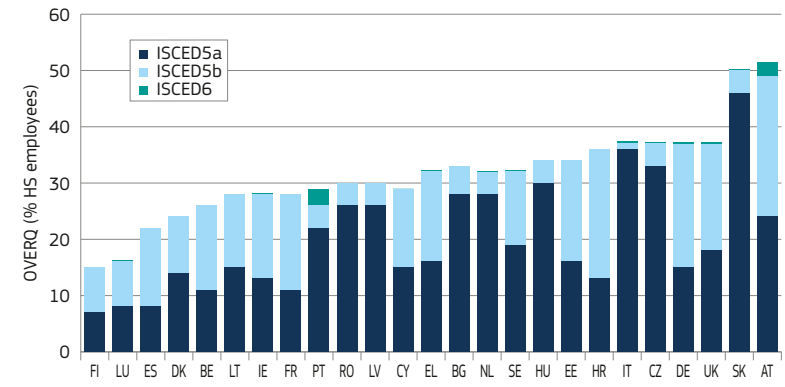
Chart 13: Percentage of over-qualified workers by country



Reading note: Age group considered 15-64.

Source: LFS 2013.

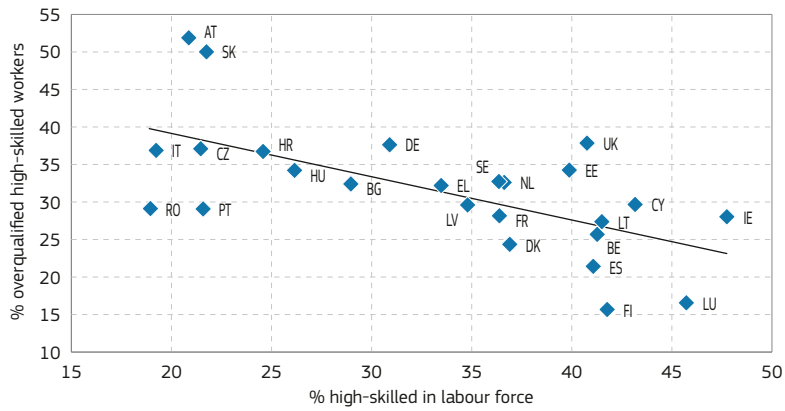
Chart 14: Percentage of over-qualified high-skilled workers by country



Reading note: Age group considered 15-64.

Source: LFS 2013.

Chart 15: Share of high-skilled workers in labour force and share of over-qualified high-skilled workers



Reading note: Age group considered 15-64. Correlation coefficient: –0.63; p–value<0.001.

Source: LFS 2013.

Among high-skilled (HS) workers, 29.0% are considered to be over-qualified in the EU, ranging from 15.7% of high-skilled workers in Finland up to 51.9% in Austria (Chart 14). The highest shares are found in Austria, Slovakia, the United Kingdom, Germany and the Czech Republic. For Austria, Slovakia and the Check Republic, this high level of over-qualification is potentially due to the high dominance (> 65%) of medium-skilled workers in the labour force; which means the modal education level for many ISCO categories is likely to be medium-skilled. This reflects the endogenous nature of the empirical measure of over-qualification. Contrary to what one would perhaps expect, a country with a high share of high-skilled individuals (e.g. Finland and Luxembourg) is likely to have a low share of the over-qualified, as many occupations are dominated by the high-skilled and therefore the 'modal education level' is upgraded to tertiary education for these countries (see also Chart 15). Note that this does not necessarily reflect higher skill requirements of the job, but rather the relative supply of highly-skilled workers.

Many of the high-skilled individuals considered as over-qualified have tertiary-level programmes that are typically short, with a minimum duration of two years full-time equivalent, and focus on practical, technical or occupational skills for direct entry into the labour markets, hence with a vocational orientation (Chart 14) ([35]). The results of this approach should be interpreted with caution; as the underlying assumptions are rather strong, possibly debatable, and they influence the outcomes to a great extent.

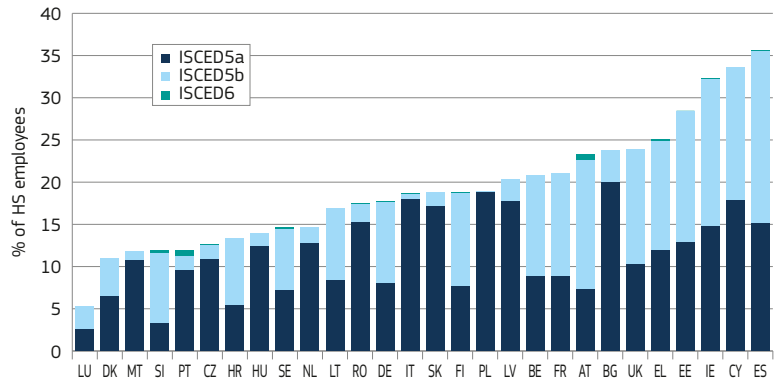
The objective approach puts the average level of over-qualification in the EU at 7.4% of all workers; or 21.9% of high-skilled workers, a significantly lower number. Over-qualification among high-skilled workers ranges from 5.3% in Luxembourg to 35.6% in Spain. The highest incidence of over-qualification (as a% of high-skilled workers) is found in Spain, Cyprus, Ireland and Estonia. Interestingly, the ranking of countries according to the objective approach and the ranking according to the empirical approach differ strongly: at the country level, there is no significant correlation between both measures.

Many of the individuals identified as over-qualified are clerks, such as secretaries and bank, library and customer service clerks ([36]). Such jobs would in some EU Member States typically be taken up by individuals with an upper secondary (or post-secondary, non-tertiary) VET degree, while in other Member States they are more often taken up by individuals who follow general education at secondary education level, potentially followed by a (short) tertiary programme.

([35]) ISCED 5b qualifications in the ISCED97 classification. These are OECD (2003) Glossary of Statistical Terms. Tertiary–type B education (ISCED 5b) Available online at https://stats.oecd.org/glossary/detail.asp?ID=5441

([36]) According to the objective approach, the highest incidence of over-qualified workers at the EU-level can be found in occupational category of customer service clerks (ISCO 2-digit category 42).

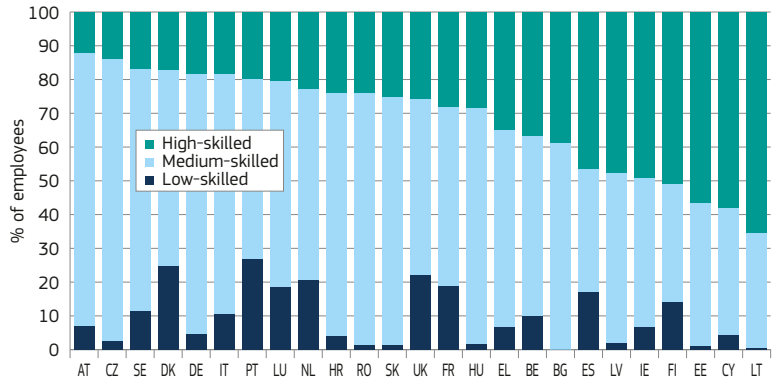
Chart 16: High-skilled in medium or low-skilled occupation, as a % of high-skilled workers (2013)



Reading note: Age group considered 15-64.

Source: LFS 2013.

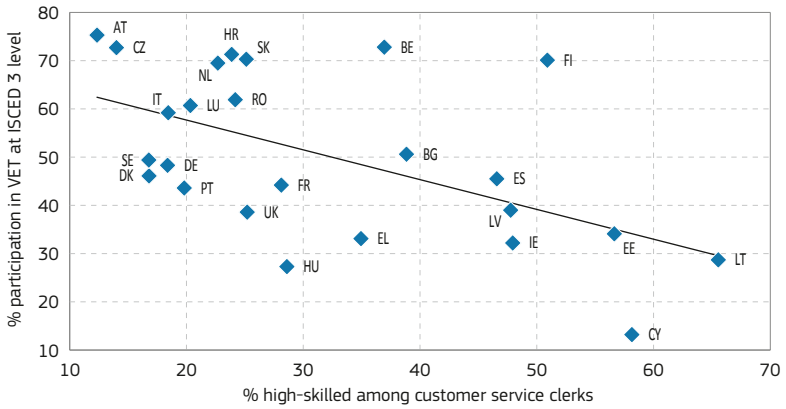
Chart 17: Educational distribution of customer service clerks



Reading note: Age group considered 15-64. LS=Low-skilled; MS=Medium-skilled; HS=High-skilled.

Source: LFS 2013.

Chart 18: % of high-skilled individuals in ISCO 42 versus VET participation at ISCED 3 level



Reading note: Age group considered 15-64. Correlation coefficient = –0.57; p–value <0.005.

Source: LFS 2013, UOE 2012 data on participation/ enrolment in education by sex [EUROSTAT variable educ_ipart_s].

Chart 17 confirms the wide variation in educational profiles of workers in this specific occupational category across EU Member States. In Lithuania, Cyprus, Estonia, Finland, Ireland, Spain and Latvia, customer service clerk jobs are predominantly taken up by high-skilled (HS) individuals. In Austria, the Czech Republic, Sweden, Italy and Germany, they are mostly taken up by individuals with an upper secondary qualification.

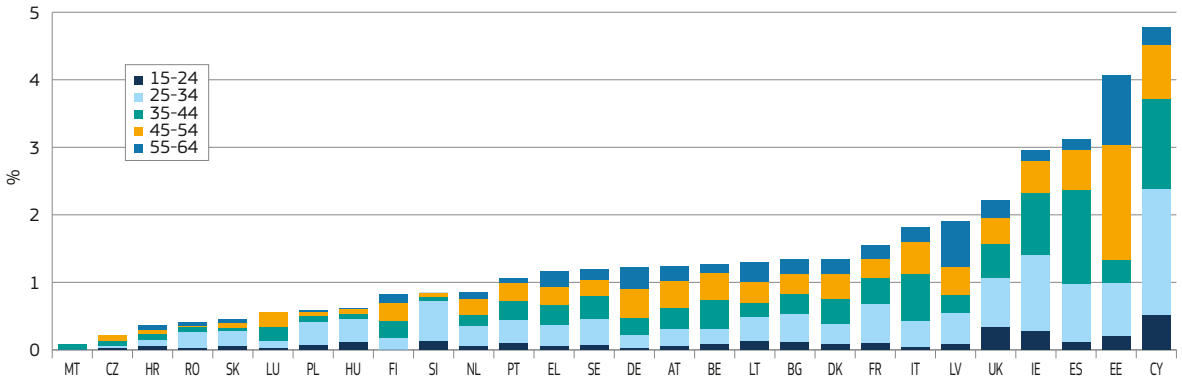
Interestingly, the countries with the highest incidence of tertiary graduates in these occupations are the countries with the lowest percentage of participation in VET at the ISCED 3 level (Chart 18). This could mean that those countries with a low level of over-qualification draw their customer service clerks and sales workers from VET graduates, which may not be available in countries with low participation in VET. Perhaps school systems across different countries do not offer the same type of programmes at the upper secondary level. In Estonia and Cyprus, for example, VET programmes seem to produce more graduates in the fields of 'Engineering, manufacturing and construction' and in 'Services' (including personal, transport, environmental and security services) than in 'Social Sciences, business and law' ([37]). Estonia and Cyprus have less than 15 % of VET graduates in the field 'social sciences, business and law' at the ISCED 3 level as compared with over 40 % in Germany. Further research is needed to corroborate these tentative explanations, but data availability is a major constraint.

Lastly, a second objective measure of over-qualification is explored, namely one that considers only individuals with a tertiary degree in elementary occupations (ISCO 9), arguably the most severe form of over-qualification. Elementary occupations are those which require low levels of skills, such as cleaners, domestic helpers, labourers in agriculture, construction and manufacturing, and food preparation. The incidence of such over-qualification is rather low: it applies to less than 0.6 % of all workers; and to less than 1.7 % of high-skilled workers across the EU. By country, figures vary from below 0.1 % in Malta to above 4.7 % of the high-skilled in Cyprus (Chart 19).

Why relatively high levels occur in Cyprus, Estonia, Spain and Ireland is another interesting topic for further exploration. It should be noted that every country is different in its labour market and education institutional features, the structure of its economy as well as historical elements. This underscores the need for a country-specific in-depth analysis of

([37]) See EUROSTAT indicator educ_grad5. The different fields considered are: Education; Humanities and Arts; Social sciences, business, and law; Science, mathematics and computing; Engineering, manufacturing and construction; Agriculture and veterinary; Health and welfare; and Services.

