



Skills, qualifications and jobs in the EU: the making of a perfect match?



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Evidence from Cedefop's
European skills and jobs survey

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Foreword

The central argument of Cedefop's European skills and jobs (ESJ) survey is that, to get the most out of its labour force, Europe must improve how it develops and uses skills.

Despite rising education attainment and high unemployment, one employer in three reports difficulty filling vacancies. But many people work in jobs for which they are overqualified and in which their skills are underused. Those graduating after 2008 are twice as likely to be overqualified for their first job as those graduating in the 1990s.

The ESJ survey, the first to look at skill mismatch over time, reveals that most adult employees constantly learn new things as their job tasks become more varied or change. Skill gaps also vary across generations. However, despite rising demand for skills and qualifications a sizeable share of jobs in the EU require only basic skills.

The policy implications of the survey's findings are profound.

The survey confirms that work-based learning (WBL) can help people find not just a job, but a good job. However, many students across the EU have limited access to WBL. The survey data strongly support extending WBL across countries, occupations, sectors, qualification levels and fields of study.

Tackling skill mismatch means helping unemployed people into the right job, not just any job. This requires a rethink of active labour market policies to help people find work. Making skills more visible through validation leading to recognised qualifications may help. Career guidance and counselling for both young people and adults also need strengthening.

The survey also confirms the need to invest in continuing vocational education and training (CVET) and adult learning to keep up with changes at work. Training provision needs to adapt to take account of workers' different learning needs and the increasing importance of problem solving, teamwork and communication skills at work.

The survey underlines that the supply of good skills depends on demand for them. European skills policies need to consider how to use the skills we have to their best effect. A key to skill demand is good jobs. Skill-intensive jobs with opportunities to learn new skills are needed to develop the labour force and improve productivity and competitiveness. Employers have considerable scope over job design, including the nature and variety of tasks as well as learning opportunities. However, a significant proportion of adult employees are in jobs with limited scope for skill development.

There remains much to learn about skill mismatch and how to tackle it. The survey, with its many insights, provides an excellent beginning.

Joachim James Calleja
Director

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Executive summary

European skills and jobs survey: identity and rationale

The most common understanding of skill mismatch in the European Union (EU) is one of employers unable to fill vacancies despite high unemployment. However, skill mismatch – a term not always clearly understood (Box 1) – is more pervasive. It is not only a problem for those looking for a job, but affects most of the workforce and can hamper both economic productivity and individual potential.

Cedefop's European skills and jobs (ESJ) survey provides insights into the match between the skills and jobs of adult workers in European countries. The analysis aims to inform a diverse audience of public vocational education and training (VET) and labour market policy-makers and the social partners, and to provide important lessons for policy-making geared towards tackling the phenomenon of skill mismatch in European job markets.

Box 1. What is skill mismatch?

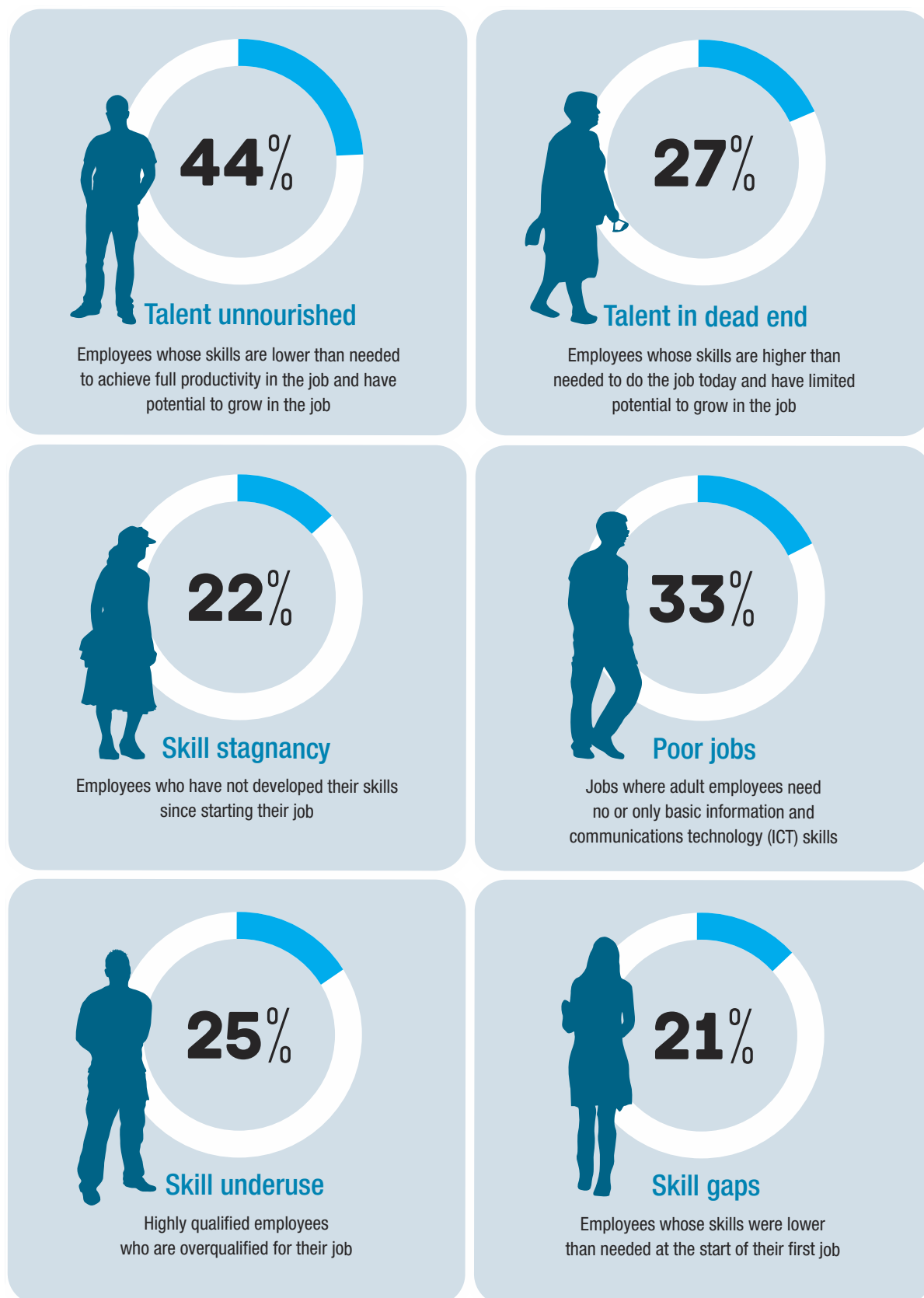
Employers unable to find the right talent, despite offering competitive wages, face skill shortages. Skill gaps arise where the skills required are unavailable in the workforce, for example, due to technological advance. Over or underqualification is where individuals take jobs that do not match their qualifications. People are over or under-skilled where, whatever their qualification level, their skills do not match their job.

The ESJ survey, carried out in 2014 in all EU-28 Member States, is a state-of-the-art survey instrument that collected information on the match of the skills of about 49 000 EU adult workers (aged 24 to 65) with the skill needs of their jobs. The data were collected using quota sampling, following extensive testing, including a pilot survey in January 2014. The fieldwork (mixed mode, online plus telephone interviewing) was conducted from March to June 2014.

The new survey provides an innovative insight into 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. People continually develop their skills, while job complexity and skill intensity may change significantly. Unlike previous studies focusing on a given point in time, the ESJ survey is the first to look at skill mismatch over time. It also distinguished between qualification level and skills needed for the job. A job requiring a particular qualification level, medium or high, may not be skill-intensive. People with a similar qualification level may have substantially different skill levels.

The survey also helps establish the evidence base to inform policies on initial (formal and work-based learning (WBL)) and continuing vocational education and training (CVET) (non-formal and informal training) and on workplace design and labour market mobility for mitigating skill mismatch.

Figure 1. Key facts from the ESJ survey



Source: Cedefop ESJ survey.

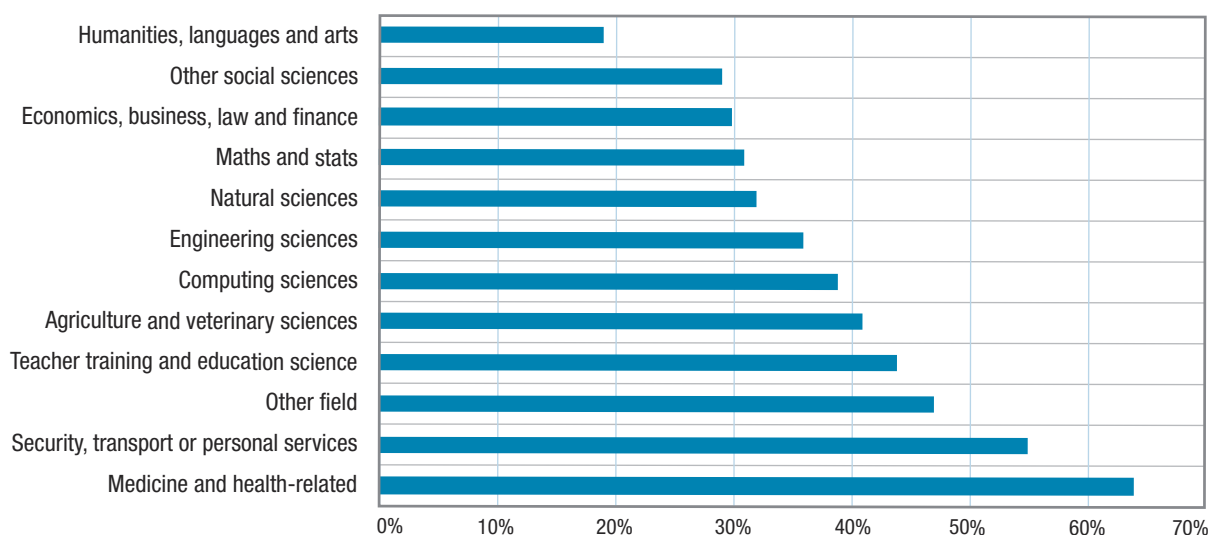
Skill mismatch during transition to work

WBL can smooth the transition into work but it is not used enough.

The ESJ survey indicates that people whose studies involved WBL are more likely to go directly from education to their first job and into more skill-intensive jobs. Given that skill mismatch is persistent, policies to improve skill matches before or at the start of the working life, such as WBL, can be highly effective.

There is a strong case for expanding WBL to align training more closely to labour market needs. Around 40% of adult employees have completed education or training involving some WBL, but this varies considerably across countries and fields of study. Only about 25% of younger (24 to 34 year-old) graduates in humanities, languages and arts, economics, business and law have participated in WBL, compared to 67% of graduates from medicine and health-related sciences.

Figure 2. Incidence of WBL by field of study, EU-28, 2014



Source: Cedefop ESJ survey.

Active labour market policies and validating learning: tackling skill mismatches due to unemployment

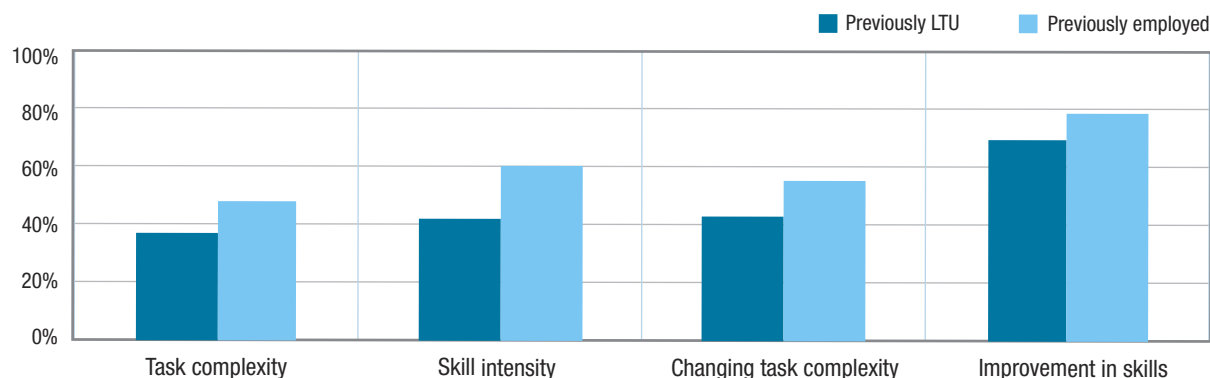
Cedefop's ESJ survey confirms that unemployed people returning to work are also more likely to enter less skill-intensive jobs that may not continuously develop their skills. Skill mismatch may, therefore, reinforce the 'scarring' effect of unemployment, where someone out of work for a while is more likely to become unemployed again in the future. It is a 'hidden' cost of getting unemployed people back to any job.

The key to addressing unemployment and skill deficits is getting people into the right job, not just any job. Many active labour market training

programmes end when an unemployed person finds a job. To ensure the best possible skill match, the unemployed should be able to complete their training programmes either before starting a job or while working. Increasing WBL for unemployed adults could also improve alignment and job prospects and give enterprises a source of new recruits.

Lack of formal certification of informal skills may hinder career progression, and job prospects (Cedefop, 2015b). Consequently, strategies to upgrade unemployed people's skills may be more effective if the skills acquired were made more visible by validating learning and certifying skills with a recognised qualification (or part of one) linked to the national and European qualifications frameworks.

Figure 3. **Difference in skill formation and skill needs of adult employees' current jobs by prior labour market status, 2014, EU-28**



NB: Percentage of workers with high-ranked scores on each index (i.e. at the top of each scale).

Source: Cedefop ESJ survey.

Skill mismatch at work

Many EU adult workers have skill deficits but not all have a chance to improve

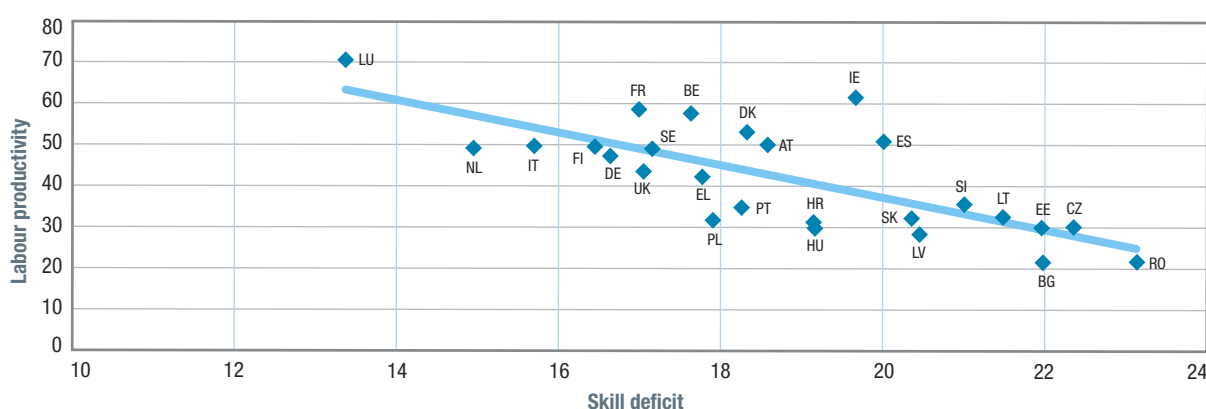
ESJ survey data show that, since they started their job, the need to learn new things and the variety of their job tasks has significantly increased for about 53% of adult employees in the EU.

Overall, around 26% of EU adult employees have significant skill deficits (their skills are much lower compared to those an average worker needs to be fully proficient in their job) leaving scope to improve skills and productivity. But even though these workers could develop, not everyone has the chance to do so, as 27% are in 'dead-end' jobs. In such jobs, employees have higher skills than they need to do their job and only limited potential to develop.

Skill gaps at work vary across generations, highlighting the challenges of tailoring CVET provision to the needs of different groups of learners. Compared to their older colleagues, younger employees are more likely to have higher skill gaps in technical skills (specialised knowledge to perform job tasks) and soft skills (communication, teamwork, customer-handling and problem solving). Older workers are more likely to have skill gaps in foreign languages, abilities to learn and apply new methods and techniques (including new technology) and in digital skills.

The dynamics of skill mismatch highlight the importance of investment in CVET and adult learning. Social partners have a key role to play. They are best placed to encourage learning at the workplace and to arrange work organisation and working time to ease participation in CVET and adult learning.

Figure 4. **Skill deficits and labour productivity, 2014, EU-28**



Source: ESJ survey; World Bank.

Good jobs are crucial to developing good skills

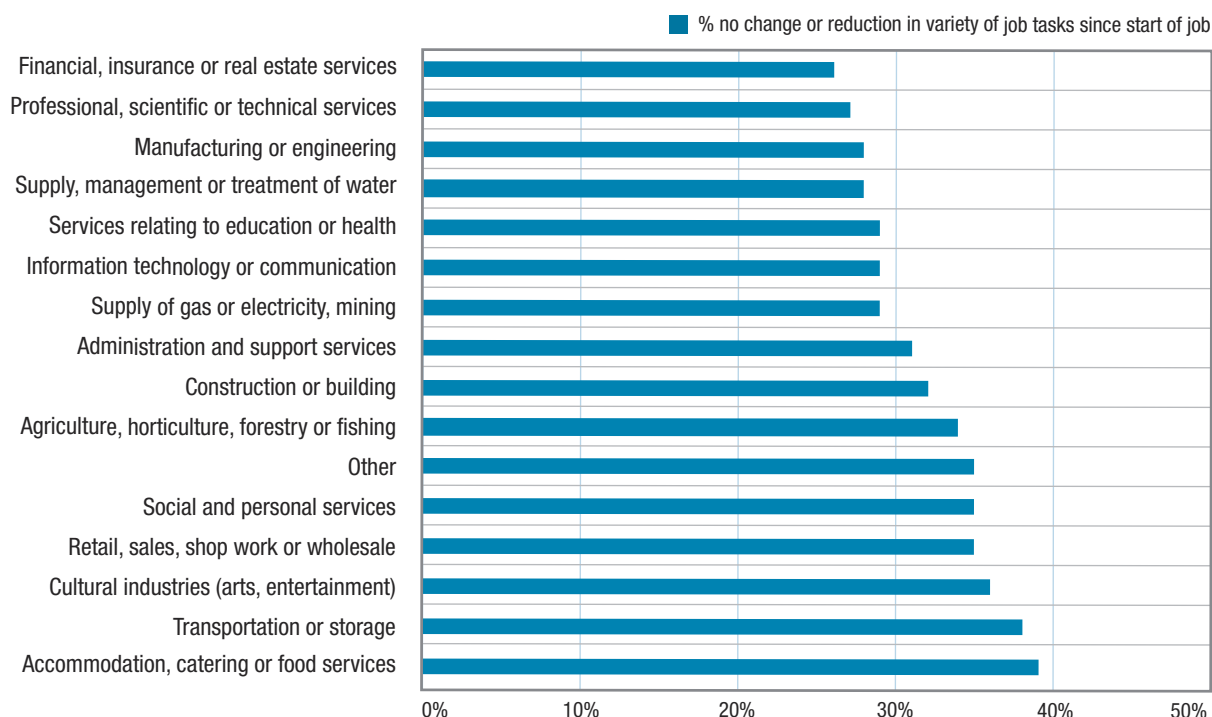
The survey finds that good jobs are needed to develop good skills. Skill-intensive jobs with opportunities to acquire skills continuously are a sign of a healthy labour market. Europe needs more jobs that can fully use and develop the skills of its workforce.

Skill demand is low and stagnant for many European workers. Cedefop's survey found that 40% of adult employees only need basic literacy skills to do their job, 58% need only basic numeracy and 33% of jobs in the EU require only basic ICT or no ICT skills at all. Over a third of jobs in sectors such as hotels and restaurants, transport and wholesale and retail have stagnant skill needs.

The ESJ survey also confirmed the close link between job stability and people working in jobs where a higher level of skills is needed. Job stability enables workers to cope with complex workplace changes that place higher demands on their skills.

Skills are Europe's competitive advantage. High-quality jobs can reduce skill mismatch, ensure skill development and improve competitiveness. Organisations have a significant degree of control in determining the skill content of their jobs and so could use better the skills available by reorganising work to adapt and deploy workers' skills as technology and working methods change. Employment stability leads to skill formation and stable careers maximise the benefits of skill investments.

Figure 5. **Share of EU jobs with stable or decelerating task complexity by economic sector, 2014, EU-28**



NB: Percentage of adult employees who reported no change or reduction in the variety of job tasks since they started their current job.
Source: Cedefop ESJ survey.

Introduction

1.1. Skill mismatch and the European economic crisis

The 2008 global economic recession had a significant impact on the wider European economy, markedly affecting the employment and social situation of EU Member States. The slow economic recovery during 2008-14 resulted in only a fraction of the 6.7 million jobs lost during the recession being recovered by mid-2014 (European Commission, 2014a). The prolonged economic slump, which has affected some EU Member States to a greater extent than others, has led to concerns that much of what was originally cyclical unemployment is in danger of becoming structural (Draghi, 2014; Institute for Public Policy Research, 2014).

Skill imbalances, in particular the rising demand for higher-skilled workers and the collapse in demand for lower-skilled or younger individuals, have underpinned rising mismatches in EU labour markets (European Commission, 2012a; ECB, 2012). The doubling of the rate of long-term unemployment between 2008 and 2013 at EU level has led to concerns about the potential skills atrophy of the long-term unemployed (European Commission, 2014a). Further, during the recession there was a stark fall in the numbers of people hired in manual occupations and in the manufacturing and construction sectors, while, according to the European vacancy monitor (European Commission, 2014d), most occupations that grew in the post-crisis era required higher levels of skill.

The sustained recession is undermining the long-term labour market potential of graduates' skills and is distorting incentives for further skill development. Graduating in a recession has persistent negative effects on career prospects and rates of return on education, because many individuals accept jobs that do not match or fully use their qualifications and skills, resulting in skill underutilisation (Oreopoulos et al., 2012; Liu et al., 2012). Also, in the aftermath of the economic crisis a large proportion of the new jobs created in the European economy were temporary or

part-time (European Commission, 2014a). This has heightened fears about repeated spells of short-term unemployment and underemployment of individuals taking up precarious employment, with associated scarring effects (European Commission, 2014a; Mavromaras et al., 2015a).

Overall, deteriorating labour market prospects in recent years, which have particularly affected younger and lower-skilled individuals, have highlighted the need for European policy-makers to continue investing in initial and adult (mainly work-based) learning and in active labour market policies, to overcome skill mismatches and ensure effective transition back into employment (Cedefop, 2015c). It has also called for making better and targeted use of VET and employment policies that encourage investment in training and the better matching of job seekers with available jobs across Europe.

In addition to the deep stigma left by the 2008 recession on the European landscape, marked long-term challenges also lie ahead of the continent, including adverse demographic pressures, technological innovations and the need to tackle rising social inequalities and tensions. This situation calls for a general rethink of European 'skills policies'. Policy-makers have increasingly recognised the need to understand better the root causes of skill mismatch in order to support evidence-based policy-making, as highlighted in the European Commission's communication *New skills for new jobs* (European Commission, 2008) and in one of the flagship initiatives of the Europe 2020 strategy, the *Agenda for new skills and jobs* (European Commission, 2010). The EU communication *Towards a job-rich recovery* (European Commission, 2012b) has also made recommendations to Member States emphasising the need to boost job creation in Europe.

Skills hold the key to higher productivity growth for Europe and are crucial for overcoming declining living standards due to the shrinking future workforce (European Commission, 2013b). Even though Europe today has one of its most highly qualified cohorts of young graduates entering the labour market, high skill mismatches

undermine economic competitiveness and growth, sustain unemployment and high social insurance costs and affect social inclusion (European Commission, 2013a; European Commission, 2014a). Continued skills development, which is not met by a corresponding increase in skill demands, is unlikely to mitigate skill mismatches in the EU labour force on its own. EU countries characterised by higher levels of competitiveness and dynamic labour markets generally do not only invest in education and training (both initial and continuing), but also in skills maintenance in the workplace (European Commission, 2014a). In this respect, the European Commission (2013a) and the Institute for Public Policy Research (2014) have shown that the loss of particular types of job since the recession has also resulted in qualified individuals having to take up jobs that fail either to match or fully utilise their skills.

1.2. Why a Cedefop survey on skill mismatch

Despite the critical nature of skill mismatch for policy-makers, the existing statistical infrastructure and evidence at a pan-European level was relatively weak and biased towards specific EU countries until a few years ago. It was also largely biased towards the view of employers on skill shortages and on the transition from school to work.

To address these deficiencies, Cedefop initiated in 2008 an ambitious research programme that has sought to investigate in depth the nature, incidence and causes of skill mismatch in European labour markets (Cedefop, 2009; 2010a). Cedefop's research has paid much attention to the education, training and development strategies that can help mitigate skill mismatch for both individuals and enterprises (Cedefop, 2012b; 2015a). It has also investigated the causes of skill mismatch among particular vulnerable groups of the population, such as older or 'silver' workers and people with a migrant background or ethnic minorities (Cedefop, 2010b; 2011). Several important issues and questions arose in this research which could not be answered in a convincing manner with the existing European data infrastructure.

Some of these questions, which have underpinned the motivation and design of the questionnaire of the new Cedefop survey on skills and jobs are covered below.

Is skill mismatch an issue of generalised concern for all EU Member States? If so, what types of skill mismatch are of greater concern?

Much of the previous academic evidence on skill mismatch has relied on information available from a limited subset of EU countries, including those that benefit from the availability of own extensive national data sources (such as the Netherlands and the UK). However, estimates of qualification mismatch as derived by Cedefop (European Commission, 2013a) highlighted that EU countries may have a differential propensity to alternative forms of skill mismatch. For instance, while southern Europe Member States (Greece, Spain, Cyprus) along with Ireland and the UK suffer from high rates of overqualification in their job markets, so higher-educated individuals are employed in medium- or low-skilled jobs, the Baltic states and several countries in eastern and central Europe (Bulgaria, the Czech Republic, Hungary, Austria) have been prone to skill shortages and skill gaps in their workforces. Even within countries, skill mismatches may affect various population groups differently: the young may be more likely to be underskilled while the older suffer mostly from skill obsolescence. There may also be different forms of skill mismatch across individuals belonging to the same group or cluster; some young individuals may be underskilled and others overskilled, even if they all have tertiary level education.

A key source of information on skill mismatch at European level is Eurofound's European working conditions survey (EWCS). Nevertheless, the focus of the EWCS on the state of working conditions in the EU implies that it cannot fully capture critical contextual information necessary for fully understanding the phenomenon of skill mismatch, including the skill intensity of jobs or the dynamics of the skill mismatch process. Further, the main measure of underskilling used by the EWCS, which focuses on individuals' need for training to cope with the

duties in their job, tends to confound the measurement of the primary concern (the need for further skill development on behalf of employees) with the overall culture and incidence of CVET in different EU Member States.

More recently, the OECD survey of adult skills (PIAAC) marked a significant improvement in the collection of data, allowing for the international comparability of adult skills, yet only 17 EU countries participated in the first round of the survey. Further, attempts to measure objectively different types of skill mismatch (Pellizari and Fichen, 2013) have been criticised (Allen et al., 2014), with some arguing that subjective perceptions of workers can also be reliable indicators of job skills required in relation to own skills (Green, 2013).

These issues justified collecting new data on skills and skill mismatch that allow for measurement and identification of a number of different forms of skill mismatch across a wide range of adult employees in European labour markets.

What has been the impact of the economic downturn on skill mismatch?

During the recent economic downturn the demand for individuals with high qualifications and in high-skilled jobs rose at the expense of the lower-skilled. Despite the marked increase in the supply of unemployed labour in depressed job markets, four in 10 EU employers still report difficulties in finding workers with the right skills (Cedefop, 2015a). The non-trivial share of firms in the EU faced with talent shortages, as reported in employer surveys, appears to be at odds with a wealth of studies on growing overqualification among employees in several advanced economies across the globe (McGuinness, 2006; World Economic Forum, 2014). It was also in contrast to the observed trend in the European labour market, which saw an increasing share of higher-educated workers finding employment in positions that are not commensurate with their qualifications and skills (European Commission, 2012a; ILO, 2014).

Contradicting findings and different interpretations called for the collection of up-to-date and comprehensive European-wide

evidence that could allow for careful evaluation of the impact of the economic crisis on skill mismatch patterns in Europe.

Why do individuals accept jobs that are not a good match with their qualifications and skills? Is the 'overeducation wage penalty' a genuine waste of productivity?

Although the academic literature has highlighted the significant costs associated with skill mismatch for both individuals and societies, recent studies that have exploited longitudinal data sets have called into question the genuine cost of education mismatch (Sloane, 2014). Past research based on cross-sectional evidence could not refute the claim that overqualification may be an outcome of conscious job choices by individuals that reflect their preferences for amenities (including a high salary, good working conditions, a positive work-life balance, challenging work, a pleasant area of work) that are extraneous to the suitability of their skills with the job's skill demands. In this case, an individual who is mismatched in terms of qualifications and skills may still enjoy a high level of job satisfaction. The empirical snapshot pointing to high levels of overqualification from cross-sectional data sets may simply reflect the optimal workings of a free labour market and therefore not merit policy intervention. In contrast, government intervention and investment of public resources in skill matching instruments is warranted if skill mismatch is a 'forced' or an inefficient outcome that arises because of market failures: inadequate supply of suitable jobs in the economy (vacancy externalities); job-finding externalities (a shrinking probability of recruitment for medium- or lower-skilled individuals due to crowding out from the higher-qualified); imperfect guidance and labour market intelligence; social constraints (such as lack of adequate supply of child care facilities); and monopsonistic practices prevailing in the job market.

All this implies that there was a need for collection of data on skill mismatch that would permit sophisticated empirical analysis that could account for the diverse preferences and constraints individuals face when selecting their job.

Are VET and WBL effective in mitigating skill gaps and in improving the match of young individuals' skills with their job demands?

The recent economic crisis and the historically high levels of youth unemployment experienced in several EU Member States have spurred the implementation of a series of important EU level initiatives, including the youth employment initiative and youth guarantees as part of it. The European alliance for apprenticeships and the quality framework for traineeships were developed in response to widespread evidence of the benefits of WBL and of apprenticeship schemes in aiding faster integration and adaptation of young persons' skills to the labour market needs.

The 2009 ad hoc module of the European labour force survey (EULFS) provided a data set that enabled some analysis of the labour market prospects of young adults in the EU according to whether their academic orientation was vocational or academic (Cedefop, 2012a). However, the lack of quantitative data available from Eurostat and other international sources has generally prevented researchers from painting a comprehensive picture of the impact of VET and WBL on different forms of skill mismatch. Further, previous evidence has focused mostly on the transition of young adults to the job market and on employment rates, without paying much attention to the type of jobs in which they find employment or to their subsequent skill accumulation.

Better data were necessary to shed more light on the impact of WBL and of VET on the skill mismatch status of individuals making the transition to their first job. The ESJ makes it possible to validate the previously disparate (mainly qualitative) evidence that has highlighted the benefits of work-oriented education and training programmes in terms of labour market success.

Is finding any job for the unemployed enough? Is the cost of skill mismatch lower than the cost of unemployment?

High unemployment is public enemy number one for the EU, along with the financial/debt crisis. The economic crisis has resulted in very high levels of (youth) unemployment that, despite evidence of rising levels of economic activity in most EU Member States, have remained persistently stuck above 10%. Many observers and policy-makers have noted that, in the aftermath of the economic crisis, getting people quickly back to work is a priority. However, others have argued that a rushed return of the unemployed to the labour market may result in them getting trapped in unproductive and low-paid jobs that will only perpetuate a low-pay/no-pay cycle. The literature has also shown that there are scarring effects associated with unemployment (and low pay) on future employment prospects (Stewart, 2007). By contrast, there is evidence that the provision of extended social support and of unemployment benefits, that can provide adequate time for unemployed or inactive individuals to search for longer, may enable them to find jobs that constitute a better match for their skills and preferences (Tatsiramos, 2014; European Commission, 2014a).

In general there is limited evidence on the extent to which skill mismatch, particularly in the form of skills underutilisation, may have long-term detrimental consequences similar to the scarring effects associated with unemployment; a few studies confirm that this is the case in Australia (Mavromaras et. al., 2015a) and in some European countries (Baert et al., 2012; Longhi, 2015). For this reason, data that allow exploration of the dynamics between unemployment (and its interlinkage with previous skill mismatch) and current labour market outcomes, including the transition to a well-matched job after an unemployment episode, were needed at pan-European level.

How does skill mismatch evolve in jobs? What actions do individuals take, formal, non-formal and informal, to develop their skills in their jobs? What is the role of the demand for skills and of job tasks in mitigating skill mismatch?

Previous literature has tended to adopt static measures of skill mismatch, focused on measurement of individuals' correspondence

between their skills and the skill demands of their jobs at the time of the survey. This has inhibited full understanding of the dynamics of the matching process between skills and labour market needs: it is widely acknowledged that people continually develop and adapt their skills throughout their careers, while job characteristics also undergo significant changes over time in terms of complexity and skill intensity of tasks. Despite this apparent dynamic character of the skill matching process in labour markets, previous scans of the incidence of skill mismatch would tend to reveal that in more than six in 10 jobs in the EU the skills of individuals are inherently 'matched'. Such a statistic could lead to misleading policy conclusions, as it erroneously gave an impression of stability in skill mismatch within jobs.

Most surveys on adult education and training have also focused on the participation of individuals in training courses, without explicit attention being given to the effectiveness of the training in terms of improving the fit of the acquired skills with the skill needs of jobs. Further, inadequate information has been collected in conventional European surveys with respect to the non-formal and informal learning that job seekers and employees may undertake to acquire the necessary skills and experience required to perform well in a job.

Despite the obvious need for information on the continuous development of skills and of jobs in European labour markets, the availability of longitudinal evidence on skill mismatch is limited, with some EU studies focusing on just a few countries (such as Germany, the Netherlands, the UK) and greater advances made in Australia (Mavromaras et al. 2007; 2010; 2012) and the US (Oreopoulos et al., 2012; Clark et al., 2014). The new Cedefop survey was developed in response to the scarcity of information on the dynamic evolution of skill mismatch among adults in their jobs.

Is labour market mobility a silver bullet for mitigating skill mismatch?

One of the traditional policy remedies suggested to tackle high rates of skill mismatch in market economies is to promote labour mobility

by adopting policy measures that can liberalise these markets, such as the reduction of employment protection legislation or the removal of other barriers to mobility (including recognition of qualifications across borders and establishment of professional rights in different occupations and countries). From an EU perspective, the promotion of labour mobility is also a key principle of EU level mobility programmes, such as 'Your first EURES job' and ERASMUS+. Several researchers have stressed that skill mismatch affecting individuals can only be a temporary phenomenon, as long as they have adequate career or occupational mobility to move to better matched jobs in different geographic labour markets (Sicherman, 1991; Robst, 1995).

While in flexible and dynamic labour markets it is important to enable efficient allocation of productive human capital to its best use, several commentators have cautioned that excessive job mobility can also be conducive to skill mismatch if it is associated with a significant loss of human capital, or with non-stable and short-term employment relationships that prompt job churning and turnover (European Commission, 2013a; Panos et al., 2014).

Despite the high policy interest on the issue of labour market mobility, existing European data sources did not allow for in-depth investigation of the relationship between both occupational and geographic mobility and skill mismatch. To tackle this deficit, the Cedefop ESJ survey included two questions to capture the extent to which adult workers in the EU have engaged in occupational or geographic mobility prior to the start of their jobs.

1.3. The European skills and jobs survey

The Cedefop ESJ survey is a state-of-the-art survey of adult employees (aged 24 to 65) in all EU-28 Member States, collecting information on the match between their skills and the skill needs of their jobs. The aim of the survey is to help inform the development of European policies on initial and continuing vocational education and training (IVET and CVET) and employment policies. To do so, it seeks to understand how

individuals' qualifications and skills are matched (or not) to the changing skill demands and complexities of their jobs. The survey also looks at the extent to which employees' skills are developed and used in their workplace (Figure 6).

The survey, carried out by the survey company Ipsos MORI and its network partners in the EU-28 Member States between 7 March and 26 June 2014, relied on quota sampling. In total, 48 676 respondents from different demographic and socioeconomic groups took part either by telephone (9 154 employees) or online (39 522 employees). A mixed methodology approach ensured that data collected provided a representative sample of the 24 to 65 working age population in each of the 28 countries.

Box 2. **Novel elements and value added of the ESJ survey**

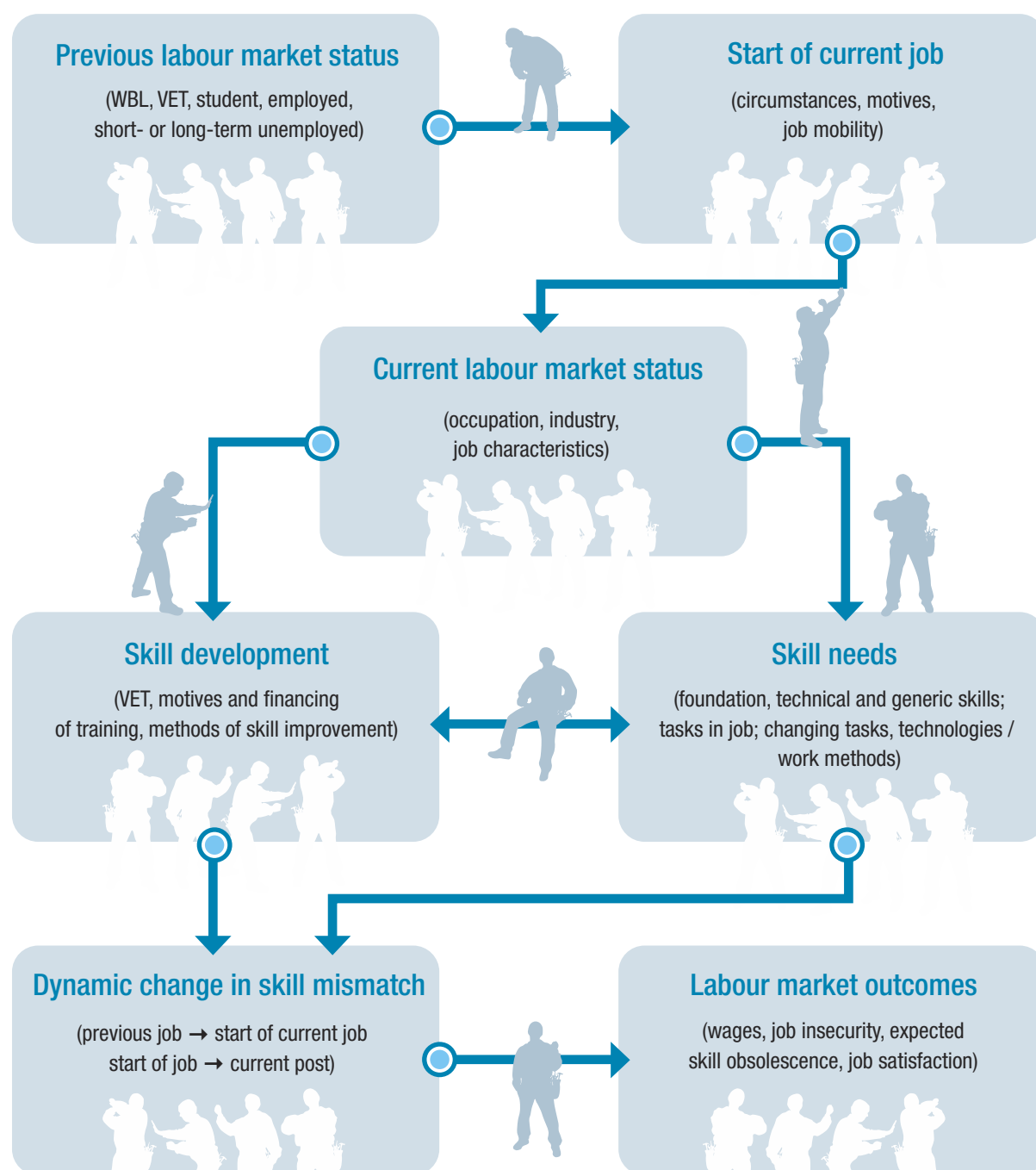
- The ESJ survey provides the first comparable evidence on skill mismatch across all EU-28 Member States from a longitudinal perspective.
- It provides measures of qualification and skill mismatch in total for each EU Member State, but also for 11 specific cognitive and non-cognitive skills.
- It collects information on VET and WBL and examines their effect on skill mismatch.
- It draws critical contextual information on the motives, constraints and preferences affecting the job choice of individuals.
- It examines the impact of job mobility (occupational, geographic) on skill mismatch.
- It looks at the determinants of individuals' skill accumulation in jobs (formal/non-formal/informal training).
- It allows comprehensive analysis of the evolution of skill mismatch by measuring the impact of dynamic changes in skills and job tasks within workplaces.

The survey asked respondents a series of questions designed to assess the extent to which a selection of their skills are seen to be important in their jobs and the extent to which their skills (as a whole, but also for 11 specific skills, including foundation, technical and generic skills) are at the level needed to do their job. The key contribution of the new survey is that it takes a longitudinal perspective, with some of these questions asked several times, referring to different time periods, enabling dynamic analysis of skill mismatch among EU employees. The survey offers the first comparable evidence of the dynamic evolution of employee skill mismatch across all EU-28 Member States.

The survey also collects information on: the micro/macro-economic motives and constraints that may influence individuals' job choice; determinants of skill accumulation in jobs, focusing on CVET; the experience of WBL as part of initial education and training; whether individuals undertook occupational and/or geographic mobility prior to accepting their current job; the changing nature of workers' tasks over time.

The survey questionnaire was prepared by Cedefop experts in collaboration with a network of leading experts in skills and skill mismatch, the OECD and Eurofound. The questionnaire was translated into the national languages of the EU countries using a strict translation protocol, managed by Ipsos MORI. In advance of the survey, extensive cognitive and pilot tests examined the content and validity of the survey instrument. Further details regarding the data collection process and the technical specifications of the survey are provided in the Annex 1.

Figure 6. Pillars of the ESJ survey



Source: Cedefop ESJ survey.

1.4. Terminology used

Skill mismatch is often used to describe various forms of mismatch between supply and demand in the labour market (Table 1). Skill mismatch – a difference between the available skills and qualifications and those required by the labour market – can be quantitative (differences

between aggregate labour supply and demand) or qualitative (differences between individual's skills and job requirements) (Sattinger, 2012). This report adopts the following terminology of skill mismatch concepts, in line with the definitions presented by Cedefop (2010a) and in accordance with literature convention.

Table 1. **Definitions of skill mismatch**

Mismatch	A situation where industries, occupations, locations or groups with different levels of education/skill differ in the ratio of unemployment to vacancies.
Skill mismatch	A situation where there is a discrepancy between the qualifications and skills that individuals possess and those needed by the labour market; a pillar of labour market mismatch.
Overqualification	A situation in which an individual has a higher qualification than his/her current job requires.
Underqualification	A situation in which an individual has a lower qualification than his/her current job requires.
Overskilling (or skill underutilisation)	A situation in which an individual is not able to utilise fully his or her skills and abilities in his/her current job.
Underskilling (or skill gap)	A situation in which an individual lacks the skills and abilities necessary to perform the current job adequately.
Skill shortage	A situation where demand for a particular type of skill exceeds the supply of that skill at the prevailing rate of pay.
Skill deficit	A situation where the skills and abilities of individuals are lower than a given benchmark level of skills.
(Economic) skills obsolescence	A situation in which skills previously utilised in a job are no longer required or have diminished in importance.

Source: Cedefop, 2010a; Cedefop, 2012b; Lazear and Spetzler, 2012; Green, 2013.

Skill mismatch often manifests at the recruitment stage. It is most notable in the form of higher unemployment rates coinciding with vacancy creation that cannot be met explicitly due to skill deficiencies in the available workforce. When employers have difficulties filling vacancies with the right talent, despite offering competitive wages, they face skill shortages.

However, mismatches in skill also arise within the workplace and during the tenure of employees, as their qualifications and skills may diverge from the formal education and skill requirements of their jobs over time. Some individuals may be hired in jobs with qualification requirements that are different from the ones that the individuals actually possess, breeding over- or underqualification. The education qualifications of employees may be insufficiently matched to those needed either to be hired for the job or to be able to perform the job to a satisfactory level.

People are over- or underskilled where, whatever their qualification level, their skills are not matched to their job. Underskilling is sometimes treated as synonymous to skill gaps,

which arise when the skills available in the workforce are insufficient to meet the demands of their jobs, for instance, due to technological advances.

Quintini (2011) has shown that an individual's qualifications mismatch and his/her skill mismatch over the career is imperfectly correlated. A sizeable share of employees, who may be matched in terms of their qualifications when entering their job, may feel that their skills are underutilised during job tenure or may become underskilled over time as the demands of their job tasks accelerate due to technological or organisational progress.

1.5. Aim and structure of report

The remainder of this report outlines key findings and empirical analysis based on Cedefop's new ESJ survey. Chapter 2 examines the evidence of the new survey with regards to the incidence and cost of different forms of skill mismatch for European citizens and economies.

Chapter 3 devotes attention to the recent economic crisis, in terms of its impact on the skill mismatch of recent cohorts of graduates and job finders relative to the pre-crisis era. The analysis focuses on difficulties of reintegrating the unemployed into work, most notably the extent to which their labour market entry is hampered by skill gaps.

To inform policies to combat the high youth unemployment in Europe, Chapter 4 investigates the magnitude of skill gaps of European citizens during their first transition to the labour market (including individuals that made a school-to-work transition). The analysis emphasises the role of VET and of WBL programmes in facilitating faster and better match of job seekers' skills with labour market needs.

Chapter 5 focuses on the dynamic evolution of skill mismatch among EU employees during their job tenure, looking at the extent to which EU

employees improve their skills in their jobs. The analysis identifies population groups that are at risk of job insecurity and skill obsolescence, due to the fact that they experience stagnation in their skill development. The positive impact of continuing vocational training (CVT) and adult learning in tackling skill mismatch is outlined.

The chapter also considers the demand side, investigating the degree to which different skills are important for performing jobs in different EU job markets and the implications for skill mismatch as implied by differences in the nature of individuals' job tasks and the extent to which such tasks are changing over time.

Chapter 6 concludes by drawing useful lessons informing the design of better and more effective policies that may mitigate skill mismatch.

Annex 1 provides further technical details on the preparation of the survey, the data collection process and the analysis of the new data.

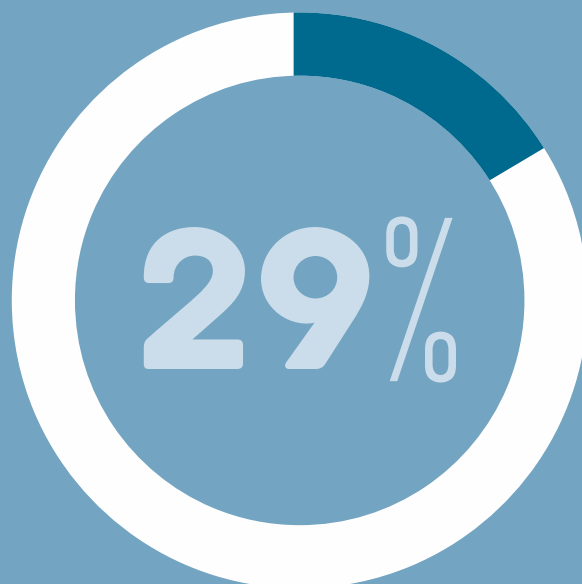
Box 3. Methodological note

The findings in this report show associations between different (sets) of individual and job characteristics and the incidence of various measurements of skill mismatch of adult workers in different EU countries. They are derived on the basis of a cross-section survey, which provides a snapshot of issues at a certain point in time but cannot be relied on to derive strong conclusions about the causality of different variables. Nevertheless, the statistical significance of most empirical findings in the report has been validated using multivariate regression analysis. In most cases discrete choice estimators (probits, multinomial logit) have been employed, given that the dependent variables of interest (qualification mismatch, skill mismatch, incidence of WBL, labour market status) tend to be binary or categorical variables. Ordinary least squares (OLS) estimators have been used in cases of continuous dependent variables, such as skill intensity of jobs and improvement in skills over job tenure. Typically, the statistical significance of the explanatory variables has been established by first controlling for key exogenous variables (gender, age, immigrant status, level of education, type of contract, occupation, industry) and subsequently taking into account other subjective and possibly endogenous determinants.

It is important to acknowledge that although survey-based questionnaires are a versatile tool for extracting

information about the skills and job features of individuals, analysis of skill mismatch in this report is based on subjective evaluation by the individuals themselves. The survey has not engaged in a direct assessment of the skills of individuals, nor does it analyse the skill requirements of jobs in an objective fashion, such as by relying on job descriptions. Nevertheless, all necessary efforts were taken during the preparation of the survey to ensure that any reporting biases on the part of the respondents are minimised. In relation to the measurement of skill mismatch, in particular, the survey employs multiple questions that aim to identify the extent of response bias among respondents in a manner that was not done in prior surveys.

Given that the survey was carried out in 28 different countries, the issue of cross-cultural comparability is also important. During the cognitive testing phase that preceded the survey, specific attention was paid to ensuring that difficult terms such as 'skills' and 'tasks' were accurately perceived by individuals in their own country context and language. Further, it has been ensured that the empirical estimates with regards to correlations among different variables have been purged of any cross-cultural influences (with the use of country dummy variables in the empirical specifications).



In 2014, **qualification mismatch** affected,
on average,
29% of the European adult working population



Qualification and skill mismatches in the EU workforce

2.1. Qualifications supply and demand in the EU job market

2.1.1. Economic and social benefits of education and training

In line with the key Europe 2020 education target, to raise the level of tertiary education attainment of adults (aged 30 to 34) to at least 40% by 2020, European countries have seen rising levels of education attainment in recent decades; this trend is expected to continue over the next decade (Cedefop, 2012d). European and national education and training policies have placed great emphasis on the skills upgrading of European citizens, based on a wealth of empirical evidence from both developed and developing countries

that confirm the significant economic and social benefits of higher levels of education and training. Individuals with higher qualifications and skills are generally found to be more likely to enjoy superior labour market and social outcomes, such as better chances of employment, higher wages and levels of job satisfaction but also elevated levels of health and social capital (OECD, 2013; Hanushek et al., 2014; European Commission, 2012a).

Cedefop's ESJ survey confirms that individuals holding a tertiary qualification in the EU earn higher hourly wages, on average, and are more satisfied with their jobs, while those with a level of education below upper secondary level feel they are in greater danger of losing their jobs in the near future (Table 2).

Table 2. **Mean effect of education level on labour market outcomes, adult employees, 2014, EU-28**

Highest level of education attainment	Hourly wage	Job satisfaction	Job insecurity	Skill intensity of jobs
Low (ISCED 0-2)	14.39	6.89	2.73	6.00
Medium (ISCED 3-4)	14.50	6.96	2.60	7.00
High (ISCED 5-6)	17.76	6.98	2.59	7.54

NB: Indices of job satisfaction (How satisfied are you with your job?) and job insecurity (How likely is it to lose your job in the next two years?) defined on a 0 to 10 scale (0 = very dissatisfied/unlikely-10 = very satisfied/very likely). The index of skill intensity is an average of the degree of importance of several skills (cognitive, digital, technical and generic) in people's jobs (0 = not important at all-10 = extremely important). Column 1 is the gross hourly wage from the job (before deductions or credits of tax and national insurance).

Source: Cedefop ESJ survey.

In 2014 European employees with tertiary education enjoyed a higher gross hourly wage premium of around 25% relative to those with medium-level qualifications, while the lower-educated suffered a 16% wage penalty ⁽¹⁾. Part of this wage premium is linked to the fact that, on average, individuals with higher qualifications are more likely to end up employed in jobs

characterised by a higher level of skill intensity. Skill-intensive jobs are those that require a higher degree of key competences (literacy, numeracy, ICT), technical skills (specialised knowledge related to field of work) and transversal or soft skills (communication, problem solving, planning, teamwork, learning to learn). Given that jobs with higher skill content are associated with higher

⁽¹⁾ Based on the estimation of a mincer-type wage regression, which controls for gender, age, age square, a quadratic term of years of employer tenure and 28 country dummy variables.

levels of labour productivity ⁽²⁾, it is evident that continuing to invest in a higher-skilled workforce for the purposes of strengthening the productivity of its knowledge-based economy is a key strategy for raising European competitiveness and growth.

An increasingly highly educated workforce is generally expected to elevate the level of demand for qualifications by employers, who will adjust their recruitment practices and skill demands over time, but also raise the overall level of labour productivity in the economy. The availability of a highly educated workforce encourages employers to restructure their jobs, making them more complex, while it can also support the adoption of advanced technology. However, when an increasing supply of qualified and skilled individuals is not effectively met by adequate demand for skills in the job market, qualification mismatches may arise in the medium-term. Qualification mismatches tend to be associated with lower economic and social returns on higher qualifications (Section 2.4), so they may ultimately undermine the incentives of young Europeans to continue investing in their human capital.

2.1.2. Qualification requirements in EU jobs

Qualification mismatches occur when the formal qualifications that individuals hold deviate from the qualifications that are required to be able to be hired for and to perform the job (Quintini, 2011). In recent years there has been increasing concern about the high and rising numbers of European employees who have taken up jobs requiring lower qualifications or skills than their own (McGuinness, 2006; Leuven and Oosterbeek, 2011; European Commission, 2013a; European Commission et al., 2014). To the extent that such qualification mismatches indicate an involuntary misallocation of qualifications and skills to jobs, they are of significant policy concern given the waste of resources that is entailed (Sloane, 2014).

For instance, without a high quality or highly esteemed vocational education system in a country, employers experiencing growth in tertiary education graduates (at EQF levels 6 to 8) may exhibit a preference for hiring such graduates for

posts that could be filled instead by individuals holding high-level vocational diplomas (EQF 5). Clerical jobs, for which employers may desire job applicants in possession of good ICT skills, or jobs in market sales and services, which require graduates with high levels of communication skills, are examples where a 'bumping down' process may take place, with high-qualified individuals displacing those with lower qualifications. Even though the qualification level of the latter could be suitable for such jobs, firms may prefer those with higher qualifications given that a higher education degree can act as a signal of higher productivity and skills at the time of recruitment. This so-called 'crowding out' effect is accentuated at times of economic recession, when the competition for a limited pool of jobs is fiercer.

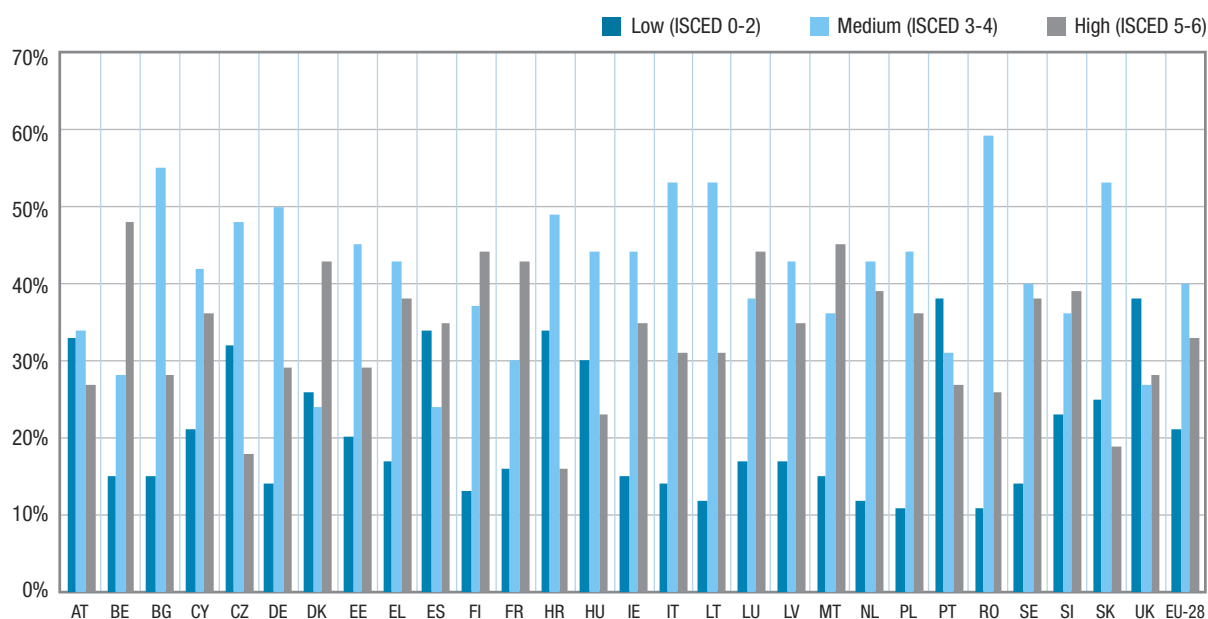
Even among tertiary education graduates, some individuals may have chosen education programmes that tend to be more generic in nature in terms of skills and competences acquired (such as humanities and arts), while others acquire skills of a more specific or technical nature. The former group may have a higher likelihood of working in jobs needing different qualifications from their own.

Respondents in the ESJ survey were asked about the qualifications and skills needed for their jobs (Figure 7). In 2014, about 33% of adult job holders in the EU believed that a tertiary education degree is required so that they can perform their job. Pointing to the need for the EU to continue investing in strong VET systems as a means of preventing skill mismatches, most EU employees (40%) responded that their jobs could be performed with a medium-level qualification, largely vocational. Moreover, 21% of adult workers stated that a low level or no qualifications at all suffice for doing their jobs.

Education requirements of jobs vary across countries. More than 40% of employees in Belgium, Denmark, France, Luxembourg, Malta and Finland reported that a tertiary education degree is needed to perform their jobs. By contrast, a high share of employees in Spain, Portugal and the UK, believe that a low qualification or no education diplomas are needed

⁽²⁾ Although the survey does not contain information on labour productivity, a positive association is found between higher skill intensity jobs and proxies of labour productivity, such as job satisfaction and hourly earnings.

Figure 7. Level of qualification needed for jobs, adult employees, 2014, EU-28



NB: Country averages based on responses to the question: 'What are the educational qualifications, if any, which someone actually needs to do your job today?' Sums not equal to 100% exclude missing responses.

Source: Cedefop ESJ survey.

at all for doing their jobs. This should be of concern, given that workers in these jobs perceive them as being of very low productivity, in the sense that they can be performed by individuals with a very basic level of education.

Table 3 shows that education requirements also depend on the occupation and industry in which individuals are employed. Close to eight in 10 adult workers in the EU employed in professional occupations and 56% of managers report a need for a tertiary education qualification to be able to perform their jobs. A total of 44% of technicians and associate professionals need a higher qualification, although a similar percentage (42%) require a medium-level degree. An upper secondary or non-tertiary education degree is also more frequently required in clerical, service and market sales, and building, crafts or related trades jobs. A higher share of employees working as plant and machine operators, in occupations related to the primary economic sector (such as agriculture or fishing) and in elementary jobs report that a low education level or no qualifications at all are needed to be able to do their jobs. Employees working in sectors providing professional or scientific services, education and health, ICT and finance or insurance are also in greater need of a tertiary education degree to be

competent in their jobs. By contrast, a greater proportion of workers in manufacturing or construction require a medium-level qualification.

It is often argued that the qualification needed to get a job is not equal to that needed to perform a job. Particularly in depressed labour markets, employers may inflate recruitment criteria to filter the best candidates. They may also deliberately seek to hire individuals with higher education as a means of hedging against greater economic uncertainty (Bulmahn and Krakel, 2002) or to stimulate innovation. This induces individuals to acquire higher qualifications to be hired in a more competitive labour market, fostering credentialism, even though the jobs for which they are hired may eventually require lower qualifications and skills than those they possess.

To investigate whether there is a discrepancy between the qualifications needed for recruitment purposes and the level of education that is a genuine prerequisite for performing the necessary tasks in a job, the survey asked respondents to assess both the level of qualifications needed to get their job, if someone would apply for their job today, and the level of qualifications needed to do their job.

Limited evidence is found in the survey to suggest that rising levels of mismatch in EU

Table 3. Incidence of adult employees by level of education needed for their job, 2014, EU-28

	Low or no qualifications	Medium	High
Occupation group			
Managers	10%	29%	56%
Professionals	3%	15%	78%
Technicians and associate professionals	9%	42%	44%
Clerical support	18%	56%	19%
Service and market sales workers	37%	45%	9%
Skilled agricultural, forestry and fishing	53%	32%	8%
Building, crafts or related trades	28%	57%	8%
Plant and machine operators and assemblers	46%	42%	3%
Elementary	65%	23%	2%
Sector of economic activity			
Agriculture, forestry and fishing	40%	34%	18%
Industry	20%	45%	28%
Services	21%	37%	36%
Public administration	18%	44%	32%
Other	29%	37%	21%
Contract			
Full-time	19%	40%	35%
Part-time	29%	40%	24%
Indefinite/permanent	19%	41%	34%
Fixed term/temporary	25%	37%	31%
Temporary employment agency	40%	37%	15%
Informal (no contract)	41%	33%	19%
Other	28%	28%	32%
Importance of skills in jobs			
Basic literacy	30%	45%	18%
Advanced literacy	9%	37%	49%
Basic numeracy	23%	43%	28%
Advanced numeracy	9%	36%	51%
Basic ICT	31%	45%	17%
Moderate ICT	13%	42%	39%
Advanced ICT	6%	32%	57%
Skill intensity index*	6.44	7.35	7.78

NB: * The index of skill intensity is an average of the degree of importance of several skills (basic, technical and generic) in people's jobs (0: Not important at all-10: Extremely important). When the sum of the columns is not equal to 100%, the residual is 'no answer' or 'don't know' responses.

Source: Cedefop ESJ survey.

labour markets are driven by inflated recruitment criteria. At a time when the European economy was characterised by disproportionately high unemployment to vacancy ratios, about 35% of EU adult workers stated in the survey that a tertiary qualification is needed to be hired for their job, in contrast to the 32.7% who said that such a degree is needed to do the job ⁽³⁾. However, the wedge between the need to have a tertiary education degree simply for recruitment purposes (75.6%) as opposed to truly performing one's job (71.6%) is greater among tertiary education graduates. Such apparent credentialism prevailing among job finders with higher levels of education is greater for younger employees (aged 24 to 29), 73% of whom stated that a higher degree is necessary for recruitment in their jobs as opposed to 67% who claimed that their level of qualification is truly needed to perform their job tasks.

These findings confirm that, overall, employers' qualification requirements when attempting to screen job candidates can potentially diverge relative to the genuine skill needs of a job, particularly when concerning workers with limited labour market histories. However, in the remainder of this report the reported qualification needed to do a job is used as a proxy for the qualification requirements of jobs, as it is believed to constitute a summary indicator of the total level of knowledge, skills and competences required by workers to be competent in their jobs ⁽⁴⁾.

2.2. Qualification mismatches in the EU

2.2.1. Incidence of overqualification

As limited job opportunities and financial constraints weigh more heavily on recent job seekers, many skilled European citizens have recently accepted jobs that do not fully use their qualifications and skills. Several sources have cautioned that, as a result of the economic crisis but also due to an increasing supply of higher-qualified individuals in European labour markets, there is a tendency towards higher overqualification across Europe (Cedefop, 2014a; ILO, 2014). Overqualified workers can be affected by a depletion of their skills, given that they utilise fewer of their competences in their jobs and they fail to develop them continuously as part of their job tasks.

Estimates of qualification mismatch based on the ESJ survey rely on direct comparison of individuals' highest qualification level with the level they report as necessary to do their job at the current time (Section 2.1). The survey confirms that a substantial share of the European workforce is employed in jobs that need a different (higher or lower) level of qualifications than their own. In 2014, total qualification mismatch affected, on average, 29% of the European adult working population: 17% were overqualified and 12% underqualified (Figure 8).

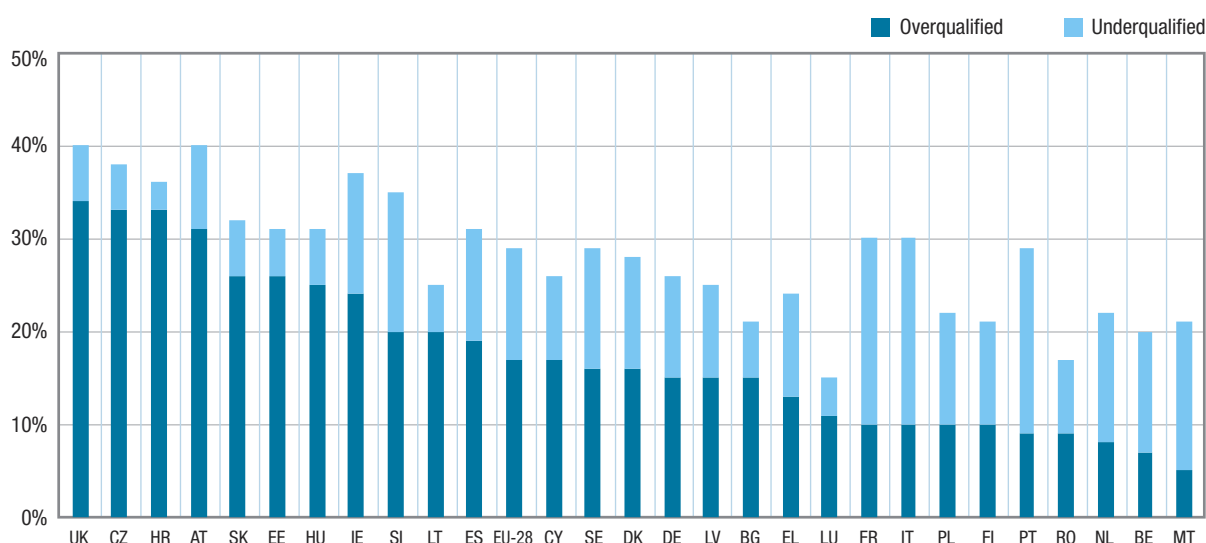
About one in four (23.6%) tertiary-educated workers and 16% of medium-qualified employees in Europe are found to be overqualified for their jobs. In 2014, 25.2% of highly qualified young adult employees (aged 24 to 35) in Europe were overqualified for their jobs, so the incidence of overqualification is higher among younger cohorts of EU tertiary education graduates.

The incidence of overqualification in the EU, as found in the ESJ survey, is very close to the level detected from the EU labour force survey

⁽³⁾ A standard t-test of the difference in the means of these two statistics, with or without assumption of equal variances, confirms that the wedge is statistically significant (t-test = 7.7).

⁽⁴⁾ Using the subjective opinions of employees to detect the level of education required in jobs has a number of advantages relative to alternative measures used in previous literature, such as the fact that they directly refer to an individual's job and rely on the information set of the job holder. By contrast, several researchers have adopted an empirical method that detects qualification requirements on the basis of the mean or modal level of education attainment within broad occupation groups, or categorise jobs according to the broad level of skills dictated by international occupation classifications (Leuven and Oosterbeek, 2011; European Commission, 2012a). Such measures tend to be affected by the endogenous influence of labour supply on the distribution of employees within occupations and neglect the marked heterogeneity of skill requirements within broad occupational groups.

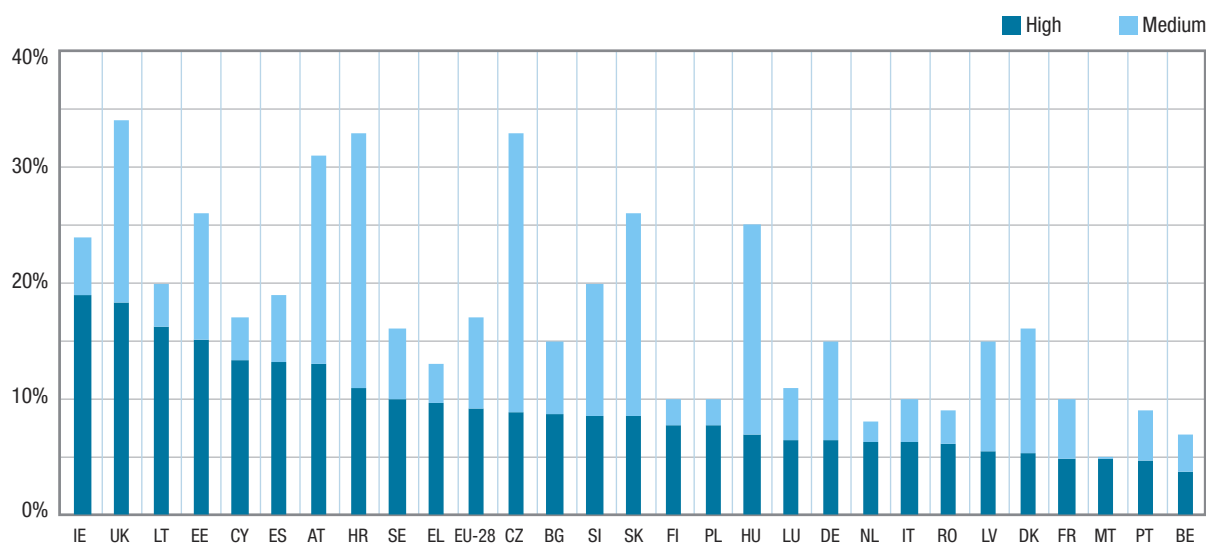
Figure 8. **Average incidence of qualification mismatch, adult employees, 2014, EU-28**



NB: Based on comparisons of an individual's highest level of education qualification with the (self-perceived) level of education qualification actually needed to do his/her current job.

Source: Cedefop ESJ survey.

Figure 9. **Breakdown of overqualification by level of education, adult employees, 2014, EU-28**



NB: Based on comparisons of an individual's highest level of education qualification with the (self-perceived) level of education qualifications actually needed to do his/her current job.

Source: Cedefop ESJ survey.

(EULFS) using a different method of measurement; in 2013 this stood at 15.5% (European Commission, 2015b). Nevertheless, there are notable differences with respect to the ranking of EU Member States. For instance, the EULFS data show that southern Europe countries (Greece, Spain, Italy, Portugal), along with the UK have the highest overqualification rates. In the ESJ survey a relatively large proportion of employees in the

Czech Republic, Estonia, Croatia, Austria, and Slovakia are found to be overqualified. Such differences could arise because of the differential method of proxying the qualification requirements of jobs. The empirical method adopted using the EULFS data, which approximates the level of education needed in different occupations by the most frequently observed qualification held by employees in the respective occupational groups,

is affected by the (endogenous) education structure of an economy. What this implies is that countries with a high share of tertiary education graduates in their adult population are least likely to have high overqualification rates. By contrast, the qualification requirements identified from the ESJ survey are more likely to reflect the views of employees regarding the level of required productivity in their jobs.

The overqualification rates presented in Figure 8 are also affected by the inclusion of individuals with upper secondary education employed in jobs that need low-skilled labour. As identified in Figure 9, most overqualified individuals in the Czech Republic, Croatia, Austria and Slovakia have medium-level qualifications. Such workers believe that they are employed in inherently low-skilled jobs, which can imply a loss of labour productivity and a waste of individuals' skills, particularly in countries with high quality (vocational) education and training systems. Nevertheless, much of the public debate in recent years has associated overqualification with the expansion of tertiary education systems in EU countries. Figure 9 illustrates that countries such

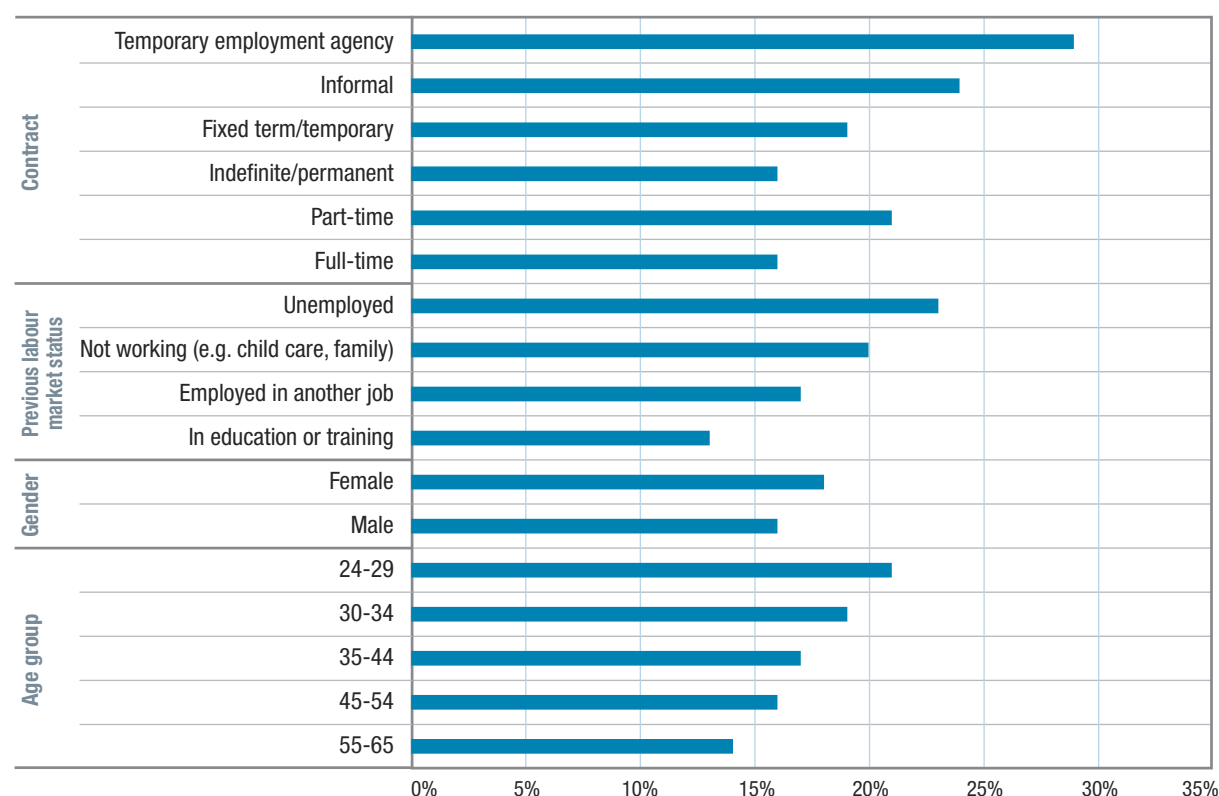
as Estonia, Ireland, Spain, Cyprus, Lithuania and the UK, have relatively higher shares of tertiary graduates employed in jobs that demand lower qualifications than their own.

2.2.2. Determinants of overqualification

Figure 10 illustrates that overqualification in the EU is more prevalent among younger employees, females, individuals who were outside of the labour market (such as unemployed or inactive) prior to accepting their current employment and those in jobs with non-standard contractual arrangements (such as part-time, informal, and temporary agency contracts).

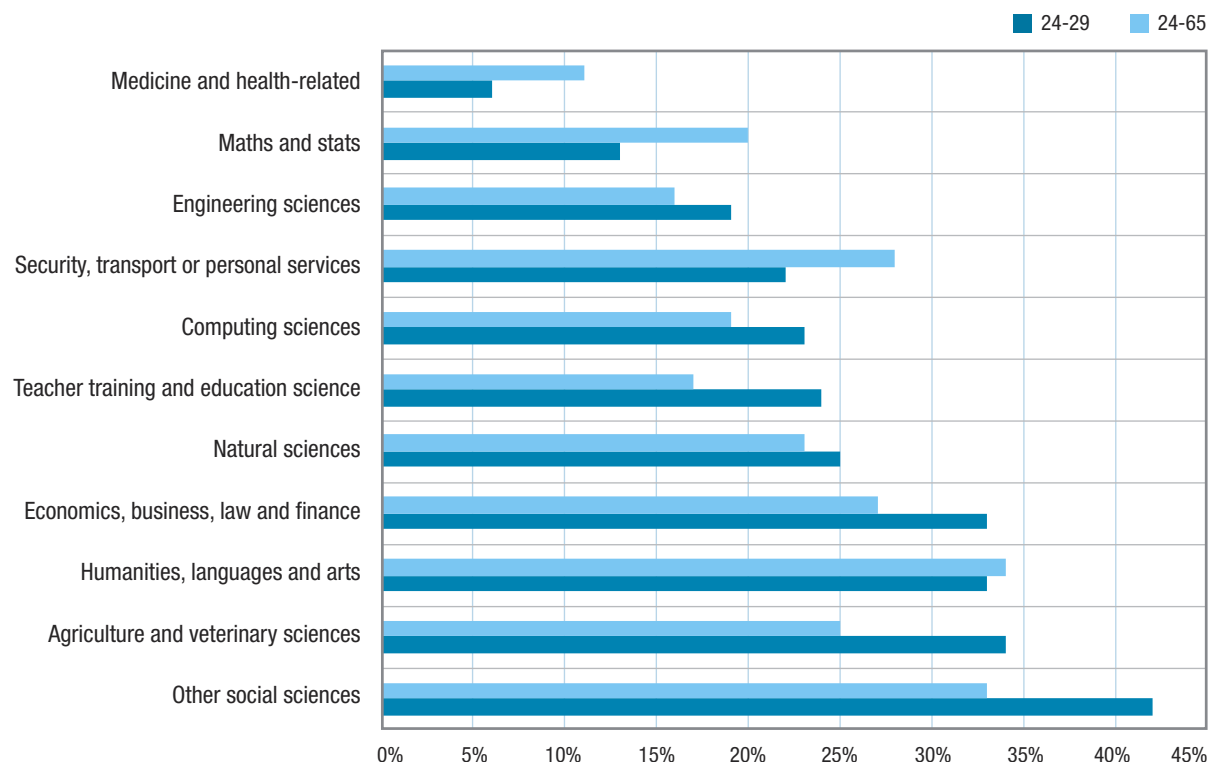
Overqualification is also higher among tertiary education graduates, particularly those who finished school in the post-crisis period. Tertiary education graduates from certain fields of study, including humanities, languages and arts and other social sciences (sociology, political sciences, anthropology, psychology) are found to be more likely to be overqualified, as opposed to university graduates with degrees in medicine or health-related sciences, engineering or computing sciences (Figure 11).

Figure 10. **Overqualification by population group, % of adult employees, 2014, EU-28**



Source: Cedefop ESJ survey.

Figure 11. **Overqualification by field of study, adult employees with higher-level qualifications, 2014, EU-28**



NB: Sample of individuals with higher-level qualifications (ISCED 5-6).
Source: Cedefop ESJ survey.

Rates of overqualification are also significantly different depending on job characteristics, with overqualification probability higher for individuals employed in smaller-sized firms and in less skill-intensive occupations and jobs (Table 4). Overqualified workers also have fewer possibilities for CVET and for career progression (they are less likely to have been promoted in their job).

The incidence of overqualification is higher among individuals employed in elementary and skilled agricultural jobs, while it also disproportionately affects plant and machine operators and assemblers and market sales workers. Adult workers in professional and managerial occupations are the least likely to report that they are overqualified for their jobs. Relative to those employed in the manufacturing sector, individuals working in wholesale and retail trade, accommodation or food services, transportation and storage, arts and entertainment, and also in ICT services are more likely to have higher qualifications relative to the ones needed by their jobs.

Table 4. **Examples of two-digit occupations with highest and lowest rates of overqualification, adult employees, 2014, EU-28**

Overqualified to do the job	
Highest	
Sales worker	32%
Food preparation assistant	32%
Labourer in mining, construction, manufacturing	31%
Cleaner or helper	28%
A protective service worker	26%
Customer services clerk	25%
Lowest	
Legal, social and cultural professional	10%
Science and engineering technician	10%
Production or specialised services manager	9%
Science and engineering professional	6%
Health professional	6%
Teaching professional	4%

Source: Cedefop ESJ survey.

Empirical analysis further reveals the importance of taking into account the job preferences and constraints faced by individuals when accepting their jobs, as they are found to be statistically significant correlates of the chances of overqualification among adult workers. Part of the reason why individuals are overqualified in their jobs can be attributed to the fact that they selected their job because of their desire for job security and a positive work-life balance, or due to its proximity to home. By contrast, adult workers who accepted their job because of the intrinsically satisfying nature of work, the fact that it offered possibilities for career progression but also the suitability with their own skills and qualifications are less likely to be overqualified.