Chart 19: High-skilled in elementary occupations – by age and by country, 2013



Source: LFS 2013.

the factors contributing to high levels of observed over-qualification.

The high levels for Spain and Cyprus, for example, are probably influenced by their labour market structure: these countries have a relatively high share of elementary jobs in their economy (13% and 17% respectively, as compared to an EU average of 9%). In many of the countries in Southern Europe, a high share of the individuals identified as over-qualified are working in a family business (NACE sector T). This applies to 20-50% of the high-skilled in elementary occupations in Portugal, Spain, Romania, Greece, Malta, Italy and Cyprus.

In Cyprus, it is mostly young (25-34) tertiary graduates who end up in such positions; in Spain, there are more over-qualified in the age category 35-44. In Estonia and Latvia, on the other hand, most over-qualified (67% and 58% respectively) are over 45, and a considerable share even over 55. This could be related to obsolescence of skills. There is also a gender dimension: in Cyprus and Estonia, the over-qualified are predominantly women (more than 70%), while in Ireland and the United Kingdom the majority (more than 55%) are men. This probably relates to the type of elementary occupations more common in each country.

In sum, the analysis in this Section has shown that as with skills shortages, measuring skills mismatch on-the-job is challenging and existing measures may not always pick up 'genuine' skills mismatches, or those that should be of most policy concern. They may point to mismatch where none actually exists. The problem of measurement error is illustrated by the very weak correlation between the different measures that have been proposed in the literature.

For those workers whose skills are genuinely mismatched on their job, the reasons may be diverse: it could relate not only to education and training systems, but also to unobserved job features, labour market institutions, the structure of the economy and historical factors. Again, in order to devise the 'right' policy mix, country-specific analysis is needed on the drivers and determinants of skills mismatch on-the-job.

2.4. Skill demand

The analysis of trends and patterns of skill demand in the EU is particularly relevant in view of new needs brought forward by technological innovation, globalisation, demographic change and the process of greening of the economy. All these trends will have an impact on future skills needs. They will provide the EU with an opportunity to exploit its comparative advantages in activities with high-technology, high-skilled and knowledge-intensive profiles. At the same time, they may also result in job insecurity and wage pressures especially for workers in routine low-skilled task-based occupations or involved in the production of tradable goods and services, and in job polarisation.

This Section investigates whether there is an accelerating increase in skill demand that is pervasive throughout sectors and occupations in Europe. In certain sectors and occupational groups the level of skills needed to perform the job is not always high and in certain cases there is no evidence of a need for skills upgrading. In other words, while we sometimes take for granted that there is rising skill demand across occupations, this is not always the case, and there might be cases in which technology leads to deskilling.

2.4.1. Skills monitoring and anticipation systems

A wide-ranging group of social actors (individuals, firms, education and training providers, human resource managers, career guidance and counsellors, PES advisors and policy-makers) are called upon each day to make decisions about the optimal development and deployment of skills. These are decisions that will ultimately determine and shape future economic outcomes (e.g. What type of education and training to undertake? What mix of skilled labour to hire? What type of training programme to offer to the unemployed?). Labour market intelligence (LMI), most notably information collected as part of labour market monitoring and skills anticipation exercises, allows them to assess current and future prospects carefully and to make informed decisions about investments that will generate the best return. Skills anticipation tools, in particular, help fill significant information gaps and can mitigate, to some extent, the emergence of future shortages and mismatches ([38]).

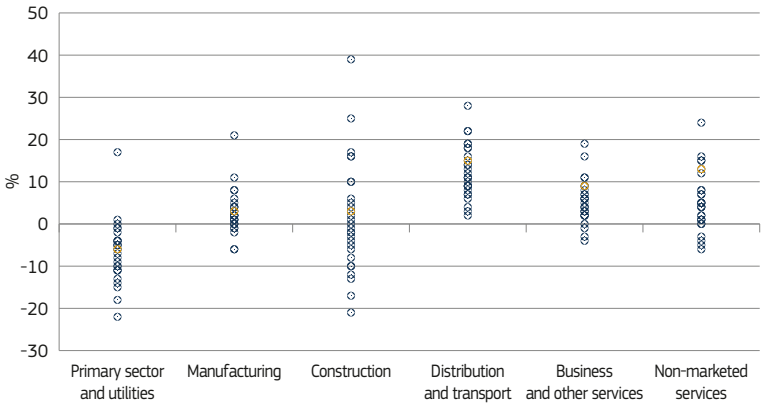
([38]) Assessing or evaluating directly the impact of investments in LMI and skill forecasting systems is difficult as such systems are inputs into the overall policy process. There is nevertheless evidence that developing LMI helps actors in the labour market to make better choices. The revealed preference of governments worldwide suggests that there is general acceptance of the principle of carrying out such work as a 'public good'. A comprehensive literature review in Canada of the impacts of LMI has also concluded that despite the difficulties 'individuals and employers do use LMI in decision-making and consider it useful, while it has a positive impact on users' labour market knowledge and on decisions pertaining to investment in education' (Murray, 2010).

Since the launch of the European Commission communication 'New Skills for New Jobs' in 2008, complemented by the flagship EU2020 initiative 'Agenda for New Skills and Jobs', concerted efforts to develop mechanisms that monitor and anticipate skill needs have been made in many European Member States (OECD–Cedefop–ETF–ILO, 2015). The main rationale for the development and proliferation of skills anticipation tools is that labour market failures, in particular information asymmetries between different market agents, make a strong case in favour of public intervention. By offering early warning signals of emerging skill mismatches, skills anticipation tools allow policy-makers sufficient scope and time to design appropriate policy measures (at present time) that can mitigate or counteract them so that they do not fully evolve in the future.

Anticipating the future is an inherently uncertain task. Yet sophisticated skills anticipation tools rely on careful study and identification of past and current labour market trends. They provide a visualisation ('a mirror extension') of a country's projected future, should it stay on a similar path as the one that prevailed in previous years. In other words, skills anticipation tools rely heavily on the assumption that past trends and existing economic realities will not be significantly disturbed in future time periods. Of course, in dynamic market economies such an assumption may ultimately prove to be false. However, the true value of skills anticipation tools becomes evident when they provide a platform to policy-makers and relevant social partners for engaging and interacting in designing future economic strategies for their respective country or locality. In addition, taking into account the typically short-term incentives of policy-making, such as regular electoral cycles and the need for immediate delivery of political objectives, skills anticipation tools can offer a useful forward-looking 'beam of light' to policy-makers, anchoring and steering their decisions over the long term.

The production of information on future skill needs typically entails the involvement of a number of actors including ministries, training institutions, public employment services and regional and local authorities. The information produced serves multiple purposes, depending on the needs of the various actors.

Chart 20: Distribution of employment growth by sector in Member States (blue dots) and EU-28 (yellow dots), 2013-2025



Source: Cedefop skills forecasts (2015).

Generally governments and stakeholders attempt to disseminate the information collected on future skill needs as broadly as possible to a wide group of potential beneficiaries (e.g. students and families, employees, unemployed).

When skills forecasting instruments are used for the purpose of manpower planning, namely attempts to influence the market system from the top down, they will almost certainly prove to be exercises in futility. But when used properly as inputs for the decision-making process, skill anticipation systems can be a very powerful tool. Governments can rely on such mechanisms for multiple uses, such as updating occupational standards, designing training schemes for workers and the unemployed, introducing educational reforms or guiding migration policy (OECD/Cedefop, 2015). Other stakeholders can also use the information as a means to inform their members or respective audiences or for shaping their own respective agendas. In principle, skills anticipation can feed directly into the decisions of policy-makers, who can channel the information towards the attainment of a broad set of objectives that will ultimately affect the future course of economic development of a country.

2.4.2. Effective skills anticipation

Anticipation systems across EU countries, although having many similarities in features and development trends, are in fact quite different in many respects. The efforts in Member States, while broadly similar, differ in methodology and in data sources used. They therefore do not produce comparable data at European level.

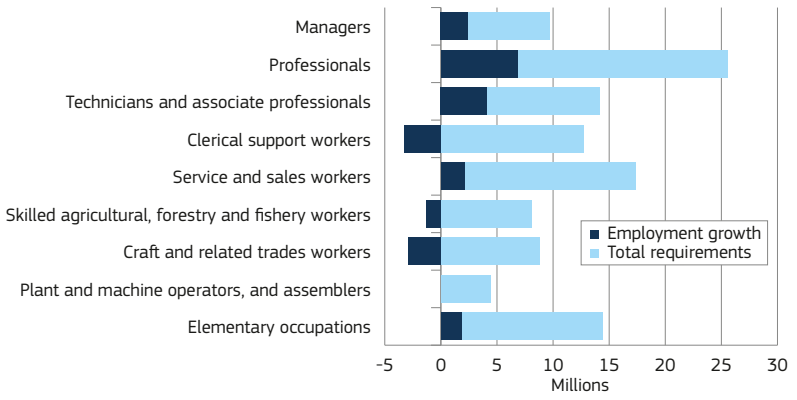
Developing anticipation systems at pan-European level is important for providing comparable data on future challenges across Europe. Cedefop (with the support of the European Commission) has produced since 2008 regular forecasts of skill supply and demand for the EU and each Member State up to 2020, including details by broad sectors, occupational groups and educational levels.

According to Cedefop skills forecasts ([39]) the annual growth rate of employment between now and 2025 will be 0.3%. Future job growth in the EU-28 will be concentrated mainly in transportation and service related sectors. Most jobs will be created in business services (legal, accounting, administration), accommodation and catering and health sectors. Employment will continue to fall in the primary sector. Despite the fact that the majority of manufacturing subsectors will experience further job losses, good employment prospects are forecast in optical and electronic equipment as well as manufacturing of motor vehicles. The situation in the construction sector, the sector most affected by the crisis, will be stabilised and minor job growth is expected in this sector in the next decade on average.

Sectoral job growth will differ markedly across countries. Chart 20 presents projected employment change between 2013 and 2025 (in%) for each EU Member State (blue dots) and for the EU-28 (yellow dots).

([39]) Cedefop forecasts are taking into consideration Eurostat's latest population projections (Europop 2013) as well as short-term economic forecasts of the European Commission. Public access to the results is available via the dedicated platform on Cedefop's website: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/skills-forecasts-main-results

Chart 21: Structure of total job opportunities by occupations in EU-28, 2013-2025



Source: Cedefop skills forecasts (2015).

24% of all job opportunities in the EU, defined as new jobs created (expansion demand) as well as replacement needs, are forecast to be in the occupational group 'professionals', which includes high-skilled jobs in science, engineering, healthcare, business and education. The second most demanded occupational group (16% of all job opportunities) will be 'shops and market sales workers'. The lowest share (4%) of total job openings in the EU will be for the occupational group 'plant and machine operators', which includes different type of industrial or factory workers such as drivers. Chart 21 illustrates that even though it is expected that there will be a falling or stagnant expansion demand for people in medium-skilled occupations (e.g. clerks, skilled agricultural and fishery workers, craft and related trades workers), namely that few new jobs are expected to be created, all occupational categories are likely to experience positive demand growth due to high replacement needs in the European economy, related to the demographic crunch.

From the supply side, and given that only the population of individuals over 55 years old is expected to grow, the total labour force in the EU is projected to fall by 1%. However the European labour force will continue to become more highly qualified. The share of the total labour force with high qualifications is expected to grow from 31% in 2013 to 39% in 2025. The proportion of individuals with medium qualifications is expected to fall from 47% in 2013 to 44% in 2025. The share of those with low qualifications is expected to be slightly below 17% by 2025. However, Chart 22 illustrates that some EU countries, such as Malta, Spain, Italy and Greece will still have a relatively higher share of low-qualified individuals compared to other Member States.

3. Skills for a better functioning labour market – Possible policy options

Education and training systems are the primary instruments to provide and update skills that are required in the labour market. Nowadays just over 80% of young people ([40]) in Europe attain at least an upper secondary education qualification ([41]), with half of secondary students receiving a vocational qualification ([42]). Around two thirds of young people access labour market with an upper secondary qualification while just over one third of them (37.9% in 2014) acquire higher education ([43]). After finishing initial education, many adults continue to renew and update their skills ([44]), albeit not regularly (in 2014, only 10.7% of adults aged 25-64 report attendance at training activities in the 4 weeks preceding the survey). Moreover, while those with higher education are well-placed to enter and continue in better jobs, this is not so often the case for those with a medium or low level of education and/or skills. Accordingly, effective performance of initial vocational education and training systems as well as adult learning systems are of crucial importance.