The constraints that individuals face both at the micro and at the macro level can influence their job search and, ultimately, the quality of their job match. In particular, workers who experienced greater financial constraints prior to job entry, and those searching for a job in a slack labour market with few suitable job opportunities, have significantly higher chances of being overqualified. The survey findings further indicate that a radical change in occupation is unlikely to form a good strategy for mitigating the chances of overqualification. Individuals employed in a completely different occupation relative to the one they had in the previous job are found to have a higher likelihood of overqualification. By contrast, those who decided to move home to a different country before accepting their current job have a significantly lower chance of overqualification.

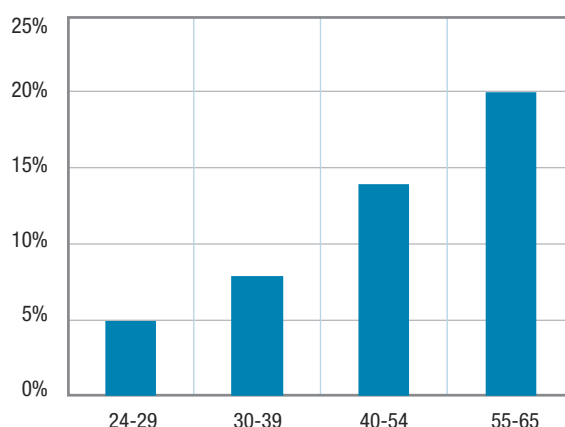
2.2.3. Underqualification of EU workers

As shown in Figure 8, about one in five employees in France, Italy and Portugal reported that their own qualification was below the level needed to do their jobs. By contrast, workers in the Baltic states, the Czech Republic and Croatia were the least likely to believe that they are underqualified for their jobs. Cedefop's ESJ survey reveals further that underqualification affects mostly older individuals (particularly those over 40) and employees with low levels of education (below lower secondary level). In 2014, about 39% of all lower-educated workers believed that a higher qualification than their own is needed to do their job, while the same holds for

about 15% of medium-qualified EU employees (Figure 12).

The underqualified are more likely to have been motivated to accept their job because of career concerns or the intrinsic nature of the job, as opposed to job security or proximity to their home. They are also less likely to have changed occupation before accepting their current job. They are employed mostly in high-skilled occupations (professionals, associated professionals) or in jobs involving a greater degree of task complexity. They have accumulated significantly more work experience and work-specific skills as they have been employed with their current employers for a longer time period.

Figure 12. **Underqualification by age group, adult employees, 2014, EU-28**



Source: Cedefop ESJ survey.

These findings highlight that underqualified employees are likely to possess a large stock of (non-formal or informal) skills to perform their jobs. Nevertheless, they lack the qualifications needed for their jobs. This indicates the need for validation or certification of their acquired, yet unrecognised, skills for the purposes of enabling their continued mobility and career progression in the labour market (European Commission, 2012a; OECD, 2013; Cedefop, 2015b).

2.3. Skill mismatches in the EU

2.3.1. Skill mismatch relative to required level

When the stock of knowledge and competences of employed workers deviate from the skill requirements of their jobs, the latter derived from

the complex set of job tasks they have to perform as part of their daily work, skill mismatch ensues. Skill mismatch is a major challenge facing European economies (Cedefop, 2010a). Evidence from past surveys, including the 2010 EWCS, have suggested that more than a half of EU workers' skills are not well-matched to their current jobs. Most mismatched adult workers are overskilled, which means they are capable of handling more complex tasks and their skills are underused; a smaller share of employees are underskilled and they lack the skills needed for their jobs.

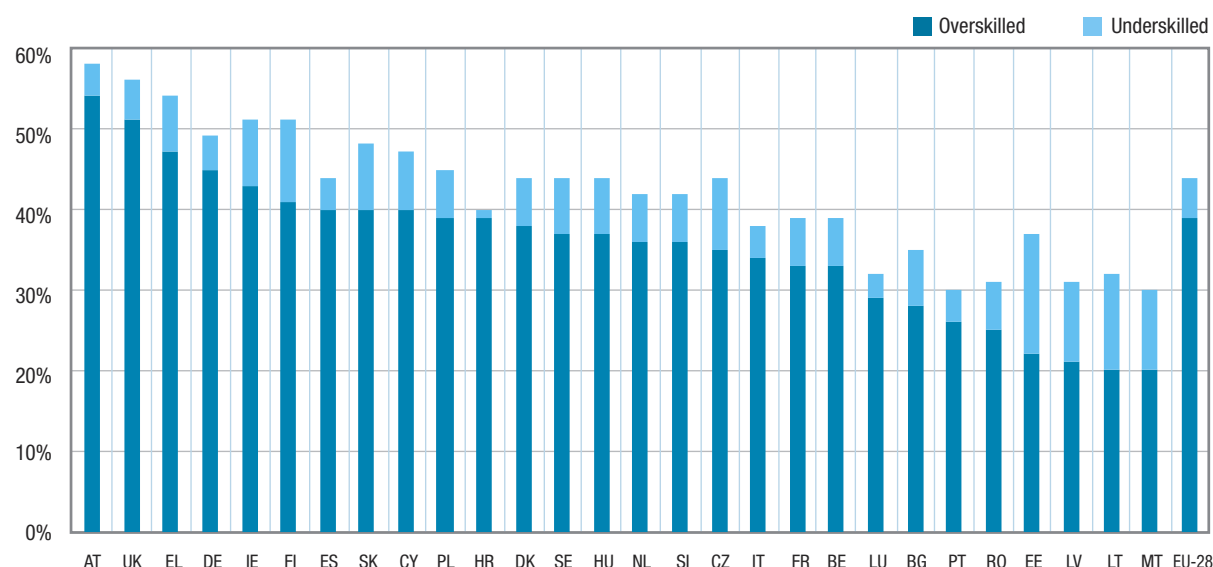
To assess the extent to which skill mismatch affected European workers in 2014, the ESJ survey asked respondents a series of questions designed to evaluate the extent to which some of their skills are seen to be important for or matched to their jobs, and also the overall degree to which their skills are at the level needed to do their job. The respondents could either report that their skills are higher than or matched to what is required by their job, or that some of their skills

are lower than what is required and need to be further developed ⁽⁵⁾. Some of these questions were asked several times, referring to different periods of the individual's working life. Respondents were asked to assess the degree of mismatch between their skills and those needed to do their jobs:

- (a) in their previous job;
- (b) at the start of their current job;
- (c) at the time of the survey ⁽⁶⁾.

Cedefop's ESJ survey shows that, in 2014, about 45% of employees in the EU-28 Member States experienced skill mismatch: 5% of workers felt that some of their skills are lower than needed to do their job and 39% believed that they have more skills than needed by their job. Self-reported underskilling is highest in the Baltic states, but also in the Czech Republic, Ireland and Finland, while more than 40% of workers feel that their skill level is higher than needed to do their job in Germany, Ireland, Greece, Austria and the UK (Figure 13).

Figure 13. Incidence of skill mismatch, adult employees, 2014, EU-28



Source: Cedefop ESJ survey.

⁽⁵⁾ The measure of underskilling used in the ESJ survey deviates from the measures adopted in the ESWC and PIAAC surveys, which asked individuals whether they are in need of training to cope with their job duties. Based on inputs from the ESJ expert group, as well as feedback received as part of the cognitive and pilot testing that preceded the data collection, a new phrasing was preferred to capture the incidence of underskilling. The ESJ measure avoids confusing the issue of underskilling with the differential provision of training in different EU countries. The question was phrased in a neutral tone, so that social desirability bias could be mitigated to some extent. This was deemed necessary given that most individuals had a natural tendency to avoid reporting that they had lower skills than needed to do their jobs.

⁽⁶⁾ As part of the cognitive testing phase of the project, particular attention was paid to whether the responses of individuals to these questions are affected by memory bias. The feedback received was that this was not an issue of significant concern, although caution needs to be exercised in the interpretation.

2.3.2. Factors related to skill mismatch

Specific groups of the European adult working population are more likely to consider that their skills exceed or are lower than those needed to do their jobs. Men are more likely than women to be overskilled, as are older workers (aged over 55) and individuals with a higher level of education. The prevalence of overskilling is found to be greatest for individuals employed as service and sales workers, plant and machine operators, and those working in elementary occupations. European workers in these occupation groups are more likely to say that their skills are higher than required (44%, 45% and 47%, respectively), as opposed to individuals working in crafts and related trades workers (31%) and as professionals (35%) (Box 4).

The importance of targeted and good-quality guidance and career counselling when choosing a job is also apparent in the survey findings. Individuals who placed greater emphasis on the fit of the job with their skills and qualifications, as well as the chances provided in terms of work experience and career development, are less likely to have ended up in a mismatched job. The contrary is true for workers whose primary motivation for selecting their job was a desire for job security.

Box 4. Skill mismatch in specific occupations

The ESJ survey collected information on the respondents' occupation at the two-digit international standard classification of occupations (ISCO) level ⁽⁷⁾. Figure 14 shows the proportion of respondents in the three broad occupation groups most likely to say that their skills are higher than required, broken down at the two-digit level. There are several differences within occupation groups, most notably among elementary occupations where street and related sales and services workers are significantly more likely than other elementary workers to say their skills are higher than required (63% compared to 47% overall). Among sales and service workers, personal care workers are the least likely to say their skills are higher than required (36% compared to 44% overall).

The constraints individuals faced at the time of their job search, both at the micro and the macro level, are an additional factor in determining whether they are employed in jobs that do not fully exploit their potential. Respondents whose skills are not matched to their job are more likely to report that they had financial difficulties at the time of their job search than those whose skills are matched (20% compared to 17%, respectively). More of them (45%) reported that there were few job opportunities available for people with their skills and qualifications at the time that they started working for their current employer (compared to 40% of those in well-matched jobs). They are also more likely to report that, despite sending many job applications, they had few opportunities to attend job interviews (39% compared to 33% of respondents not experiencing skill mismatch).

Relative to individuals whose skills are well-matched to what is needed by their job, overskilled workers are employed in jobs that require, on average, a higher degree of task complexity and a higher level of skills to perform them. Nevertheless, the latter type of workers appears to be dissatisfied by the fact that, even though they were in possession of a higher stock of skills relative to what was needed at the start of the employment relationship, the extent of continued development in their skills since then was limited. By contrast, the complexity of the tasks they perform, defined by the continual need to learn new things or to engage in a greater variety of challenging tasks, decreased since the beginning of their job tenure.

Respondents are more likely to consider that their skills lag behind those needed to do their job (underskilled) if employed in higher skilled occupations (managers, professionals) or in sectors of economic activity related to professional, scientific and technical services and in the manufacturing and engineering sectors. Underskilled workers are more likely to have returned to (temporary) jobs following a spell of inactivity. Given that such individuals may have experienced some atrophy of their skills during the time they remained at distance from the labour market, some catching up is needed to be able to follow the demands of their job.

⁽⁷⁾ <http://www.ilo.org/public/english/bureau/stat/isco/> [accessed 7.8.2015].

Figure 14. **ISCO groups most likely to say their skills are higher than required in current job, adult employees, 2014, EU-28**

Two digit occupation groups who say their skills are higher than required...

Elementary occupations

ISCO 91: 45
Cleaners and helpers

ISCO 92: 35
Agricultural labourer

ISCO 93: 42
Labourer in mining/construction

ISCO 94: 43
Food preparation assistant

ISCO 95: 70
Street and related sales and service workers

ISCO 96: 51
Other elementary workers

Sales and service workers

ISCO 51: 45
Personal service workers

ISCO 52: 47
Sales workers

ISCO 53: 36
Personal care workers

ISCO 54: 42
Protective service worker

Plant and machine operators

ISCO 81: 42
Stationary plant machine operators

ISCO 82: 47
Assemblers

ISCO 83: 47
Drivers and mobile plant operators



Source: Cedefop ESJ survey.

Underskilled employees are also less likely to feel that their job has offered them opportunities to improve their skills while the complexity and difficulty of their tasks has continually increased since the time they started their current period of employment.

Another significant finding of the survey is that there is a significant degree of persistence in skill mismatch: being overskilled (underskilled) even in a previous job significantly increases the chances of being overskilled (underskilled) in the current job. Being in a matched job in the past significantly reduces the chances of becoming underskilled in the future (see Section 5.2 for further discussion).

2.3.3. Skill deficits undermining productivity potential

Overskilling is associated with lower levels of labour productivity and waste of employee skills, making it an issue of policy concern. However, the incidence of skill mismatch reported above is based on the self-perceptions of individuals and

may be biased. Although some would argue that individual workers possess the best information on the competences required to be proficient in their jobs, it is likely that their opinions will diverge from those of their managers or from what could be considered a given benchmark of optimal performance in the long term. Deviation of the skill levels from such an optimal threshold would then constitute a measure of their skill deficit ⁽⁸⁾.

To assess the extent to which EU employees understate the degree to which their skills have scope to be developed further in their jobs, even though they may feel that they have 'surplus skills' that are ineffectively utilised at present, the survey asked respondents a novel question. Individuals were asked to rate, on a 0 to 100 scale, the extent to which their skills deviate from the level of skills necessary to carry out their job as well as possible. This self-reported measure of the distance between the skills needed to do the job in the best possible way and workers' own skills is a unique new measure of skill mismatch at work ⁽⁹⁾. In this case the benchmark is defined

⁽⁸⁾ Respecting convention, the definition of a skill deficit as described by Green (2013), the assessment of the skills of individuals relative to a given benchmark, is adopted here.

⁽⁹⁾ The self-reported measure of a skills deficit in the ESJ survey was initially piloted in a small-scale online survey on skill obsolescence carried out in 2011 in four EU countries (Cedefop, 2012b). It was also tested in the pilot phase of the ESJ survey, with no significant difficulties found in the ability of individuals to respond to such a question. In future waves of the survey an additional question may

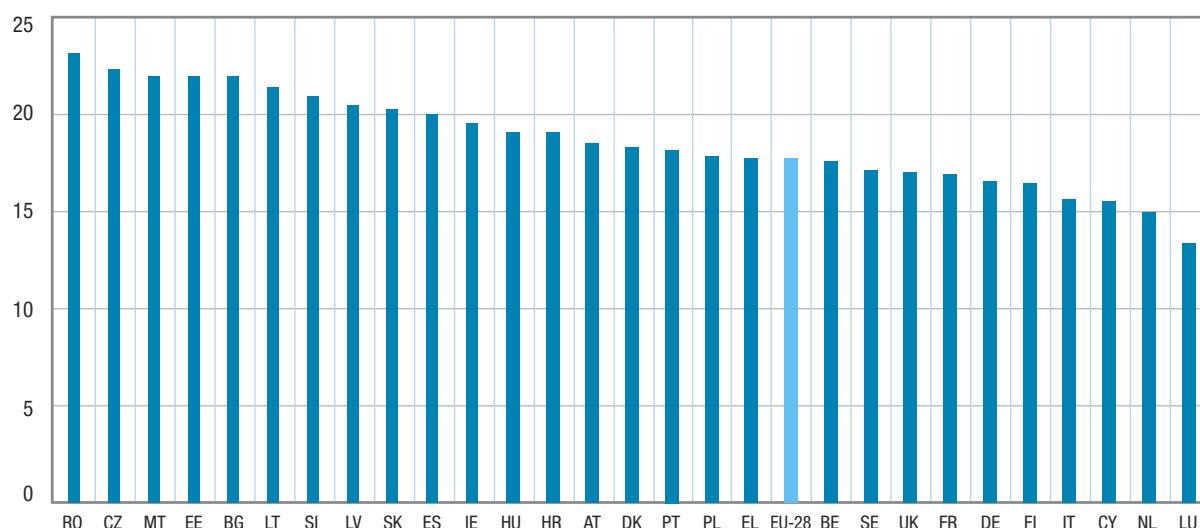
as the level of skills needed so that the employee can achieve the best possible performance level in his/her job. Such a measure differs relative to the conventional construct that has been used in the literature, as described in Section 2.3.1, which typically asks employees to evaluate their skills in relation to those needed to carry out their job duties, regardless of how well these tasks are carried out.

The measure of skill deficit used here attempts to detect the extent to which individual workers have space to grow in their jobs. It is a measure that is more closely aligned to the notion of individuals being lifelong learners in modern societies, as espoused by the European education and training strategy 2020. It is not at odds with the claim that about 40% of EU workers are overskilled for their jobs, given that the contemporary presence of overskilling (the potential to do more demanding job duties) and dynamic underskilling (the need to further develop one's skills) is at the heart of talent management (Cappelli, 2008; Cappelli and Keller, 2014). Workers might have, simultaneously,

some skills deficits with regards to achieving higher productivity dividends from their job but may be broadly overskilled in relation to the execution of their daily job tasks. Workers tend to be in possession of a range of diverse skills but not all of them will be useful for the organisation at a given point in time (Ployhart and Moliterno, 2011; Ployhart et al., 2014). The talent management approach focuses on the potential of workers – some of workers' skills will become useful to the organisation at some point in the future – rather than focusing on the contemporary skill (mis)match in the job. It also takes into account that the optimal productivity potential of jobs may change within organisations over time, given that organisations may alter the way in which they approach the market, change product lines or revise their production process altogether, with implications for the subsequent productivity frontier of jobs.

Respondents were asked to think about the level of skills needed to do their job as well as possible. They then rated their own level of skills relative to this benchmark on a scale from 0 to

Figure 15. **Average skill deficit by EU Member State, adult employees, 2014, EU-28**



NB: Skill deficits are derived as the difference between the level of skills needed by an employee to do his/her job as well as possible (equal to a score of 100) and his/her own assessed skill level relative to that benchmark. The average EU employee who rated his/her skills as 82 on the 0-100 scale therefore has a skill deficit equal to 18. The larger the skill deficit, the greater the productivity loss for a given worker and the need for continuing training and skills upgrading.

Source: Cedefop ESJ survey.

also be asked, which will request from the respondent to report what he/she thinks would be his supervisor's/rater's assessment of his/her skills gap (if any). This could lead to better comparative results, given that in the field of performance assessment the latter formulation appears to yield a higher correlation with a rater's true assessment than the own self-reported measure of performance by an employee (Schoorman and Mayer, 2008; Schat and Frone, 2011). It was not possible to try this additional formulation in the existing survey due to space and time constraints.

100, where 0 means that they need to develop all of their skills (they are still at the start of the process of becoming fully proficient in their jobs) and 100 that they have all of the skills needed (they have achieved the highest level of proficiency in their job). The skills deficit of employees is inversely related to their self-reported relative measure of skills in the survey: $\text{skills deficit} = 100 - \text{individual's assessed skill level}$. A smaller skill deficit implies that workers' skills are relatively closer to being fully productive, while the opposite case signifies that employees have ample scope to develop their potential productivity in their jobs via continuing training or other forms of skills upgrading.

In the pooled EU-28 sample, the mean assessed skill level of adult employees on a 0 to 100 scale where a score of 100 corresponds to the optimal benchmark of performance, is 82 and the median is 85, so the responses were skewed towards the higher end of the scale. As a consequence the average skill deficit in the EU workforce is equal to 18%. This implies that the stock of skills in the EU workforce should be developed by about one fifth, should the EU wish to reach the maximum productivity potential of its stock of employed human resources. Roughly one in four (26%) workers in the EU assessed

their own skill level at or below 75, which corresponds to the highest quartile of the distribution of the skill deficit variable. These employees can be characterised as suffering from significant skill deficits (on average, they have a skill deficit of 38%). Only one in seven (14%) rated themselves as 100 on the scale, meaning they have all the skills they need to do their job as well as possible; most respondents acknowledge that they need to develop their skills to some extent.

Figure 15 indicates that employees in Bulgaria, the Czech Republic, Malta, Romania and the Baltic states suffer from the largest skill deficits among EU Member States. At the opposite side of the spectrum, workers in Germany, Italy, Cyprus, the Netherlands and Finland, are more likely to believe that their skills are close to the optimal performance threshold of their jobs.

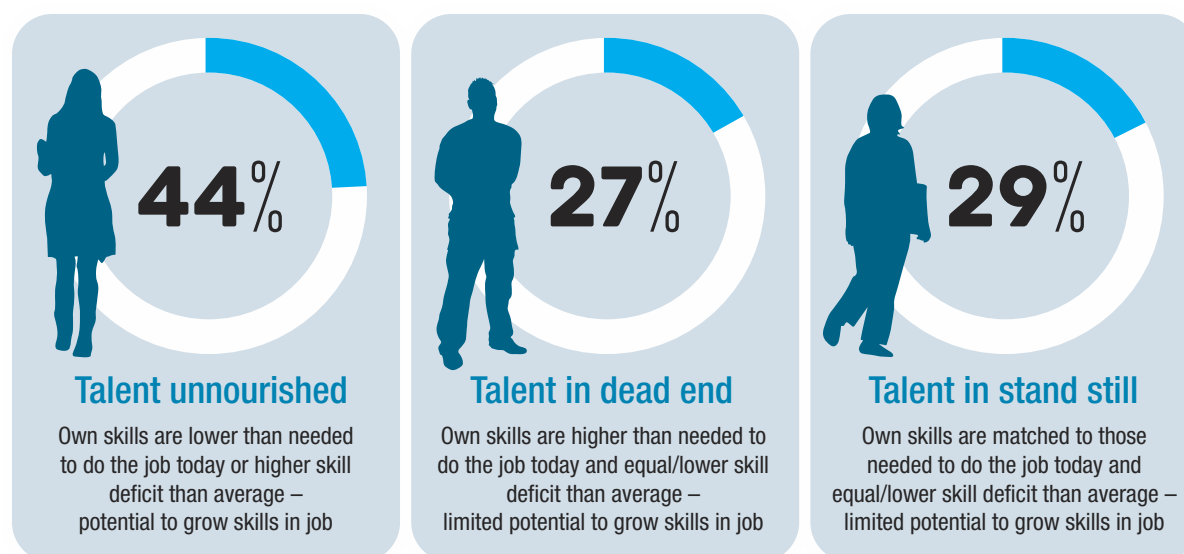
On average, younger employees with fewer years of employer tenure, as well as those who experienced a previous spell of unemployment before commencing their current job, are more susceptible to greater skill deficits. Individuals employed in higher-skilled occupations (technicians and associate professionals, professionals) experience larger skill deficits, as

Table 5. Worker groups by type of skill mismatch/deficit, adult employees, 2014, EU-28

Skill deficit	Current skill mismatch		
	Underskilled	Overskilled	Matched skills
Above average skill deficit	Underskilled with growth potential	Overskilled with growth potential	Matched with growth potential
% current skill mismatch group	74%	32%	47%
% total workforce	(4%)	(12%)	(26%)
Below average skill deficit	Underskilled with limited growth potential	Overskilled with limited growth potential	Matched with limited growth potential
% current skill mismatch group	26%	68%	53%
% total workforce	(2%)	(27%)	(29%)

NB: The average skill deficit, used as a threshold to categorise employees according to whether they fall below or above it, is the predicted values based on an OLS regression with dependent variable the skill deficit of respondents and independent variables as follows: age, gender, level of education, native status, attitudes to learning, previous labour market status, occupation, industry, size of firm, change in job role since start of job, multisite workplace, part-time contract, temporary contract, log(hours), years of employer tenure, public sector, index of task complexity in job, index of skill intensity in job.

Source: Cedefop ESJ survey.

Figure 16. **Worker groups by type of skill mismatch, adult employees, 2014, EU-28**

Source: Cedefop ESJ survey.

do those in non-permanent jobs and single site workplaces. Adult workers in the manufacturing and engineering sector report higher skill deficits relative to those in the wholesale and retail trade, transportation or storage and other service-related industries (finance and insurance, education and health, cultural industries).

Adopting a talent management approach to identifying whether individuals' skills are matched or not to their jobs provides a more nuanced picture of the incidence of skill mismatch in EU labour markets. For instance, when taking into account the scope that individual employees acknowledge to have to augment their skills in their jobs, it becomes evident that almost one third of overskilled employees (32%) – those who reported that their skills are higher than needed to do their jobs at present – have considerable scope to grow as professionals in their jobs (Table 5). Similarly, 47% of those with matched skills in their current job believe that their skills lag behind the level needed to be fully proficient in their jobs. For about one quarter of workers who declared that their skills need to be developed to do their jobs, the scope for further skill accumulation is limited.

Following the underlying logic described above, it is possible to identify three distinct groups of employees in EU job markets according to the degree to which their skills and, subsequently, their productivity, can be augmented in their jobs or are matched to the

job's upper threshold of skill requirements. Figure 16 illustrates that the skill deficits of about 44% of the EU adult workforce lie above the average skill deficit as defined for individuals with comparable individual and job characteristics in their own country. For this group of workers – the 'unnourished talent' – there is additional scope to improve their skills and productivity in their jobs. By contrast, 27% of adult workers in the EU are in 'dead-end' jobs, defined as jobs where their skills are not only ineffectively utilised but also do not require continuing improvement as they are closer to the optimal productivity threshold than the average worker. Finally, 29% of EU employees are in a 'standstill' situation: their skills are matched to what is needed to do the job and are close to the average skill deficit.

Adult workers in dead-end jobs are more likely to be young, male and in possession of a higher level of education. They are more prone to having selected their current employment in search of job security or because it offered a good work-life balance, as opposed to focusing on other job amenities, such as the possibility to accumulate work experience, career prospects or intrinsic satisfaction. Talent in dead-end jobs had greater chances of encountering financial difficulties in the period preceding the start of their employment and also experienced limited opportunities to find jobs suitable for their own skills and qualifications. They are more likely to

be employed in part-time, low-skilled or elementary jobs. Employees working in industries such as wholesale and retail trade, accommodation and food service, transportation and storage and other service industries (such as cultural, social and personal services) are more likely to be in this group relative to those in manufacturing and engineering. Individuals in dead-end jobs experience limited possibilities for skill development and training and their job tasks have not evolved markedly over time.

The typical characteristics of the group of unnourished talent are female and prime- and older-aged workers. Their underlying motivation when accepting their jobs was the need to accumulate more work experience and the career prospects offered. Even though their jobs are inherently skill-intensive and subject to dynamic changes in technologies and in task complexity over time, the degree to which such workers have improved their skills since the start of their tenure is deemed by them to be insufficient.

Individuals who engaged in a significant change in occupation before starting their current job generally have higher chances of not being in jobs with a close match between their skills and the skills needed. Individuals with matched skills and limited potential to grow their skills in their jobs – a standstill situation – tend to have lower levels of education, more years of tenure with their current employer and be less likely to face financial constraints or limited job opportunities at the time of entry into their current jobs.

2.3.4. The imperfect relationship between qualification and skill mismatch

While workers can be well-matched in terms of their formal qualifications, relative to those required by employers at the time of recruitment, they may nevertheless become mismatched in

their levels of skills and vice versa. Such discrepancy can arise from heterogeneity of skills and abilities between individuals with the same credentials. Evidence from the OECD PIAAC survey, for instance, has highlighted significant variance in the assessed level of foundation skills between individuals with the same level of education, which accounts for a significant part of their differences in labour market outcomes (OECD, 2013). Alternatively, individuals mismatched by qualifications may have adequate skills required for their jobs due to the accumulation of informal skills and work experience acquired in the labour market or in their job over time.

A population group of significant policy concern, given the marked waste in terms of lost potential productivity, are the 'genuinely overqualified': individuals employed in jobs that require both lower qualifications and skills than their own. Some workers may be forced to accept a job below their qualification level because of a poorly performing labour market or because of other individual constraints (such as family obligations or financial constraints). Genuinely mismatched workers (Table 6) are of particular policy concern, given the involuntary nature of their mismatch and the associated loss of productivity due to the underutilisation of their skills (Green and Zhu, 2010). They tend to be locked in a low-skill-intensity equilibrium, given that their jobs are characterised by low skill content. Provision of career guidance and counselling to enable such workers find alternative jobs or career paths suited for their skills and qualifications is necessary, as are policies to support a higher level of skill utilisation within their workplaces.

By contrast, policy-makers could be concerned less about the misallocation of education resources for workers who may have

Table 6. **Combinations of qualification and skill mismatch**

Genuinely mismatched	Individuals characterised by a mismatch in their qualifications and in their level of skills relative to the job requirements
Apparently mismatched	Individuals characterised by a mismatch in their qualifications but are not mismatched in their level of skills relative to the job requirements
Perfectly matched	Individuals whose qualifications and level of skills are matched to the job requirements

Source: Cedefop, 2010a; European Commission, 2013a.

Table 7. **Qualification versus skill mismatch, adult employees, 2014, EU-28**

Skill mismatch			
Qualification mismatch	Underskilled	Matched skills	Overskilled
Underqualified	7.7%	63.3%	28.9%
Matched qualifications	5.2%	58.3%	36.5%
Overqualified	4.4%	35.7%	59.9%
	Talent unnourished	Talent in standstill	Talent in dead end
Underqualified	47%	34%	19%
Matched qualifications	44%	31%	25%
Overqualified	41%	18%	41%

Source: Cedefop ESJ survey.

accepted jobs below their qualification level for personal reasons, own preferences (such as a wish to stay closer to a particular locality due to job or environmental amenities) or because of their inherently lower abilities (Mavromaras et al., 2010; Quintini, 2011; European Commission, 2013a). In this case, overqualified individuals may not suffer from simultaneous underutilisation of their competences and may, instead, enjoy a high level of job satisfaction, rendering them ‘apparently mismatched’.

The ESJ data confirm that most overqualified workers (six of 10) have surplus skills relative to those needed for their job or are in dead-end and static jobs (so are ‘genuinely overqualified’) (Table 7). About 9% of the EU workforce is genuinely overqualified. However, four of 10 overqualified employees are in jobs where their level of skills is matched to or is lower than required, or have considerable potential to grow their skills. This group of ‘apparently overqualified’ workers corresponds to about 6% of the EU labour force. Even though such workers have a higher qualification relative to what is needed for their job (for example a tertiary education graduate employed in a job in need of a higher-level vocational degree) they are still in need of continuous skill development to be able to perform it.

Similarly, most EU employees who entered into their jobs with lower credentials than required by their job today nevertheless have the proper or higher skills required to carry out their job tasks. For this group of mismatched workers (about 6% of the total EU workforce) it is crucial

to certify and validate their skills, to the extent that the absence of formal certification of their informal skills may inhibit their further labour market mobility and career progression. At the same time, about 47% of such workers (9% of total EU employees) are in need of continuous skill development to be able to perform to the maximum level of productivity in their jobs.

Ample space for continued growth in skills is also the case for about four in 10 employees in the EU whose qualifications are at the right level (matched) for their jobs (28% of the total sample of EU adult employees). However, the remaining two quarters of this group (corresponding to 35% of the whole EU adult workforce) have skills that are adequate for the tasks required by their jobs.

2.4. The cost of qualification and skill mismatch

Qualification and skill mismatches entail significant economic and social costs for individuals. Past literature, focused on a subset of EU countries and specific non-EU countries (including Australia, US), has shown that overqualified workers are more likely to receive lower mean wages and to have lower job satisfaction relative to similarly-educated workers (McGuinness, 2006). The evidence on the wage consequences of overskilling is, by contrast, less clear-cut. While overskilled workers have been found to be subject to small yet significant wage penalties in the Australian labour market, the effect of overskilling on wages was found to be

Table 8. Impact of qualification-skill mismatch on labour market outcomes of tertiary education graduates, adult employees, 2014, EU-28

	Overqualified		Matched qualifications		
	Overskilled	Matched skills or underskilled	Overskilled	Underskilled	Matched skills
Gross hourly wage	17.64	14.96	18.32	16.67	18.56
Job satisfaction	6.17	7.08	6.91	6.74	7.35
Job insecurity	3.02	2.81	2.51	3.1	2.35
Skill obsolescence	3.82	4.05	3.74	4.78	3.92

NB: The scales of job satisfaction, job insecurity and skill obsolescence are measured on a 0 to 10 scale, where 0 = very unlikely/very dissatisfied and 10 = very likely/very satisfied.

Source: Cedefop ESJ survey.

statistically insignificant in a sample of OECD countries surveyed as part of the recent PIAAC exercise (OECD, 2013).

According to the ESJ survey, tertiary education graduates who find a job that is a perfect match to both their level of qualifications and skills enjoy the best labour market outcomes relative to other mismatched population groups (Table 8). They receive the highest mean earnings and are the most satisfied with their jobs. They generally feel that it is very unlikely that they will lose their job in the next year. Compared to those who are perfectly matched, overqualified tertiary education graduates receive lower gross earnings, although having higher skills than needed by the job is associated with higher mean wages. The genuinely overqualified (overqualified and overskilled) suffer from the highest levels of job dissatisfaction, while the underskilled are more likely to worry about their skills becoming outdated in the foreseeable future.

EU workers employed in jobs demanding higher qualifications or skills than their own are significantly more likely to have greater levels of perceived skill obsolescence, a consequence of the fact that these individuals are employed in jobs of higher than average skill intensity (Figure 17). While 33% of underskilled employees think

their skills are likely or very likely to become outdated in the next five years, 20% of matched or overskilled workers stated that this is true. Employees who suffer from significantly larger skill deficits in their jobs are more worried about their inability to keep up with the rising skill demands of their jobs.

Not having the right skills to be fully proficient in one's jobs, or skills and qualifications that are below what is needed to perform the tasks and duties in a job, is also associated with significantly higher levels of job insecurity ⁽¹⁰⁾. All groups of mismatched employees, whether they suffer from qualification or skill mismatches, or their skills are in deficit relative to the optimal productivity threshold of the jobs, rank their levels of satisfaction significantly lower relative to comparable matched employees (Figure 18) ⁽¹¹⁾, ⁽¹²⁾.

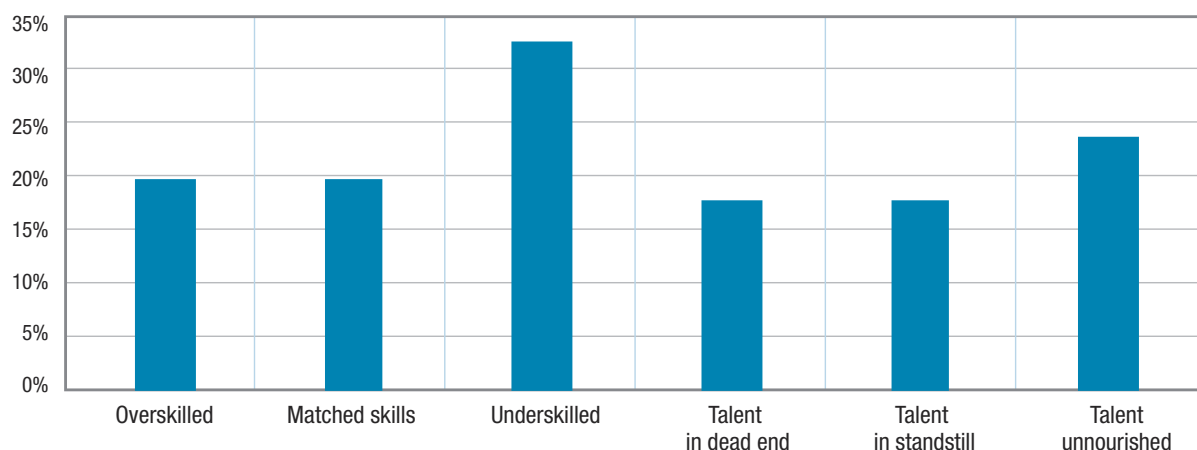
Earning functions reveal that the genuinely overqualified suffer from a 22% wage penalty relative to perfectly matched employees (matched in both qualifications and skills), despite having the same level of education (Table 9). By contrast, the apparently overqualified have 18% lower gross hourly wages, on average. The lower wage penalties of overqualified workers whose skills are matched to their job imply that employers adjust wages according to individuals'

⁽¹⁰⁾ The survey showed that respondents in Greece and Cyprus had the greatest levels of job insecurity in 2014 (32% and 28% said it was likely that they would lose their job in the next year, compared to 13%, on average, in the overall sample of EU employees), while respondents in western Europe were the most confident about keeping their jobs.

⁽¹¹⁾ All raw findings reported in this section have been validated in a multivariate regression framework that examines the independent influence of qualification and skill mismatch on the skills obsolescence/job insecurity/job satisfaction scales taking into account several individual and job characteristics as well as the skill intensity of jobs.

⁽¹²⁾ For example, seven in 10 respondents (73%) who said their skills are matched to what is required by their job were satisfied with it compared to around 60% of respondents who thought their skills are either above or below what is required. Just over one in 10 respondents who thought they are overskilled or underskilled said that they are dissatisfied with their job (14% and 12% respectively), compared to one in 20 who reported that their skills are matched (6%).

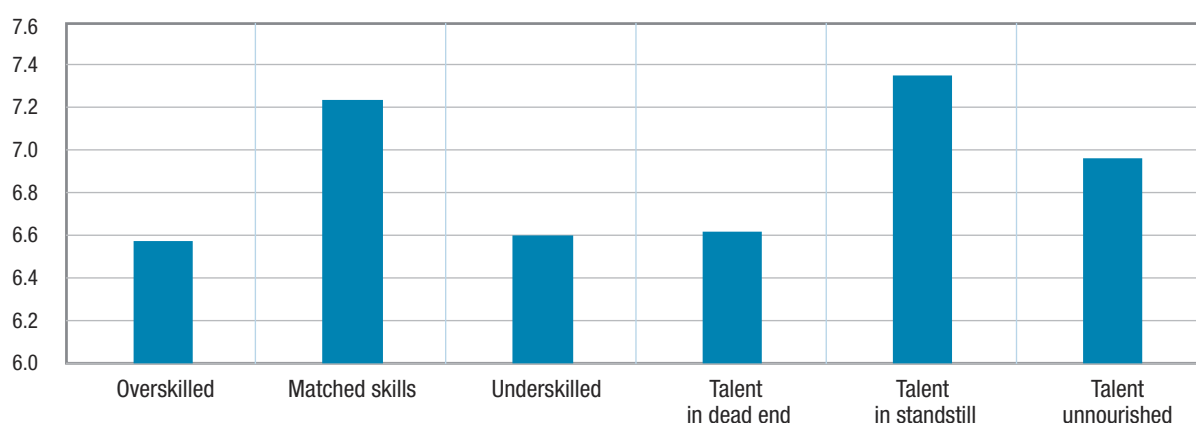
Figure 17. **Impact of current skill mismatch on likelihood of skills obsolescence, adult employees, 2014, EU-28**



NB: Average share of respondents who said that it is likely or very likely (i.e. a score above seven in a 0 to 10 scale) that several of their skills will become outdated in the next five years.

Source: Cedefop ESJ survey.

Figure 18. **Impact of skill mismatch on job satisfaction, adult employees, 2014, EU-28**



NB: Average job satisfaction score on a 0 to 10 scale, where 0 = very dissatisfied and 10 = very satisfied.

Source: Cedefop ESJ survey.

productivity and skills (OECD, 2013). This is also evident by the fact that underqualified workers, who nevertheless possess the required skills to do their jobs, are more likely to enjoy positive relative wage premiums. Underqualification is generally associated with higher wages compared to those of workers who are well-matched in their qualifications and skills, although the effect of underskilling is not statistically significant, on average, once the (typically higher) skill intensity of their jobs is taken into account.

A significant part of the wage penalties of overqualified workers, especially those with medium-level education, can be attributed to being in industries, occupations and jobs with lower skill content (Mavromaras et al., 2015b). By

contrast, the wage premiums of underqualified workers partially reflect their employment in more skill-intensive jobs, with the residual wage difference arising due to their higher stock of (non-formal and informal) skills and abilities. Even among individuals employed in jobs with comparable skill intensity, significant wage differentials (in the order of 8 to 10%) continue to be observed between individuals mismatched in their qualifications and the perfectly matched.

Part of the significant wage penalty of overqualified tertiary graduates also arises because of their own job preferences, since these individuals are less likely to select jobs on the basis of suitability with their own skills and qualifications (Mavromaras et al., 2015b).

Table 9. **Impact of qualification-skill mismatch on gross hourly earnings, adult employees, 2014, EU-28**

	Job requires upper secondary degree	Job requires tertiary education degree
Upper secondary graduate	Matched qualification	Underqualified
Overskilled	14.56	17.46
Matched skills	13.76	16.51
Underskilled	14.95	19.09
Tertiary education graduate	Overqualified	Matched qualification
Overskilled	17.64	18.32
Matched skills	14.58	18.56
Underskilled	17.69	16.67

Source: Cedefop ESJ survey.