Initial Vocational Education and Training (I–VET) provides young people with a recognised qualification and training for a particular profession. Most I–VET is carried out as part of upper secondary education (between the ages of 16 and 19), though I–VET at higher levels (beyond upper secondary education) has significantly developed in recent decades in Europe.

Continuing Vocational Education and Training (C–VET) aims to provide employees with work-, profession- or career-related skills. C–VET is often non-formal and in most cases requires the participant to have a certain minimum level of basic skills (literacy, numeracy, digital) in order to be able to take part in the training. This is however only one of the options adults have to improve their skills. Thus a broader definition of adult learning is used to understand and analyse the activities that adults need undertake. Adult learning covers the entire range of formal, non-formal and informal learning activities, general and vocational, undertaken by adults after leaving initial education and training. Besides C–VET, other forms of adult learning include: provision of basic skills to adults needing them; language and other courses to support the integration of immigrants, 'second chance' education; learning for a formal qualification later in life, and courses undertaken for personal development and interest but not linked directly to the working life.

([40]) Based on age group 30-34.

([41]) For statistical purposes, there is the International Standard Classification of Education (ISCED). Each qualification can be assigned to a certain level: i.e. ISCED levels 0-2 cover education pre-primary, primary and lower secondary education (usually until the age of 15); ISCED 3 covers upper secondary education (usually between age 16 and 18); ISCED 4 covers post-secondary non-tertiary education; while ISCED levels 5 and above cover tertiary education. In this chapter low level of education is considered below upper secondary (ISCED 0-2); medium level is considered– upper secondary and post-secondary non-tertiary (ISCED 3-4); while high level is considered– tertiary education (ISCED 5 and above).

([42]) There are two orientations of education – general and vocational. According to the official definitions of the ISCED classification, vocational education is defined as educational programmes that are designed for learners to acquire the knowledge, skills and competencies specific for a particular occupation or trade or class of occupations or trades. On the other hand general education is defined as educational programmes that are designed to develop learners' general knowledge, skills and competencies and literacy and numeracy skills, often to prepare participants for more advanced educational programmes at the same or a higher ISCED level. General education includes educational programmes that are designed to prepare participants for entry into vocational educational programmes but do not prepare for employment in a particular occupation or trade or class of occupations or trades, nor lead directly to a labour market relevant qualification.

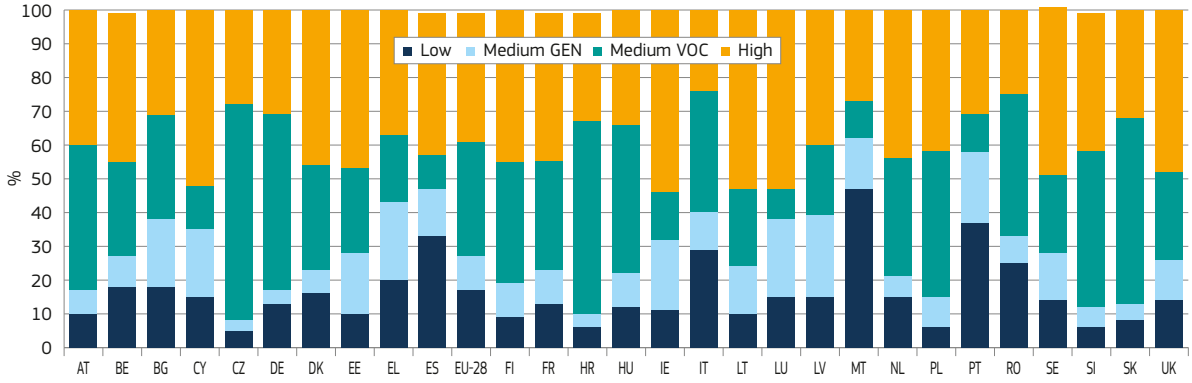
([43]) Close to two fifths (37.9%) of the population aged 30–34 in the EU-28 had a tertiary education in 2014; http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics

([44]) Up to 40% of the population aged 25-64 (more than 100 million adults) at least once a year attend some education or training. Eurostat Adult Education Survey (AES), 2011.

Chart 22: Changes in the labour force (15+) by qualification, 2013-2025, EU (%)

Source: Cedefop skills forecasts (2015).

Chart 23: Distribution of population, aged 30-34, by educational attainment level, 2014



Reading note: The analysis excludes respondents who did not respond to the questions on highest level of education attained or the orientation of this level.

Source: DG EMPL calculation based on Eurostat Labour Force Survey data. The data considers the age group 30-34.

Some groups (low-skilled, unemployed, inactive, etc.) are a particularly important target group, as they often do not have access to C–VET. For these adults, general adult learning – often supported by public funding – is provided. It firstly targets the acquisition of basic skills. This branch of adult learning is also important for the workplace because – even if the learning is organised outside the workplace – it can help low-skilled adults acquire the basic competences that they need to be able to take part in work-related training. Because of their contribution to improving adults' skills, a key focus of policy is to raise levels of participation in both C–VET and general adult learning.

Within this Section we use the term Vocational Education and Training (VET) to refer primarily to the initial VET in secondary education, while for all the different forms of learning after initial education (including C–VET), we use the term 'adult learning'.

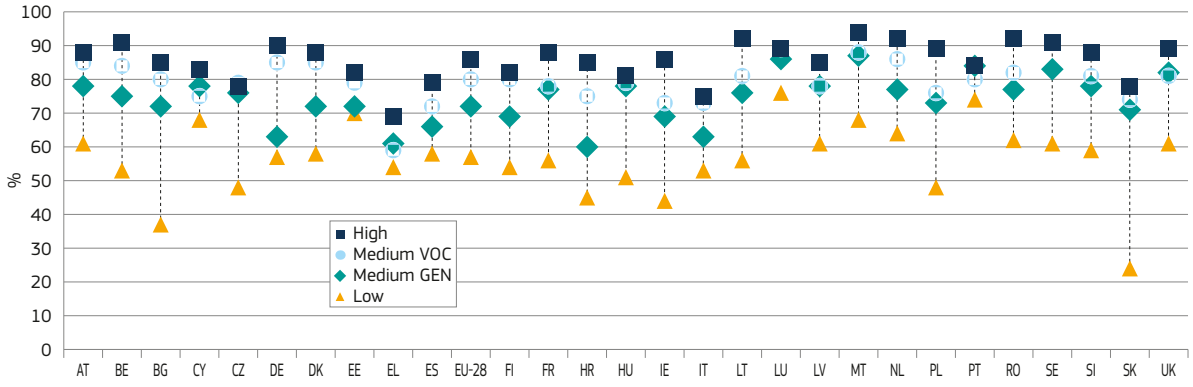
The Section will also explain the importance of ALMPs in providing individuals with adequate skills and reducing skill shortages in the labour market. It will also illustrate policy options to make skills more visible and comparable.

3.1. Initial education and training

Every year, more than 5 million youngsters enter the working-age population (in 2014 there were 5.3 million young people aged 15). Given the different ages and levels of educational attainment at which young people enter the labour market, it is not straightforward to assess the distribution of skills that is provided throughout the initial education systems, which start from early childhood education and for most end at upper-secondary or tertiary levels. Nevertheless, the EU has set for 2020 a twofold target of ensuring that at least 40% of young people have completed higher education by the time they reach the age of 30 (the target is measured for the age group 30-34) and no more than 10% leave school without achieving an upper-secondary qualification (measured for the age group 18-24). As most young people finish their initial education before the age of 30, for practical purposes, the same age group as used for higher education attainment (30-34) can be used as a reference to assess the distribution of skills of young people leaving initial education.

As shown by Chart 23, in the EU-28 almost 20% of young adults (aged 30-34) have not achieved even upper secondary qualifications, while almost 38% have attained a university diploma. Another 10%, after finishing general upper secondary education do not continue further into higher education. The remaining 33% just achieve a vocational degree at the upper secondary level. However there is large variation across countries. It is interesting to note, that the share of low-skilled young people is also very similar for younger age groups (i.e. for 25-29 it was 16.6% and for 20-24 it was 17.8%). It is interesting to note that the low-attainment rises from the age of 20 to the age of 25 and then drops at the age of 30. If left unaddressed, the low attainment among the 20-24 group today will become a low attainment in the group 30-34 in 2024.

Chart 24: Employment rates of young adults aged 30-34 by level of education, 2014



Reading note: The analysis excludes respondents who did not respond to the questions on highest level of education attained or the orientation of this level or labour market status.

Source: DG EMPL calculation based on Eurostat Labour Force Survey data. The data considers the age group 30-34.

Almost 50% of EU students enrolled at upper secondary level undertake vocational education and training (I–VET), almost 40% of them undertake higher education making VET a key source of new skills and competencies for EU economies. Cedefop forecasts that by 2025 almost 85% of job opportunities will require at least medium-level qualifications and substantial vocational skills. This will also require a steep increase in the availability of high-level skills, where VET also has a key role to play, with an increasing number of countries setting up VET programmes at post-secondary and tertiary level. VET systems can provide vocational, job-specific skills that fit the needs of employers, but also equip learners with key competences enabling long-term employability and adaptability to manage transitions from education to employment, as well as from one employment position to another or from unemployment to employment.

In the EU-28, employment rates are highest for those with higher education or VET diplomas; those with (secondary level) general education suffer a substantial disadvantage in the labour market – approximately 13 percentage points less likely to be in employment – while those without an upper secondary diploma are a further 11 percentage points less likely to be in employment and are almost as likely to be employed as not. Nevertheless, there are substantial differences across countries. The employment rates for those who left education without a secondary diploma or a vocational qualification are substantially lower in most Member States. One way in which these adults could look to improve their employment prospects would be to pursue further education which includes a vocational qualification. This means that opportunities to learn later in the course of life are essential to tackle unemployment, inactivity and social exclusion. But, as the following analysis shows, these same adults are also unlikely to undertake such learning without external support. Thus, there is a need for public intervention to facilitate access to learning.

3.2. Adult learning

Adults' current skills levels are largely determined by the education and training opportunities that were available to them in youth, through initial education and training. Nevertheless, the rapidly changing needs of the labour market require continuous updating of skills and knowledge. The description of the EU skills landscape above showed the untapped potential of adults in the EU: engaging them in education or training could bring the necessary skills and secure their employment. It would also help them participate and contribute more to society as a whole. Thus better-functioning and more comprehensive systems for adult learning and continuing training are needed (Bandi and Iannone, 2015).

This Section reviews the participation in adult learning in the EU, by also analysing how it varies across different groups of people. It then describes the provision of adult learning and tries to highlight the barriers that prevent a larger number of people from being involved in it.

3.2.1. Participation in adult learning in the EU

Participation in learning brings a broad range of benefits (see European Commission, 2015) ([45]). Individuals can expect economic, social and well-being benefits from participation in learning, with the strongest evidence existing for the impact on employability. Employers also benefit from the impact on productivity and profitability of companies ([46]). Finally, adult learning also brings broader benefits to society overall ([47]).

Raising the levels of participation in both work-related and general adult learning has been a key focus of EU policy. In particular, the European Council has set a target: by 2020 the share of adults who have participated in adult learning should reach 15% ([48]).

LFS data show that in 2014, only 10.7% of the EU adult population had undertaken education or training recently in the 4 weeks prior to the interview, which means that the EU is far from reaching this target. In the case of low-skilled adults the average is under 4%. AES data show that in total 40% of adults participate in education annually ([49]). The fact that only 40% of adults have at

([45]) European Commission (2015) 'An in-depth analysis of adult learning policies and their effectiveness in Europe'.

([46]) Ibid.

([47]) Ibid.

([48]) 2009/C 119/02 Council conclusions of 12 May 2009 on a strategic framework for European cooperation in education and training ('ET 2020').

([49]) Two main data sources provide statistical evidence on participation in adult learning in Europe, each measuring it in a different way: (1) 'Recent' adult participation in learning – at least one formal or non-formal learning activity during the last four weeks prior to the survey, collected through the European Labour Force Survey (LFS); (2) 'Annual' adult participation in learning – at least one formal or non-formal learning activity during the last 12 months prior to the survey, collected through the European Adult Education Survey (AES). While a reference period of 12 months is considered to allow a more comprehensive measure of participation in education and training, data from the AES are only available every 5 years. Due to a higher frequency of the availability of LFS data, results from the LFS were chosen to illustrate the progress towards the ET 2020 benchmark on participation in lifelong learning.

least one learning activity per year can be considered low in the context of the need for all adults to be learning constantly, in order to adapt to change and development. As a matter of comparison, in the United States the occasional participation rate (at least one learning experience per year) in 2012 was close to 60% ([50]).