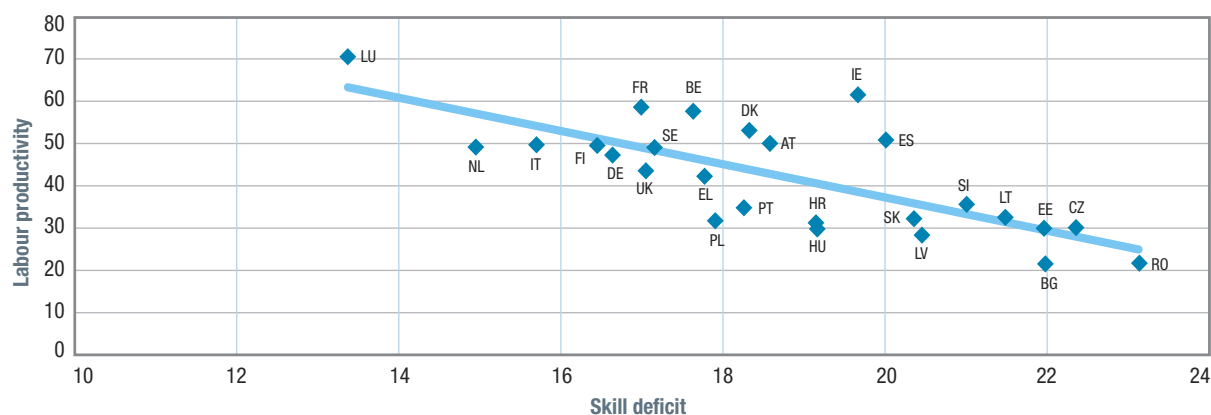
Instead, they place a higher premium on jobs with more security, a trend which is expected to have been accentuated in recent years as many individuals will have sought for job security to cope with the high levels of economic uncertainty caused by the economic crisis. These findings also highlight the importance of high quality career guidance and counselling in terms of its potential to inform better the motives and job choices of individuals. The overqualified also face greater financial constraints relative to the perfectly matched, an additional factor that accounts for their lower average wages.

Even though the survey highlights significant productivity loss associated with the underutilisation of the skills of higher educated graduates, higher levels of education and skills among individuals are valued by employers in the labour market. For instance, while overqualified tertiary education graduates (those in a job requiring only an upper secondary qualification or less) receive, on average, an hourly gross wage equal to EUR 15, this is higher than the respective mean wage of matched upper secondary graduates in a comparable job (which is equal to EUR 13.7). This wage difference is greater when the overqualified tertiary graduate also has surplus skills relative to what is needed by the job (EUR 17.6). Similarly, an underqualified upper secondary graduate (employed in a job requiring tertiary qualifications) earns on average, less than well-matched workers in similar jobs (tertiary graduates in jobs in need of a tertiary education level). However, the earnings of the former are greater than those of an upper

secondary graduate in a job that is commensurate to his/her level of qualification.

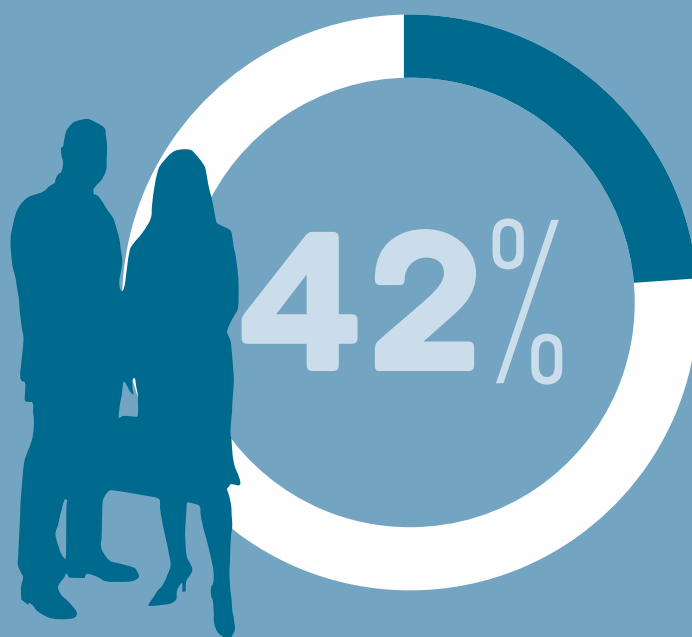
Skill mismatches do not only impose costs on individuals and enterprises, but also have negative consequences for economies at macro level. Figure 19 illustrates that there is a significant negative raw correlation, in the order of -0.75, between the incidence of skill deficits that affect the employee populations in EU countries and the cross-country variance in levels of labour productivity. Overall, the correlation implies that EU Member States that can lower the average level of skill deficit in their workforce (for example by means of additional or better quality CVET) can potentially enjoy significant benefits in enhanced labour productivity. The strong negative relation shown in the chart confirms that the measure of skill deficit collected as part of the ESJ survey is a good indicator of labour productivity, and explains more than half of its variance across EU countries. It highlights that EU Member States that fail to explore fully the potential of their skilled workforce will be hampered by significant productivity losses and can suffer from reduced ability to explore efficiency gains in the production process or to engage in innovation (OECD, 2013).

Figure 19. Skill deficits and labour productivity, 2014, EU-28

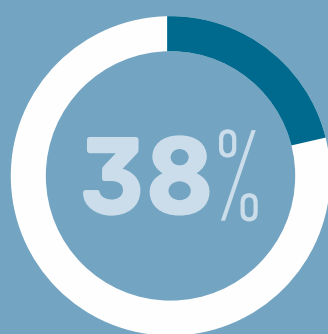


NB: Labour productivity is calculated as GDP PPP (estimates) divided by employment and working hours. Skill deficits are derived as the difference between the level of skills needed by an employee to do his/her job as well as possible (equal to a score of 100) and his/her own assessed skill level relative to that benchmark. Country averages of skill deficits are displayed in the chart.

Source: Cedefop ESJ survey; World Bank (development data group).



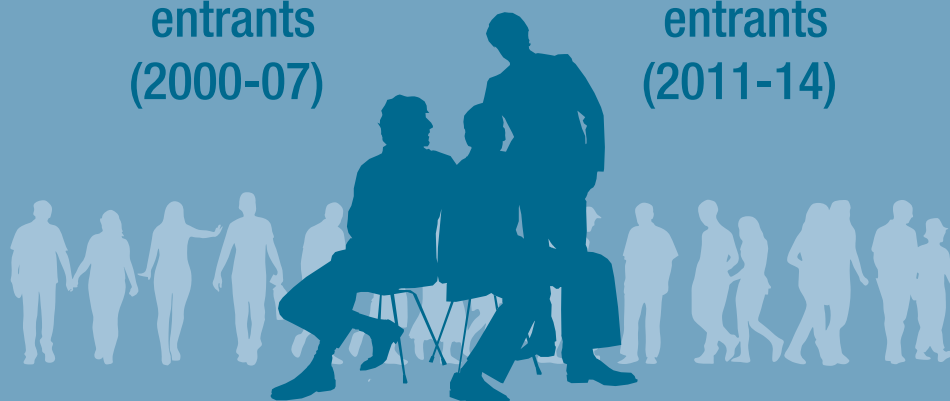
42% of EU workers had few opportunities
to find jobs
suitable for their skills and qualifications
when searching for a job



Pre-crisis
labour market
entrants
(2000-07)



Post-crisis
labour market
entrants
(2011-14)



The legacy of the crisis: un(der)employment and skill mismatch

3.1. Graduate entry to the labour market

The intense job destruction resulting from the 2008 economic crisis, and the general rise in the duration of unemployment, exacerbated concerns about deskilling affecting millions of unemployed European citizens. Rising levels of skill mismatch were also fuelled by limited job creation, which compromised the job prospects of lower-educated individuals while prompting higher levels of graduate overqualification, coupled with significant restructuring in crucial economic sectors of the European economy (including construction and manufacturing). Evidence of a small rise in European structural unemployment, as also reflected by the outward shift in the EU Beveridge curve, is said to illustrate rising matching inefficiencies in European labour markets. Part of these matching frictions is related to a growing imbalance between demand for and supply of skilled labour (ECB, 2012; European Commission, 2014a).

Even during times of high unemployment and low vacancy creation in many EU labour markets, about four in 10 establishments in the EU claimed that they could not find labour with the right skills (Eurofound, 2013). Employers often claim that they encounter difficulties in finding not only individuals from particular professions (such as skilled trades workers, metal machinery and sheet workers, engineers, health and ICT professionals, accountants and managers) but also for ‘job ready’ graduates and/or candidates who possess the right mix of technical and soft skills (European Commission, 2014d; Manpower, 2014). Cedefop (2015a) has shown that a significant part of such difficulties is not genuinely related to an absence of skills on behalf of job applicants but reflects numerous other influences,

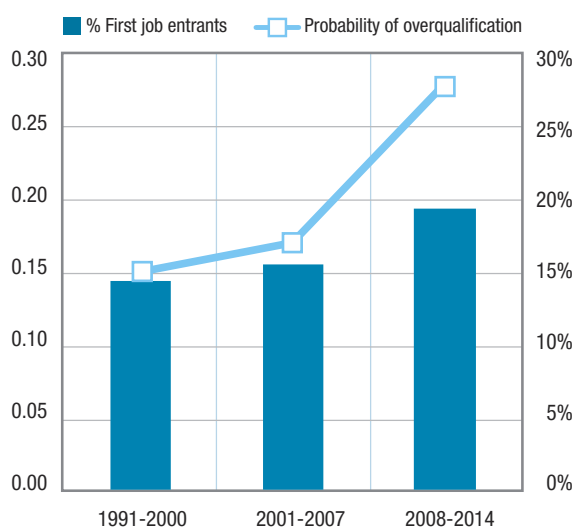
such as the offer of jobs with undesirable job conditions, inefficient talent management and recruitment practices and geographic unsuitability.

However, Cedefop (2015a) has also shown that genuine shortages in the supply of skilled labour can be a constraint for Europe’s most innovative and dynamic enterprises, which compete in international markets. Skill shortages are more likely to have constrained the productivity potential of a subset of EU economies during the economic downturn (Germany, Poland, Slovakia, UK), considering that low or falling unemployment rates have coincided with rising difficulties to fill vacancies by employers (European Commission, 2015b). However, in several other EU countries (Bulgaria, Greece, Italy) there is growing divergence in the propensity of employers and individuals to find suitable skills and jobs. This signifies the existence of deeper or structural matching barriers in these economies, which tend to be two-sided: educated workers are failing to find employment that is suitable for their skills and qualifications while employers are failing to find labour with desired skills.

In addition to concerns about skill shortages, the ESJ survey cautions that a greater share of the most recent cohorts of EU graduates has accepted jobs that need lower qualifications than their own. A raw comparison of the perceived qualification match between individuals who graduated post 2008, after the onset of the global financial crisis, with earlier cohorts of graduates, reveals that the former are more likely to have entered into their first jobs as overqualified workers relative to the latter (Figure 20) ⁽¹³⁾. The probability of overqualification has risen from about 0.15 to 0.17 in the pre-crisis period to 0.28 for recent (post-2008) graduates.

⁽¹³⁾ The analysis refers to individuals who have graduated from at least an upper secondary level of education, although the main empirical conclusion, that a higher share of recent graduates have accepted jobs requiring lower qualifications than their own, holds even when restricted to tertiary education graduates only.

Figure 20. **Overqualification of first job entrants by graduation cohort, 2014, EU-28**



NB: Sample of overqualified individuals with above upper secondary qualifications whose current job is their first; overqualified workers have a higher level of education attainment relative to the self-reported level actually needed to do the job. Cohort of graduation is determined by the question: 'In what year did you achieve your highest level of education?' The probability of overqualification is based on estimates of a probit regression that controls for individual and job characteristics to ensure that comparable individuals are contrasted across cohorts.

Source: Cedefop ESJ survey.

The increasing probability of overqualification among recent labour market entrants is statistically significant and holds even after taking into account several observable factors that could confound the divergent overqualification rates between separate graduate cohorts. For example, the estimated probability is robust even accepting that the average graduate may have different demographic and socioeconomic characteristics that vary depending on the period of graduation ⁽¹⁴⁾. Such observable (yet non-exhaustive) factors in the ESJ survey include the years of employer tenure of an individual employee, age at start of the first job, gender, the type of contract offered, career progression since the start of the job, as well as the overall skill intensity of the job (captured by the type of occupation and industry of the employee as well as the complexity of job tasks).

3.2. Return of the unemployed to work

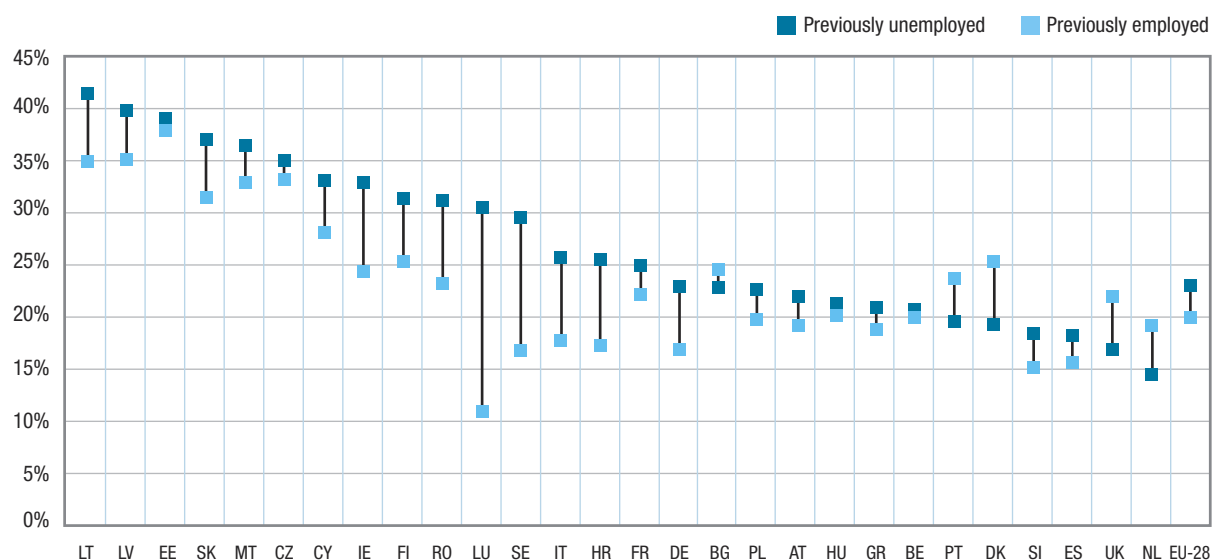
Across Europe, the financial crisis and sluggish economic recovery have caused unemployment to increase to over 10% (Eurostat, 2014), affecting the overall composition and quality of Europe's labour supply. ESJ survey data show that 18% of adult employees in Europe were unemployed or not working before starting their current job. About 20% of employees who began their current employment in the post-crisis period (2011-14) were previously unemployed as opposed to 13% during the years of the crisis (2008-10) and 10% in the pre-crisis era. Recent labour market entrants in Greece and Spain are the most likely to have been unemployed before starting their current job (40% and 32%, respectively), illustrating the impact of the deep recession in these countries. In Greece, those who were previously unemployed are the most likely to have been unemployed for more than a year (58% compared to 42% for the EU).

Reintegration of the unemployed back into the labour market is a significant challenge and highlights the need to invest in the prevention of skill mismatches not only at the time of their job (re-)entry but also during their jobs, after they have returned to the labour market. Given that the unemployed, and in particular those unemployed for more than one year before starting their current job (LTU), are likely to have experienced some skills atrophy (or lack of further skill development) during the time they were outside the labour market, they are more susceptible to having lower skills than needed by their jobs and will consequently be in need of continuous learning so that their skills can catch up with changing job requirements.

The ESJ survey confirms that, on average in the EU-28, previously unemployed individuals returning to the labour market, particularly those in long-term unemployment, are more likely to suffer from underskilling at the time of job entry, relative to those moving from one job to another (Figure 21). The chances of previously

⁽¹⁴⁾ It is acknowledged that comparisons of skill mismatches of different cohorts of graduates who made the transition to their first job at distinct time intervals are likely to be hampered by varying population compositions and economic circumstances over time. Memory bias may also affect the responses to the survey, particularly in relation to questions about the respondents' skill gaps at the time of entry into the job.

Figure 21. **Difference in shares of underskilled employees at job entry by prior labour market status, adult employees, 2014, EU-28**



NB: Responses to the question: 'When you started your job with your current employer, to what extent would you say that some of your skills were lower than required to do the job at that time and needed further development?'

Source: Cedefop ESJ survey.

unemployed persons reporting that they were underskilled when they started their job are highest in the Baltic states, the Czech Republic, Malta, Slovakia and lowest in Spain, the Netherlands, Slovenia and the UK.

The ESJ survey also asked respondents to rank how well matched a set of their specific skills is to the level that is needed to do their jobs. The selected skills covered a broad range of cognitive, digital and transversal skills, identified in the literature as aggregate groupings that effectively summarise or capture the variance of a wider range of different tasks performed by individuals as part of their jobs (Mañé, 2013; Table 11 for details).

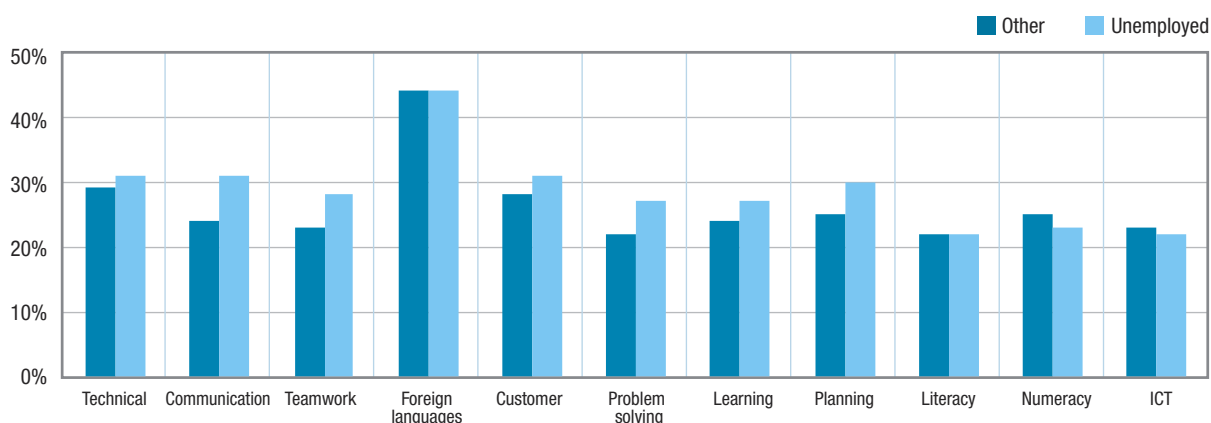
Figure 22 contrasts the mean shares of individuals in the EU with skill gaps in their current job according to whether they were unemployed prior to finding their jobs or not. It is clear that a spell of unemployment is not associated with greater cognitive and digital skill gaps (in literacy, numeracy, ICT and foreign language skills) for those who returned to employment, relative to those who did not experience a period out of work ⁽¹⁵⁾. Nevertheless, the ESJ data highlight

that a past episode of unemployment manifests in higher raw skill gaps in technical and generic skills, which employers also tend to identify as the primary reasons for the difficulties they face in filling their open vacancies (Manpower, 2014). This poses a significant challenge for training programmes geared towards mitigation of skill mismatches of the unemployed (for example as part of active labour market policies or other adult learning courses), as it implies that they need to strike a balance between the endowment of a right blend of job-specific and soft skills to prepare job seekers better for their return to the world of work (Cedefop, 2015c).

The survey highlights that reintegration of the unemployed is a significant challenge for Europe, given that they are likely to possess specific characteristics relative to other segments of the adult working population. For instance, they are more likely to be lower educated, non-natives and are generally faced with considerable financial constraints while searching for employment. They are more likely to suffer from skills obsolescence and increased risk of stigmatisation (such as having fewer opportunities to attend job

⁽¹⁵⁾ Part of the reason for this is that a greater share of previously unemployed workers are employed in elementary jobs as well as in clerical and sales occupations and it is more likely for individuals to think that their level of skills is higher than required in lower-skilled occupations.

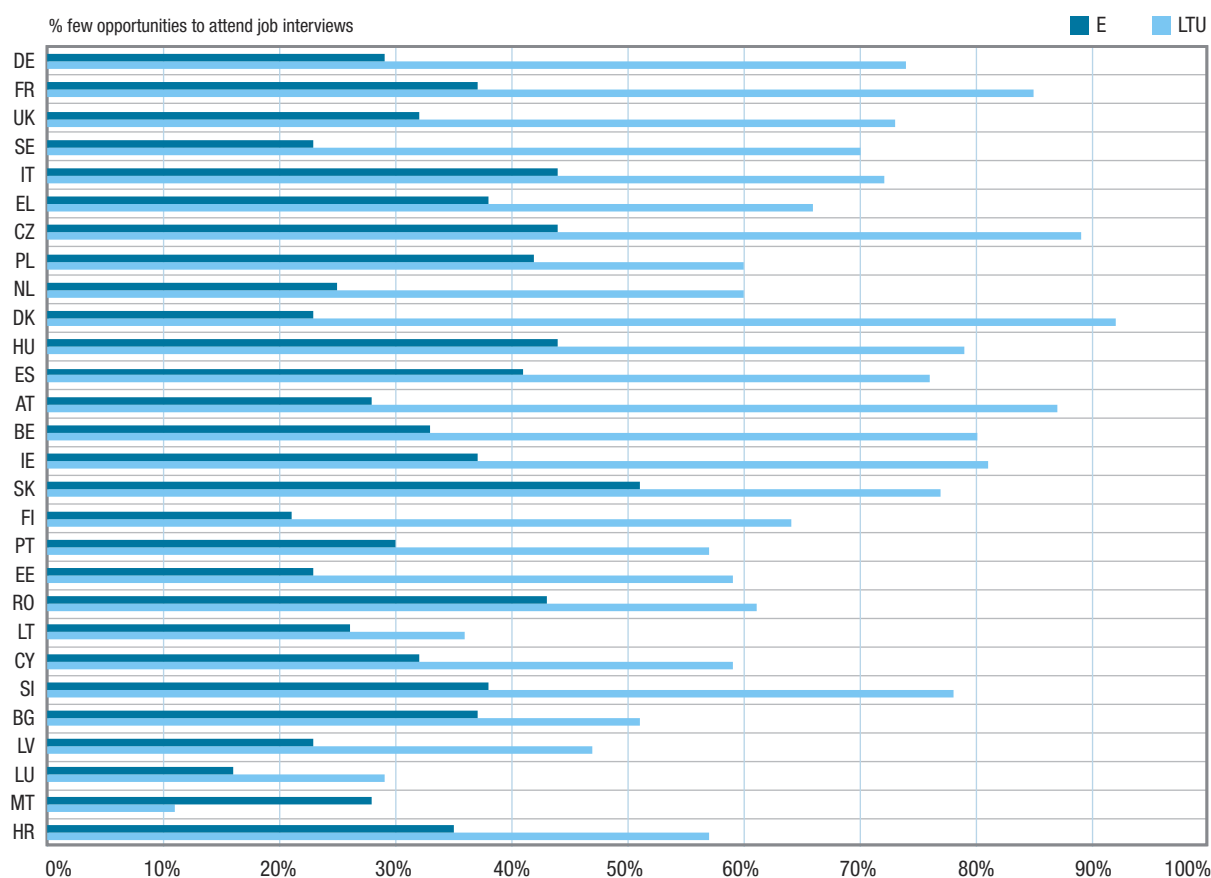
Figure 22. **Raw difference in shares of employees with low-ranked skills relative to those required for their job by past unemployment status and specific type of skill, 2014, EU-28**



NB: Share of respondents below the lower quartile of the distribution of responses to the question: 'How would you best describe your skills in relation to what is required to do your job?' (corresponding to scores below 6 in a 0 to 10 scale, where 0 means that the level of skills is a lot lower than required and 10 a lot higher than required).

Source: Cedefop ESJ survey.

Figure 23. **Lack of opportunity to attend job interviews by past labour market status and EU Member State, adult employees (aged 24-65), 2014**



NB: Responses to the question: 'Did any of the following circumstances apply before you started working for your current employer? Despite sending many job applications, I had few opportunities to attend job interviews; E = employed in another job before starting current job; LTU = unemployed for more than one year before starting current job.'

Source: Cedefop ESJ survey.

interviews, despite sending many applications) (Figure 23). The previously unemployed would benefit from better career guidance and counselling, given that they are more likely to have selected their mismatched job for reasons of job security, as opposed to its suitability for their skills and competences. They also have a lower propensity to geographic mobility, such as moving between EU countries or even within regions of their own country.

The greater probability of underskilling among workers who experienced a prior spell of unemployment, mainly LTU, should be a concern for two reasons.

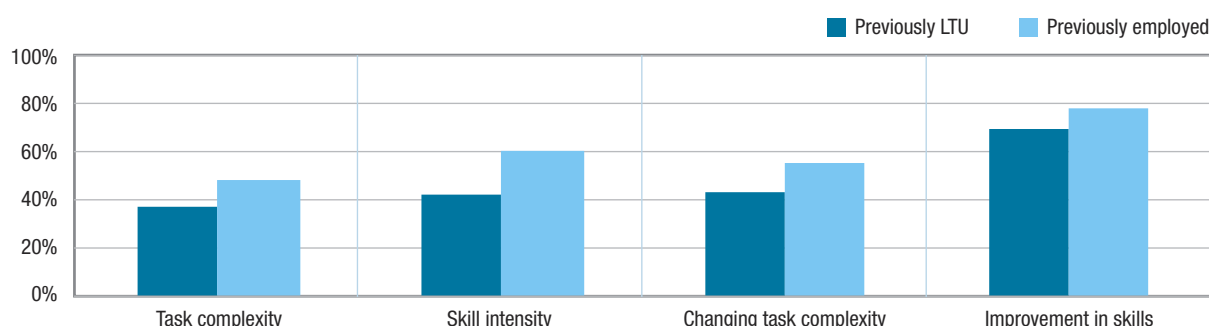
First, the LTU who have managed to find a job are likely to possess particular characteristics (such as better employer networks) or better skills that distinguish them from the remaining total pool of LTU individuals. It is therefore reasonable to expect that the latter group is likely to be characterised by significantly higher skill deficits that will inhibit their reintegration to the labour market, posing even more significant difficulties for public policy.

Second, according to the ESJ survey data, EU workers who experienced a spell of long-lasting unemployment are also more likely to be

in jobs with lower job complexity and skill intensity relative to those who were previously in employment (Figure 24). The disadvantaged starting point of the previously LTU who return back to work is expected to perpetuate over time, given that the skill formation of individuals over their lifespan is just as much a function of their past investments in human capital as it is dependent on the nature of skill needs and of work tasks in their jobs (Desjardins, 2014).

Figure 24 illustrates that, on average in the EU, the skills of the previously unemployed returning to a new job are less likely to improve during their job tenure, relative to those who were previously employed in other jobs or graduates entering their first job. Statistically significant ‘skill formation penalties’ for the previous unemployed are found in nine EU Member States, most notably in Greece, the Netherlands, and Slovenia, but also in Bulgaria, Germany, Spain and the UK (Figure 25). The finding is robust even when accounting for the different levels of skill mismatch between the two groups when they started their new jobs, changes in the technologies and tasks required by their jobs over time, and whether they experienced any within-job progression (such as promotion) ⁽¹⁶⁾.

Figure 24. **Difference in skill formation and skill needs of adult employees’ current jobs by prior labour market status, 2014, EU-28**



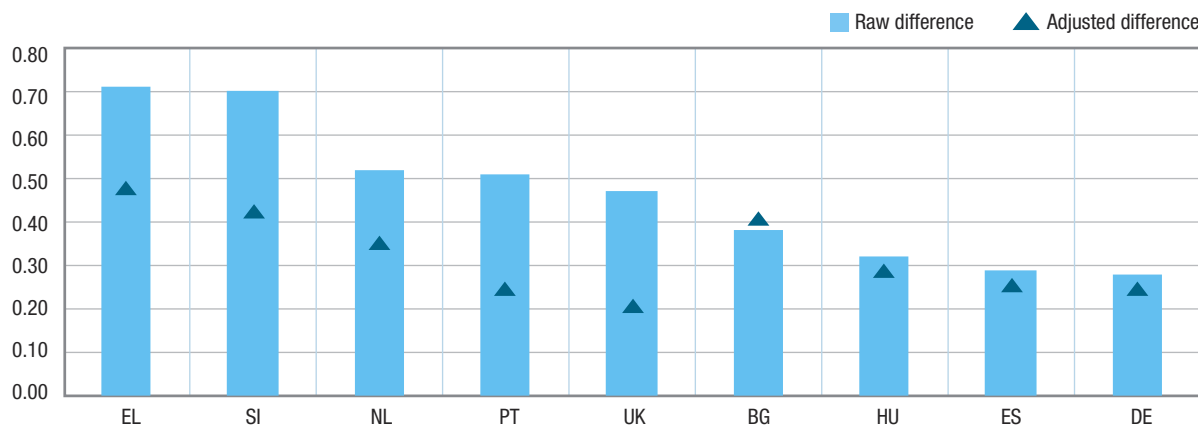
NB: % of employees at the top of each scale: above three in the scale of task complexity; above seven in the scales of skill intensity, changing task complexity and skill improvement ⁽¹⁷⁾.

Source: Cedefop ESJ survey.

⁽¹⁶⁾ The finding holds when employing different econometric methodologies (e.g. OLS, matching estimators, instrumental variables) and model specifications that take into account a number of historical variables that preceded their differential labour market status. However, there are several changes that may have taken place over time in people’s jobs that have not been fully captured by the ESJ survey. There is also considerable cross-country heterogeneity in the estimated effect. For details of the estimation methodology, see Annex 2.

⁽¹⁷⁾ The scales in Figure 24 are derived as a Cronbach’s alpha scale coefficient based on the following items: Task complexity (zero to four scale) = how often, if at all, does your job involve the following? (a) responding to non-routine situations during the course of your daily work; (b) learning new things; (c) choosing yourself the way you do your work. Skill intensity (0 to 10 scale) = how important are the following skills for doing your work? (a) literacy; (b) numeracy; (c) ICT; (d) technical; (e) communication; (f) learning to learn; (g) teamwork; (h) foreign language; (i) customer handling; (j) problem solving; (k) planning and organisation. Changing task complexity (0 to 10 scale) = have the following increased, decreased or remained the same since you started your job with your current employer? (a) the variety of tasks; (b) the difficulty of tasks; (c) the need to learn new things. Improvement in skills (0 to 10 scale) = compared to when you started your job with your current employer, would you say your skills have now improved, worsened or stayed the same?

Figure 25. **Difference in skill formation within jobs between previously employed and unemployed workers, 2014, EU-28**



NB: Bars: difference in the skill improvement scale between previously employed and previously unemployed workers. Triangles: difference in skill improvement scale adjusted for age, gender, native status, highest level of education, skill mismatch status in previous job, employer tenure and employer tenure squared. Responses to question: 'Compared to when you started your job with your current employer, would you say your skills have improved, worsened or stayed the same?'

Source: Cedefop ESJ survey.

3.3. Impact of the economic crisis

Evidence from the ESJ survey indicates that the rise in the share of overqualified young labour market entrants has been exacerbated by the economic crisis. In the current economic climate, competition for jobs is particularly high and so it is possible that people felt that they needed to accept jobs for which they were not ideally suited, particularly those who faced difficult personal situations. To try to understand the extent to which challenging personal circumstances might impact upon people's decisions to accept unsuitable jobs, the ESJ survey asked respondents about their situation before they started their current job in relation to family obligations, whether they owned their main residence or had to pay a mortgage, and whether they had considerable financial difficulties before starting their job with their current employer. It also asked respondents to assess the macroeconomic landscape affecting them; for example, whether there were few job opportunities for people with their skills and qualifications and whether they had opportunities to attend job interviews.

On average in the EU, 42% of respondents felt in 2014 that they had few opportunities to find jobs suitable for their skills and qualifications at the time of their job search. Over a third (35%)

had few opportunities for job interviews (despite sending many applications). Respondents in Bulgaria, Greece, Cyprus, Hungary and Romania were most likely among all Member States to say that they had few suitable job opportunities before accepting their current job. In the aftermath of the economic crisis a greater proportion (52%) of job finders encountered unsuitable job opportunities in relation to their own qualifications and skills before they accepted their current employment.

As shown in Figure 26, those who found their current job after 2011 were more likely to receive a limited set of suitable job offers relative to those hired before the crisis. The higher probability of recent job finders finding few suitable jobs is statistically significant and remains so even if other important individual and job characteristics are included, which could affect their overall set of available job opportunities. For example, females and individuals who experienced a previous spell of unemployment are more likely to have been confronted with a limited availability of suitable job possibilities. The same holds for those faced with particular constraints that may have inhibited their ability to search more extensively for a suitable job, including family obligations, financial constraints, home-ownership or labour market immobility.

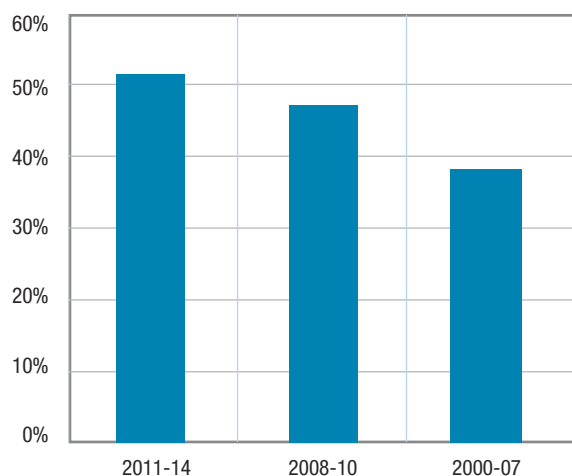
Financial distress and declining household incomes at the time of job entry have also weighed more heavily on the job choices of

recent labour market entrants, forcing individuals to accept mismatched jobs. Around one in five respondents (19%) faced considerable financial difficulties before entering into their current job. Employees in eastern and southern Europe were more likely to face financial difficulty than those in northern and western Europe (30% and 23% compared to 16% and 13%, respectively). Employees from Germany and Luxembourg were least likely to have faced such adverse labour market circumstances. Generally, overqualified workers are more likely to say that they had financial difficulties prior to finding their job.

The ESJ findings fail to support the argument that higher recent qualification mismatches can be attributed to deteriorating skills quality of recent graduates. As shown in Figure 27, a smaller share of recent graduates and job finders

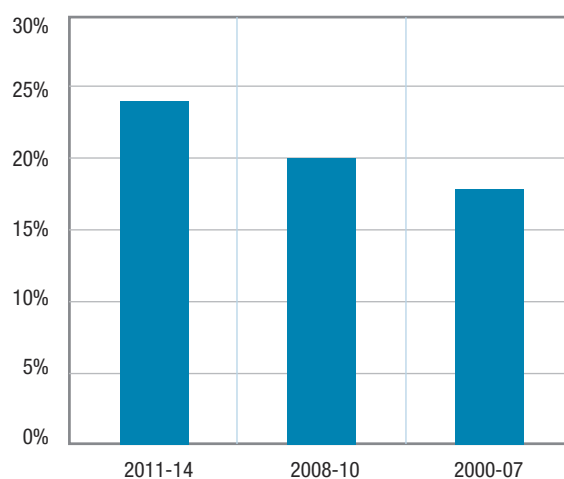
indicated in the survey that their skills were lower than needed at the time of entry to their job, relative to previous cohorts. Part of the smaller probability of underskilling among recent graduates can be attributed to the fact that the jobs created post-2011 are more likely to be precarious or of lower quality. However, even taking into account differences in skill intensity and in other job characteristics (type of contract, part-time job, small firm, type of industry and occupation) between the graduate cohorts, no statistically significant differences in rates of underskilling are found.

Figure 26. **Share of adult employees with few opportunities to find a job suitable for their skills and qualifications by period of job entry, 2014, EU-28**



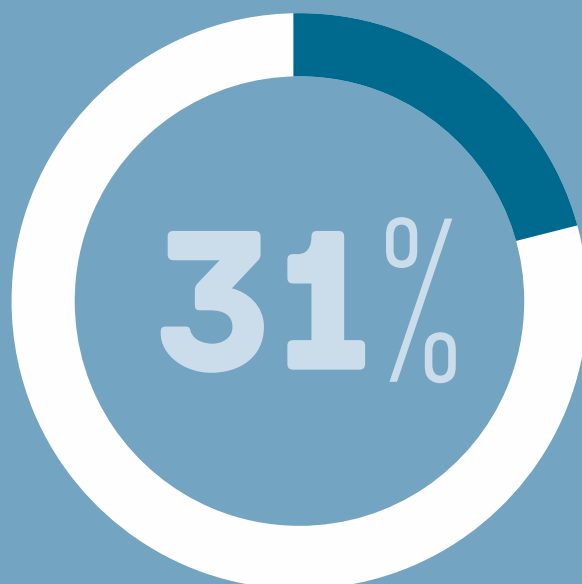
Source: Cedefop ESJ survey.

Figure 27. **Average share of adult employees (aged 24-65) underskilled at the start of their job by period of job entry, 2014, EU-28**



NB: Share of adult employees with positive responses to the 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: Cedefop ESJ survey.



31% of EU employees
who made a transition from school to their first job
had lower skills than needed
when they started their job



Tackling skill mismatches among the young with high quality VET

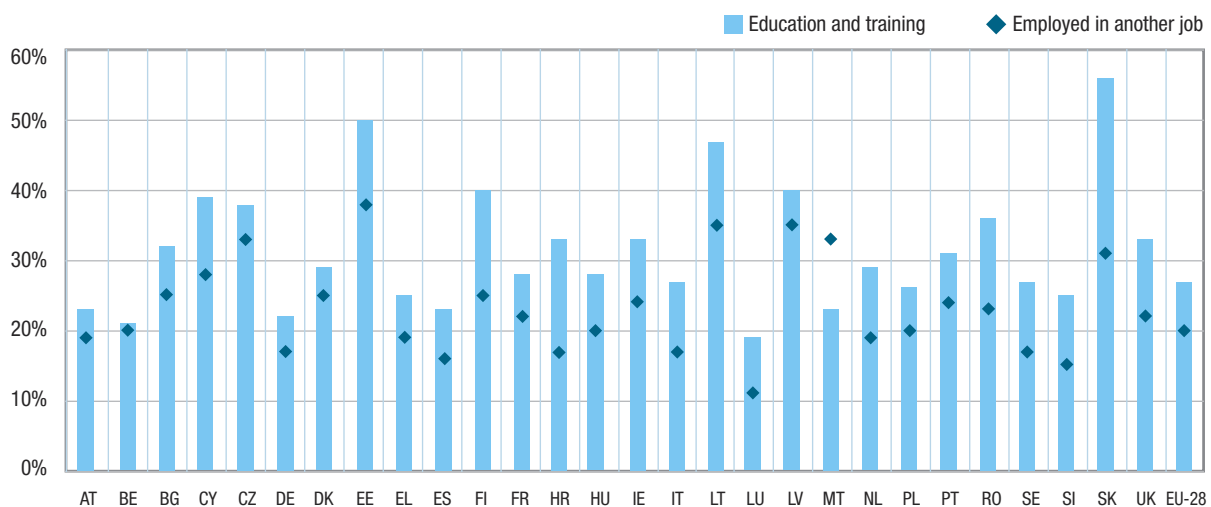
4.1. Underskilling at labour market entry

Following the outbreak of the financial crisis, several Member States (including Bulgaria, Greece, Spain, Italy and Cyprus) experienced markedly higher rates of youth unemployment and of young people who were neither in employment nor in education or training (NEETs). This raised concerns about the ability of their education and training systems to integrate young individuals effectively into the labour market. Much attention has been paid to their weaker VET systems (relative to countries with dual training systems) and the low incidence of apprenticeships and WBL in these countries (Cedefop, 2012a; Eichhorst et al., 2012). Some have argued that the weaker investment in graduates' skills in these countries may be related to why employers report difficulties in finding the right talent, particularly why they report technical and soft skill deficits among young graduates (McKinsey Centre for Government, 2012).