Countries that have a relatively high participation rate share similar characteristics: they have flexible and comprehensive LLL strategies in place, their adult learning offer fits into an overall quality assured framework for education and training, adult learning is adequately funded and differences in earnings and social status between the higher and lower skilled are relatively small.

It is important to distinguish formal, informal and non-formal modes of learning. Formal learning occurs in an organised and structured environment (e.g. in an education or training institution or on-the-job) and is explicitly designated as learning (in terms of its objectives, time or resources). It is intentional from the learner's point of view. It typically leads to validation and certification. Non-formal learning is embedded in planned activities; it is not always explicitly designated as learning but it contains an important learning element. It is intentional from the learner's point of view. Informal learning results from daily activities related to work, family or leisure. It is not organised or structured in terms of objectives, etc. It is mostly unintentional from the learner's perspective ([51]).

Out of the adults who take part in learning, only around 12% take formal education courses; more than 90% take non-formal activities (around 5% do both)--. In the context of a discussion of the role played by adult skills in the EU's economy, it is encouraging to note that almost all the (recorded) adult learning that takes place is job-related. Out of all the adults who take part in learning, around 75% take part in non-formal and work-related training, giving it the largest share of adult learning activity.

Although adult learning comprises to a large extent non-formal and informal learning, developments in validating and recognising this learning for career progression or towards further learning and qualifications are lagging behind, in both the public and private sector. Recent research by Cedefop shows that in-company developments in this area mirror the same problems and inequalities as we have noted in adult learning provision more generally ([52]). It is worth noting, that in line with the 2012 Council Recommendation on validation of non-formal and informal learning ([53]), the Member States have committed to set up national arrangements for validation of non-formal and informal learning by 2018 (for more information see Section 3.4).

Informal learning or learning through work ([54]) happens constantly at the workplace and is the mainstay of skills maintenance. Although it is not easily captured in data collections due to its complexity and omnipresence, past analyses (ESDE 2014, Chapter 2) suggest that using skills in the workplace is a key determinant of overall skills levels. To capture the results of this type of learning, career development plans and portfolios could be used better and more widely.

Participation in adult learning differs substantially across the population. There are some groups of adults who face particular challenges, requiring specific and targeted policy responses. The three groups which have the least access to adult learning are people who are low-qualified (including low-skilled), those not in employment, and those near retirement (aged 55-64).

Low-qualified adults are three times less likely to participate in learning compared to high-qualified adults. Not only do lower-qualified people need more of the learning opportunities, they also require most of the learning hours, if this is to have a durable impact on their skills levels and enable them to acquire a qualification. However, in practice, highly qualified adults receive around 45% of all training hours, medium-qualified people receive about 42% and low-qualified people receive only 13% of all hours.

Adults who are unemployed or inactive in the labour market are two times less likely to participate in learning than employed adults. Older adults aged 55-64 are also two times less likely to participate in learning as compared to the cohort aged 25-34. The rate of participation in adult learning on average decreases with age, but the difference between the 55-64 cohort and the 45-54 cohort is bigger than between other cohorts This suggests that participation in adult learning is also strongly linked to labour market participation ([55]).

Overall, in 2014 there were 65 million adults in the EU whose educational qualification was at most lower-secondary (ISCED 2). Out of those, around 27 million are employed, 22 million not active in the labour market, 10 million unemployed and around 7 million self-employed. On average, one out of four low-qualified adults takes part in training at least once a year. While this is share is slightly higher for low-qualified adults who are employed (around one third), participation rates for the others low-qualified adults are even lower, as low as 8% for low-qualified inactive and 19% for low-qualified unemployed adults.

In terms of the incidence of low skills among people who are not employed ([56]), 27% have low literacy skills and 34% have lower numeracy skills compared to the whole population (20% and 24%). In Ireland, Spain, France, Italy and the United Kingdom, where youth unemployment rates are higher than for people aged 25-64, a large share of young people (20% or above) have low skills in literacy or numeracy (i.e. at most at level 1).

Overall there were around 25 million unemployed adults aged 25-64 in the EU in 2011. Out of those, around 10 million were low-qualified (ISCED 0-2), 11 million had a medium qualification (ISCED 3-4) and around 4 million had a high qualification (ISCED 5-6). While almost 50% of the high-qualified unemployed participated in adult learning in 2011, only around 20% of adults with lower qualifications did so.

([50]) Education at a Glance 2014: OECD Indicators, Indicator C6.

([51]) Cedefop, (2009), European Guidelines for Validating Non-formal and Informal Learning, Luxembourg ISBN 978-92-896-0602-8.

([52]) http://www.cedefop.europa.eu/EN/publications/23963.aspx

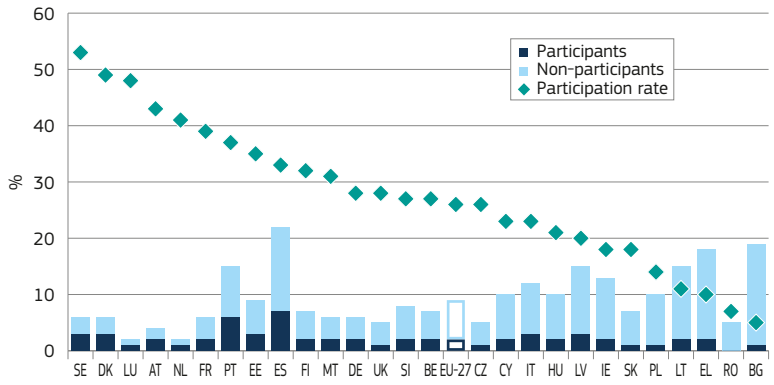
([53]) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2012:398:0001:0005:EN:PDF

([54]) For instance, by doing, by dealing with customers, by exchanging with colleagues or asking for their advice or assistance.

([55]) DG EMPL analysis based on the Survey of Adult Skills (PIAAC) and Adult Education Survey.

([56]) 'The survey of adult skills (PIAAC): implications for E&T policies in Europe', European Commission, Brussels, October 2013.

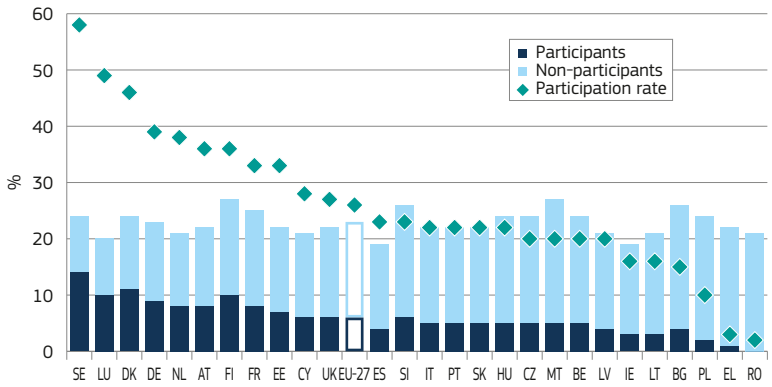
Chart 25: Rate of participation in adult learning and share ofunemployed adults (25-64), 2011



Reading note: Data on participation of low-skilled unemployed individuals for LU, NL and RO is unreliable, based on Eurostat reliability thresholds: if for certain sub-population the number of respondents is lower than a set threshold, the data is flagged as unreliable (i.e. standard deviation beyond acceptable limit).

Source: DG EMPL calculation based on Eurostat Adult Education Survey data.

Chart 26: Rate of participation in adult learning and share of adults aged 55-64, AES 2011



Reading note: Data on participation in EL is unreliable.

Source: DG EMPL calculation based on Eurostat Adult Education Survey data.

Despite a high number of unemployed adults in Spain and Portugal, their rate of participation in learning was above the EU-28 average, whereas in Latvia, Lithuania, Greece and Bulgaria very few unemployed adults took part despite high rates of unemployment in those countries. The situation in Spain and Portugal shows that it is possible to provide unemployed adults with many learning opportunities. In Portugal, the New Opportunities Initiative (now reformed and delivered by the centres for qualification and vocational training, created in 2013) shows that with targeted policy it is possible to up-skill and offer qualifications to substantial numbers of low-skilled adults. In Spain progress towards the EU benchmark on adult participation has been continued. ICT has been used with some success in serving low-qualified adults through the *Aula Mentor* initiative ([57]).

([57]) http://www.aulamentor.es/

Finally, the participation rates of older people should increase significantly if the EU is to meet its 2020 target of a 75 % employment rate. Overall there were around 60 million adults aged 55-64 in the EU in 2011. Out of those, around half (30 million) were inactive (mostly due to illness or retirement); around 26 million were employed and 4 million unemployed. Among the adults aged 55-64 who are employed, around 45 % of employed older adults participated in adult learning in 2011, while only around 20 % of the inactive or unemployed did so. Of all the inactive adults in the EU aged 25-64, half of them were older adults aged 55-64, while most of the rest were women withdrawn from the labour market due to childrearing or other family responsibilities.

Older adults are often at a great disadvantage. The Evaluation of European Social Fund (ESF) support for LLL ([58]) shows that even when ESF measures are targeted, older workers (despite their skill and learning needs) receive fewest opportunities. In ESF-funded measures, 2007-2010, the level of older workers' participation was lower than that of the other two target groups examined (young people and low-skilled). The 55-64 age group as a proportion of the working-age population across the EU-27 was 17.5 % in 2008, yet on average across Member States just under 5 % of participants in ESF were from this age group. In some countries this group was not prioritised or targeted; more activities were found in countries already preoccupied with reacting to demographic change (e.g. Austria, the Netherlands and the United Kingdom). The same tendency has been identified by the latest ESF ex-post evaluation for the period 2007-2013, indicating that across the EU-27, the ESF investment in human capital reached 4 % of young people (aged 15-24) in the programming period (annual average), ranging from 29 % per year in Estonia to below 1 % in Cyprus and Sweden. The coverage rate of older people (aged 55-64) was lower, at 1 % at the EU-27 level, with highest levels (4 %-5 %) in Estonia, Portugal and Slovenia ([59]).

3.2.2. Provision of adult learning

The European Adult Education Survey ([60]) has provided evidence that most of the training in Europe as well as key motivations and barriers related to training are all job-related. Furthermore, two thirds of all work-related non-formal learning is provided or sponsored by the employer. Therefore employer participation in providing learning opportunities is of key importance.

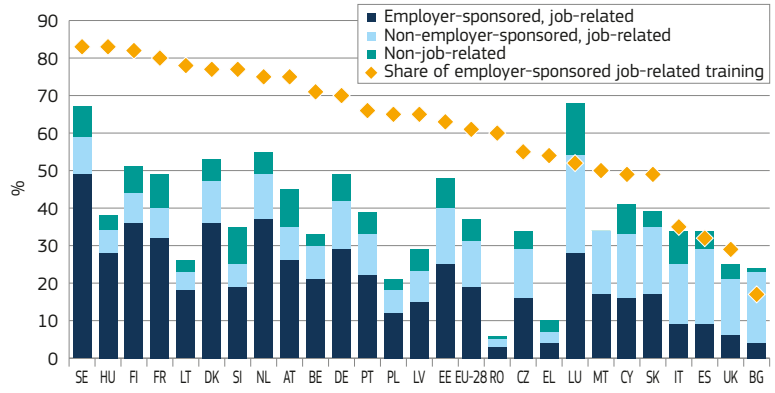
But this differs depending on the size of the company: big employers (250+ employees) provide training opportunities on average for half of their employees; medium-sized employers (50-250 employees) provide it for a third of their employees; while small employers (10-50 employees) provide it for only a quarter of employees.

([58]) European Commission (2012b) Evaluation of the ESF support for Lifelong Learning.

([59]) European Commission (2015) ESF 2007-2013 Ex-post Evaluation: Investment in Human Capital

([60]) http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Adult_education_survey_(AES)

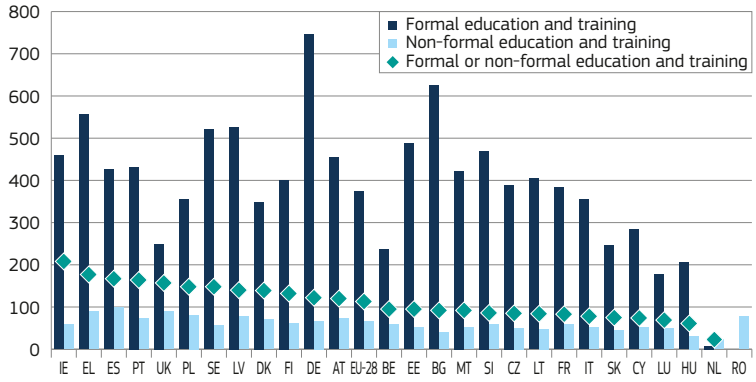
Chart 27: Share of non-formal education and training sponsored byemployers, EU-28, 2011



Reading note: In this graph employers include both private and public organisations.

Source: DG EMPL calculation based on Eurostat Adult Education Survey data.

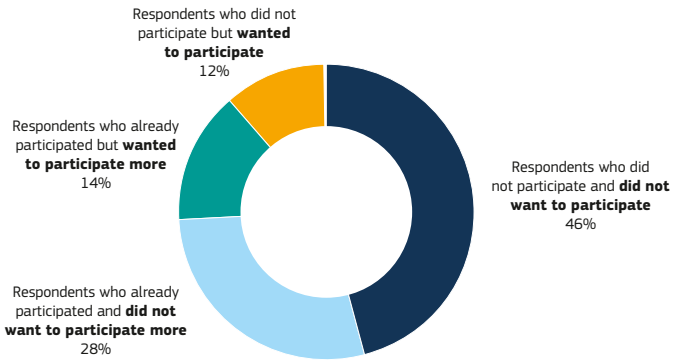
Chart 28: Average training hours per participant, EU-28, 2011



Reading note: Data on average duration of Formal education and training is not available for Romania. Results for the Netherlands are unreliable.

Source: DG EMPL calculation based on Eurostat Adult Education Survey data.

Chart 29: Distribution of the will to participate, or participate more, in lifelong learning, EU-28, 2011



Reading note: Participation in education and training considered with at least one learning occasion during the last 12 months.

Source: Eurostat Adult Education Survey data.

The employers' role in encouraging and funding learning by their employees is crucial. Encouraging employers – especially smaller and medium-sized employers – to develop learning opportunities is essential. In countries where smaller companies are at a large disadvantage, measures could include skills needs and skills fit analyses or audits as well as training and career plans. At the same time, large companies are much more likely to report that public policies have had an influence on their training provision.

Beyond participation, the issues of quality or sufficiency of training activities are also essential – one aspect of this can be illustrated by looking at the average duration of training episodes (Chart 28).

Formal programmes are longest in duration (on average 374 hours per year), while non-formal programme participants participate in training on average 65 hours per year. Finally, training provided and/or funded by the employers is particular as it tends to be of very short duration: on average participants receive only 25 hours per year. However it is estimated that training in excess of 100 tuition hours is required to make significant learning progress, particularly for those who lack basic skills ([61]).

3.2.3. Overcoming barriers to participation

Given that many opportunities for learning exist, especially for employees of larger enterprises, it is necessary to examine what factors hinder adults from undertaking learning, such as lack of willingness to learn and situational barriers.

Recent research ([62]) shows that non-participation in adult learning can be caused by several kinds of factors, each requiring a different policy response. The factors are: situational (e.g. job or family), institutional (e.g. procedures that discourage participation), dispositional (e.g. attitudes and self-perceptions), or lack of information or finance. Public policy, including social and educational can seek to reduce the impact of these factors.

Detailed information on the different barriers and obstacles to learning, including lack of financial resources, lack of time or lack of learning opportunities, is available from the Adult Education Survey ([63]). This is summarised in Chart 29.

Almost half (46%) of adults in the EU-28 did not participate and do not want to participate in learning the future. Two thirds of those who already participate in learning (i.e. 28% of the total adult population) did not want to participate in more adult learning (their learning needs were 'satisfied'), whereas 14% would have liked to participate more than they actually did (especially in Luxembourg, Denmark,

([61]) Vorhaus et al. (2011).

([62]) Desjardins and Rubenson (2013).

([63]) http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Adult_education_survey_(AES)

Cyprus, Sweden and Slovakia). On the other hand, 12% of European adults aged 25-64 were not engaged in learning but were willing to.

Most adults who did not participate in learning indicate a strong link between learning and requirements on-the-job. Provided that the tasks required to be performed at one's job do not indicate a lack of skills or do not require updating of skills, many adults do not see the value and benefit of learning. The key reasons for lack of willingness to learn are: (a) unwillingness to do more learning, because of previous failure or lack of opportunity to put results to good use; (b) assuming that learning has to be related to the current job which particularly for the low-skilled might not require any additional skills; (c) possible unawareness of the possible benefits of continued learning.

Nevertheless, a substantial number of adults (26% of total EU adult population aged 25-64) were willing but unable to access enough learning. This includes both those without opportunities to learn and those who have had some opportunities to learn but were willing to learn more than earlier opportunities allowed them.

Table 6: Main obstacles to participation in learning, all adults in the EU-28, 2011

Obstacle	2011
Respondent did not need it for the job	50%
Respondent did not have time because of family responsibilities	21%
Training conflicted with the work schedule	18%
Respondent did not need it for personal (not related to job) reasons	15%
Training was too expensive or respondent could not afford it	13%
Health or age	9%
Respondent experienced difficulties in finding what he/she wanted	9%
Lack of employer's support or public services support	8%
Other	14%

Reading note: The obstacles to participation are reported here both by those who participated and those who did not.

Source: Eurostat Adult Education Survey data.

Table 7: Reasons cited by companies for not providing employee training, EU-28, 2010

Reason	2005	2010
Employees skills are sufficient	74	77
People with relevant skills were recruited externally	53	49
Available training was too expensive	23	32
Company focused the training for those still in education	10	25
Other reasons	21	17
Lack of suitable training courses in the market	15	14
Company faced difficulties to assess its training needs	10	13
Major training effort realised in a previous year	8	12
Employees had no time to participate in training	32	11

Reading notes: Eurostat Continuous Vocational Training Survey covers only those employers who employ 10 or more employees and pursue activities in the business economy and other non-market services (NIAAC sectors B to N, R and S). The wording of the items in the tables has been rephrased for the reasons of simplicity.

Source: Eurostat Continuous Vocational Training Survey data.

While a lack of awareness of the need for learning is a key reason cited as the main obstacle to learning, other reasons, notably the lack of time due to family responsibilities and/or due to working schedules are also very frequent. A lack of financial resources, health/age reasons, limited access to relevant learning opportunities, or insufficient employer and public support were other reasons often cited as limiting opportunities to learn.

Situational barriers are easier to deal with, usually through public intervention often through structural measures (e.g. childcare, services long-term care services time off work for studying). Such interventions may often be outside the realm of education policy (e.g. activating and enabling social protection benefits and services labour regulation policies, etc.) (Heidenreich and Rice, 2016).

Policies can also tackle the other specific barriers to participation identified by those who say they are willing to learn. For example: 'lack of time due to family reasons' could be addressed by improving the provision of care and similar services or wider use of distance learning; 'lack of time due to conflict with job schedule' could be addressed by implementing effective training leave rules; 'cost' issues could suggest the need for targeted support for those on low incomes; health/age barriers could require adapted training or facilities.

Although it is not one of the main barriers to learning, the offer of funding for adult learning can improve take-up; higher national spending on this is linked to higher participation rates. Experiments with vouchers targeted at adults who need learning most has found them to be less successful for low-skilled people; tax incentives, 100% grants and loans appear to be more suited to their needs ([64]).

Not having learning opportunities close to home or place of work is another barrier. The High Level Group on Literacy pointed to the potential use of libraries to provide literacy locally and to develop inter-generational reading activities for older people and children, incentives for older people to stay in reading and digital reading opportunities for adults and older people. The Commission will shortly publish a study on the potential of open educational resources for adult learners.

A big number of employers, who do not provide training for their employees, indicate a number of reasons for not providing the training. In particular, these include a good fit between employee skills and jobs' requirements as well as a possibility to find relevant talent on the labour market when needed.

Some countries have managed to include low-skilled groups by extending the length of learning programmes to enable the learner to achieve a higher level or qualification, by embedding basic skills in VET, work-based or community learning, in cooperation with the media, cultural and civil society organisations, and by developing the competences of teachers.

Research ([65]) shows that incorporating basic skills development in the provision of courses helps attract potential learners, and is an effective way of improving learning outcomes and learner retention.

([64]) http://ec.europa.eu/education/library/study/2013/adult-financing_en.pdf

([65]) European Commission (2015) 'Study on the analysis of adult learning policies and their effectiveness in Europe'.

Other ways to effectively promote active inclusion are involving intermediary organisations such as community groups and trade unions to engage harder to reach adults in learning, and providing guidance and counselling services to attract learners to adult learning.

Those who are unemployed may benefit from ALMPs geared towards helping them return to work. Such measures are often job-related training offers. In the period 2000-2006, over 40% of the European Social Fund (ESF) ([66]) financed a number of such programmes, which reached 3.9 million citizens. While many focused on the acquisition of vocational skills or qualifications for expanding sectors, some included ICT or literacy and numeracy, such as the project Care Training, in England. Monitoring of the Spanish programmes showed that only 23% of the training participants subsequently found a job. Similarly, during the 2007–2013 period a substantial number of unemployed adults has been reached. Across the EU, the ESF investment in human capital reached 3% of the unemployed people (annual average), ranging from 42% per year in Portugal to below 1% in eight Member States. The coverage rate for long-term unemployed was slightly lower at 2%, ranging from 27% in Portugal to below 1% in 14 Member States ([67]).

Keeping adults in work with the help of continuing education and training is likely to be a self-sustaining policy, as those adults who work are in general more likely to participate in training and at the same time keeping them well-skilled allows them to stay in the work force. In Poland the government has amended the Polish Labour Code, so that employees aged 45 or more can benefit from the services provided by jobcentres (the financing of training, examinations and educational loans) in the same way as unemployed people and to specify employers' minimum obligations to train older employees.

Low-qualified older people who are inactive are a group particularly hard to attract to adult learning. This challenge could be approached by combining social and health services with opportunities to learn, covering topics like healthy behaviours, community activities or self-care. Policies to support activation and active aging are also likely to have a positive impact on participation of these adults in education.

Research in this field ([68]) suggests that participation in adult learning is strongly linked to the availability of learning opportunities, in particular by the level of work-based and job-related training available, and related to the disposition of adults towards learning in general and the habit of learning.

This, in conjunction with the foregoing analysis, provides some indications about ways forward that could overcome those barriers and significantly increase participation rates in adult learning. To do so they should be carefully targeted at the specific needs of different groups, ensuring that they acquire necessary skills for successful participation in the rapidly changing economic environment.

3.3. Active Labour Market Policies

3.3.1. Better Vocational Education and Training and Vocational Guidance

When skill deficits are the underlying source of shortages and mismatches in the labour market, education and training measures, activation policies and measures to increase labour productivity assume great importance. Work-based learning programmes such as apprenticeship schemes provide young people with work experience and a mix of job-specific and transversal skills, necessary for overcoming the negative perceptions of employers regarding the work attitudes, soft skills and behavioural traits of younger individuals (Cedefop, 2015d) ([69]). Improving the quality and relevance of vocational education and training (VET) systems is also a key prerequisite for enhancing the attractiveness of apprenticeship and vocational tracks to students and young adults which feed into occupations that suffer from skill shortages ([70]).

Training programmes, as part of Active Labour Market Policies (ALMPs) for both the unemployed and the employed are best provided in close alignment with areas of the economy affected by skill shortages. In some Member States targeted training programmes have been recently introduced, tailored to particular local labour market needs and sectors considered as 'critical' or of high growth potential (Cedefop, 2015c). By collaborating closely with regional or local economic development authorities, training programmes are typically offered by local public employment services (PES) that focus on specific technologies (e.g. IT sector) and skills (e.g. environmental) identified as important by local employers (see Box 3 in the Annex of this chapter for examples).