The ESJ data show, as expected on the basis of their limited work experience, and given that education and training systems cannot prepare young people fully for any job they take on entry to the job market, that levels of underskilling for young people (in particular, females and the low-qualified) at the start of their first job tend to be higher than of the average employee. A total of 31% of respondents whose current job is their first and 27% of those who were in education or training before they started their current job said that their skills were lower than required when they started (Figure 28). This is significantly higher than the average incidence of underskilling at job entry for the whole sample (22%) and confirms that a significant share of people making the transition from school to the labour market do not possess the level of maturity in their skills required by their jobs.

Figure 29 indicates that younger employees are more likely to give a lower ranking to their technical skills (specialised knowledge to perform job tasks and handle technical equipment)

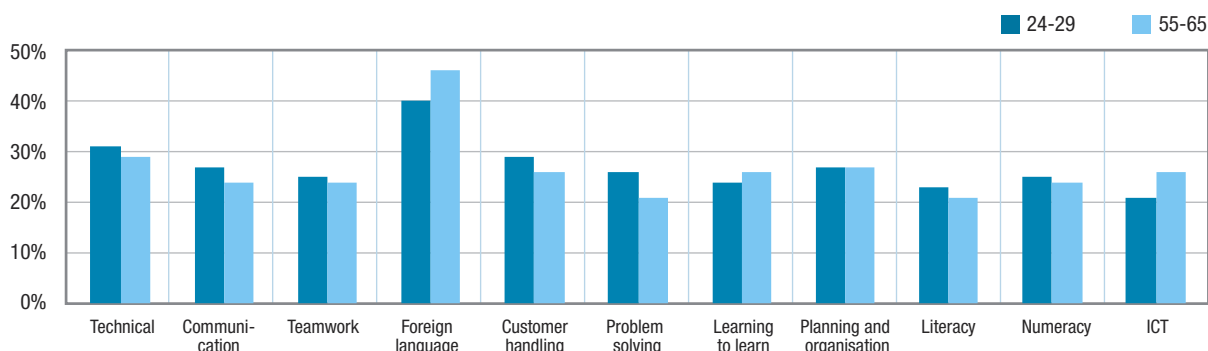
Figure 28. **Raw difference in shares of underskilled employees at job entry by prior labour market status, 2014, EU-28**



NB: Responses to question: 'When you started your job with your current employer, to what extent would you say that some of your skills were lower than required to do the job at that time and needed further development?'

Source: Cedefop ESJ survey.

Figure 29. **Raw difference in shares of employees with low-ranked skills relative to those required for their job by age group and specific skill type, 2014, EU-28**



NB: Share of respondents below the lower quartile of the distribution of responses to the question: 'How would you best describe your skills in relation to what is required to do your job?' (corresponding to scores below six in a 0 to 10 scale, scale where zero means that the level of skills is a lot lower than required and 10 a lot higher than required).

Source: Cedefop ESJ survey.

relative to older workers, a greater share of whom report that their skills are higher than required. The younger cohort is also more likely to exhibit higher levels of underskilling in soft skills, such as communication, teamwork, customer handling and problem solving. Those older are more likely to be underskilled in foreign languages, learning to learn (learning and applying new methods and techniques in your job; adapting to new technology, equipment or materials; engaging in own learning) and in digital skills.

The gap between the skills of younger workers and those needed by their jobs during the school-to-work transition also vary considerably across the EU, reflecting differences in the quality and responsiveness of education and training systems but also in technologies and level of skills demanded in entry level jobs across distinct EU economies. New labour market entrants from Slovakia and the Baltic states experienced the highest skill gaps in contrast to those from Luxembourg, Austria, Slovenia and Sweden. In Slovakia, the proportion of respondents who were previously in education or training and who said that their skills were lower than required at the start of their job is more than twice as high as the EU average (56% compared to 27%).

4.2. Tackling initial skill mismatches with VET

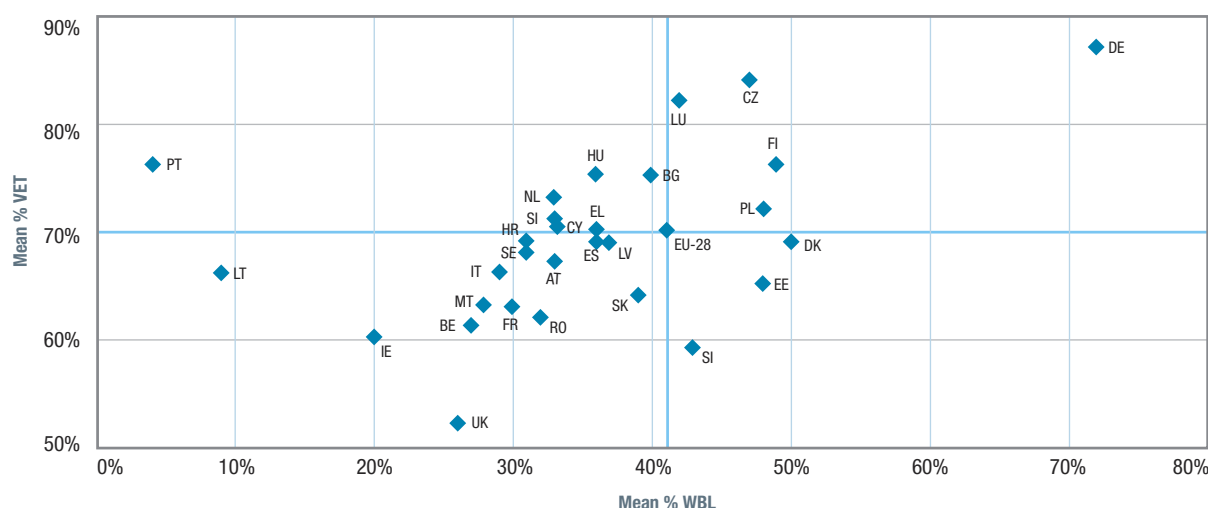
The higher skill gaps of younger workers relative to the adult workforce implies that significant investment in their further skills development is required to attain a better match between their skills and those needed in the labour market. This can be addressed partly by improving their education and training but, crucially, via continuous learning on the job.

VET is a key pillar of European education and training systems, although EU Member States differ in the attractiveness and emphasis placed on this sector as opposed to academically-oriented streams. The contribution of VET, particularly work-based and apprenticeship-type schemes, to fight youth unemployment, to ensure a better match between training and labour market needs and to ease transitions to employment is now more widely recognised at a pan-European level. As an indication of the urgency of reforms in this sector, 22 country-specific recommendations adopted within the 2014 European semester exercise were related to VET (European Commission, 2014b).

About seven in 10 respondents to the Cedefop ESJ survey, holding at least an upper secondary education (ISCED level 3 and above), described their highest qualification as vocational (70%) ⁽¹⁸⁾. The share of employees with a VET

⁽¹⁸⁾ A vocational degree was defined in the survey as one that is 'designed for acquiring knowledge, skills and competences closely linked to a particular job or trade'.

Figure 30. **Average incidence of WBL versus share of employees with VET as highest qualification, adult employees with at least upper secondary qualifications, 2014, EU-28**



NB: Employees with above upper secondary qualifications (ISCED 3-5); lines: EU-28 average (41% WBL; 70% VET); positive responses to questions: 'Overall would you describe your highest qualification as vocational i.e. designed for acquiring knowledge, skills and competences closely linked to a particular job or trade?' and 'Did your study take place only within an education institution (e.g. a school, college or university) or did it involve some learning in a workplace (e.g. apprenticeships, internships, other forms of WBL)?'

Source: Cedefop ESJ survey.

degree is highest in countries such as Czech Republic, Germany and Luxembourg and lowest in Ireland, Slovenia and the UK (Figure 30) ⁽¹⁹⁾.

The ESJ survey shows that VET is instrumental in ensuring excellence and inclusion in education and training. Medium-qualified graduates with vocational qualifications are more likely to select their jobs because they are closely suited to their skills and qualifications, as opposed to reasons such as job security, proximity to home, pay and benefits. As Table 10 shows, a VET degree can also ensure smoother transition from education to work and, in particular, entry into jobs that are well matched to their qualifications and skills. For these reasons, VET graduates generally enjoy higher average levels of satisfaction in their jobs and are less likely to fear losing their jobs in the near future.

Table 10 also shows that a significantly smaller share of individuals with a VET degree (at above upper secondary level) experienced an intermittent spell of unemployment during their transition from school to their first job. A total of

22% of medium-qualified employees that did not gain skills closely linked to a particular job or trade as part of their studies were unemployed before finding their first job, as opposed to 13% of graduates with a VET degree. A smaller proportion of VET graduates are overqualified in their jobs and are more likely to be employed in jobs that need their specific qualifications. Although there is no significant evidence that the skills of VET graduates as a whole lag behind those required by their jobs at the time of recruitment, raw levels of underskilling among younger VET graduates tend to be higher (although this difference is not statistically significant). A much lower share of individuals with a VET qualification exhibits gaps in terms of their specialised knowledge to perform their job duties and to handle specialised technical equipment. Nevertheless, a greater proportion is found to have lower foreign language, literacy and numeracy skills than needed by their jobs compared to non-VET graduates.

⁽¹⁹⁾ Respondents employed in industries such as services relating to education or health, construction or building, and manufacturing or engineering are the most likely to describe their highest qualification as a vocational qualification (78%, 73% and 73% respectively). The same holds for those working as craft and related trades workers (77%) and as technicians and associate professionals (75%). By contrast, individuals working in financial, insurance or real estate services, cultural industries (arts, entertainment or recreation) and retail sales, shop work or wholesale are the least likely to be VET graduates.

Table 10. **Skill mismatch of adult employees by VET status, 2014, EU-28**

	Unemployment before first job		Overqualified		Underskilled at start of job	
	24-29	24-65	24-29	24-65	24-29	First job
non-VET	22%	22%	29%	22%	24%	28%
VET	13%	14%	15%	22%	26%	30%

NB: Sample of individuals with medium-level qualifications (ISCED 3 to 4).
Source: Cedefop ESJ survey.

Taking into account a number of relevant correlated factors, VET graduates are also found to have significantly smaller skill deficits in their jobs and are more likely to be closer to the full productivity threshold. This is evident in Figure 31, which illustrates that, on average, individuals with a medium-level VET qualification are more likely to be in jobs where their skills are a closer match to their current and potential skill requirements.

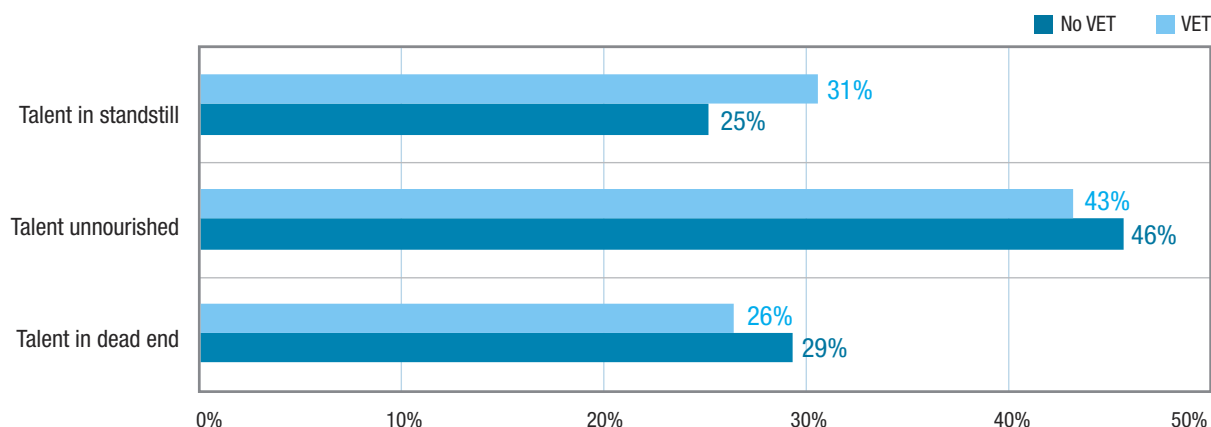
Overall, the findings of the ESJ survey provide strong evidence that vocational skills and qualifications are a valuable route for mitigating youth unemployment and qualification mismatch, in particular increasing rates of overqualification, in European labour markets. However, the slightly greater skill gaps of VET graduates at the start of their (first) jobs are a continued reminder of the need for reform and the pursuit of quality assurance in the VET sector, in line with the revised medium-term priorities of the Bruges communiqué process (Cedefop, 2015b). Such reforms must ensure that the skills of recent students enrolled in VET programmes remain relevant and aligned to labour market needs.

4.3. Promoting all forms of WBL

Strengthening WBL (apprenticeships, internships) and VET systems is a key element of the EU's strategy to combat high youth unemployment, as confirmed by the new set of medium-term (2015-20) priorities in VET (European Commission and Latvian Presidency of the Council of the European Union, 2015). The rethinking education communication (2012a) stressed the need to invest in building world-class VET systems and increase participation in WBL. The European alliance for apprenticeships, 'youth guarantee' and 'youth employment initiative' – all launched in 2013 – confirmed the crucial role of VET in increasing the employability of young people. Learning in the workplace is also an effective way to retrain and upskill the unemployed and adults.

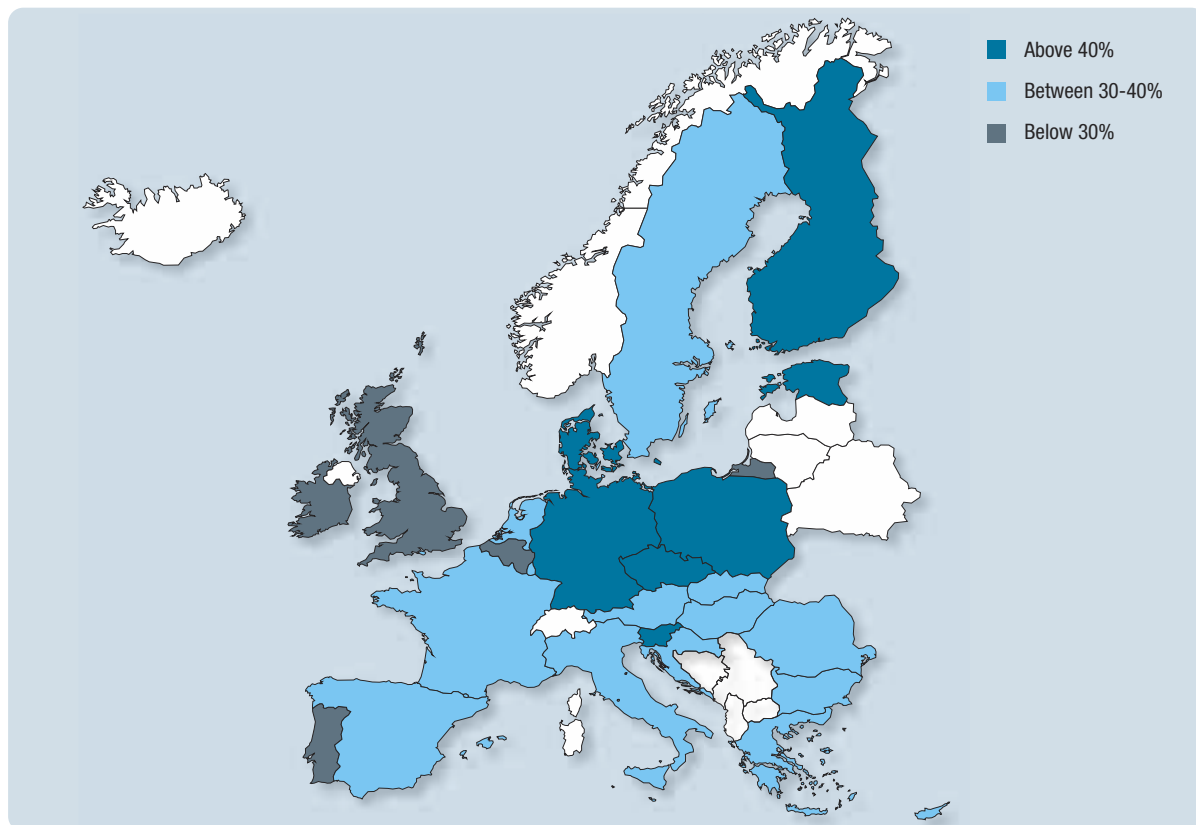
Cedefop (2015b) has reported on the significant progress made at EU Member State level since 2010, in terms of implementation of national policy initiatives aimed at meeting one of the most important strategic objectives of the Bruges communiqué, the promotion of WBL as

Figure 31. **Skill mismatch groups by VET status, medium-qualified adults, 2014, EU-28**



NB: Sample of individuals with medium-level qualifications (ISCED 3 to 4).
Source: Cedefop ESJ survey.

Figure 32. **Proportion of adult workers who completed study involving some workplace learning, 2014, EU28**



NB: All respondents who have completed upper secondary, post-secondary or tertiary education.
Source: Cedefop ESJ survey.

part of IVET and CVET. To find out more about vocational learning and its influence on skill mismatch, respondents with post-upper secondary qualifications were asked if their studies took place only in an education institution, such as a school, college or university, or if it involved some WBL, such as an apprenticeship, internship, or some other form of WBL.

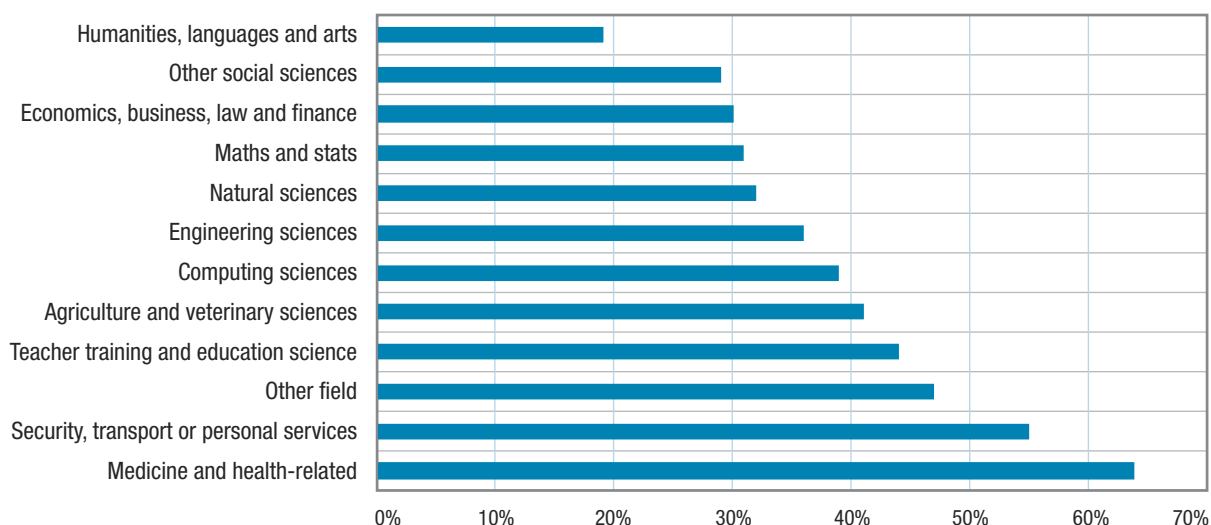
Despite increasing attention to and reforms involving WBL in EU Member States, most (56%) adult employees in the EU (with at least an upper secondary level of education) responded that they completed their studies only within an education institution (a school, college or university). By contrast, 41% of adult workers said that their studies involved some learning in a workplace in the broad sense. Stark differences in WBL exist between the EU-28 (Figure 32). Over two thirds of adult workers in Germany have completed some form of WBL, where the two-tier system emphasises vocational qualifications for individuals attending *Hauptschule* and

Realschule. In contrast, respondents in Portugal (91%), Lithuania (87%) but also Ireland (77%), Malta (73%) and the UK (72%) have predominantly learned in a school-based setting.

Substantial differences in the incidence of WBL are also evident between different education programmes or broad fields of study. Over 67% of recent graduates (aged 24 to 34) from medicine and health-related sciences acquired some experience in a workplace as part of their studies. At the other end of the spectrum, only 25% did so among those who studied humanities, languages and arts, economics, business and law or other social sciences (Figure 33).

There is also a difference by industry when looking at the share of adult workers who had a WBL experience as part of their education. Figure 34 shows that respondents who work in finance, insurance or real estate, cultural industries or professional, scientific or technical services are the most likely to have completed study that took place only within an education institution (67%,

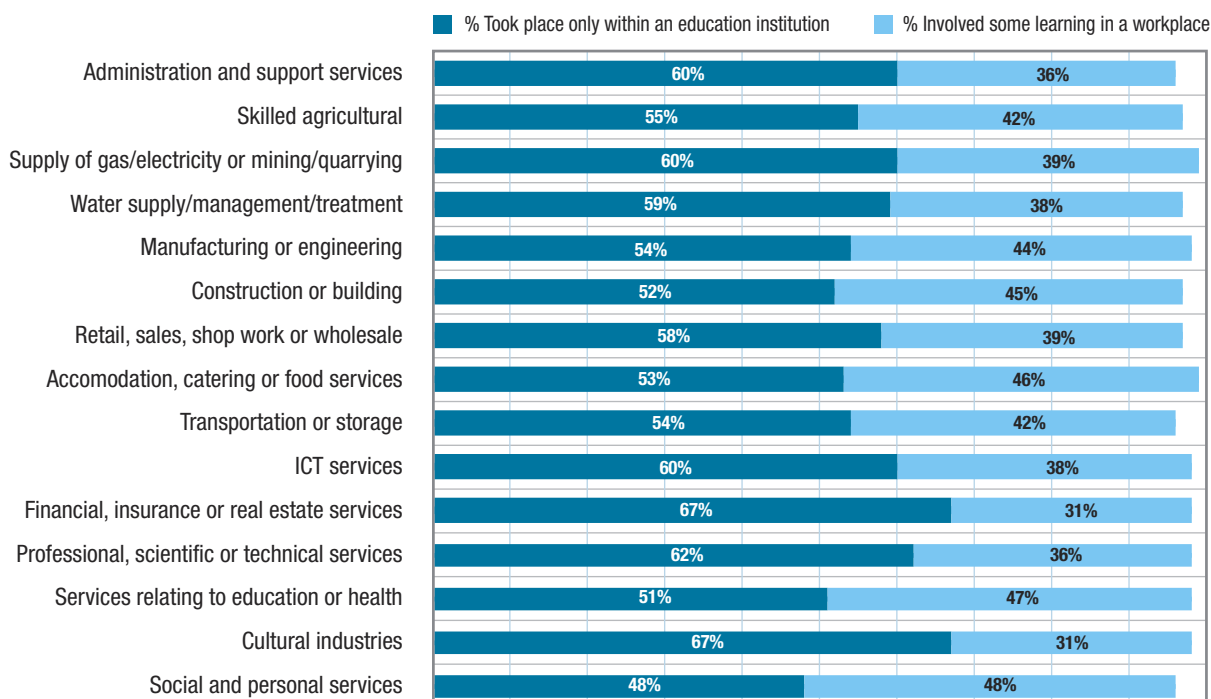
Figure 33. **Incidence of WBL by field of study, adult employees, 2014, EU-28**



NB: All respondents who have completed upper secondary, post-secondary or tertiary education.

Source: Cedefop ESJ survey.

Figure 34. **Work-based learning by industry, adult employees, 2014, EU-28**



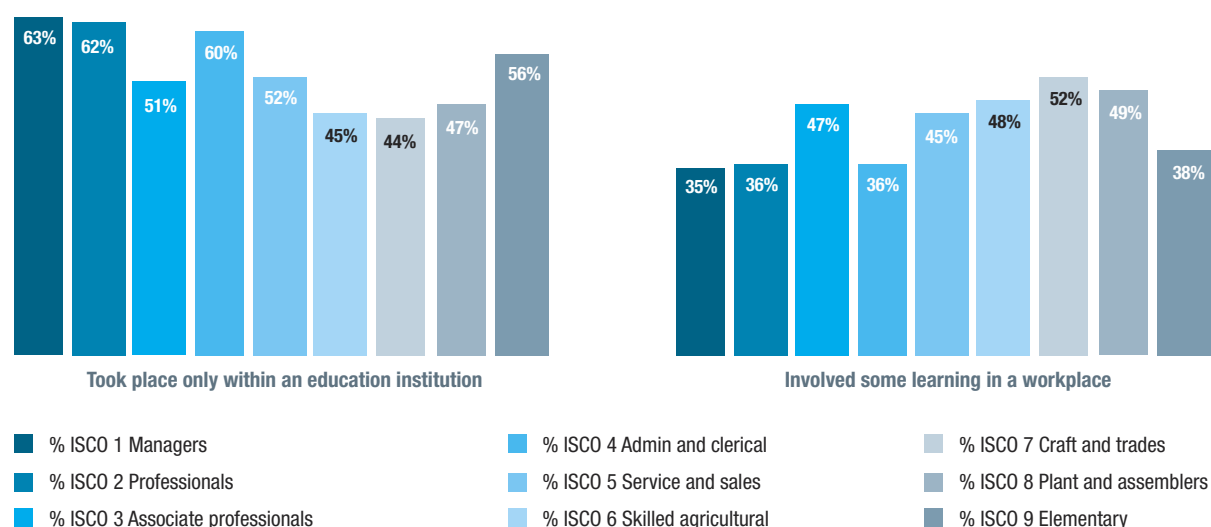
NB: All respondents who have completed upper secondary, post-secondary or tertiary education. Sums not equal to 100% exclude missing responses.

Source: Cedefop ESJ survey.

67% and 62% respectively). This is likely to reflect the greater level of theoretical knowledge required to enter employment in these industries. In contrast, those working in the social and personal services, services relating to education or health or in accommodation, catering or food services are more likely to have completed study

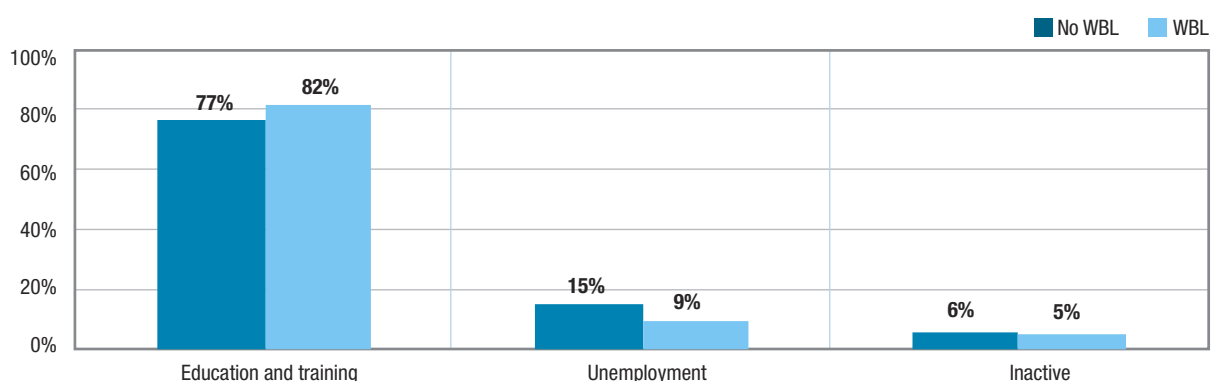
that involved some workplace learning (48%, 47% and 46% respectively). This may be because roles in these industries tend to involve more customer-facing interaction and therefore individuals are likely to need greater levels of practical experience before they start working in the industry.

Figure 35. **Work-based learning by occupation group, adult employees, 2014, EU-28**



NB: All respondents who have completed upper secondary, post-secondary or tertiary education.
Source: Cedefop ESJ survey.

Figure 36. **Transitions to first job by WBL and past labour market status, 2014, EU-28**



NB: Sample of medium- and higher-qualified workers, whose current job is first job; categories do not sum to 100% because the graph excludes the previously self-employed and 'don't know' responses.
Source: Cedefop ESJ survey.

The ESJ findings confirm a relationship between how individuals acquire skills and the skill needs of their respective occupations. As shown in Figure 35, managers, professionals and clerical support workers are most likely to have completed studies that took place only within an educational setting. Those who are employed as craft and trades workers, plant operators and assemblers and skilled agricultural workers are most likely to have completed studies that involved some learning in a workplace. As before, this may be due to the higher level of practical and technical skills required by these latter occupations, while the former are in greater need for theoretical or academic knowledge and competences.

As with the possession of a VET qualification, a WBL spell during one's studies is positively associated with the likelihood of individuals making a direct transition from school to their first job, as opposed to having experienced an intermittent spell of unemployment or inactivity (Figure 36). On average, 82% of adults entered into their first job directly after education and training if they had engaged in some form of WBL, as opposed to 77% of those from a purely school-based education. A total of 15% of the latter group also entered into their first job after having spent some time in the unemployment pool, while only 9% of WBL graduates did so.

This positive relationship between WBL and the probability of making a direct school-to-first-

job transition holds even after taking into account that VET and WBL graduates may have entered their first jobs younger (due to a shorter cycle of studies), or may have been more likely to encounter adverse financial and family circumstances prior to job entry, relative to those with an academic/school-based education. It is also not affected by the fact that the two groups of individuals with a different academic orientation may be characterised by a differential aptitude for learning and/or have different job preferences.

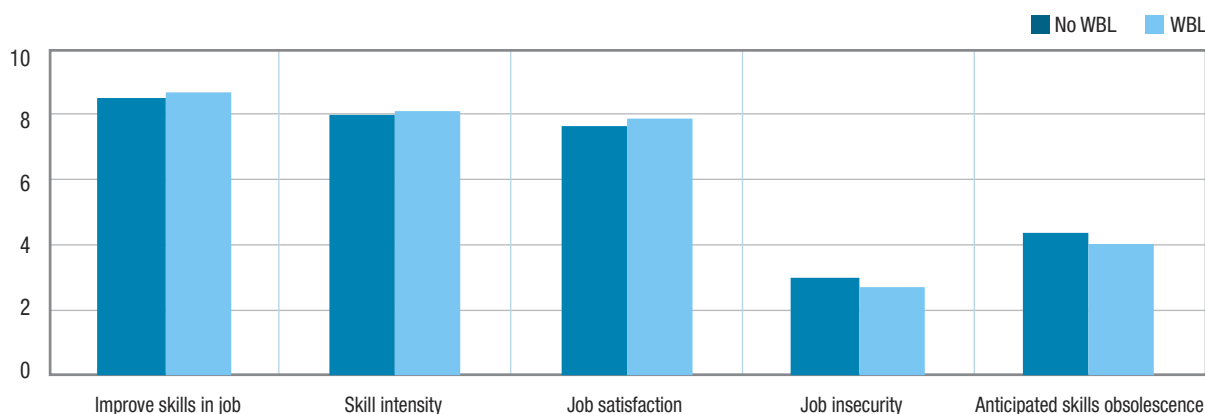
Given that some individuals undertaking WBL may have not yet completed formal education, implying that some of the employees at the time of the survey may be in a job as part of their education programme, the analysis has used only individuals on indefinite contracts. Since most WBL (apprenticeship) contracts that are part of formal education programmes are temporary, restricting the analysis to include only permanent contract workers ensures that the relationship between WBL and speedier entry to the labour market of individuals after school is not affected by the incidence of any temporary WBL transitions. Empirical analysis using the ESJ data confirms that the positive empirical relationship of WBL is robust even when restricting the analysis to permanent contract holders.

The ESJ reveals some additional benefits of WBL for the labour market situation and wellbeing of adult employees (Figure 37). On average, respondents who completed studies that involved some WBL had to devote less time searching for a job before finding their current employment and had more opportunities to find a job that is

suitable for their own skills and qualifications. They are also found to have higher (raw) levels of job satisfaction, are more content with their job security and believe that their skills are more durable and have smaller chances of becoming obsolete in the medium-term.

Apart from aiding smoother integration into the labour market, individuals whose studies involved some WBL are also significantly more likely be in jobs that form a good match for their level of qualifications and which entail greater levels of task complexity and skill intensity. Partly due to the greater skill demands of their (first and current) jobs, new labour market entrants with a history of WBL are also more likely to acknowledge that some of their skills were lower than needed at the start of their first employment, compared to comparable graduates who followed a purely school-based education. The higher skill gaps of those who did some learning in a workplace may also arise because they may have acquired an informational advantage with regards to the true nature of the skills demanded in their workplace. This would result in greater self-awareness about the true extent to which their skills are matched to their job tasks. Further, individuals who followed separate forms of learning as part of their formal education may also have different (unobserved) traits, abilities, job networks or other characteristics correlated with their skill mismatch status at the time of job entry. However, more extensive data explicitly focused on the school-to-work transition of WBL graduates would be required to decouple the

Figure 37. Mean labour market outcomes and work-based learning status, 2014, EU-28



NB: Sample of medium- and higher-qualified workers; indices measured on 0 to 10 scale.

Source: Cedefop ESJ survey.

exact source of their skill mismatches relative to those following different learning tracks.

The data highlight that graduates whose studies involved some workplace learning are more likely to enjoy a virtuous cycle in their (first) jobs. This may be because of the elimination of information asymmetries regarding their abilities or the establishment of greater trust between the employer and employee ⁽²⁰⁾. The fact that their jobs are more conducive to learning and have higher skill content feeds into their greater propensity to have improved their skills in their jobs (whether they are still in their first jobs or are in subsequent jobs), relative to those whose education took place solely within an education institution.

The findings point to several directions in which WBL can be expanded further and on which policy-makers can concentrate their efforts to succeed in meeting one of the key goals of the revised medium-term priorities for VET (Riga conclusions), to promote WBL in all its forms. First, the data highlight that more progress is required in terms of making WBL a more attractive option for males, who are found to be less likely than females to participate in studies involving some learning in a workplace ⁽²¹⁾. Despite greater attention paid to the merits of WBL in recent years, proliferation of WBL can only be achieved if it is integrated further in fields without a WBL tradition, particularly in tertiary education. Related to this is the need for the attractiveness and relevance of such types of learning to be extended to non-conventional occupations and industries. The survey findings also confirm that significant efforts need to be made to expand WBL to private sector and smaller-sized establishments, an objective that requires significantly more involvement and commitment by employers and other social partners.

4.4. Importance of key competences for VET

4.4.1. Fundamental key competences

The importance of key competences (either fundamental or transversal) ⁽²²⁾, continues to grow in EU labour markets, as also revealed by the ESJ survey. To understand how important fundamental skills are for the ability of adult employees to carry out their job tasks in European labour markets, respondents were asked to describe the highest level of literacy, numeracy and ICT skills they require. Literacy and numeracy skills were defined at two levels; basic and advanced. ICT skills were defined at three levels; basic, moderate and advanced. The respondents were also asked to rank the importance of a further list of transversal and technical skills required for their jobs. The list of skills surveyed was selected on the basis that they comprise aggregate bundles of a wide list of tasks performed by individuals as part of their jobs (Mañé, 2013). A list of 11 broad groupings of skills were included in the questionnaire and defined as shown in Table 11.

About half the respondents (49%) in the survey said that they need advanced literacy skills to be able to perform their jobs (Figure 38). It is interesting that a high level of advanced literacy skills is required by the occupation groups anticipated to grow the most in terms of employment (Cedefop, 2012d). About three quarters of individuals working as managers and professionals and over a half of clerical support workers and technicians and associate professionals need advanced literacy skills for their jobs, according to the survey (Figure 39).

Most of the respondents (58%) acknowledged that they need to be able to carry out calculations using decimals, percentages or fractions and to be able to understand tables and

⁽²⁰⁾ Unfortunately, it is not possible to ascertain from the survey whether the respondents found their first jobs at the same employer where their spell of WBL took place.

⁽²¹⁾ The fact that males are less likely to participate in WBL than females holds even after taking into account that the two sexes tend to study different fields (e.g. females are more likely to enrol in the fields of humanities and arts, while males in engineering) or enter into different industries and occupations.

⁽²²⁾ As defined in the corresponding recommendation from 2006, the eight key competences consist of communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression. The recommendation also refers to fundamental skills of language, literacy, numeracy and ICT as essential foundation for learning. Learning to learn, social and civic competences, initiative-taking and entrepreneurship, and cultural awareness and expression are considered 'transversal key competences' (Council conclusions 2010 on competences supporting lifelong learning and the 'new skills for new jobs' initiative).

Table 11. **Bundles of skills used in ESJ survey**

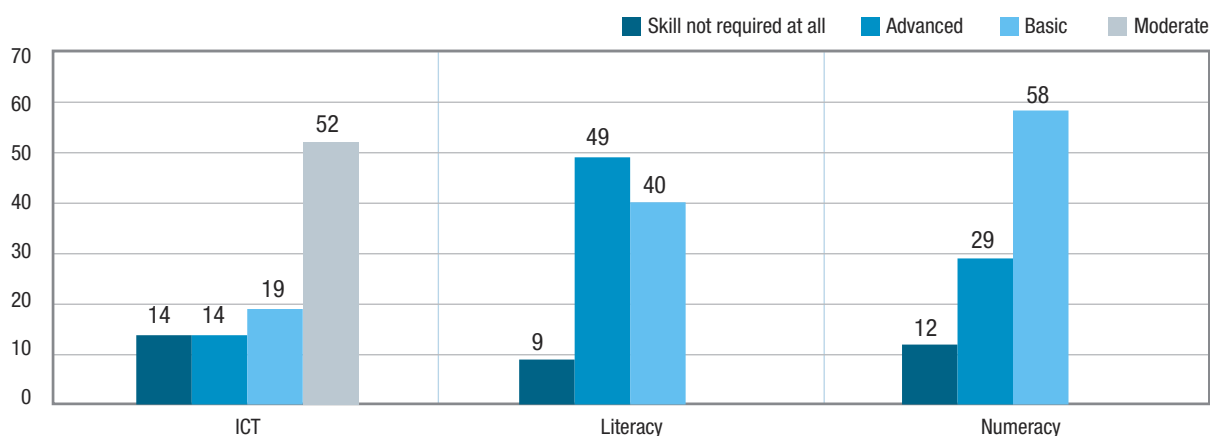
Skills	Definitions
Fundamental	
Basic literacy	Reading manuals, procedures, letters or memos.
Advanced literacy	Writing long documents such as long reports, handbooks, articles or books.
Basic numeracy	Calculations using decimals, percentages or fractions, understanding tables and graphs.
Advanced numeracy	Calculations using advanced mathematical or statistical procedures.
Basic ICT	Using a PC, tablet or mobile device for email, internet browsing.
Moderate ICT	Word-processing, using or creating documents and/or spreadsheets.
Advanced ICT	Developing software, applications or programming; use computer syntax or statistical analysis packages.
Foreign language skills	Using a language other than your mother tongue to perform job duties.
Transversal	
Communication skills	Sharing information with co-workers/clients. Teaching and instructing people. Making speeches or presentations.
Teamwork skills	Cooperating and interacting with co-workers. Dealing and negotiating with people.
Customer handling skills	Selling a product/service. Dealing with people. Counselling, advising or caring for customers or clients.
Problem solving skills	Thinking of solutions to problems. Spotting and working out the cause of problems.
Learning skills	Learning and applying new methods and techniques in your job. Adapting to new technology, equipment or materials. Engaging in own learning.
Planning and organisation skills	Setting up plans and managing duties according to plans. Planning the activities of others. Delegating tasks. Organising own or other's work time.
Technical	Specialist knowledge needed to perform job duties. Knowledge of particular products or services. Ability of operating specialised technical equipment.