Targeted training initiatives can help ensure the provision of skills to individuals who are in demand in the labour market and alleviate skill shortages over the medium term. However a number of important caveats must be taken into account. First, the considerable lags involved in the upskilling or reskilling of (unemployed) individuals highlight the danger of excessively relying on such measures for the purposes of meeting any immediate job vacancies of companies. By contrast, investing in the key competences and adaptability of the workforce is likely to be an automatic stabiliser of future skill shortages (de Beer et al., 2015) ([71]). Key competences (including basic and career management skills) are a foundation for the sustained matching of people's skills to evolving job requirements and new work contexts, particularly when job-specific skills can

([66]) The European Social Fund: Active Labour Market Policies and Public Employment Services, European Commission.

([67]) European Commission (2015) ESF 2007-2013 Ex-post Evaluation: Investment in Human Capital.

([68]) European Commission (2015) 'Study on the analysis of adult learning policies and their effectiveness in Europe.

([69]) Such schemes have moved high up on national, EU and international policy agendas and are clearly visible in the policy developments of recent years, from the Youth on the Move flagship initiative (Council of the EU, 2010) to the Youth Guarantee (Council of the EU, 2013). EU policy-makers have also committed to maximising work-based learning, including apprenticeships, as part of the Bruges Communiqué and the European Alliance for Apprenticeships (Cedefop, 2015c).

([70]) In a 2013/14 survey of the European Quality Assurance in VET (EQAVET) network, most EU Member States reported that they had devised a national quality assurance approach and have set up national reference points (NRPs) to promote the EQAVET framework, though not all NRPs deal with all types of programmes in I-VET (Cedefop, 2015d).

([71]) Spurred by the recent emphasis on learning outcomes, work on educational and vocational standards and revisions of core curricula, several Member States have paid increasing attention to including key competences as part of their IVET programmes. Assessing key competences, in particular soft skills, in the context of occupational skills demonstrations, within training firms or projects that learners carry out jointly with or for enterprises is a strategy that can contribute to the alleviation of future skill shortages among young labour markets entrants (Cedefop, 2015d).

quickly become outdated. In this respect, a challenge in designing training programmes tailored to areas of specific skill shortages is providing an adequate skill mix that is specific enough to meet occupational needs whilst also taking into account the limits of transferability of tightly-knit job-specific skills.

Qualitative shortages that arise because of an absence of sufficient labour market intelligence and information should be tackled instead via the provision of better guidance and career counselling within schools and tertiary education institutions. Steering young people towards specific training and educational pathways in greater demand in the labour market can mitigate the risk of ill-informed choices, which often arise not because of a lack of awareness regarding the benefits of practical professions but due to their poor image and social desirability pressures (MCG, 2012). Better job matching by Public Employment Services (PES) that exploits newly developed and innovative digital platforms and ICT tools, which profile the skills of job applicants and vacancies, can further ameliorate information mismatches (Cedefop, 2015c). In addition, although significant progress has been made in recent years in the development of systems of labour market intelligence and skills anticipation in several EU countries, the existing statistical infrastructure with regard to monitoring vacancies and skill shortages is relatively weak. Significant challenges also exist with regards to achieving a better integration of the information received by labour market monitoring tools in the actual design of labour market policies, as a means of increasing the quality and effectiveness of labour market programmes (OECD–Cedefop–ETF–ILO, 2015).

3.3.2. A skill matching perspective for ALMPs

ALMPs and Public Employment Services (PES) are often criticised on the grounds that they focus on the immediate placement of individuals in jobs rather than on the provision of adequate support and retraining so that unemployed persons can find a sustainable job match over the long term (Ohlsson and Storrie, 2007). For instance, the success of ALMPs is often evaluated by measuring the share of employment achieved among participants but without including criteria related to the quality of the skill match realised and/or the sustainability of employment (Cedefop, 2015b). When deadweight, locking-in and other displacement effects are taken into account, only a marginal positive effect of such policies is often revealed (Card et al., 2010; Kluve, 2010) ([72]).

Effective ALMPs should therefore be evaluated based on the extent to which training instruments for the long-term unemployed (LTU) improve their position in the labour market in the long term. The LTU encounter a number of disadvantages when looking for jobs and, therefore, have multiple and complex needs (Zimmermann, 2015). They may require a significant number of different interventions over an extended period of time, including training in a broader set of basic competences that improve individual employability, before a successful match of their skills in the labour market can take place via targeted or more specific interventions. Nevertheless, 'most training programmes tend to focus on job-specific skills and do not target the development of key competences in a systematic way and the approach taken to integrate these competences in "return to work" programmes seems to be implicit and lack comprehensiveness' (Cedefop, 2013, p. 10).

An inventory of skill matching instruments implemented in various Member States shows that many have adopted or have revised training instruments geared towards the general skills upgrading of the unemployed in the aftermath of the economic recession (see Cedefop, 2015b). Crucial ingredients identified as necessary for the effectiveness of such ALMPs are the provision of vocational certificates to the unemployed following the completion of a training course as well as the ability to improve skills within a real work context as opposed to an exclusive reliance on classroom training. Work-based learning (WBL) programmes, in particular, constitute effective instruments of ALMPs targeted at overcoming potential barriers that low-qualified LTU individuals face in (re-)entering employment (Cedefop, 2013).

Member States also increasingly understand that a well-defined connection between skill needs anticipation and ALMPs is crucial to support the unemployed in finding sustainable employment. Linking training offered to the unemployed to labour market needs is a strategy adopted by several EU countries in the aftermath of the economic recession. PES and Ministries of Labour and Education in several EU countries (e.g. the Czech Republic, Denmark, France, Austria, Croatia, Ireland, Estonia and Portugal) rely on analyses of skills assessments and forecasting to inform the provision of re-training, on-the-job training programmes and/or the design of apprenticeship schemes (OECD/Cedefop, 2015). PES in Belgium, Croatia and Estonia actively guide the specific training of the unemployed towards occupations identified as having shortages or towards those sectors deemed to be critical for future strategic development priorities.

To maximise the effectiveness of ALM policies and programmes, integrated labour market intelligence and skill anticipation systems are essential. However, the current data architecture in several EU countries is characterised by serious deficiencies ([73]). Most importantly, there is a significant shortage of information on actual skill needs and skill supply in different occupations. As a consequence, policy-makers and relevant educational and labour market actors often have to rely on imperfect signals of skill needs, such as vacancy data or claims of recruitment difficulties by employers (as discussed in Section 1.3 'Where the EU stands' above). Designing ALMPs to respond to contemporaneous vacancies per se, however runs the risk that a significant proportion of those trained to cater to specific shortage areas will be simply augmenting an already adequate supply of skills. Distinguishing vacancies between those representing additional job opportunities and those which are filled as a result of normal turnover is therefore an important prerequisite for ensuring lasting job prospects for both job-ready and disadvantaged job seekers ([74]).

([72]) However, training instruments as part of ALMPs are also often found to have intangible benefits, such as the creation of a feeling of higher self-–esteem among the LTU (Andersen, 2010).

([73]) Transitions data between and within occupational groups, employability data on transitions from school to work and graduate employability based on tracer studies, correspondence between educational programmes and occupational choices are just some examples of data gaps affecting most labour market analyses that could inform a better design of ALMPs.

([74]) Pouliakas, K., and McGrath, J., presentations at European Parliament workshop 'The impact of the crisis on skill shortages', Brussels, 23 March 2015, available at: http://www.europarl.europa.eu/committees/en/empl/events-workshops.html?id=20150323CHE00091

3.4. Making skills visible and comparable

3.4.1. Validating and recognising skills

The lack of relevant skills is not the only cause for low employability and skills mismatches. In many cases, skills exist in the labour market but are not identified, exploited or rewarded. Skills and qualifications acquired in a given country and in a specific economic sector might not be recognised or even properly understood by prospective employers of other countries and sectors. Skills acquired on the job or through other relevant experiences are not necessarily recorded in a qualification or documented. The problem is particularly acute for third-country nationals, and the potential contribution of migration to assuage the skills needs of the labour market remains virtually untapped.

According to a recent Eurobarometer, 6.0% of EU citizens have tried to work or study in another EU Member State but were not able to do so. This was partly due to a lack of recognition of their qualifications and related support and information. In comparison to this, 3.3% of the total labour force in 2013 was mobile. It is evident that there is potential for greater mobility also based on improved recognition of qualifications at EU level.

3.4.2. Recognition and transparency of skills and qualifications

When moving to a new job or to further learning, whether within or across borders, learners and workers require a fair, reliable and efficient system for recognition of their skills and qualifications. As can be seen below, the term 'recognition' is used in different contexts, can have different meanings and can refer to different aspects of recognition.

Regarding recognition of qualifications in regulated professions, i.e. professions access to which and pursuit of which is subject by virtue of legislative or administrative provisions to the possession of specific professional qualifications ([75]), the European Union has developed a comprehensive system of legal texts and case law in order to allow the holder of a professional qualification to access and pursue that profession, or part of that profession as appropriate, in another Member State on a permanent or occasional and temporary basis, under the same conditions as nationals. The main tool is the 2005/36/EC Directive ([76]) on the recognition of professional qualifications besides some specific directives for given professions e.g. lawyers. The 2005/36/EC Directive provides for three systems of recognition. One allows the automatic recognition of professional qualifications acquired and concerns 5 health professions, the profession of architect and of veterinary surgeons. The second system of recognition is based on professional experience and concerns professions mainly related to the crafts and trade domain. The remaining system, the general system, enounces the general principle of freedom to access and pursuit of a regulated profession to the holder of the related qualification in another Member State under the same conditions as nationals with applications of compensatory measures in case of substantial differences. The general system allows also to take due account of the professional experience as appropriate.

Academic recognition focuses on recognition of periods of study or qualifications issued by an education or training provider with regard to a person wishing i) to begin studying ii) to continue studying or iii) to use an academic title. Recognition of higher education qualifications or qualifications giving access to higher education, is provided for in the context of the Lisbon Recognition Convention ([77]).

The Commission has launched a range of tools aimed at making skills and qualifications more transparent and comparable. These tools create a better understanding of skills and qualifications (e.g. by employers) and make their recognition easier, so their portability across the EU is increased. Work on the comparability of qualifications across Europe started a decade ago and the European Qualifications Framework (EQF) has advanced Member States' trust in the quality of each other's qualifications. To date, 22 Member States have referenced their national qualifications frameworks to the eight European levels provided for in the EQF and the remaining countries plan to do so in the course of 2015 and 2016.

Other tools include: the European Job Mobility Portal; EURES; the EU Skills Panorama, which is a central access point for information on skills and jobs intelligence across Europe, ESCO and Europass, a set of documents including a CV to make skills and qualifications clearly and easily understood., The European taxonomy on Skills, Competences, Qualifications and Occupations (ESCO), still in development, aims at making skills more transparent in the European labour market and the education and training sector. It should enable better services in two basic steps.

First, it provides a vocabulary and basic information on occupations, knowledge, skills, competences and qualifications in Europe. ESCO links this vocabulary systematically to the other European and international transparency instruments, such as the EQF, the e-Competence Framework (e-CF), the Statistical Classification of Economic Activities in the European Community (NACE) and the International Standard Classification of Occupations (ISCO). This way, ESCO not only contributes to interoperability with national and international classifications, it also puts the knowledge, skills and competences of people in focus.

Second, ESCO makes the vocabulary and information reusable in applications. Tools and services can use ESCO to deliver better services, for example through better user interfaces, search functionality or job matching algorithms. This way, ESCO enables competence-based job matching, and allows jobseekers and employees to identify new career paths and learn how their specific skills match with different occupations. End users will benefit from these enhanced services, often without even knowing about ESCO. The Commission integrates ESCO with other European projects, such as EURES, the EQF, Europass and the European Skills Panorama, in order to enhance their quality and potential impact.

Qualifications awarded by international sectorial bodies or multinational companies cannot be directly related to the European levels of the EQF and rely exclusively on national processes. This generates parallel recognition processes,

([75]) See article 3(1)(a) of Directive 2005/36/EC.

([76]) Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications (Text with EEA relevance) OJ L 255, 30.9.2005, pp. 22–142.

([77]) http://conventions.coe.int/Treaty/en/Treaties/Html/165.htm

resulting in cumbersome procedures and sometimes inconsistent results across countries for similar qualifications. Such situations hinder cross-European mobility.