Source: Cedefop ESJ survey.

graphs as part of their daily job tasks. Slightly fewer than one in three adult employees (29%), mainly individuals working in managerial positions (50%) and as professionals (43%), but also one in four workers in clerical jobs (26%), also need to be competent enough to carry advanced mathematical calculations or statistical procedures in their job (Figure 40). Managers and professionals are more likely to need advanced

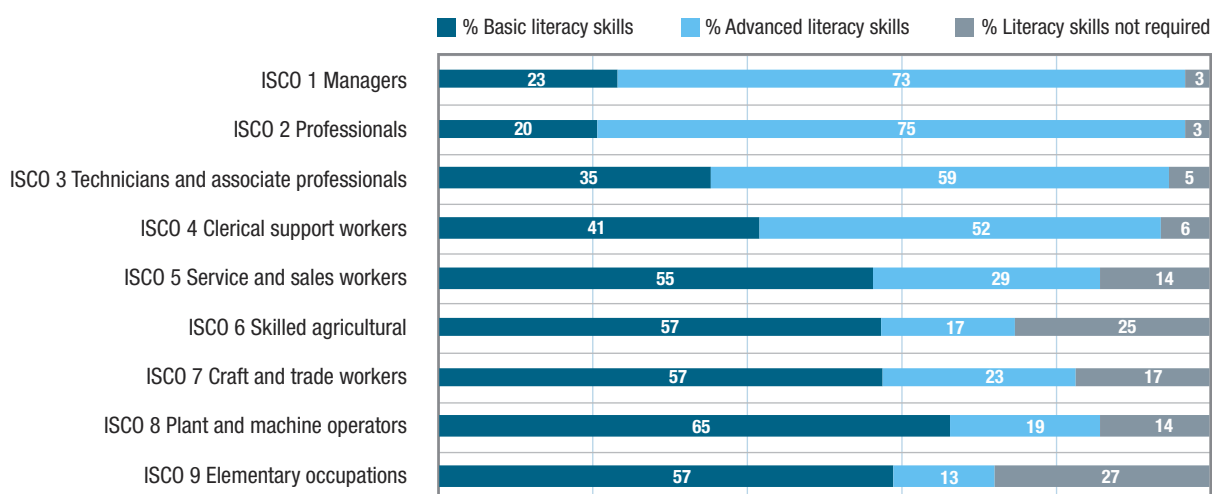
numeracy skills if they work in particular industries, such as construction or building (69% managers and 62% professionals) or financial, insurance or real estate services (59% managers and 61% professionals). Advanced numeracy skills are also required in the supply of gas or electricity, mining or quarrying sector (as stated by 63% of managers and 49% of professionals, respectively).

Figure 38. Level of fundamental skills required for the job, adult employees, 2014, EU-28



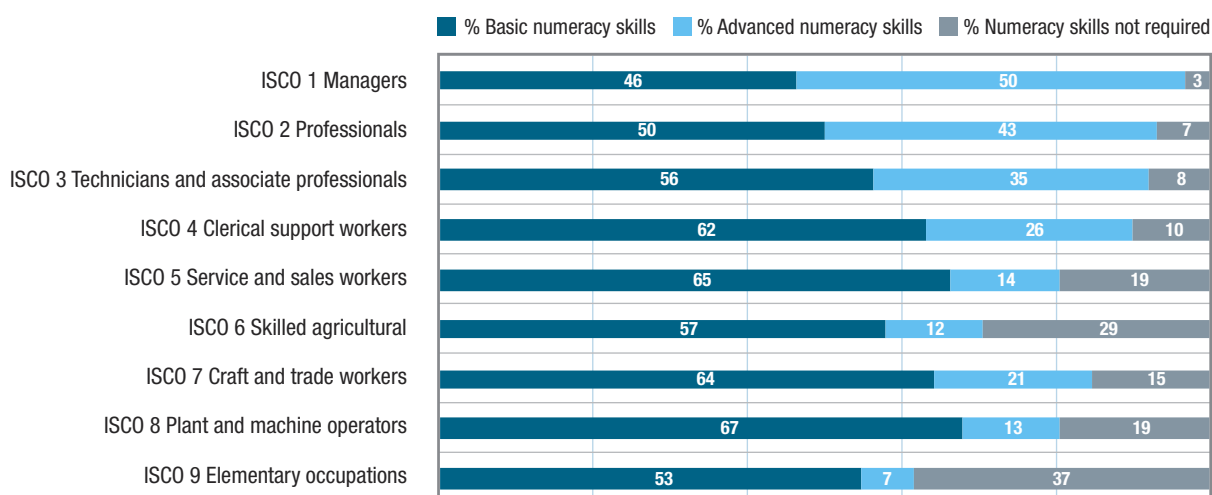
NB: See Table 11 for definitions of the levels of skills.
Source: Cedefop ESJ survey.

Figure 39. Highest level of literacy skills required by occupation, adult employees, 2014, EU-28



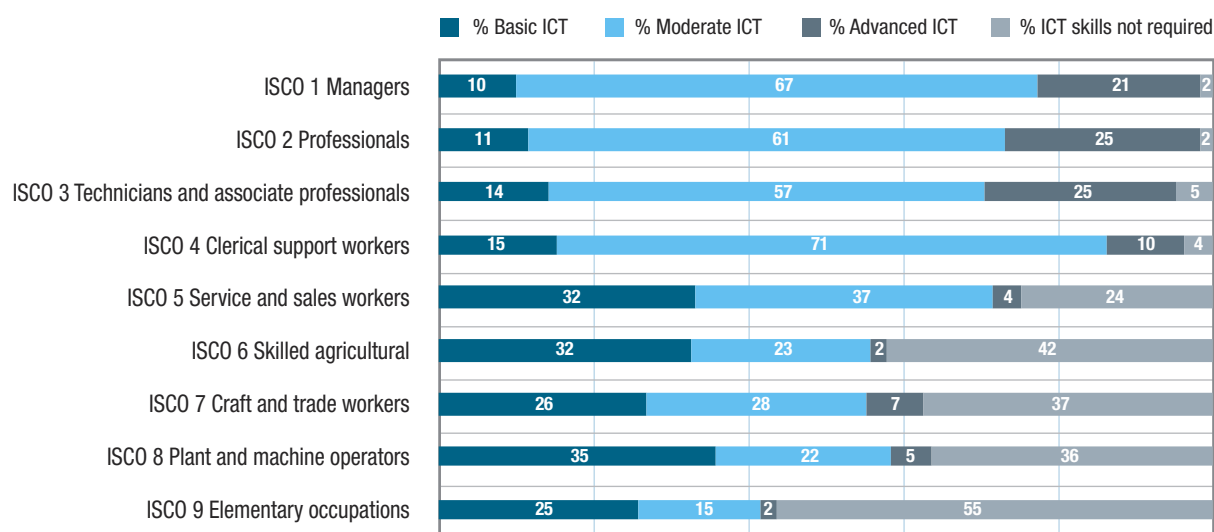
Source: Cedefop ESJ survey.

Figure 40. Highest level of numeracy skills required by occupation, adult employees, 2014, EU-28



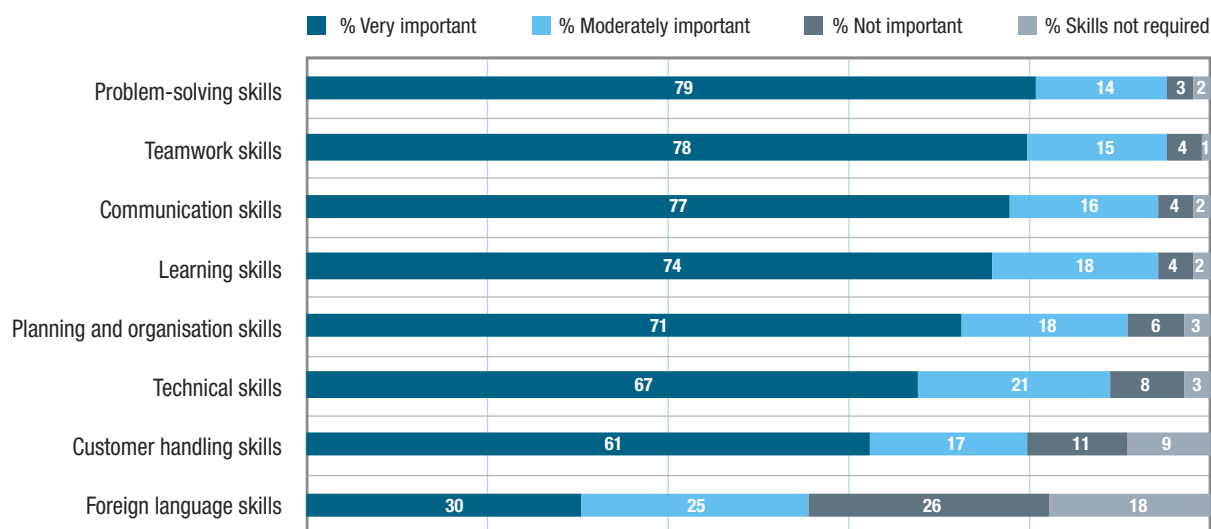
Source: Cedefop ESJ survey.

Figure 41. **Level of ICT skills required by occupation, adult employees, 2014, EU-28**



Source: Cedefop ESJ survey.

Figure 42. **Importance of transversal skills for job, adult employees, 2014, EU-28**



NB: % of all respondents (48 676). Responses to the question: 'On a scale from 0 to 10, where zero means not at all important, five means moderately important and 10 means essential, how important are the following skills for doing your job?'. Responses in the interval 7 to 10 of the importance scale have been classified as 'very important', four to six 'moderately important' and zero to three 'not important'; 'skill not required' is a separate category. 'Don't know/no answer' not shown.

Source: Cedefop ESJ survey.

4.4.2. Digital skills

About seven in 10 EU adult workers need to possess at least a moderate level of ICT skills to be able to do their jobs (52% moderate level and 14% advanced). More than a fifth of those in managerial and professional roles or as technicians and associate professionals need advanced ICT skills for their jobs (21%, 25% and 25%, respectively). Around seven in 10 (71%) clerical support workers require at least a moderate level of ICT skills to perform their job

tasks. Even 42% of adults employed in elementary jobs need some level of ICT skills to be able to do their jobs in contemporary labour markets (Figure 41).

4.4.3. Other competences

Adult employees were asked to rank the importance of a further list of transversal or technical skills required for doing their jobs. For more than three in four EU employees, such skills are deemed to be very or moderately important

for doing their job ⁽²³⁾. Figure 42 shows that problem solving and teamwork skills, closely followed by communication skills, are considered to be very important by adult employees for doing their jobs (79%, 78% and 77%, respectively).

Foreign language skills are considered by adult EU workers as being of least importance for their jobs among the set of key competences quoted in the questionnaire: 26% stated that such skills are not important and 18% not required. Nevertheless, more than half of EU employees (55%) require foreign language skills for their jobs, and the need for proficiency in foreign language skills is found to be highest in particular occupations, such as managers, science and engineering professionals, and ICT technicians or ICT professionals.

4.4.4. STEM skills

STEM skills are defined as those skills 'expected to be held by people with a tertiary-education level degree in the subjects of science, technology, engineering and maths' (EU skills panorama, 2014). These skills include 'numeracy and the ability to generate, understand and analyse empirical data including critical analysis; an understanding of scientific and mathematical principles; the ability to apply a systematic and critical assessment of complex problems with an emphasis on solving them and applying the theoretical knowledge of the subject to practical problems; the ability to communicate scientific issues to stakeholders and others; ingenuity, logical reasoning and practical intelligence' (ibid, 2014).

The understanding and scope of STEM skills varies widely from country to country. Supply is relatively clearly identified in terms of qualifications achieved in STEM subjects, although definitions of STEM subjects can vary. For example, medicine, structural engineering and sports science are not included in some definitions. 'Core' STEM subjects typically include: mathematics; chemistry; computer science; biology; physics; architecture; and, general, civil, electrical, electronics, communications, mechanical, and chemical engineering.

Following this distinction, STEM graduates have been identified within the ESJ survey by retaining tertiary education graduates whose field of study is either engineering, maths and stats, natural sciences and computing sciences. Around 31% of adult workers are found in the ESJ sample to have graduated from a STEM degree. About half (52%) of adult workers employed in the broad industrial sector are STEM graduates, while about a quarter (26%) are employed in services and a fifth (21%) in public administration. Most (59%) adult employees in the ICT sector are graduates from STEM subjects as are about half of workers in manufacturing (52%) and construction (48%) sectors. About 48% of adult employees in the professional, scientific and technical services have completed a field related to STEM (Figure 43).

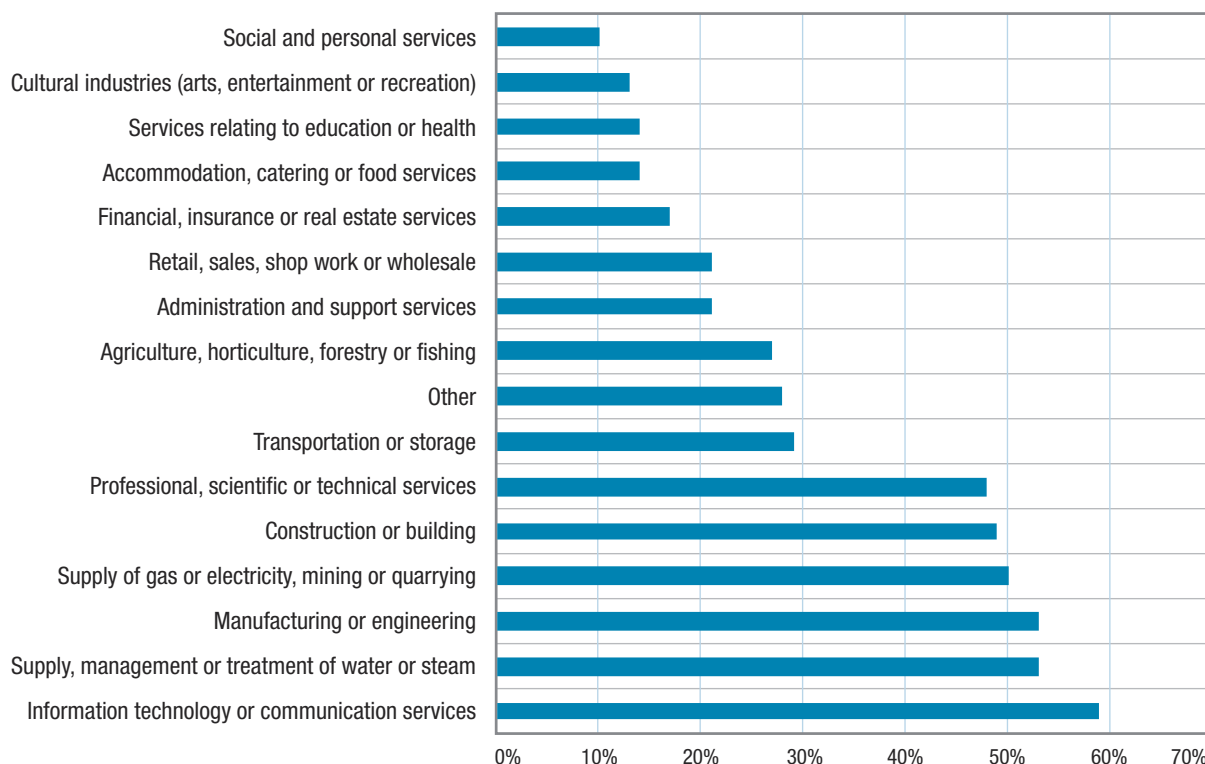
As a further indication of the demand for STEM graduates in EU labour markets, STEM graduates are more likely to be employed in high-skilled occupations, in particular as professionals and technicians and associate professionals (such as ICT technician, or business and administration technician). About 22% of tertiary education graduates are employed as science and engineering professionals, ICT professionals or as science and engineering or ICT technicians.

Shortages of STEM skills in advanced economies are frequently reported. For example, the Manpower talent shortage surveys (Manpower, 2014) always place skilled trades workers, engineers and technicians at the top with regards to the professions in which employers have most difficulties filling their jobs. The extent to which such recruitment bottlenecks reflect the inability of employers to offer an attractive job package (in terms of salary and working conditions) rather than a shortage of skills per se is an issue of contention (Cedefop, 2015a).

Although the ESJ survey suggests that, on average, a greater share of STEM graduates had lower skills than needed when they started their first jobs (34% of first job entrants were underskilled, compared to 30% from other fields), this difference is not statistically significant when other important correlated factors are taken into

⁽²³⁾ It is likely that customer handling, foreign language skills and technical skills are not rated as important as the remaining set of skills because they tend to be more specific to particular occupations. Service and sales workers and managers are more likely to say that customer handling skills are important to their current job (76% and 75%, respectively).

Figure 43. **Share of STEM graduates by industry, adult employees with tertiary level education, 2014, EU-28**



NB: STEM graduates are graduates with a tertiary education degree in the fields of engineering, maths and statistics, natural sciences and computing science.

Source: Cedefop ESJ survey.

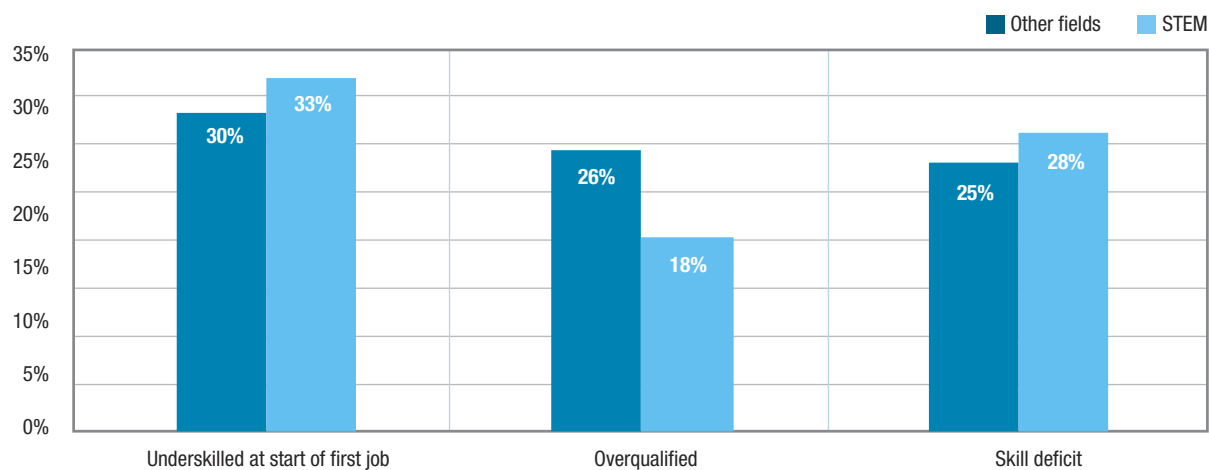
account (gender, age, occupation, industry). However, the ESJ suggests that STEM graduates with tertiary level qualifications are employed in jobs that are well-matched to their level of qualifications. Specifically, there is a significantly lower chance that they are overqualified relative to tertiary graduates from other fields (Figure 44) ⁽²⁴⁾.

Even though STEM graduates are more likely to be employed in jobs that are matched to their qualifications, they are nonetheless found to have relatively higher skill deficits, implying that they have room to develop their skills further to reach full proficiency. This is likely to be a consequence of the demand for high level skills in their jobs, with 54% of STEM tertiary graduates stating that they experienced recent changes in the technologies used at their work in comparison to 45% of graduates from non-STEM fields. Around 20% of STEM graduates think that it is very likely

that some of their skills will become outdated in the next five years, as opposed to 15% of graduates from humanities and education (Figure 45). The ESJ data indicate that concerted efforts are required by education and training providers so that STEM graduates possess the right set of key competences and skills to enable them continuously to adapt and improve their skills throughout their working lives. However, the greater skill deficits of STEM graduates also suggest that employers need to invest in their continued skill development, should they wish to exploit the full potential of their skills and ensure that they are up to date with the rapidly changing nature of their job tasks.

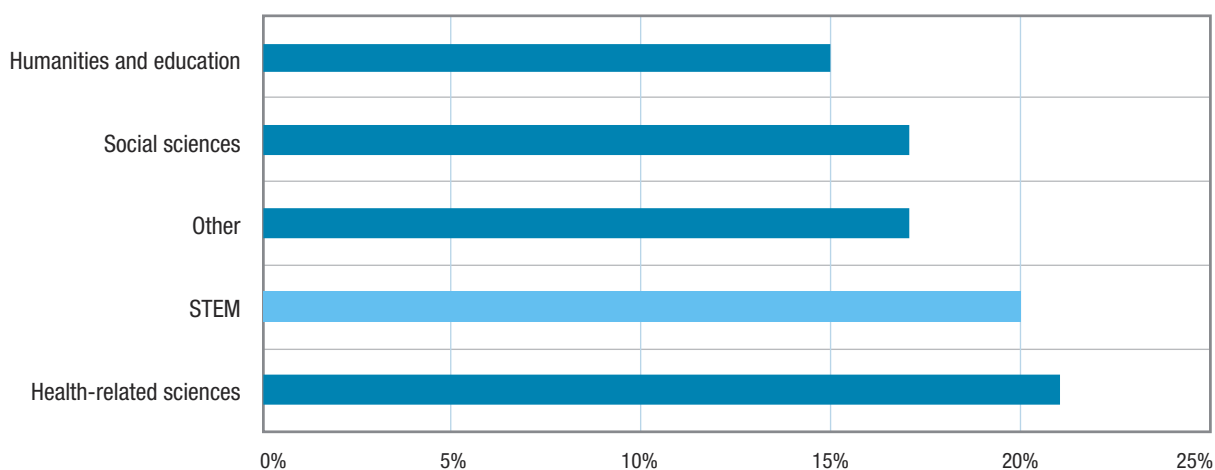
⁽²⁴⁾ Other fields include economics, business and law, agricultural studies, teacher and education sciences, humanities, arts, medicine and health-related sciences and other social sciences.

Figure 44. **Incidence of qualification and skill mismatch of adult employees with tertiary level education by STEM status, 2014, EU-28**



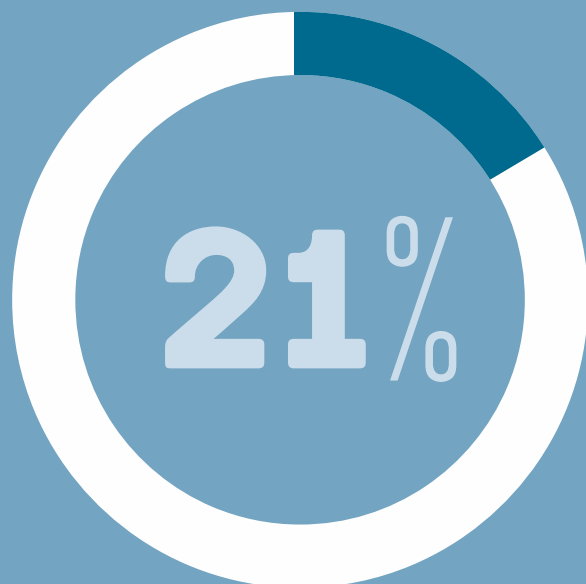
Source: Cedefop ESJ survey.

Figure 45. **Share of adult employees with tertiary level education who think it very likely that some of their skills will become outdated in the next five years, 2014, EU-28**

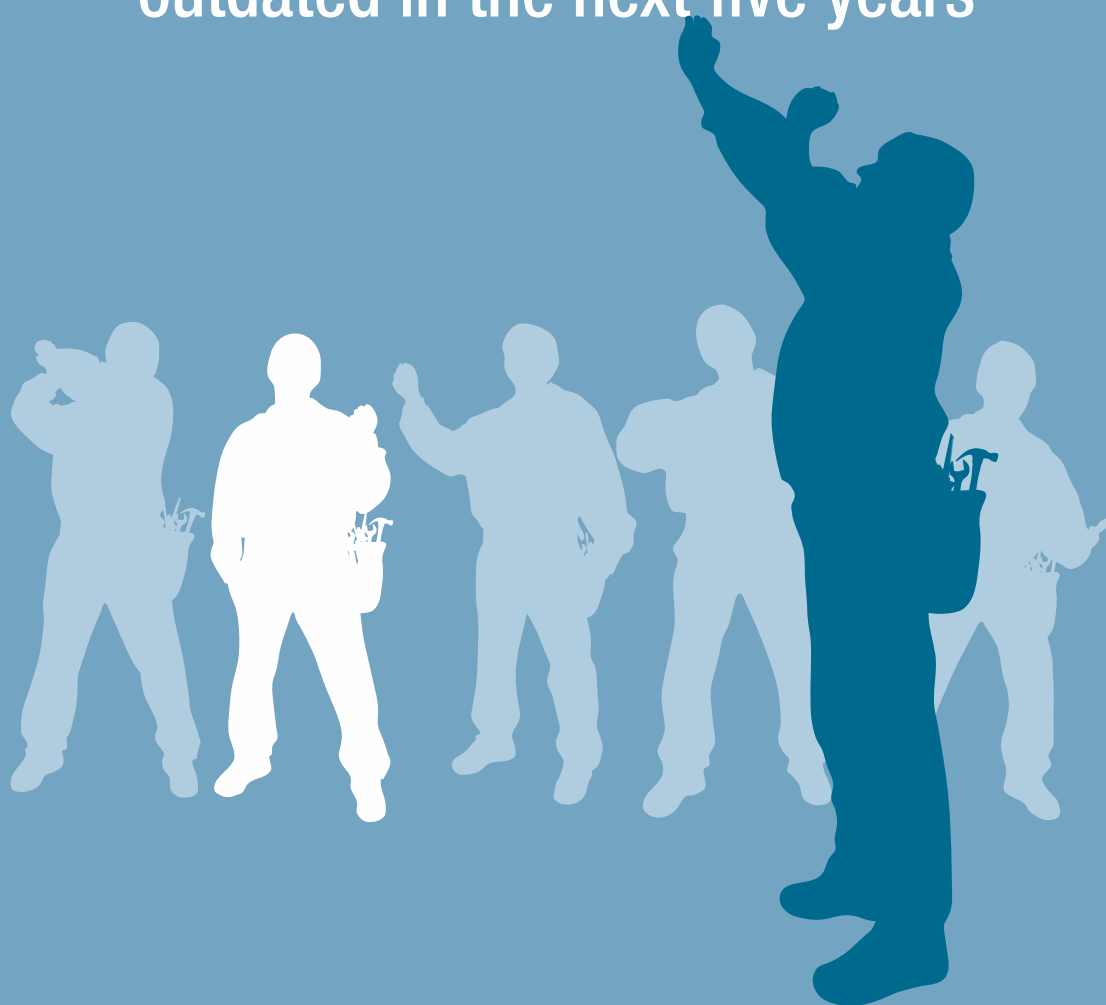


NB: Percentage of respondents with scores above eight in the 0 to 10 skill obsolescence scale.

Source: Cedefop ESJ survey.



One in five EU workers
think it very likely that some of their skills
will become
outdated in the next five years



Matching better skills to better jobs

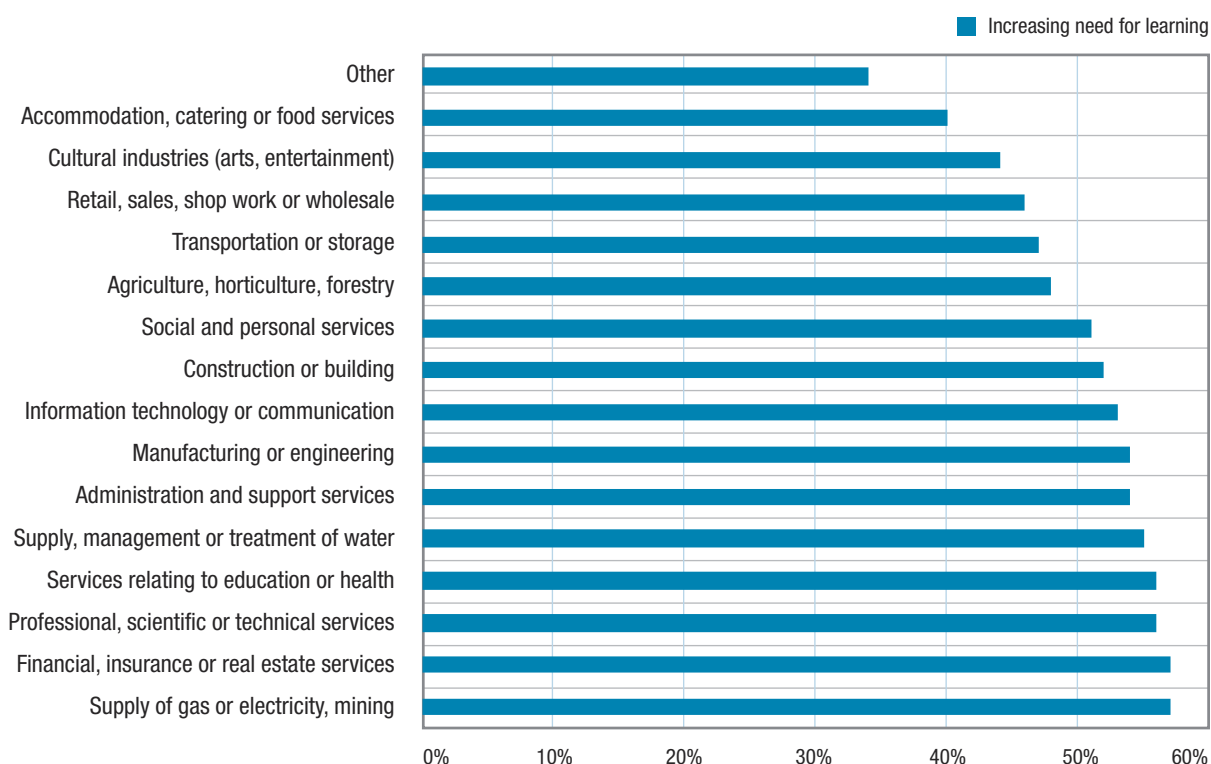
5.1. Shifting skill needs in European job markets

The findings of the ESJ survey emphasise the high level of skill demand that exists in EU job markets. It also confirms the need for EU policy-makers to intensify their efforts to strengthen the integration of key competences in VET curricula and provide more effective opportunities to acquire or develop those skills through IVET. However, coping with the dynamic challenges of competitive job markets, such as rapid technological progress, changing professional requirements, globalised markets and a shrinking workforce, requires extensive participation by adults in continuous learning and a high commitment to investment in skills upgrading and

competence-development throughout life. Lifelong learning, CVET and validation of non-formal and informal learning are necessary ingredients, as in the European Commission's strategy for rethinking education and training (European Commission, 2012a).

European workplaces are in a constant state of flux and employees in today's labour markets are often requested to adjust their skills in response to new technologies and working methods, as well as developing new skills that will allow them to cope with the challenges of increasingly customer-oriented, global value production chains reliant on high skill demand (Timmer et al., 2014). Across Europe, 47% of EU workers have seen the technologies they use change since the time they started their current

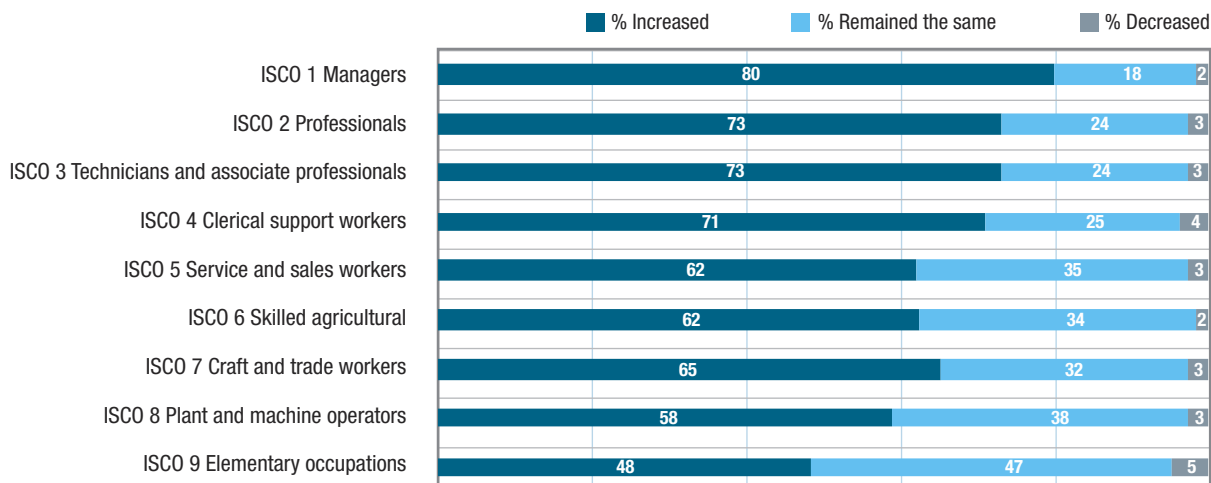
Figure 46. **Share of jobs with significant rise in the need to learn new things by industry, adult employees (aged 24-65), 2014, EU-28**



NB: Responses to the question: 'On a scale from 0 to 10, where 0 means it has decreased a lot, five has stayed the same and 10 has increased a lot, has the need to learn new things increased, decreased or stayed the same since you started your job with your current employer?' The figure depicts share of respondents with a score above the median of the distribution (equal to a score of eight).

Source: Cedefop ESJ survey.

Figure 47. **Share of jobs with rising variety of tasks by occupation, adult employees, 2014, EU-28**



NB: Responses to the question: 'On a scale from 0 to 10, where 0 means it has decreased a lot, five has stayed the same and 10 has increased a lot, has the variety of tasks increased, decreased or stayed the same since you started your job with your current employer?' Increased depicts share of respondents with a score above five.

Source: Cedefop ESJ survey.

job, while 43% experienced changes in their working methods and practices, according to the ESJ survey ⁽²⁵⁾. An additional 29% saw changes in the products or services produced within their workplace, while 26% have recently experienced changes in the intensity of contact they have with clients or customers.

Some 51% of adult employees are in jobs involving the need always or usually to learn new things (19% always; 32% usually), while 44% sometimes have to learn new things. A total of seven in 10 EU adult workers admit to having considerable flexibility in how to perform their job tasks, so their skills need to be resilient and adaptable to be able to cope with such autonomy. Most employees (72%) always or usually have to work as part of a team. For more than half EU employees (53%) the need to learn new things and the variety of the job tasks has significantly increased since the time they started their job, illustrating the dynamic evolution of skill demand in modern economies and the extent to which EU employees continuously have to cope with a changing working pace.

Figure 46 illustrates that the need for continuous learning is most prominent in the financial and professional services industries but

high demand for learning is also evident in certain advanced manufacturing sectors (such as supply of natural resources). Apart from individuals in elementary jobs, most adult workers have seen the need to learn new things and the variety of tasks in their jobs increase since their current employment started (Figure 47).

5.2. Evolution of adult worker skill mismatch

As a consequence of the dynamically evolving skill needs of jobs described above, about a quarter (26%) of adult employees in the EU labour market think it is moderately likely, and one in five (21%) think it is very likely, that several of their skills will become outdated in the next five years. Employees in Estonia and Romania (42% and 39%, respectively) are the most likely to say they will suffer from very high levels of perceived skill obsolescence, in contrast to those from Malta and Bulgaria (Figure 48).

More than three in 10 respondents working in information technology or communication services think it is very likely to see some of their skills become outdated in the foreseeable future

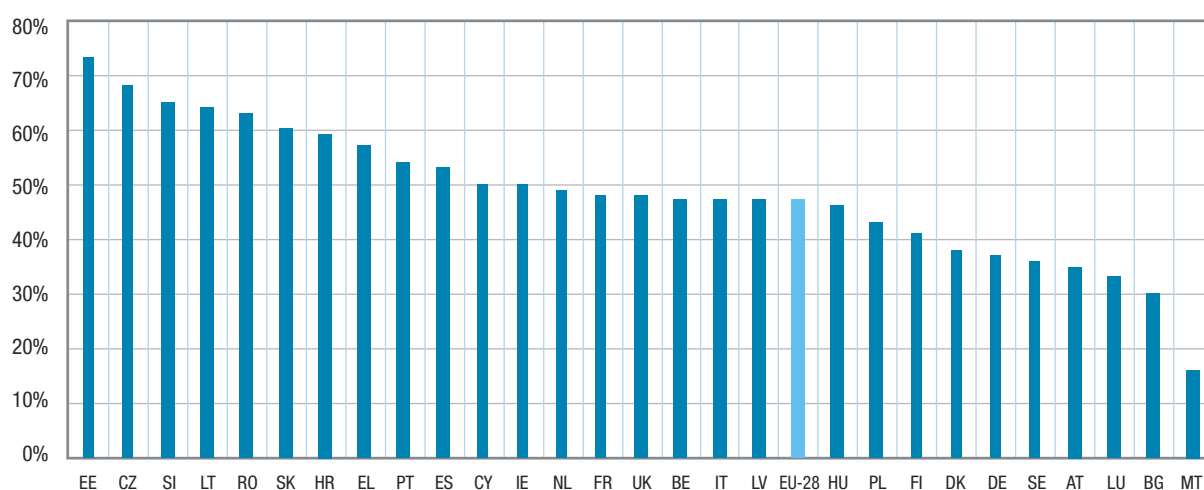
⁽²⁵⁾ For those with long job tenure, the question was restricted to whether the changes in their workplace have taken place within the past five years that they have been in their job.

(Figure 49). This is reasonable given that the capacity to store, communicate and compute information has advanced rapidly in the past 25 years with the introduction of the internet, digital technology and open source computing. Skill obsolescence is also high in financial, insurance or real estate services and in professional, scientific and technical services. Concerns about their skills becoming outdated over the medium-

term are highest among respondents employed as professionals as well as technicians and associated professionals, with 23% stating that it is very likely; in contrast, those employed as skilled agricultural workers and plant and machine operators and assemblers are the least likely to worry about such a contingency.

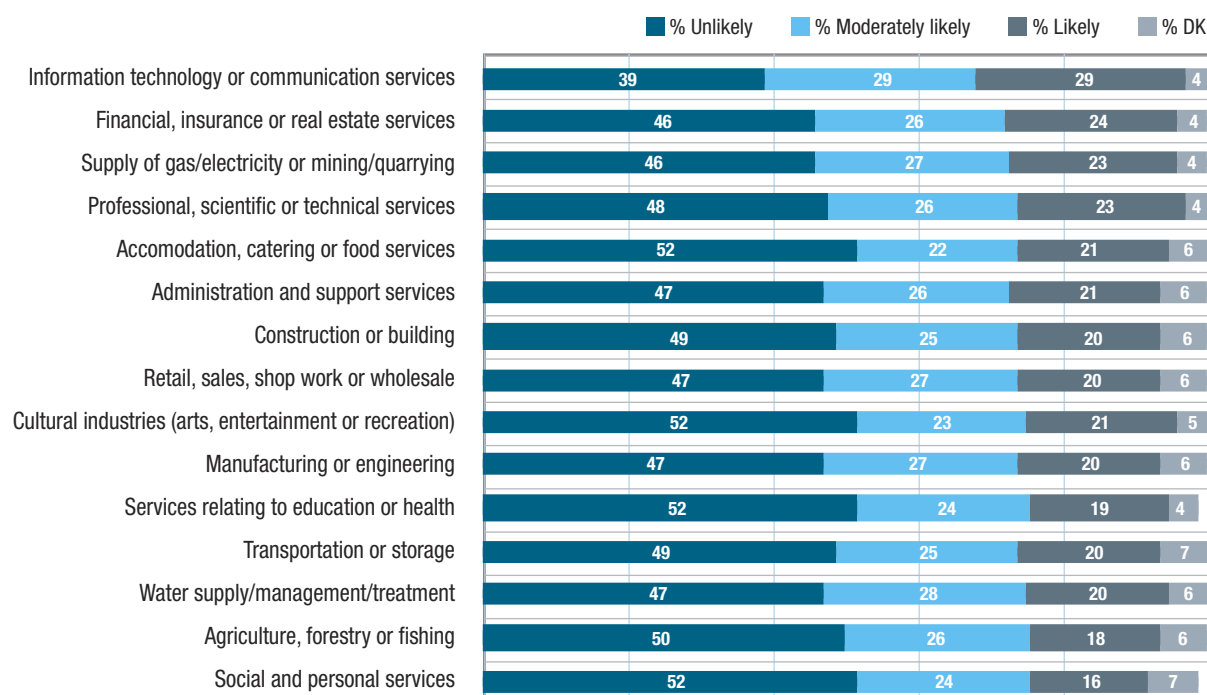
Even though individuals anticipate their skills becoming obsolete due to evolving skill demands

Figure 48. **Likelihood of skills becoming outdated in next five years, EU-28, 2014**



NB: Percentage of adult employees who think it is moderately or very likely that several of their skills will become outdated in the next five years.
Source: Cedefop ESJ survey.

Figure 49. **Likelihood of skills becoming outdated by industry, EU-28, 2014**



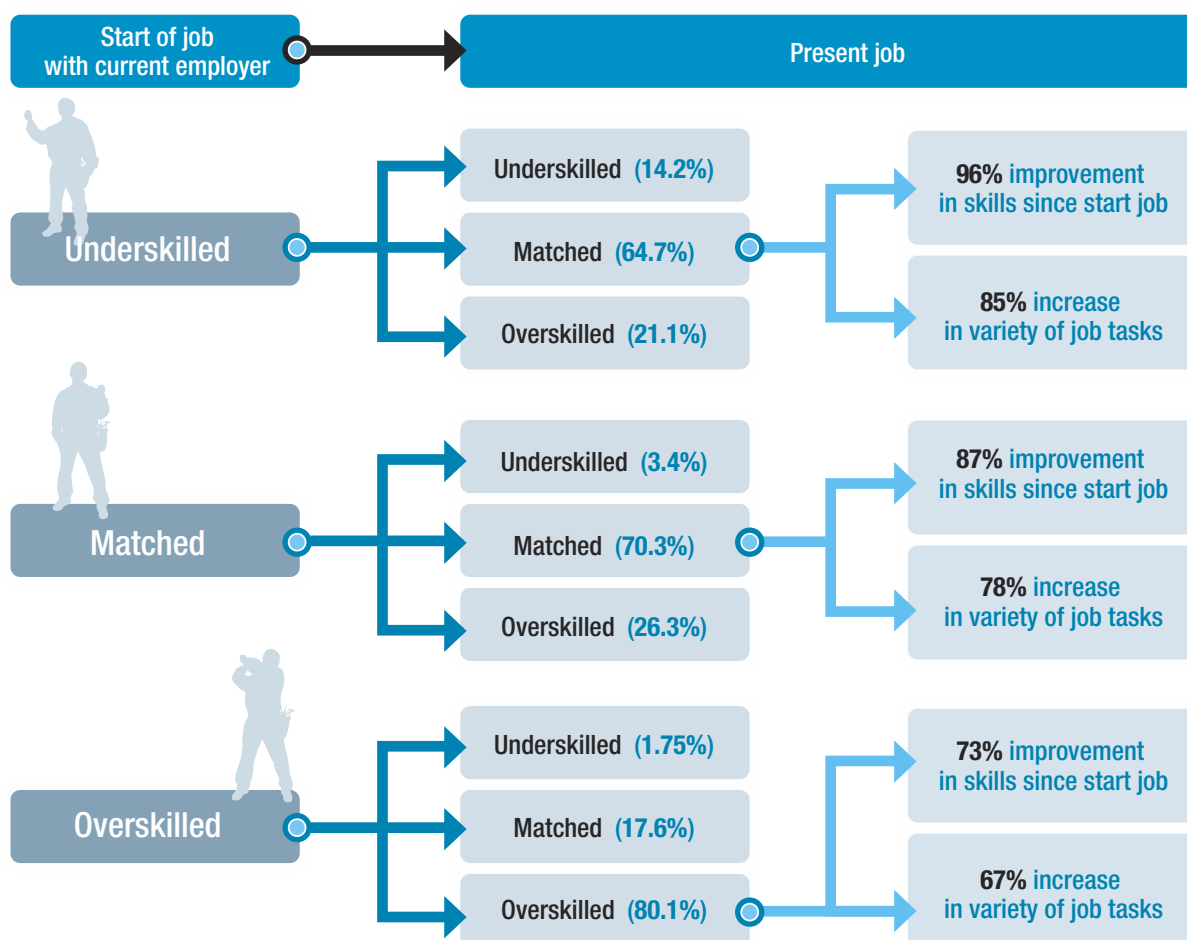
NB: Percentage of adult employees who think that several of their skills will become outdated in the next five years.
Source: Cedefop ESJ survey.

and/or lack of continuous learning, the ESJ data show that the skill mismatch status of individuals is characterised by persistence ⁽²⁶⁾. On average, six in 10 adult workers in the EU who entered a mismatched job remained in the same state of mismatch after several years of being in it. Those who entered jobs that do not fully exploit their skills, most of which are dead-end jobs (as defined in Section 2.3.3), are more likely to remain stuck in the same situation of skill mismatch. A total of eight in 10 EU employees who were overskilled at the start of their current

job have remained in the same state throughout their tenure (Figure 50) ⁽²⁷⁾. A total of seven in 10 workers with matched skills at the start of their current employment have matched skills even after several years of working in the same job. There is less persistence for employees who enter into their jobs with lower skills than needed, given that such jobs tend to be the most dynamic and, as a consequence, individuals develop their skills at a fast(er) pace relative to other states of skill mismatch.

The entry point to the labour market or to a

Figure 50. **Dynamic evolution of skill mismatch between start of current job and present time, adult employees, EU-28**



NB: Share of EU employees with positive answers to the questions: 'Overall, how would you describe your skills in relation to what is required to do your job?' And 'When you started your job with your current employer, overall, how would you best describe your level of skills in relation to what was required to do your job at that time?' (a) My skills are higher than required by my job; (b) my skills are matched to what is needed by my job; (c) some of my skills are lower than required by my job and need to be further developed.

Source: Cedefop ESJ survey.

⁽²⁶⁾ It is not possible with the cross-sectional data at hand to decouple accurately the extent to which this persistence reflects state dependence or simply unobserved heterogeneity among workers who are in mismatched jobs. Estimates based on panel data available in Australia show that the probability of overqualification or overskilling is strongly related to the past incidence of skill mismatch, after controlling for unobserved individual effects (Mavromaras et al., 2012).

⁽²⁷⁾ A slightly smaller yet significant degree of persistence in overskilling (74%) is found for first job entrants.

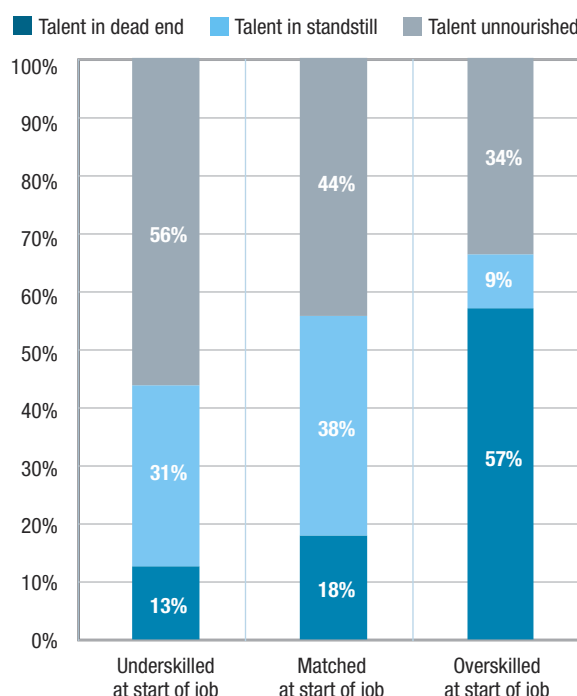
job matters. Entry into skill-intensive jobs is crucial to avoiding getting trapped into a mismatched state and learning conducive forms of work, that can ensure the continuous provision of non-formal or informal learning for adult workers, are critical for avoiding the stagnation of their skills within dead-end jobs.

The persistence in the skill mismatch of individuals nevertheless hides a significant degree of dynamics in the evolution of individuals' skills and in the complexity of tasks within their jobs. One in four adult workers who entered a job with matched skills became overskilled after several years of job tenure. Similarly, even within apparently 'stable' job-worker matches, whereby employees remain consistently matched over time, there are dynamic changes taking place in the skill needs of their jobs and in their skill development. For instance, 87% of individuals who remained matched over time improved their skills since starting their job and for one in three (33%) the improvement was very significant. At the same time, 78% experienced an increasing variety in their job tasks over time.

Individuals who remained consistently overskilled since the time they entered their job experienced a significantly smaller degree of skills improvement (73%; for 23% the improvement was very significant) relative to those with matched skills. They are also in comparatively less challenging jobs, with 67% experiencing an increasing variety in the tasks they perform. By contrast, workers who made the transition from an initial state of overskilling to matched skills in their current job saw their job tasks become markedly more varied (with 81% experiencing a rise in task variety).

In contrast to employees who were initially matched or overskilled, individuals who entered their jobs with lower skills than needed (underskilled) are less likely to get stuck in the same state and more likely to experience a continuous (co-)evolution in their skills and in the skill needs of their jobs. Some 96% experienced skill development since they started their job, with 50% experiencing very significant improvement: this is aided by the fact that underskilled workers are also more likely to be in dynamic jobs that entail increasing complexity of job tasks over time (as in the 85% that saw an increase in the variety of their tasks).

Figure 51. **Skill mismatch transitions within jobs, adult workers, 2014, EU-28**



Source: Cedefop ESJ survey.

Evidence shows that more than half the workers (57%) who enter their jobs with higher skills than needed are likely to get trapped in a dead-end situation, with limited potential for further growth in their skills. However, a third of these (34%) still have some space to develop their skills to reach maximum productivity in their jobs. By contrast, a small proportion of workers who enter their jobs with matched skills or lower skills than needed end up in a dead-end setting. Instead, most such employees are characterised by skill deficits, rendering the further provision of continuous vocational training critical for enhancing their labour productivity (Figure 51).

These findings show that the evolution of the skill mismatch status of individuals depends crucially on the interplay between opportunities to develop their skills in their jobs and the skill intensity of their job tasks (Table 12). In some cases individuals need to 'keep moving forward in order just to stand still', as with those whose skills remain consistently matched to their job needs. For these workers their level of skill development is merely sufficient to compensate for the constant increase in the complexity of their job tasks.

Table 12. **Evolution of skill mismatch within jobs in relation to skill development and job complexity, adult employees, 2014, EU-28**

Skill mismatch transitions within job				
Changes since start of job	matched at start of job → overskilled at present time (ref: matched → matched)	matched at start → underskilled at present time (ref: matched → matched)	overskilled at start → overskilled at present time (ref: overskilled → matched)	underskilled at start of job → matched at present time (ref: underskilled → underskilled)
Improvement in skills	↑	↓	↓	↑
Increase in task complexity (variety, difficulty, need to learn new things)	↓	↑	↓	↑↓
Change in technologies, work methods, etc.	↑	↑	↓	↑↓

NB: ↑ = positive effect; ↓ = negative effect; ↑↓ = no significant effect. Estimated probability patterns of skill mismatch transitions based on multinomial logit regressions; to compare 'like with like' the reference category includes individuals with the same skill mismatch state at the start of their jobs; the regressions control for the level of job complexity and skill intensity of a job, changes in job roles (e.g. promotion) since the start of a job and other individual and job characteristics of the respondents. See Annex 2 for details.

Source: Cedefop ESJ survey.

Other individuals are more likely to move to a state of overskilling, from an original state of matched skills, because their skill accumulation was not accompanied by a corresponding increase in job complexity. The overskilled are more likely to experience changes to the technologies and working methods they use, but this appears to be associated with a process of deskilling or of skills being replaced by technology (Autor et al., 2003; Freeman, 2015), which is potentially linked to the routinisation of their jobs (Cedefop, 2010c). Remaining in a persistent state of overskilling is associated with jobs not characterised by increasing task complexity and with no further skill development taking place over time.

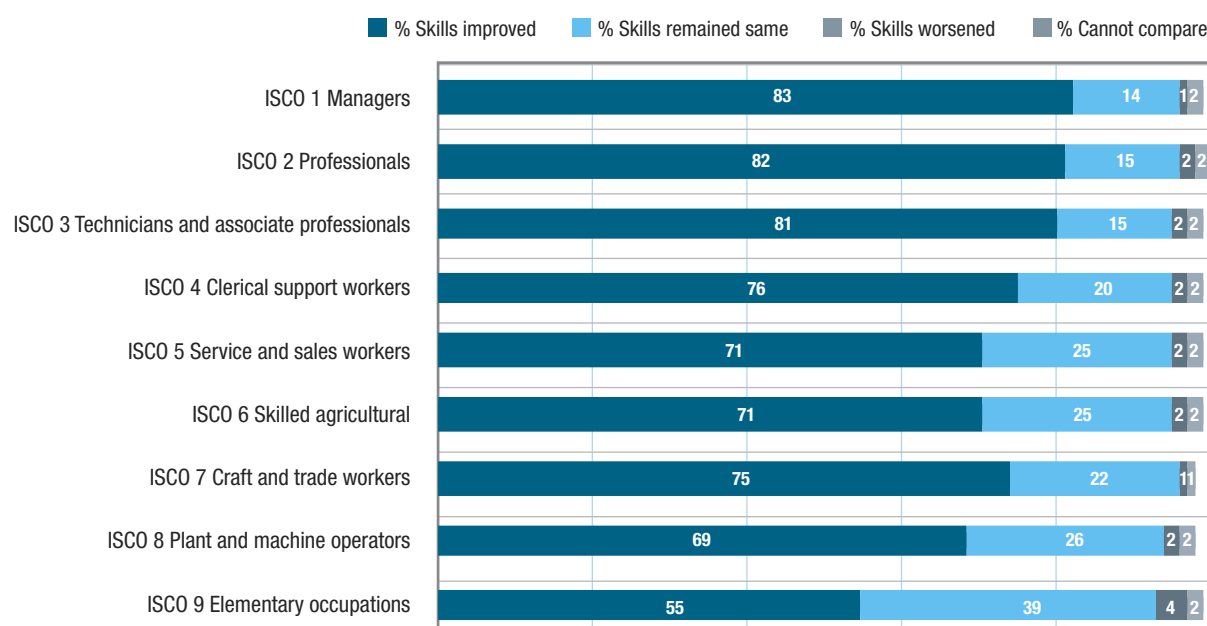
When technological changes in jobs are associated with increasing task complexity, yet individuals' skills fail to keep up with the rapid pace of change, it is more likely that employees will become underskilled, even if their skills were originally matched to their job requirements. By contrast, an individual's progression from an initial skill gap to having matched or surplus skills some years later on is associated with rapid skills accumulation that is not accompanied by skill-augmenting jobs.

The above patterns make it clear that two underlying forces determine whether individuals can tilt away from skill mismatch: the extent of their continuous investment in skills and the degree of job complexity. Depending on the direction of these forces, adult workers can either gravitate towards a 'virtuous' scenario, involving positive feedback between job complexity and skill development or a 'vicious' one, in which workers' jobs and skills remain stagnant over time. The remainder of the chapter focuses on the extent to which adult workers in the EU develop their skills via their investment in continuous non-formal and informal learning and on factors that are correlated with their chances of being employed in skill-intensive jobs.

5.3. Skill development and adult learning in the EU

Cedefop's ESJ survey highlights that considerable skills accumulation takes place in European workplaces. About three quarters of EU employees (76%) have improved their skills since starting their current jobs. Younger individuals, or

Figure 52. Improvement in skills within jobs by occupation, adult workers, 2014, EU-28



NB: Share of EU employees with positive answers to question: 'Compared to when you started your job with your current employer, would you say that your skills have now improved, worsened or stayed the same?'

Source: Cedefop ESJ survey.

those entering their first jobs after completing education, are more likely to experience positive growth in their skills as they accumulate additional years of work experience and job-specific know-how.

Nevertheless, more than one in five (22%) EU employees fail to develop their skills in their current jobs. Skill development is less likely to occur among males, those who returned to the job market after experiencing a spell of unemployment, individuals who entered their jobs with higher education and skills than required by the job ⁽²⁸⁾ and older employees. Even after taking into account the additional years of employer tenure and the original match of the (higher stock of) skills of older workers to their jobs, those aged over 40 years old are less likely to improve their skills in their jobs relative to employees aged 24 to 39. Considering that older-aged workers are equally or more concerned about their skills

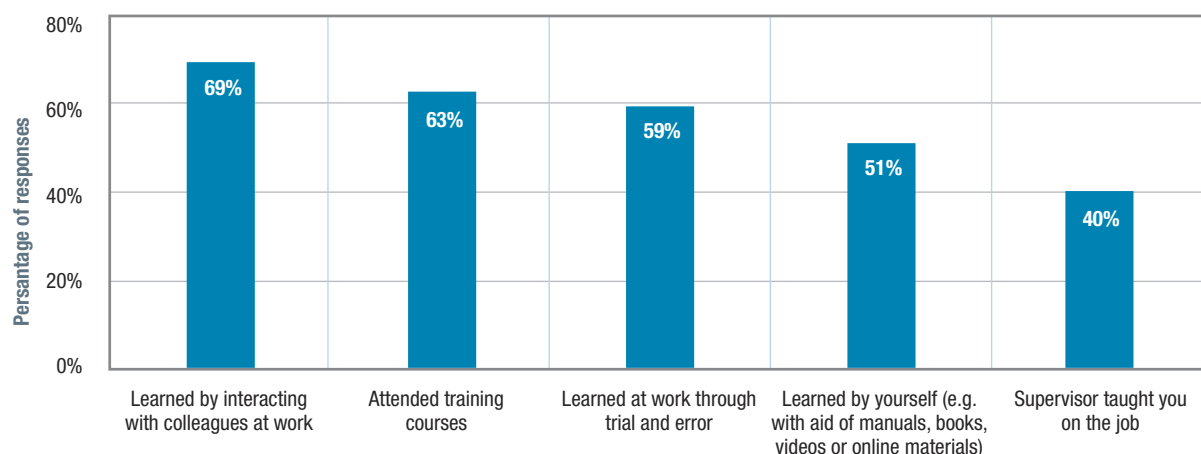
becoming obsolete in future years, greater attention is required by policy-makers to designing age-friendly skills policies, which take into account the specific needs and circumstances of 'silver workers' (Cedefop, 2010b).

Individuals employed in semi-skilled and low-skilled occupations are also found to be less likely to improve their skills in their jobs. A total of 43% of individuals working in elementary occupations and 28% of plant and machine operatives have not improved their skills since they started their current job (Figure 52) ⁽²⁹⁾. Adults who work in the accommodation, catering or food services and transportation and storage industries are most likely to say that their skills have remained the same (28% and 26% respectively). Employees in the supply, management, treatment of water/steam are more likely to say that their skills have worsened (4% compared to an overall average of 2%).

⁽²⁸⁾ However, the slower growth in the skills of individuals who were overskilled at the start of their jobs is subdued if they are employed in jobs that involve a high level of task complexity.

⁽²⁹⁾ Elementary workers (e.g. labourers, packers, goods handling and storage staff) tend to perform routine and repetitive tasks as part of a production chain or process, which may leave less opportunity to learn or develop new techniques. Prior research by Cedefop (2010c) also suggests elementary workers may also be constrained by structural and social inequality; that is, they may be lower educated and have limited access to education/training. This may arise either due to lack of personal resources or because of biased company training policies which fail to invest in their skills, due to the comparatively high level of investment required to improve their skillsets and the low value added of their posts to the firm.

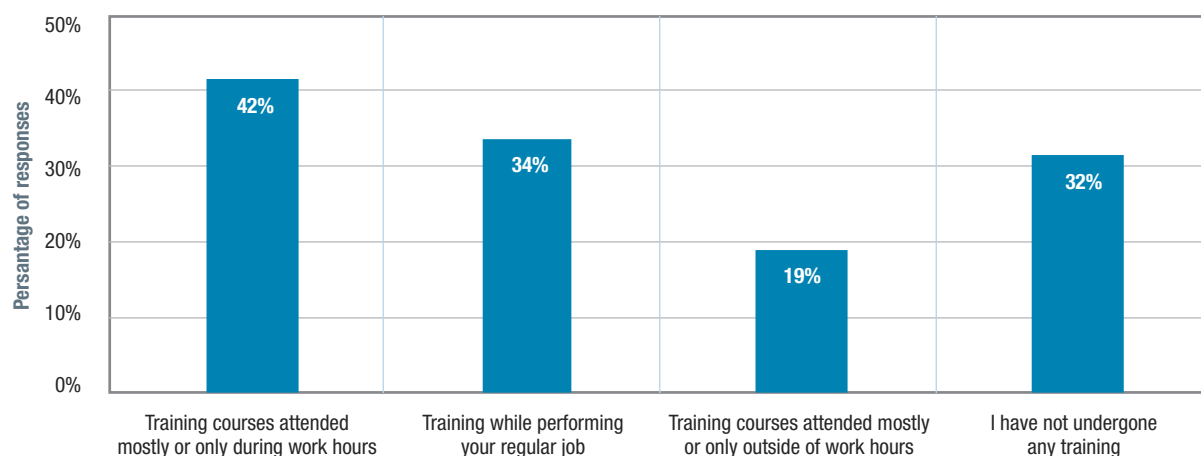
Figure 53. **Method of improving/acquiring new skills in job, adult workers, 2014, EU-28**



NB: Share of EU employees with improved skills and positive answers to question: 'Since you started your job with your current employer, have you done any of the following to improve or acquire new skills?'

Source: Cedefop ESJ survey.

Figure 54. **Types of training completed in last 12 months, adult workers, 2014, EU-28**



NB: Share of EU employees with positive answers to question: 'In the last 12 months have you undergone any of the following types of training in your current job?'

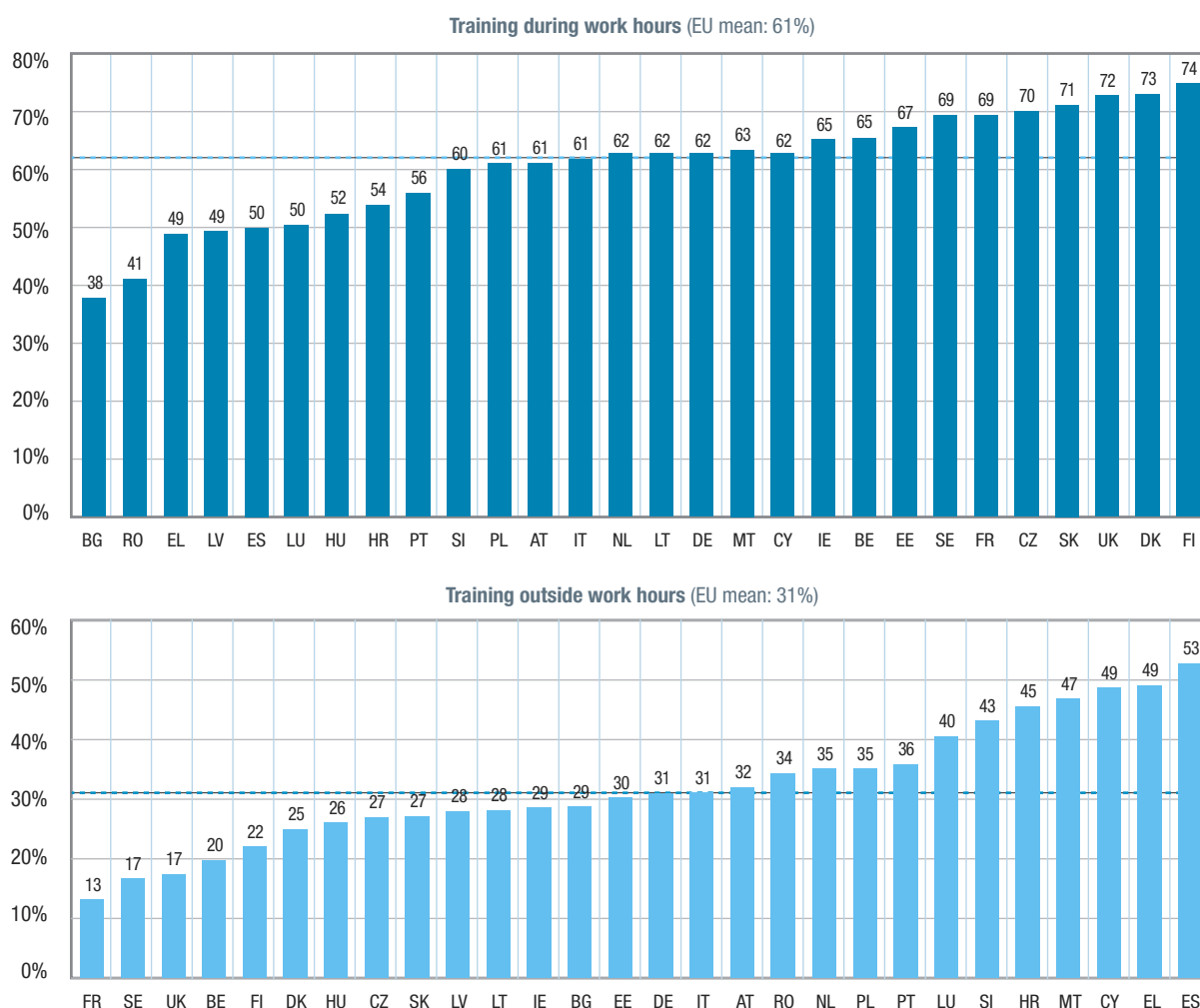
Source: Cedefop ESJ survey.

Provision of training is an important pillar of European lifelong learning policies aimed at enabling adults at risk of skill obsolescence to upgrade their skills or to reskill (Cedefop, 2013). The ESJ survey highlights that a significant majority (63%) of adult EU employees who have improved their skills in their jobs (including those in their first jobs, recent job finders, and those more resilient to technological and workplace changes) have done so by attending training courses (Figure 53).

Nevertheless, about 32% of EU employees did not undergo any training between 2013 and 2014 (Figure 54). About 45% of adult employees in specific economic sectors (including

accommodation, catering or food services; construction; and agriculture) and 55% of those in elementary jobs, did not receive any training, either on or off the job, in the previous year. Older workers, those employed in smaller-sized, private sector firms and individuals returning to the labour market after being unemployed are less likely to have received training. The same holds for lower-qualified individuals. This training bias holds independently of the fact that the lower educated are more likely to be employed in lower-skilled occupations and industries, or in jobs with lower skill content. The fact that training is biased against adults with lower education and with a history of unemployment is a cause for concern,

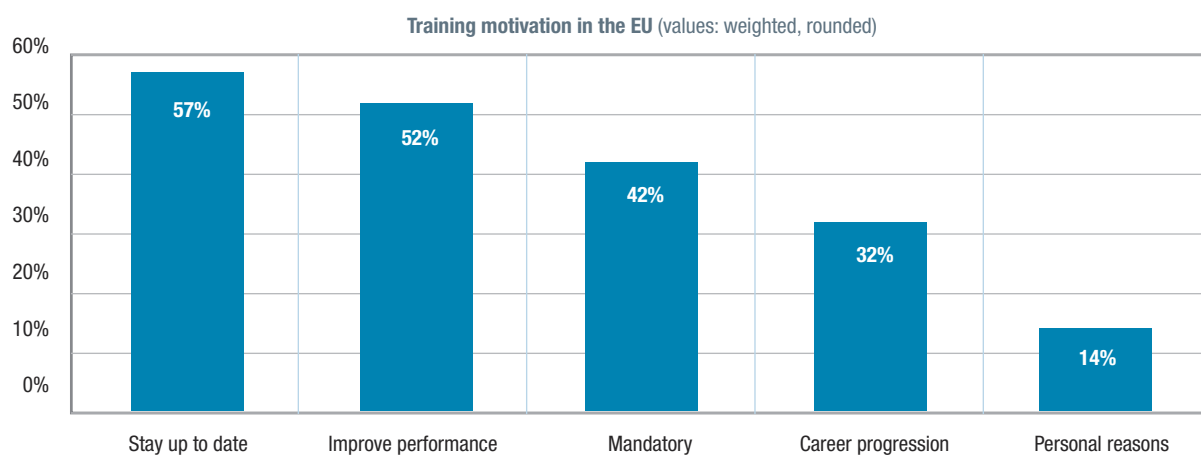
Figure 55. Incidence of training completed in last 12 months by type, adult workers, 2014, EU-28



NB: Share of EU employees with positive answers to question: 'In the last 12 months have you undergone any of the following types of training in your current job?'

Source: Cedefop ESJ survey.

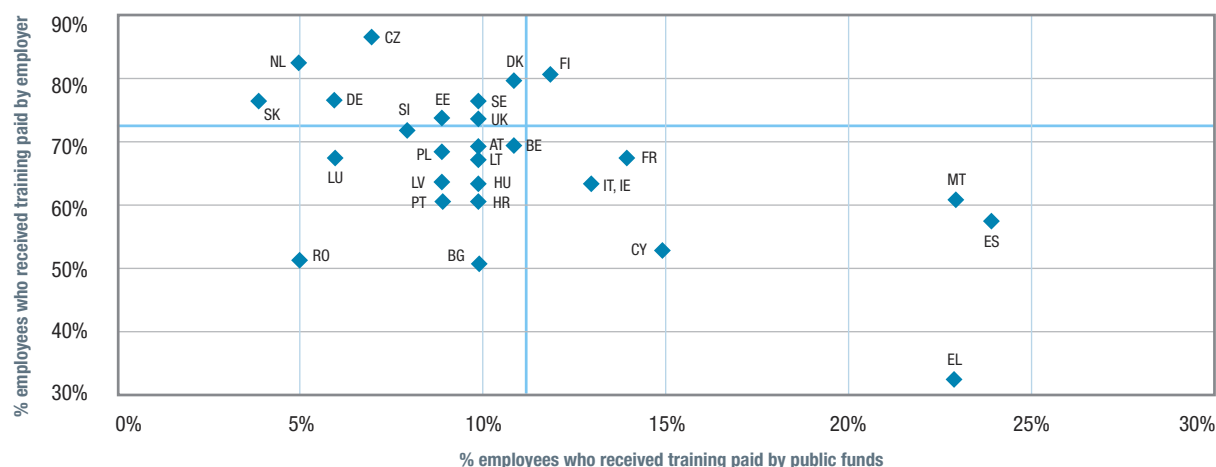
Figure 56. Reasons for participating in training, adult workers, 2014, EU-28



NB: Share of EU employees who participated in training in the last 12 months with positive answers to question: 'What were your reasons for doing this training?'

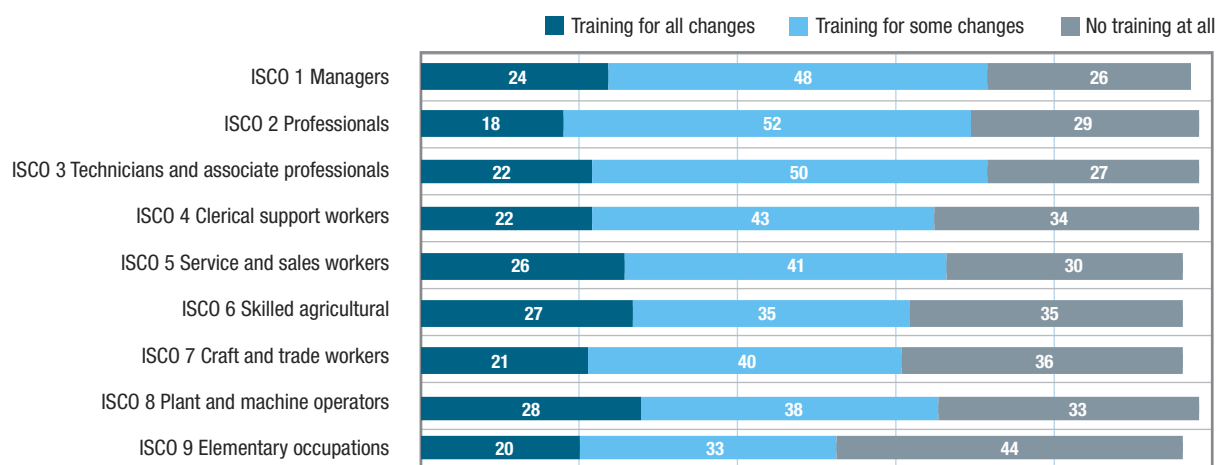
Source: Cedefop ESJ survey.

Figure 57. **Public versus private financing of training, adult employees, 2014, EU-28**



NB: Sample of employees who received training in the last 12 months; lines: EU-28 averages.
Source: Cedefop ESJ survey.

Figure 58. **Work place changes supported with training activities offered by employer by occupation, adult employees, 2014, EU-28**



NB: Share of EU employees who experienced recent changes in their workplace with positive answers to question: 'Were any of these changes supported by training activities paid for by your employer?'
Source: Cedefop ESJ survey.

as it perpetuates their disadvantaged labour market position over time, sustaining inequalities in incomes and in job prospects.

Significant differences are also observed in training participation across EU Member States, which mirror the cross-country patterns observed in the latest wave of the adult education survey (AES) carried out by Eurostat (Figure 55). Employees in Denmark, Finland, the UK, and also the Czech Republic and Slovakia, are the most likely to receive training during work hours in contrast to adult workers from Bulgaria, Greece and Romania. A high percentage of

adults from southern Europe Member States (Greece, Spain, Cyprus, Malta) engage, instead, in training outside of working hours (Figure 55).

Confirming the findings of the latest wave of the AES survey, job-related and employer-sponsored training activities are found to comprise the lion's share of adult learning. The ESJ survey indicates that most employees (57%) engaged in training courses to stay up to date with changing skill needs of their job or to perform their jobs better (52%) (Figure 56); mandatory training ranked third (42%). Approximately a third of respondents who underwent training did so to

promote their career prospects. 14% of adult workers pursued training for personal and non-job-related reasons.

A total of 73% of employees underwent training with full or partial financial support from their employer, while 11% financed it themselves or via a government programme ⁽³⁰⁾. Significant differences exist between Member States with regards to who pays for training. Employees in the south of Europe and Balkans (Bulgaria, Greece, Spain, Cyprus, Malta and Romania) are the least likely to have training funded by their employers, a void that appears to be filled by the public sector (Figure 57). Employers in Greece, in particular, are unlikely to pay for training (33%). Around a quarter of respondents in Greece paid for training themselves or underwent training that was paid for by the government or another public sector employer (26% and 23%, respectively). In comparison, almost nine of 10 respondents in the Czech Republic were likely to have undergone training that was paid for by their employer (86%).

The survey also asked if any changes in technologies, products and working methods were accompanied by training paid for by the employer. Among those who experienced recent changes in their job, around one in five EU employees received training to deal with all changes (22%), under half received training for some of the changes (45%) and three of 10 received no training (31%). More than four in 10 respondents employed in elementary occupations received no training at all (44%), despite the fact that their jobs were affected by technological or other workplace changes (Figure 58) ⁽³¹⁾. Females, individuals who were unemployed prior to starting their job, and employees in smaller-sized, private sector firms are also found to have lower chances of having received training supported by their employers.

Despite the importance of non-formal training, about seven in 10 survey respondents said that they improved or acquired new skills in their job via informal methods, such as learning by interacting with colleagues at work. A significant proportion did so by learning at work through trial and error (59%). Skill formation tends to increase

significantly with additional years of tenure with the same employer, which also explains why a large percentage of underqualified workers admit to having skills that are matched to or higher relative to what is needed by their jobs. It is evident that a substantial part of skill accumulation of employees takes place informally, rendering the recognition and validation of such acquired, yet unrecognised, skills crucial for enabling their continued labour market progression and mobility (OECD, 2013; Cedefop, 2014b).

5.4. Bad-quality jobs can undermine lifelong learning

Good skills lead to good jobs, but bad-quality jobs can ultimately undermine lifelong learning and the development of better skills over the working life. The empirical analysis based on the ESJ highlights the close relationship between the degree to which adult employees improve their skills in their jobs and the skill intensity and job complexity of such jobs. Individuals employed in professions with high autonomy and learning at work are found to be more likely to improve their skills since they started their job.

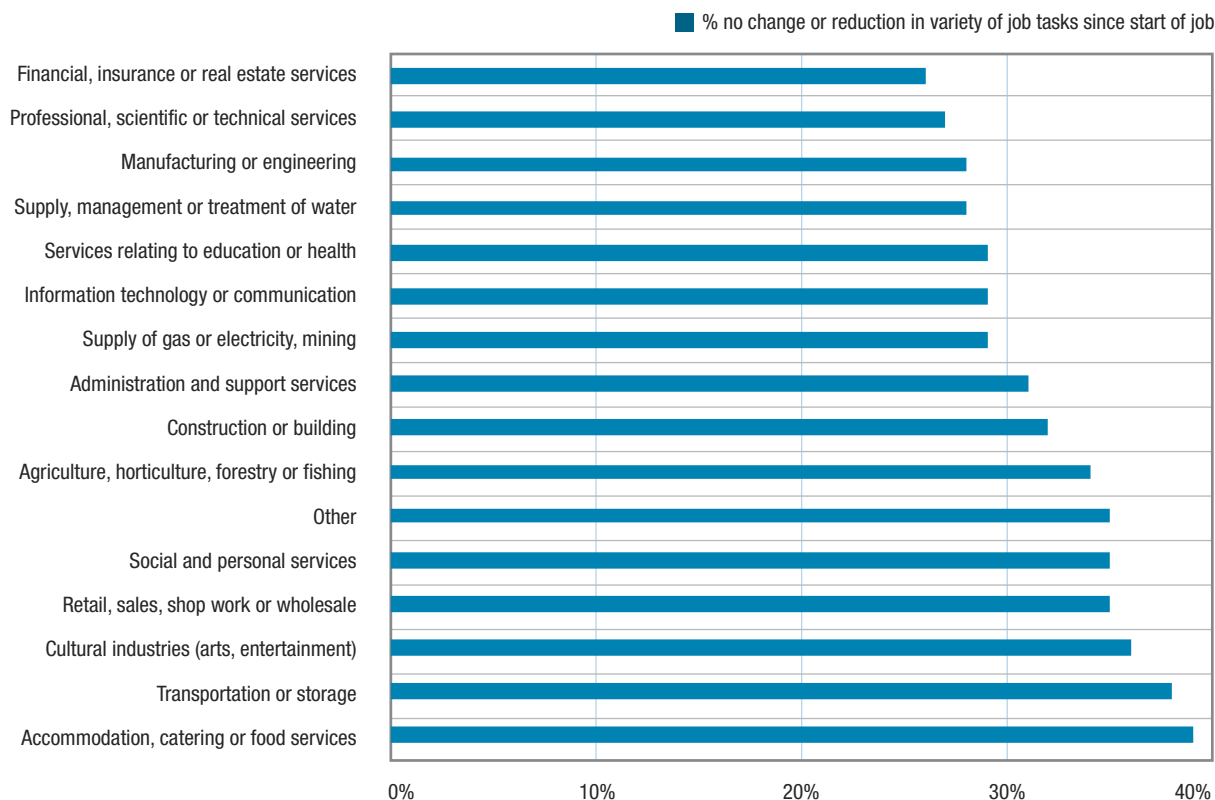
Despite high and rising levels of skill demand affecting the majority of the EU adult workforce, as described in Sections 4.4 and 5.1, more than a third of jobs in some economic sectors (hotels and restaurants, transport, cultural industries and wholesale or retail trades), are still characterised by low need for continuous learning or for staff that can carry out a wide-ranging set of tasks (Figure 59). Overall, 22% of respondents stated that the variety of their job tasks has remained the same or has fallen. Respondents working in elementary occupations are the most likely to say that the variety of their tasks has remained the same or has fallen since starting their job with their current employer (43%). Elementary workers are also the most likely to say that the need to learn new things in their current job has either stayed the same or decreased.

A sizeable share of EU jobs only requires a

⁽³⁰⁾ However, part of the employer-sponsored training could have been financed via a government-funded programme (e.g. ESF), although respondents may not have been aware of it.

⁽³¹⁾ Plant and machine operators and assemblers are the most likely to receive training for all the changes (28%), which may be due to the physical risks involved in this type of occupation, resulting in a higher or mandatory provision of health and safety training.

Figure 59. **Share of EU jobs with stable or decelerating task complexity by economic sector, 2014, EU-28**



NB: Percentage of adult employees who reported no change or reduction in the variety of job tasks since they started their current job.
Source: Cedefop ESJ survey.