3.4.3. Validating skills acquired outside the formal education and training system

Based on the 2012 Council Recommendation on the validation of non-formal and informal learning (VNFIL), inroads have been made on the validation of skills acquired outside of the formal education and training system, for example through work experience, in-company training, digital resources, volunteering and life experience in general. Member States have agreed to put in place arrangements for the validation of VNFIL experiences by 2018 enabling individuals to obtain a qualification (or part of it) on the basis of their validated experiences. These experiences would be linked to qualifications and in line with the EQF and would have the same or equivalent standards as qualifications obtained through formal education. Opportunities and uptake of validation, however, still vary significantly across Member States. Some of the major challenges include: the low level of awareness regarding the possibilities and potential value of validation, especially amongst the general public; the social and labour market acceptance of validation which, whilst growing, remains in many countries lower than the acceptance of formal education; the level of bureaucracy and costs involved in validation; and the lack of a long-term and comprehensive approach to validation, which in many cases remains a collection of initiatives and projects with low coordination between stakeholders and across sectors. Identification of validation of skills is particularly relevant for people with lower qualifications, the unemployed or those at risk of unemployment, and for those who need to change their career paths, i.e. to identify further training needs and access re-qualification opportunities.

3.4.4. What needs to be done? Adjustments required at EU level

Based on progress already made, a new level of ambition is necessary to make skills and qualifications recognised and valuable to employers across Europe and economic sectors. In this regard, a revision of the Council Recommendation on the European Qualifications Framework is planned and the possibility of giving European levels to qualifications awarded by international sectorial bodies or multinational companies is being considered.. Furthermore a mechanism should be established through which EQF levels are attributed to 'Common Training Frameworks' as provided by Directive 2005/36/EC ([78]). The revision of the EQF should also contemplate the opportunity of aligning mature qualifications frameworks of non-European countries to the EQF. This would support comparability and recognition of qualifications of non-EU nationals and Europeans seeking job and learning opportunities in other parts of the world. Finally, the various web tools and services to support skills documentation as well as transparency and recognition mentioned above should be streamlined into one single service in order to improve their effectiveness.

4. Conclusions

Well-functioning labour markets rely on a match between the skills and formal qualifications of the workers and those that the jobs require and employers look for. Formal qualifications are often quite different from the real skills workers have but are nevertheless an important way to signal skill levels.

In popular discourse, 'skills' are used as an all-encompassing term and often interchangeably with competencies, qualifications and behavioural traits. Yet labour market economists, policy-makers, education and HR practitioners may insist on more precision seeking to distinguish between, for example, formally acquired attested skills or qualifications, skills in the narrow sense or what one is capable of doing, acquired during formal education but also through experience, soft skills, and finally competencies (i.e. how well one's skills are applied in practice, a concept that captures also attitudes, motivation and personality traits).

The fast changing economy of today, with ever stronger knowledge and innovation components, is rendering people's skills obsolete more quickly than ever before. Demand for entirely new kinds of skills is emerging. This imposes new requirements on workers, employers, policy-makers and research. Workers need to upgrade their skills to adjust to changing demands. Employers need and are expected to offer good training opportunities for workers and modernise their recruiting and HR policies. Effective and efficient investments in education and training for skills and implementation of instruments that foster their development are necessary; this requires a long-term perspective, based on predictions from research about the likely future labour market demand. The attainment of high-quality and relevant formal qualifications is also needed along with mechanisms for the validation of workers' non-formal and informal learning.

This agenda could apply for any country or region in the world. The EU faces special challenges. The shrinking of its labour force due to declining fertility, combined with increased life expectancy – a fast ageing society – means that the current standard of living can be sustained in the future only through higher productivity. Opportunities for productivity increases lie mainly in knowledge sectors that require a high level of skills, creativity and flexibility.

Governments, businesses and workers alike have high stakes in predicting the future evolution of the labour market demand for skills. Skill demand forecasting will help to make for good investment decisions and career choices.

In anticipation of the future needs of the labour markets, the EU adopted a 2020 policy target of a 40% share of tertiary level graduates amongst 30-34 year olds. The rate stood at 36.9% in 2013 and is likely to be met in 2020 extrapolating the trends since 2010 ([79]). In the past, higher education was strongly linked with higher job quality and higher pay. However it is not certain to what extent the current and future graduates will be able to replicate the job market success of older cohorts, with many graduates experiencing over-qualification.

Some Member States seem well placed to confront the challenge of global competition but others not. The latest PISA results for secondary schools see a number of Member States below the United States which is already well under the OECD average. Some school systems need major improvements. Adult skills,

([78]) http://conventions.coe.int/Treaty/en/Treaties/Html/165.htm

([79]) For more information see Education and Training Monitor http://ec.europa.eu/education/tools/et-monitor_en.htm.

as measured by PIAAC, also show poor skills in several Member States reinforcing the urgency of improving worker training programmes in them.

In the EU it emerges that a tertiary degree is increasingly a prerequisite, but not a guarantee, of employment in mid- and higher-paying jobs. It remains to be seen to what extent the link between higher education and better jobs has been permanently changed by the employment slump in the crisis. Cedefop, the EU's skills research agency, still predicts that the largest share of job openings (24 %) in 2025 will be in the 'professional' high-skilled job sectors.

Well-designed, efficient and accessible education systems and training schemes, with strong links to the labour market, are crucial for building up and maintaining the required level of skills in the labour force. When it comes to education and training of adults, particular attention should be devoted to the workers currently disadvantaged on the labour market, i.e. the low-skilled, unemployed and inactive. Job-oriented training also appears essential for assuring a transition from school into the labour market. In most EU Member States and among the population aged 20-35 without a tertiary education degree, the employment levels are higher in workers who received job-oriented training as opposed to those who did not.

Training programmes should be regarded as a key part of ALMPs and therefore a responsibility of governments. Employers could be encouraged to engage in continued improvement of their staff's skills. In addition, motivation by workers themselves to upgrade their skills is necessary.

Finally, there is a particular role for Europe with regard to transnational skill recognition. Continued administrative and legal efforts are important to assure the EU-wide comparability of professional qualifications and validity of diplomas obtained in another country.

ANNEX

Box 3: Examples of policy instruments providing training specifically tailored towards areas of skill shortage in EU Member States

Several EU countries and regional authorities have recently adopted or adjusted their active or adult vocational training programmes, to correspond to areas of their economies explicitly identified as suffering from a skill shortage (Cedefop, 2015b).

Examples of instruments targeted at the unemployed

In Spain local PES offices have offered training courses to the unemployed, explicitly oriented to the upgrading of skills in **SAP technology.** This was as a response to the industry demand for computer programmers with skills in the SAP programming language.

The instrument ***Cloud Academy*** **(United Kingdom** – ***Northern Ireland*****)** offers a 21-week training programme to provide the unemployed with the skills and experience required to take up new opportunities in the IT industry. Irish employers increasingly identify cloud computing as a critical area of growth in the ICT sector. Funding is provided by the PES while the training is delivered by employers.

Ways to nursing (Austria) seeks to combat current / future shortages in the healthcare sector by fully supporting and financing the unemployed in their education to start a career as a healthcare professional. The instrument seeks to meet the growing unmet demand for personnel in healthcare by overcoming the lack of attractiveness of the care sector and by upgrading the skills of the low-qualified, spurring their interest in pursuing a new career in the field of care and nursing.

Examples of instruments targeted at the employed

Addressing Skill mismatches in the Aviation Maintenance Industry (Malta) is a training instrument targeted at different educational levels with the aim of providing basic and advanced training in various skills related to aviation maintenance. Training is provided in aircraft maintenance, avionics systems, aircraft structures and composites as a response to the identified lack of skills in the aviation maintenance sector.

The **Energy Challenge Fund (United Kingdom – *Scotland*)** aims to address skill shortages identified in the Scottish renewable energy sector, which cannot be tackled only by graduates of the initial education system. Therefore this fund enables new entrants to Scotland's energy sector to receive qualifications necessary for working in renewables, oil and gas, subsea and micro-renewables. The initiative is related to and supports the government´s Energy Skills Investment Plan.

Skillnets *(Ireland)* are Irish enterprise-led support bodies, supported by the government, whereby skill networks are formed by employers in similar sectors to determine skill needs, and promote and facilitate enterprise training and workplace learning. Training is provided by the network of companies on wide-ranging specific skills that are relevant for working in the entire sector, not only in particular companies. Over 60 of these training networks are currently supported.

The ***Centre for Resource Efficiency (VDI ZRE, Germany)*** is closely linked to the Association of German Engineers and offers qualification courses for employees of companies and consultants giving basic technological insights to saving materials and energy in processes and conveying methods for efficiency increases. The offer includes general courses for all sectors as well as sector-specific courses. VDI ZRE offers seminars at different universities in order to integrate resource efficiency aspects in existing courses, as well as support to universities in setting up study courses on resource efficiency.

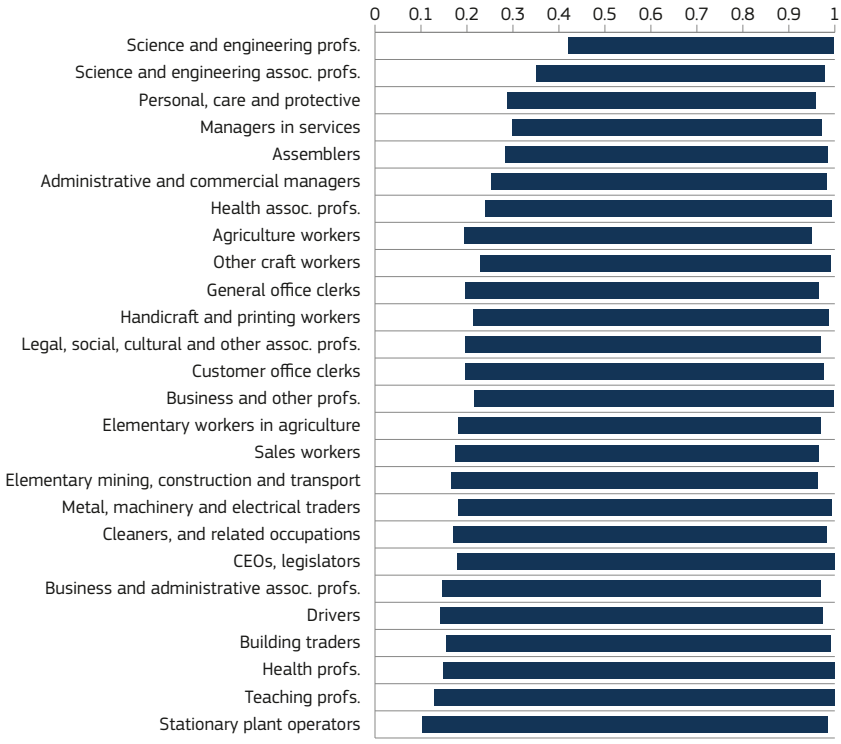
Box 4: Anticipated labour market imbalances in the EU labour market

Cedefop's skills forecasts enable the detection of key economic sectors and occupational groups which are likely to experience labour market imbalances in the next decade. By comparing forecasted employment trends broken down by different occupations with the anticipated labour supply patterns in each country, Cedefop has constructed a series of potential labour market imbalances indicators which depict (in a non-dynamic equilibrium framework) their inclination towards future quantitative labour shortages or surpluses in European countries. Such future imbalances reflect a projected (hypothetical) reality that may occur under the strict assumption that current trends in labour demand and supply will not experience significant changes or breaks in the series. It is expected, however, that dynamic market economies are likely to experience adjustments in wage levels, changed labour market participation rates and migration flows that may disturb the future evolution of imbalances.

Chart 30 indicates the variation of one such indicator, namely an indicator of anticipated 'difficulties to hire' by 2-digit occupational groups, across the European countries. Values close to 1 imply that the expected demand for professionals in a specific occupational group is likely to be sufficiently met with the existing supply of individuals in each labour market, whereas values further away from 1 signify the possibility of intense labour market imbalances. Occupations with the greatest spread of the indicator exhibit the possibility of the greatest 'labour market tensions' affecting the EU labour market, since jobs in the specific occupations are likely to be filled more easily in some Member States, while others will be prone to experiencing marked labour/skill shortages.

In general, labour market imbalances are found to prevail across all occupations and there is a marked divergence in the propensity of different EU countries to experience labour shortages in the future. For instance, *stationary plant and machine operators* is the occupational group predicted to have the greatest variance of hiring difficulties across EU countries, with some countries (e.g. Germany, Finland, France, the United Kingdom) being less likely to experience labour shortages in this occupation as opposed to Cyprus, Denmark, Sweden and Italy. *Teaching and health professionals*, but also several medium- and lower-skilled occupations (e.g. *drivers, cleaners*) are predicted to face imbalances in future EU economies (the latter arising due to a consistently declining supply of individuals allocated to such occupations). Intra-EU tensions are likely to be smaller for *science and engineering professionals*, although some countries (e.g. Spain, Ireland) are forecasted to encounter significant bottlenecks for such professionals.

Chart 30: Variation in indicator of 'anticipated difficulty to hire' across EU Member States by occupation, 2014-2025



Source: Cedefop skill forecasts http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/skills-forecasts-main-results

Box 5: Linking active public training policies ad skills anticipation

As part of the instrument **Training for the unemployment (Croatia)** the PES draws up an annual training plan on the basis of:

(a) an analysis of statistical indicators for labour supply and demand;

(b) expert opinions;

(c) an employer survey;

(d) development programmes implemented at county level.

Based on these inputs, annual training plans, including specific proposals for training programmes to be offered to the unemployed, are drawn up at the local level. These training programmes last approximately 6 months and are offered by the local PES. A crucial condition for this to work is the historically close connection between the Croatian PES and the training providers.

Another interesting ESF-funded approach was adopted in Ireland, where an instrument has been developed that contributes to skill matching for longer-term unemployed individuals to meet local labour market needs. This instrument, **Momentum**, focuses primarily on improving the employability of long-term unemployed individuals, by providing training in areas with recognised skill shortages and existing vacancies. The programme funds the provision of free education and training projects to allow 6 500 long-term unemployed individuals (who have been unemployed for 12 months or longer) to gain skills and to access work opportunities in identified growing sectors. Momentum is an initiative supported by public funding, delivered in partnership with both public and private education and training providers that work closely with local employers. The instrument includes specific projects targeting individuals younger than 25 years of age, but is primarily targeted towards the wider target group of longer-term unemployed individuals. Its focus on sectors with current or future shortages shows how instruments for the unemployed can be used to mitigate skill shortages in certain sectors or occupations.

Source: Cedefop (2015b).

Table 8: PIAAC – Average results in literacy by country and age group

	16 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
OECD Average	275	283	285	283	281	277	271	265	258	253
Australia	284	284	287	288	291	286	281	272	269	257
Austria	270	284	283	276	279	272	269	263	251	248
Canada	270	280	286	284	283	276	272	265	263	258
Czech Republic	275	284	285	288	278	272	268	263	264	261
Denmark	271	281	284	280	284	279	268	263	257	249
Estonia	282	291	288	284	279	276	271	267	262	259
Finland	288	304	307	310	305	293	291	276	265	255
France	271	279	280	276	272	262	255	253	243	241
Germany	275	282	285	278	274	276	267	260	260	247
Ireland	267	274	275	276	273	270	258	261	251	250
Italy	265	255	264	257	253	253	249	248	238	230
Japan	295	303	309	309	308	306	300	294	284	267
Netherlands	288	300	299	297	296	292	280	274	262	259
Norway	268	282	288	289	288	288	282	273	266	258
Poland	281	281	281	273	270	266	263	255	252	246
Republic of Korea	292	294	292	287	285	271	264	254	250	238
Slovakia	273	278	279	278	282	273	273	267	265	267
Spain	260	267	264	262	263	256	253	244	228	225
Sweden	271	291	293	287	290	285	282	270	271	257
United States	264	277	278	272	274	272	266	266	262	264

Source: PIAAC – 2012.

Table 9: PIAAC – Average results in literacy by country and gender

	Male	Female
OECD Average	274	272
Australia	281	279
Austria	272	267
Canada	275	272
Czech Republic	276	272
Denmark	271	271
Estonia	275	277
Finland	286	289
France	262	262
Germany	272	267
Ireland	268	265
Italy	250	251
Japan	298	295
Netherlands	287	281
Norway	280	276
Poland	264	270
Republic of Korea	276	269
Slovakia	273	274
Spain	254	249
Sweden	281	278
United States	270	269
Flanders (Belgium)	278	273
England and Northern Ireland (United Kingdom)	274	271

Source: PIAAC – 2012.

Table 10: PIAAC – Average results in literacy by country and level of education

	ISCED 1	ISCED 2	ISCED 3A-B	ISCED 3C shorter than 2 years	ISCED 3C 2 years or more	ISCED 5B	ISCED 5A, bachelor degree	ISCED 5A, master degree
OECD Average	223	252	278	253	261	287	300	308
Australia	232	265	292	:	271	287	308	312
Austria	:	253	269	257	:	285	307	309
Canada	214	247	:	:	:	285	308	313
Czech Republic	:	259	283	243	259	293	298	303
Denmark	195	249	292	254	261	287	293	306
Estonia	236	260	273	249	255	277	309	297
Finland	236	273	:	:	:	294	314	326
France	206	244	271	:	251	288	295	305
Germany	253	245	261	:	:	280	292	304
Ireland	220	246	:	:	:	279	298	304
Italy	209	242	267	245	251	:	281	287
Japan	:	267	289	279	289	304	318	332
Netherlands	248	259	292	:	266	294	309	323
Norway	:	255	286	267	264	289	299	310
Poland	244	249	269	:	242	:	291	299
Republic of Korea	223	257	273	:	270	283	295	304
Slovakia	:	249	283	251	265	:	292	296
Spain	218	241	264	:	247	267	279	296
Sweden	213	259	283	238	269	299	309	310
United States	190	237	:	:	:	283	298	310
Flanders (Belgium)	226	251	275	:	249	295	296	316
England and Northern Ireland (United Kingdom)	:	233	283	251	265	280	:	:

Source: PIAAC – 2012.

Table 11: PIAAC – Average results in numeracy by country and age group

	16 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
OECD Average	266	276	280	279	277	274	268	263	256	250
Australia	270	270	274	276	279	273	270	259	255	246
Austria	274	284	287	277	284	279	276	273	259	256
Canada	262	273	276	277	274	270	265	257	255	248
Czech Republic	268	286	289	288	277	278	271	273	268	259
Denmark	265	281	288	286	290	290	280	273	270	262
Estonia	272	283	283	284	276	274	270	267	261	258
Finland	277	292	301	304	297	288	285	274	263	258
France	259	268	271	268	268	257	246	246	234	234
Germany	270	280	286	277	276	280	272	264	264	249
Ireland	253	263	263	268	261	259	251	248	240	236
Italy	257	244	266	259	252	250	245	243	236	225
Japan	275	289	299	296	298	295	292	291	282	268
Netherlands	281	289	292	294	290	285	280	274	262	262
Norway	264	278	280	289	289	289	282	278	272	259
Poland	265	271	271	270	263	260	261	248	242	245
Republic of Korea	281	281	284	277	277	265	256	247	241	221
Slovakia	276	280	280	278	284	278	280	270	267	264
Spain	250	259	255	259	258	252	245	240	225	216
Sweden	265	288	292	283	288	284	281	271	273	265
United States	238	258	261	258	261	255	247	252	248	247

Source: PIAAC – 2012.

Table 12: PIAAC – Average results in numeracy by country and gender

	Male	Female
OECD Average	275	263
Selected countries	275	263
Australia	274	261
Austria	282	268
Canada	273	258
Czech Republic	280	271
Denmark	283	273
Estonia	276	270
Finland	287	277
France	260	249
Germany	280	263
Ireland	262	250
Italy	252	242
Japan	294	282
Netherlands	289	272
Norway	286	271
Poland	261	259
Republic of Korea	269	258
Slovakia	277	275
Spain	252	240
Sweden	286	272
United States	260	246
Flanders (Belgium)	288	272
England and Northern Ireland (United Kingdom)	269	255

Source: PIAAC – 2012.

Table 13: PIAAC – Average results in numeracy by country and status in employment

	Full-time employed	Part-time employed	Unemployed	Pupil, student	Apprentice, internship	In retirement or early retirement	Permanently disabled	Fulfilling domestic tasks or looking after children/ family	Other
OECD Average	278	265	249	279	260	252	221	247	256
Selected countries	278	265	249	279	260	252	221	247	256
Australia	279	264	249	282	:	254	:	236	253
Austria	282	272	260	298	257	253	:	261	269
Canada	273	260	243	277	270	254	212	238	256
Czech Republic	281	267	261	284	:	262	244	271	:
Denmark	290	275	258	279	261	247	:	257	265
Estonia	278	275	259	285	:	251	238	264	264
Finland	290	281	257	289	:	250	236	292	285
France	264	246	239	274	248	240	207	217	237
Germany	282	266	240	293	273	247	215	247	262
Ireland	271	247	241	267	:	248	188	238	242
Italy	257	249	236	263	:	234	:	221	234
Japan	297	277	271	289	:	281	:	280	:
Netherlands	290	281	255	290	272	271	236	251	271
Norway	290	269	254	277	246	259	241	231	:
Poland	268	261	242	276	257	244	220	244	249
Republic of Korea	265	255	255	286	:	:	:	250	253
Slovakia	287	270	245	289	:	259	241	261	:
Spain	259	246	233	266	:	217	199	219	243
Sweden	290	277	258	276	:	251	:	230	262
United States	262	249	225	257	:	249	206	249	255
Flanders (Belgium)	292	273	261	288	:	262	230	247	:
England and Northern Ireland (United Kingdom)	273	261	235	264	:	264	206	233	246

Source: PIAAC – 2012.

Table 14: PIAAC – Average results in problem solving by country and age group

	16 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
OECD Average	291	297	297	294	288	282	276	268	262	255
Australia	296	295	296	295	296	286	285	282	272	267
Austria	288	299	298	294	285	284	278	270	261	258
Canada	293	295	293	291	290	285	278	270	264	258
Czech Republic	295	298	296	298	279	274	271	269	267	259
Denmark	288	299	308	298	295	287	280	269	262	249
Estonia	290	296	290	288	279	270	262	256	251	248
Finland	298	307	311	309	303	290	283	271	257	249
Germany	292	298	300	291	286	285	279	266	265	253
Ireland	284	288	285	284	279	270	270	263	255	247
Japan	297	302	310	309	304	299	287	276	273	252
Netherlands	296	304	300	301	293	292	280	274	266	256
Norway	289	302	302	301	296	289	280	274	264	255
Poland	289	285	281	280	274	268	262	252	246	242
Republic of Korea	302	305	299	287	284	270	263	259	256	255
Slovakia	287	286	284	285	280	278	277	272	269	275
Sweden	293	308	309	300	300	288	285	271	267	254
United States	278	291	287	279	285	273	274	267	269	265
Flanders (Belgium)	294	303	300	294	289	283	275	263	256	250
England and Northern Ireland (United Kingdom)	284	290	291	292	285	281	277	266	266	260

Source: PIAAC – 2012.

Table 15: PIAAC – Average results in problem solving by country and gender

	Male	Female
OECD Average	286	280
Australia	289	289
Austria	289	279
Canada	283	281
Czech Republic	285	281
Denmark	285	281
Estonia	280	276
Finland	291	288
Germany	285	280
Ireland	280	274
Japan	298	289
Netherlands	290	282
Norway	289	283
Poland	279	271
Republic of Korea	286	280
Slovakia	282	280
Sweden	290	286
United States	280	275
Flanders (Belgium)	284	278
England and Northern Ireland (United Kingdom)	285	276

Source: PIAAC – 2012.

Table 16: PIAAC – Average results in problem solving by country and status in employment

	Full-time employed	Part-time employed	Unemployed	Pupil, student	In retirement or early retirement	Fulfilling domestic tasks or looking after children/ family	Other
OECD Average	285	279	273	301	254	274	275
Australia	291	287	274	304	273	275	286
Austria	286	277	274	308	256	279	277
Canada	284	279	272	300	260	278	272
Czech Republic	282	287	281	302	259	290	:
Denmark	287	275	280	298	243	:	284
Estonia	275	276	268	299	245	282	262
Finland	289	288	277	309	243	306	280
Germany	284	276	270	307	260	266	283
Ireland	282	271	265	291	246	264	256
Japan	299	281	281	307	:	284	:
Netherlands	290	288	268	306	260	255	283
Norway	291	274	279	299	243	:	:
Poland	274	283	264	296	240	260	253
Republic of Korea	280	273	286	307	:	269	284
Slovakia	281	275	270	292	272	:	:
Sweden	290	283	281	302	247	286	280
United States	280	274	261	290	262	278	279
Flanders (Belgium)	286	271	269	304	251	254	:
England and Northern Ireland (United Kingdom)	286	277	267	293	260	263	278

Source: PIAAC – 2012.

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