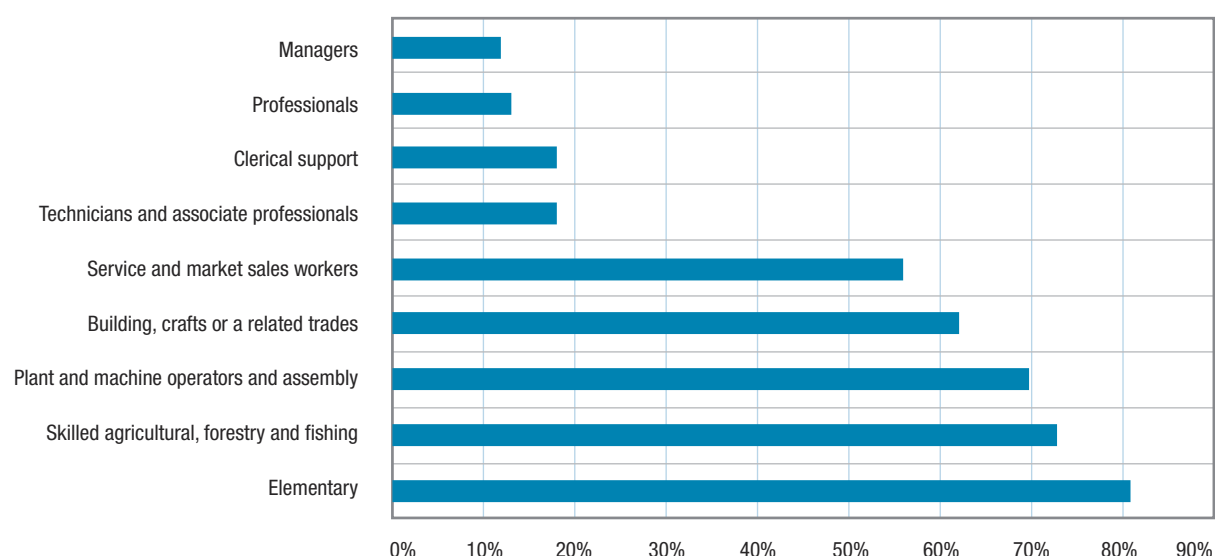
basic level of cognitive or digital skills. Respondents working as service and sales workers, craft and trade workers, plant and machine operators and in elementary occupations are more likely to require basic literacy skills. A quarter of respondents employed as skilled agricultural workers or in elementary occupations report that their current jobs do not require literacy skills (25% and 27% respectively) and one third say the same about the required numeracy skills (37% and 29% respectively).

Despite the EU's ambition to improve competitiveness by investing in the digital economy ⁽³²⁾, a third of EU workers (33%) are employed in jobs that require only basic digital skills or no skills at all, putting them at a disadvantage in terms of their working and everyday life. Individuals employed in jobs requiring only basic or no ICT skills are observed to have lower gross hourly wages, on average,

and are less likely to have experienced career progression in their jobs. More than half of all workers in elementary occupations (55%) and a significant share of skilled agricultural workers (42%), crafts and related trades workers (37%) and plant and machine operators (36%) do not require ICT skills in their jobs at all (Figure 60). For comparison, fewer than two in 10 workers in clerical and professional jobs require either basic or no ICT skills to do their jobs.

While there are significant differences in the importance of skills attached to the jobs of individuals working in different sectors of economic activity and occupation groups, the survey also reveals significant heterogeneity in the level of skill demand within broad clusters of occupations or industries. To obtain a clearer picture of the factors associated with better chances of individuals working in jobs with higher skill content, it is necessary first to strip out the

⁽³²⁾ <http://ec.europa.eu/digital-agenda/en/news/digital-agenda-investment-digital-economy-holds-key-europes-future-prosperity-says-commission> [accessed 10.8.2015].

Figure 60. **Share of jobs requiring basic or no ICT skills, adult employees, 2014, EU-28**

Source: Cedefop ESJ survey.

influence of the individuals' occupation and sector from the variance in the skill intensity of jobs. This allows examination of the purged effect of a further set of individual and job characteristics in the likelihood that individuals are employed in jobs that demand a high level of skills ⁽³³⁾, ⁽³⁴⁾.

Regardless of the occupation and sector of employment, individuals with lower levels of education or with poor attitudes to learning are less likely to be in jobs with high skill demand. Skill requirements are also influenced by the quality of individuals' labour market transitions: obtaining a job after undergoing a spell of unemployment bears a negative association with a job's skill content, compared to individuals who engaged in a direct job-to-job transition. Workers who were long-term unemployed prior to starting their current job face an even larger penalty in terms of skill content. Entering a first job directly from education and training is also associated with jobs of lower skill content compared to the previously employed, which is reasonable given that employers are more likely to trust high-skilled jobs to individuals with a given level of work experience. The higher level of skill demand found for individuals who benefited from upward vertical career mobility (such as promotion) in their job

offers further evidence of the tight link that exists between the continuous skill development of workers and the skill intensity of their jobs. Employers are also more likely to request a higher level of qualification as a prerequisite to hiring individuals in more skill-intensive jobs.

It was mentioned in Section 2.2 that the motives underlying the job choices of adults can be important drivers of their likelihood of ending up in a mismatched job. This illustrates the critical role of interventions in career guidance and counselling for tackling skill mismatch. Focusing on the relationship between individuals' motives and the degree of importance of skills in their jobs, it is confirmed that individuals who selected their jobs because of suitability with their own skills and qualifications, and to a lesser extent on the basis of higher monetary benefits and promotion prospects, are more likely to be found in jobs with high skill needs.

The formation of skills through non-formal and informal learning is an investment by firms, in many respects akin to other forms of investments organisations undertake to put in place new productive infrastructure, capital equipment and technological innovations. However, investment in skills has a defining

⁽³³⁾ In the remainder of this section, the terms 'skill demand', 'skill needs', 'skill intensity', 'skill importance' and 'skill content' are used interchangeably as descriptors of an summary index of the importance of a set of cognitive, digital and generic skills, as described in Section 4.4.

⁽³⁴⁾ See Annex 2 for a description of the empirical methodology used to derive the main conclusions discussed in this section.

characteristic, not shared by other types of financial or capital investments, in that it is embodied in human beings. Consequently, to be able to capture the returns from such investments in skills, firms and individuals have to benefit from stable employment relationships of sufficient duration that can allow them to amortise their original outlays.

The ESJ highlights that there is a significant relationship between the stability of adult employees' jobs and the extent to which their jobs are of high skill intensity. Individuals in non-temporary contracts are more likely to be employed in jobs of increased skill content ⁽³⁵⁾. The analysis suggests that this positive correlation is mediated by the positive association between permanent jobs and those that are characterised by higher levels of increasing job complexity ⁽³⁶⁾ or workplaces that entail a significant degree of dynamic change in technologies and working practices ⁽³⁷⁾. This suggests that it is not the permanent nature of a contract *per se* that is associated with more skill-intensive jobs, but that employment stability can act as a means of coping with uncertainty and dynamic workplace changes making higher demands on the skills of workers.

A finding of particular interest is the negative relationship between workplace size and skill content: employees in smaller-sized firms are more likely to believe that their jobs need a higher level of skills to be performed (a higher level of skill intensity) compared to those in larger-sized workplaces. It is well-reported that small and medium-sized enterprises (SMEs) provide less CVT to their staff relative to larger-sized organisations (Cedefop, 2010d), which partly reflects the skewed distribution of occupations in the latter; for example, a greater share of

professionals are employed in larger-sized firms while SMEs rely more on service and market sales workers. Nevertheless, the ESJ data reveal that, after taking into account their differential occupational/sectoral distribution, individuals in SMEs require a higher level and spectrum of skills to do their jobs compared to comparable workers in large establishments.

Another tool that employers can use to stimulate or craft the level of skills needed by their staff is the task complexity of their jobs ⁽³⁸⁾. There is a significant degree of heterogeneity in skill needs in jobs that is not captured by occupational classifications (Figure 61). Generally, employers competing in the same industry or occupational markets have significant scope to influence the level of skills needed by their employees to perform their jobs. Using data from the OECD PIAAC survey, Pouliakas and Russo (2015) have shown that more complex jobs (offering greater autonomy and requiring solution of complex problems) tend to have higher cognitive (literacy and numeracy) skill requirements. Organisations that employ smarter job design principles may enjoy positive productivity premiums as a consequence (Box 5). Such positive dividends will also arise because jobs with higher skill content are more likely to attract higher educated individuals, with positive attitudes to learning, during the recruitment and selection stage (ibid, 2015). Task complexity is consistently and robustly linked to the skill content of jobs. Given that jobs involving a greater need to execute a variety of tasks, or to learn new things, are intrinsically dependent on possessing a high level of skills among the workforce, it follows from the ESJ that they are also associated with lower chances that individuals are or will transit to a state of overskilling.

⁽³⁵⁾ The data cannot give a clear-cut answer as to whether individuals in permanent contract jobs are more likely to progress to jobs/posts that require a higher level of skills or whether employers are more likely to offer indefinite contract posts for positions of higher skill content and productivity when recruiting labour (externally or internally). The data also do not account for differences in unobserved characteristics of individuals who take up different types of contracts (risk aversion, time discount rates), even though the preferences of the two groups for what is perceived to be an optimal job bundle can differ markedly (Pouliakas and Theodossiou, 2009).

⁽³⁶⁾ Increase in job complexity is a scale based on the score on three items in the ESJ questionnaire: change in the variety of tasks, in the difficulty of the tasks, and in the need to learn new things. It ranges from 0 to 10; higher values denote increases in task complexity, low values (close to zero) denote a reduction in task complexity.

⁽³⁷⁾ The index of organisational change gauges the degree of change that has taken place in the organisation during the five years preceding the interview (or since the beginning of employment for those with less than five years of tenure). It is based on answers to four items: changes in the technology used, in working methods and practices, in the product or service produced, and in the amount of contact with clients or costumers. It ranges from one to four; higher values are associated with higher degree of organisational change.

⁽³⁸⁾ The job complexity scale is based on the score on three items representing job tasks (Q 13): responding to non-routine situations, learning new things, and choosing yourself the way in which you do your work (autonomy). The scale ranges from 0 to 10, higher values denoting higher degree of job complexity.

Box 5. Heterogeneity of skills across and within occupations and the importance of job design

US data have confirmed that most wage variation takes place within detailed (five-digit) occupational groups and that establishments' characteristics are just as important as occupations in explaining wage variation (Lane, et al., 2007; Barth et al., 2014). Wage dispersion across establishments, above and beyond wage dispersion across different occupations, has also contributed to the rise of wage inequality in Germany (Card et al., 2013). This evidence suggests a need to understand better what drives the difference in wages between jobs in the same occupation group and within the same job title. Many have attributed such variance in wages to different personnel or human resource management (HRM) practices that firms employ (recruitment, training, career progression, job design, employee empowerment) and to their complementarity with the skills of the workforce (Cedefop, 2012c).

One component of HRM is job design, which may provide at least part of the answer. Jobs within the same job title may turn out to be very heterogeneous with respect to the skills needed to attain proficient performance (see Figure 61). In fact, the above-mentioned evidence from Germany and the US suggests that wage variation across jobs, regardless of occupation, is linked to the way organisations design jobs and utilise skills (Spitz-Oener 2006; Autor, 2013; Autor and Handel, 2013).

To explain the relationship between job tasks and skill mismatch, the task approach assumes that proficiency in more complex jobs requires workers with a wide spectrum of skills. Jobs can be designed in various ways and this will have an impact on the way workers will have to deploy their skills to be productive: some organisations will choose to bundle a variety of different skills into complex jobs while other companies will choose to break down production into precisely described and rather narrowly defined tasks encompassing only a limited number of skills, which

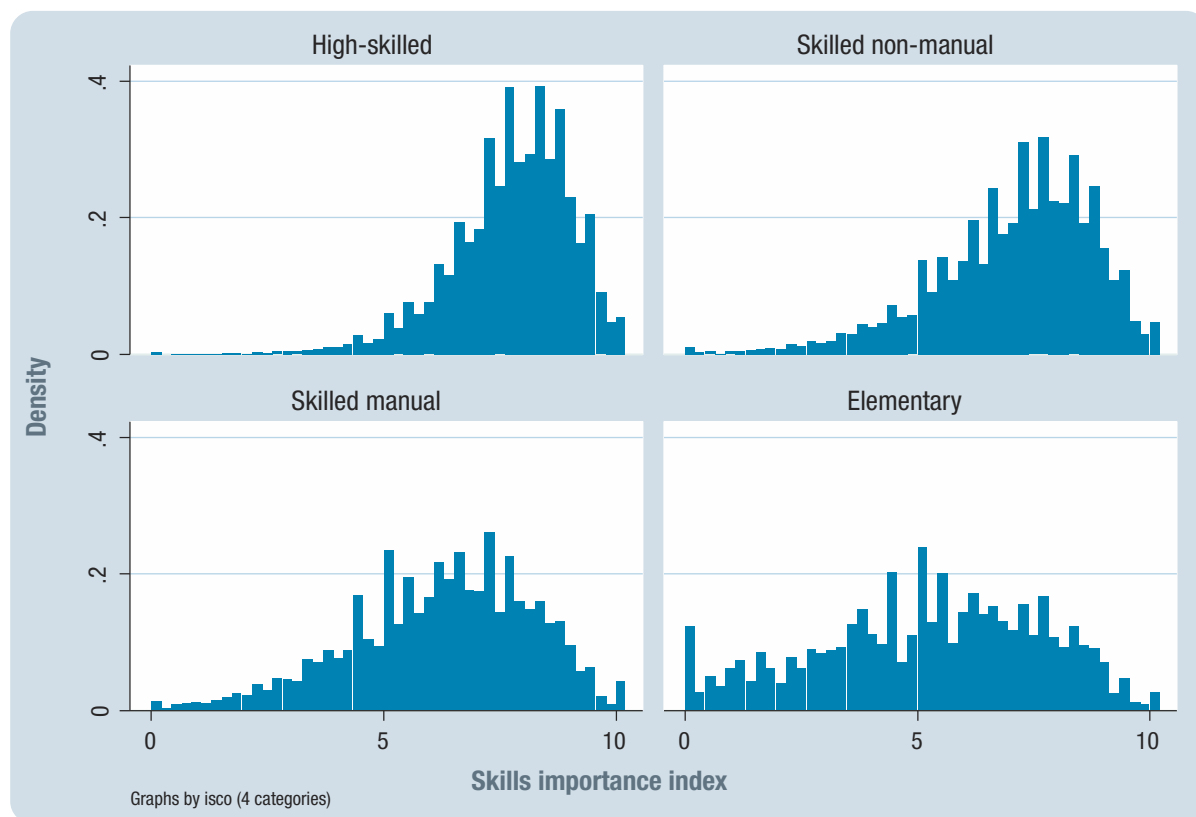
then become jobs (Korpi and Tåhlin, 2009). The way organisations make use of workers' skills is affected by various contextual factors, some of which include the technology adopted and the way the production process is organised (Bresnahan et al., 2002) ⁽³⁹⁾.

Management studies and organisational psychologists link job design to skill utilisation by assuming two useful extreme job design configurations: complex jobs (performing non-routine operations, solving complex problems, possessing a degree of autonomy in the way job tasks can be performed) versus narrowly defined jobs (designed so that workers perform simple and repetitive tasks and use only a limited number of skills). The first configuration is often termed high-performance working practices, while the second case can correspond to the more traditional tayloristic or fordist mode of work organisation. These two polar cases represent the two extremes on a scale that subsumes the varied spectrum of possible ways in which work can be organised (acknowledging that job complexity comes in degrees). The actual positioning of an organisation on the complexity scale will be influenced by an organisations' culture, business and product strategies (Boxall and Purcell, 2011; Sung and Ashton, 2015); job design is intimately linked to the relative importance of human capital as a source of competitive advantage, on which the success of the organisation rests (Takeuchi et al., 2007; Messersmith et al., 2011; Ployhart and Moliterno, 2011; Jiang et al., 2012; Jiang et al., 2013; Patel et al., 2013; Nyberg et al., 2014; Ployhart and Hale, 2014; Ployhart et al., 2014; Fulmer and Ployhart, 2014). The relevance of human capital as a source of competitive advantage is particularly significant for firms adopting advanced manufacturing techniques, and for organisations relying on product and process innovations, and on product or service customisation (Ichniowski et al., 2000).

The analysis provides strong support to the notion that good and stable jobs (non-temporary, full-time, involving complex tasks within dynamic organisations) are also jobs with higher skill content that entail a smaller likelihood of overskilling among adult workers.

⁽³⁹⁾ The way production is organised is influenced by the industry in which organisation operates and by its size. However, there remains substantial variability in the way organisations craft jobs (simple versus complex set ups) even within industry and size class.

Figure 61. **Variance of skills importance index within occupational groups, adult workers, 2014, EU-28**



Source: Cedefop ESJ survey.

5.5. Helping labour market transitions tackle skill mismatch

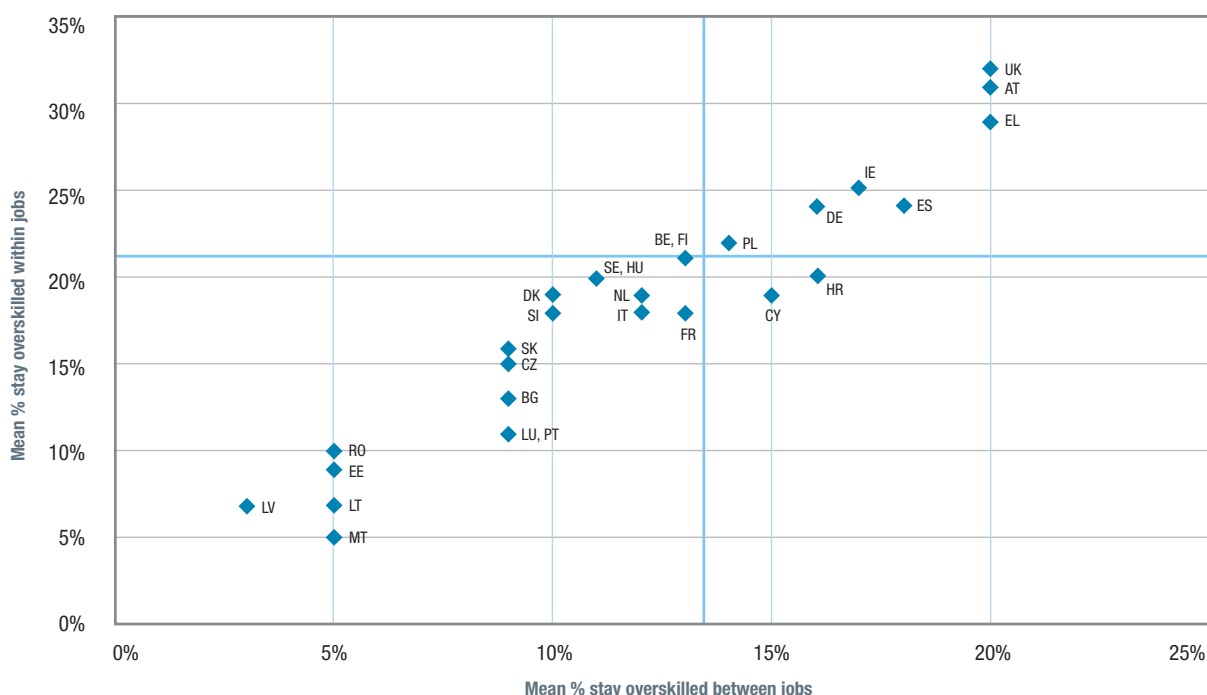
The ESJ survey points out that the chances of exit from a persistent status of skill mismatch are greater for individuals who change jobs, as opposed to relying on the more gradual adaptation of skills to skill needs taking place within jobs. Skill mismatch is a persistent phenomenon and it is difficult for individuals to change their skill mismatch status both within and between jobs. But the chances of transition to a different skill (mis)match state are greater when individuals engage in job mobility.

While 14% of EU employees remained in a perpetual state of overskilling or skill underutilisation after changing to a new job, more than 20% did so during their job tenure (Figure

62). The probability of individuals making a transition to or remaining stuck in jobs that underutilise their skills varies across Member States. Employees in Greece and the UK are characterised by the highest persistence in skill underutilisation, followed by Germany, Spain, Austria and Poland. In these countries there are high chances that individuals will remain overskilled both when changing jobs and throughout their current employment.

Overall, 57% of EU employees did not change mismatch status between their previous and the start of the current job (they either remained matched or mismatched), but approximately 34% did so ⁽⁴⁰⁾. Slightly more than a half of all respondents who were either overskilled or underskilled in their previous job moved to a different skill mismatch state (with approximately two thirds making the transition to matched skills) (Table 13). For comparison, 65%

⁽⁴⁰⁾ The remaining 9% of the adult employee sample comprises missing cases.

Figure 62. **Persistence of overskilling between and within jobs, adult workers, 2014, EU-28**

NB: Based on responses of individuals who said their skills were higher than needed by their previous job, at the start of their current job and at present; lines correspond to EU-28 averages.

Source: Cedefop ESJ survey.

Table 13. **Skill mismatch transitions: previous job and start of current job, adult employees, 2014, EU-28**

Start of current job	My skills are higher than needed to do my job	My skills are matched to what is needed to do my job	Some of my skills are lower than needed to do my job
Previous job			
My skills are higher than needed to do my job	46.4%	36.4%	17.2%
My skills are matched to what is needed to do my job	19.6%	61.8%	18.6%
Some of my skills are lower than needed to do my job	15.9%	37.3%	46.8%

Source: Cedefop ESJ survey.

of EU adult employees were 'stuck' in the same skill mismatch state between the start of their current job and the time of the survey.

Transitions from one job to another are generally associated with greater chances of individuals moving to or remaining in a state of underskilling; they have lower skills than needed to do their new job, and fewer chances of

remaining overskilled (given that the overskilled are more inclined to move to a new job in which their skills are either below or matched to the level needed in their new jobs). By contrast, adult workers are more likely to move from being underskilled to having matched or more skills as they accumulate additional years of tenure within their jobs (Table 13).

Table 14. **Distribution of adult workforce according to skill mismatch transitions between previous job – start of current job – present job, adult employees, EU-28, 2014**

Skill mismatch transition	Transition from previous job to start of new job	Transition from start of new job to present
Matched-matched	32%	35%
Matched-overskilled	10%	13%
Matched-underskilled	10%	2%
Overskilled-overskilled	13%	21%
Overskilled-underskilled	5%	0.5%
Overskilled-matched	10%	5%
Underskilled-underskilled	5%	3%
Underskilled-matched	4%	14%
Underskilled-overskilled	2%	5%
Missing values	10%	2%

Source: Cedefop ESJ survey.

The above transitions suggest that EU and national mobility programmes have considerable scope to contribute to better reallocation of mismatched individuals to jobs that offer a better match with their skills. Stimulating individuals' labour market mobility can typically take the form of either movement across occupations or mobility across different localities ⁽⁴¹⁾.

According to the ESJ survey, one in eight (12%) respondents said that their previous job was exactly the same as their current job, while two in five (43%) said that their occupation is different, and three in 10 (31%) said it is similar. Individuals who embarked on a significant occupational change (a move to a different occupation relative to previous) are more likely to be lower-educated, self-employed prior to accepting the new job (potentially because of prior failure or difficulty in the survival of a business) and to be employed in jobs that require lower levels of (technical) skills. Individuals who faced greater difficulties finding a job that can

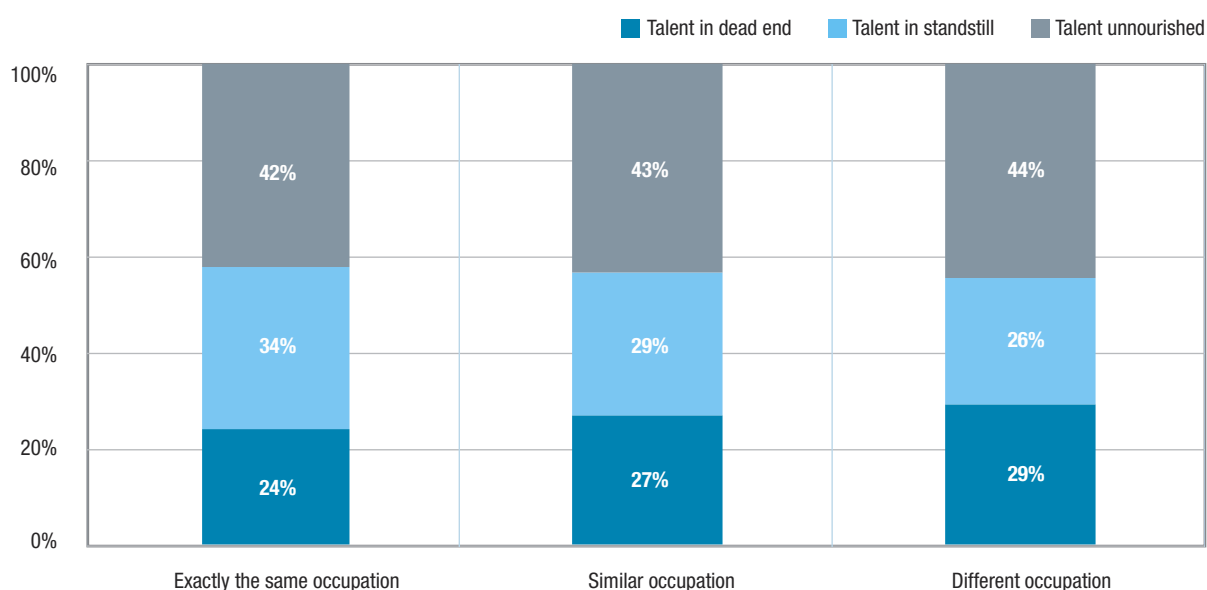
match their own skills and qualifications and greater financial distress are also more likely to have selected a completely different occupation prior to commencing their new employment.

'Radical movers', those who move to a different occupation requiring a very different skills set (especially in the initial period of employment), have greater chances of eventually making a transition to a state of overskilling. As shown in Figure 63, 29% of adult workers who moved to a completely different occupation ended up in dead-end jobs, presumably because such a move is also associated with a considerable loss of occupation-specific skills (Panos et al., 2014), as opposed to 24% of those who remained in exactly the same occupation.

These findings caution that some people faced with disadvantaged individual or labour market circumstances may feel they have little choice but to change occupation, even if it is not a suitable fit for their skills. Effective policy programmes that seek to stimulate occupational

⁽⁴¹⁾ The ESJ survey enquired about these two types of labour market mobility. Respondents were asked the questions: 'Were you working in the same occupation in your previous job as in your current job?' (a) Exactly the same; (b) similar; (c) different; (d) my current job is my first job; (e) don't know. And 'Did you have to move home when you started your job with your current employer?' (a) Yes, to a different country; (b) yes, but within the same region of the country in which you live; (c) yes, to another region of the country in which you live; (d) don't know. Due to time limitations, it was not possible to retrieve the exact occupation code of respondents in their previous job to compare with their current one; the survey relied, instead, on their subjective evaluation. The findings described in this section are dependent on the respondents' own evaluation of what constitutes a 'different' occupation to the one they held in their previous job. With regards to the question on geographic mobility, examples of regions were offered to the respondents that correspond to the conventional NACE 2 level, as defined by Eurostat.

Figure 63. Skill mismatch by type of occupational transition, adult workers, 2014, EU-28



Source: Cedefop ESJ survey.

mobility must ensure that they are accompanied by targeted vocational training and guidance services and social security support that can prolong and smooth the transition of these individuals to better-matched professions.

The ESJ survey confirms other evidence that intra-EU mobility is very limited (European Commission, 2015a, pp. 87-122). Around one in five (17%) of respondents had to move home; 9% moved to a different region, 6% moved but within the same region, and 2% had to move to a different country. Across Europe, respondents in the countries most severely impacted by the prolonged economic crisis, Ireland, Greece, France and Italy, were the most likely to say that they had moved home before they started their job.

On average, younger, high-educated males are more likely to have moved to a different EU country prior to commencing their current job, motivated by the need to advance their career prospects. For instance, 20% of younger respondents aged 24 to 40 moved home compared to 15% of those over 40. By contrast, geographic mobility is less common among females, older and lower-educated individuals and those who experienced previous spells of unemployment or inactivity; these are more likely to be vulnerable to economic shocks and to suffer from skill gaps. Policies that aim to support individuals in finding work in other EU countries, including those falling under the auspices of EURES, will need to pay greater attention to these target groups.

Conclusions and lessons for policy

6.1. No one-size-fits-all policies for skill mismatch

Qualifications and skill mismatches imply a collective waste of talent and resources, with potentially significant economic and social consequences. Better management of skills and human resources can lead to economic benefits, as well as benefits in workers' wellbeing. But policy instruments will vary depending on the type of qualification-skill mismatch situation ⁽⁴²⁾.

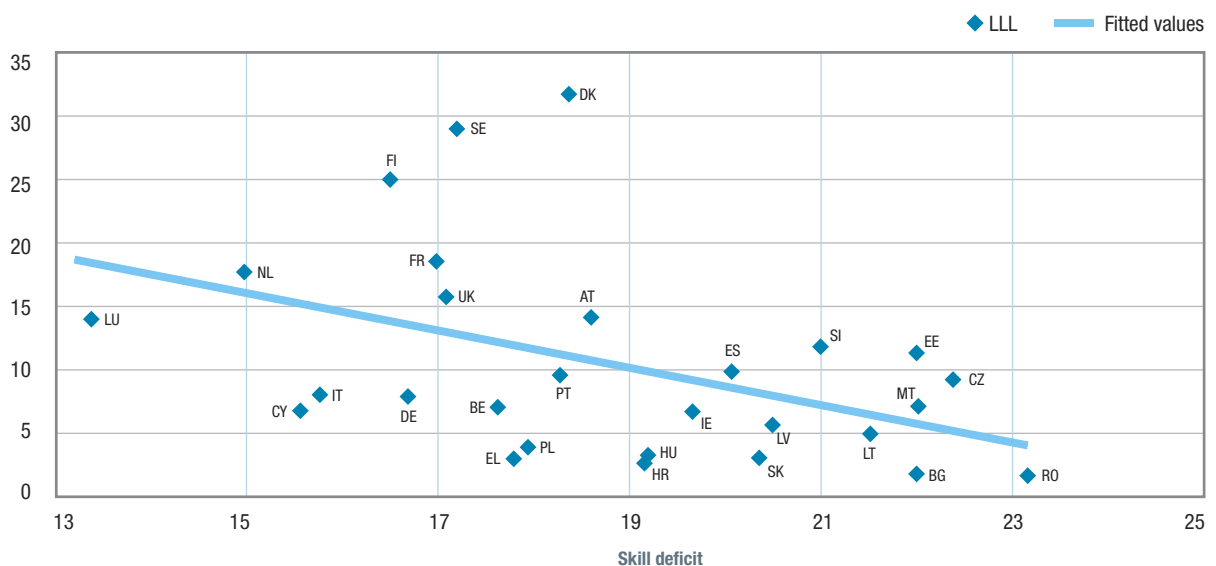
A population group of significant policy concern, given the marked waste in terms of lost potential productivity, are individuals in dead-end jobs, which require lower skills than their own and which offer limited opportunities for further growth. This group appears to be locked in a low-skill-intensity equilibrium, given that their jobs are characterised by low skill content. The provision of career guidance and counselling to enable such workers to find alternative jobs or career

paths suited for their skills and qualifications is necessary in this case, as are policies to support higher skill utilisation within their workplaces. Changing jobs is also found to be a potential remedy, although the ESJ survey cautions that significant occupational transitions may be associated with higher subsequent skill mismatches due to the loss of job-specific human capital.

Some EU employees have also entered jobs with lower education credentials than the ones required at present time, but are nevertheless in possession of the proper or higher skills required to carry out their job tasks. This group of individuals face another challenge. For them it is crucial to certify and validate their learning, to the extent that the absence of formal certification of their informal skills may inhibit their further career progression.

However, the ESJ survey shows that most EU workers are employed in jobs with sufficient

Figure 64. Skill deficits and lifelong learning, adult workers, 2013-14, EU-28



NB: Lifelong learning refers to persons aged 25 to 64 who stated that they received education or training in the four weeks preceding the survey; 2013 data.

Source: Cedefop ESJ survey; Eurostat.

⁽⁴²⁾ Desjardins (2014) reaches at a similar policy conclusion, with a different categorisation of the skill mismatch groups: low-skill match (individuals with low skills in low-skilled jobs), high-skill match (individuals with high skills in high-skilled jobs), low-skill mismatch (individuals with low skills in high-skilled jobs) and high-skill mismatch (individuals with high skills in low-skilled jobs).

scope to enjoy further productivity dividends as long as continuous skill development is provided. Policy efforts to address skill mismatch for this group would require continued investment in their skills and support to adult learning to enable them to cope with the rapid evolution of their job tasks. As shown in Figure 64, there is negative correlation between EU Member States with the smallest incidence of adults participating in lifelong learning in 2013 (the European Commission's main indicator of lifelong learning) and the magnitude of skill deficits affecting their adult workforces a year later (correlation coefficient = - 0.41; p-value = 0.03).

6.2. School-to-work transition and skill mismatch

Concerted efforts are needed by EU policy-makers to prepare new labour market entrants adequately, particularly lower-skilled vulnerable graduates, to make an effective transition into the world of work. Given the marked persistence of skill mismatch, policies that target the establishment of better skill matches at the beginning of individuals' labour market histories should enjoy greater efficiency gains relative to those that seek to address the problem *ex post*.

Improving the match of individuals' skills with their job needs at an early stage of their working lives is dependent on strengthening the channels of communication between the worlds of education and work, the provision of customised career guidance and counselling, the promotion of job mobility, the provision of better intelligence on labour market opportunities and support to job networks (World Economic Forum, 2014). It is also critically reliant on the timing of entry into the labour market, given that finding a job in a slack job market may undermine an individual's long-term career prospects.

The ESJ survey therefore calls for the further strengthening of EU and national programmes aimed at delivering specialised training modules, assistance to jobseekers, and matching and placement services via ICT tools aimed at younger-aged people, such as 'Your first EURES job'.

WBL, in particular, offers a beneficial strategy for aiding a speedier transition into the job

market. It is also more likely to place individuals on a virtuous path, characterised by high-skill requirements in their jobs and opportunities for further skill accumulation. But the ESJ survey suggests that European policy-makers wishing to support WBL should pay greater attention to fields of study as well as occupations and industries where WBL is not yet common.

6.3. Active labour market policies need greater focus

Recent skill mismatch policies in Member States have emphasised the need to retrain unemployed workers, in particular those with long spells of joblessness, focusing on augmenting and matching their skills with labour market needs in emerging or predominant national industries (Cedefop, 2015c). The findings of the ESJ survey indicate that a strategy focused solely on skill upgrading may be less effective in the current economic environment, given that current unemployment includes a greater pool of skilled and experienced individuals actively seeking to (re-)enter a depressed job market. For this reason, active labour market policies must pay greater attention to the quality and suitability of the jobs that the unemployed accept as part of their transition back into employment (Tatsiramos, 2010). Public employment services (PES) play a key role in ensuring that the much-needed return to employment growth does not come at the expense of lower-quality skill matches, which will ultimately compromise or prolong the job crisis in coming years (World Economic Forum, 2014). New innovative methods and ICT tools have also been recently adopted by several Member States attempting to ensure a better degree of matching between the skills of job applicants and of enterprises (Cedefop, 2015c). Utilising the full set of European tools for education and training for the purposes of active labour market policies (including accreditation/recognition of skills of the unemployed, competence-directed training) is a strategy adopted by few EU countries at present, but which has the potential to improve the overall effectiveness of employment services (*ibid*, 2015a).

The ESJ survey also highlights the importance of PES and career guidance services

focusing on the promotion of workers' skills, aspirations and interests when supporting the reintegration of unemployed workers. Workers who base their career decisions (accepting a job offer) on having their own skills and qualifications match those needed by their jobs are generally more likely to end up in skill-intensive jobs which ensure continued skill development.

Rapid economic restructuring in turbulent economies may require some degree of occupation change for those who wish to return to the labour market. The ESJ survey emphasises that individuals embarking on a radical change in occupation would greatly benefit from accompanying training during the transition. Significant readjustment in the match of their skills with the requirements of their new jobs is also required.

6.4. One-shot solutions will be short-lived

The ESJ survey cautions the importance of preventing skill mismatch in a dynamic framework that acknowledges the possibility of skill gain and skill loss by workers and changing job content (Desjardins, 2014). One-shot solutions to improve match between the skills of adults and those needed in the labour market, including the acquisition of additional qualifications or a formal certification of the (informal) skills of employees, may be short-lived as they will be insufficient to sustain a continuous skills balance over the duration of individuals' job tenure. Continuous investment in training and other forms of on-the-job learning are needed to maintain an adequate balance between increasing job demands (spurred by workplace innovation and changes in the complexity of jobs) and workers' skills.

Contrary to the received wisdom that SMEs have a limited capacity to provide enough training, jobs in SMEs tend to require broader use of skills (jobs are more skill-intensive) and workers in SMEs experience faster skills development. The ESJ survey confirms the centrality of SMEs in the skill formation process; they might invest less in training, but they are comparatively better at setting up effective on-the-job learning systems.

6.5. Employment stability leads to continued skill formation

Excessive focus on numerical flexibility could be counterproductive as it undermines skill formation. Non-standard and precarious forms of employment contracts can foster labour market segmentation. Several Member States suffer from a dual labour market where such contracts are accepted involuntarily and associated with fewer training opportunities, limited social security rights and lower job satisfaction than permanent contracts (Pouliakas and Theodossiou, 2010). Young people are more likely to have precarious employment terms and conditions, a share that has increased since 2007, while they also have a higher propensity to be employed in part-time jobs (European Commission, 2014a).

Temporary contracts can be effective stepping stones into regular and secure employment, particularly in some Member State apprenticeship schemes. Most job creation in the post-crisis era has been driven in temporary jobs. The ESJ survey suggests that, in addition to the risk of lower earnings and job insecurity, temporary labour contracts may come at a significant long-term cost, as they are associated with jobs that demand a lower level of skills. A focus on flexibility also shortens time on the job, which is crucial for the development of skills. Employer overreliance on non-stable contracts, which may be necessary in coping with erratic production fluctuations, must be balanced against the need to ensure continued learning and utilisation of individuals' skills over the long-term.

6.6. Skill demand must be stimulated in the EU

Even though one in four European workers acknowledge that they suffer from skill gaps when entering a new job, the ESJ survey highlights that a non-trivial share of employees are in dead-end jobs that underutilise their skills. Such jobs tend to be associated with lower-paid and precarious work and can undermine the value and further adaptation of the skills of individuals with a high level of education. Further, the ESJ has also shown that tackling the skill deficits of unnourished talent requires greater commitment

to their continuing learning, which is intrinsically dependent on raising the bar with regards to the skill intensity of their jobs. Even among the group of individuals who are in ‘standstill’, a high level of skill needs in their jobs is necessary to balance their continuous learning and to avoid their transition to overskilling and associated demotivation over time.

It is important for EU policies to stimulate the level of skills required and used in jobs. Employers competing in the same industry or occupation markets have significant scope to influence the level of skills needed by their employees to perform their jobs, in light of their marked heterogeneity in managerial practices and job design (Bloom and van Reenen, 2007; 2011; Pouliakas and Russo, 2015). Promoting high-skill work and organisational practices that foster work complexity is an important course of action, given that jobs entailing greater employee autonomy, learning and task discretion are generally associated with higher skills needed to perform them. But the exchange of best practices on job and workplace design is unlikely to be sufficient, given that employers are typically bound by varying sets of norms, capabilities, cultures, historical trajectories and idiosyncratic ‘social architectures’ influenced by their immediate industry or environment (Green, 2013). Organisational learning with regards to best practices is also likely to be slow and incremental.

Directing investment expenditure to projects with high capital-skill complementarity (such as via the European fund for strategic investments) is also necessary for raising the level of skill demand. Supporting businesses in innovation of high value-added products, services and business models via EU modernisation investments in industry and research and development is a requisite for shifting EU firms towards a high-skills equilibrium, in which they can compete on the basis of higher-end product market strategies. Financing investment projects with a long-term horizon will induce employers to adopt a strategic approach to talent management and opt out of low-skill, low-cost production strategies.

Aligning industrial policy with substantial institutional transformation in VET systems to meet the needs of industry is acknowledged as a pertinent strategy for mitigating skill mismatch, as evidenced by the experiences of the south-east Asian tiger economies in previous decades. Industrial activity in the EU has become increasingly integrated into global value chains over past decades, resulting in increasing employment of highly skilled labour (Bruegel, 2013; Timmer et al., 2014) ⁽⁴³⁾. However, the ESJ survey identifies a number of economic sectors (including administration of support services; retail and sales; accommodation, catering and food services; transportation and storage; cultural industries and social and personal services), mostly reliant on service provision, which are susceptible to skills underutilisation. In these sectors greater policy efforts are required to revamp skill demand.

Governments, as large providers, funders and procurers of goods and services to the market economy, have multiple policy levers for influencing employers’ demand for skills. Governments can support local enterprise partnerships that seek to bring together local skill strategies with wider economic development priorities. They can also legislate on mandatory qualification or skill standards in occupations as well as adjusting the lower floor of minimum wages in accordance with the conditions of the labour market to prevent overreliance on low-skilled immigrant labour.

6.7. Stimulating better EU labour market skill matches

During the recent economic crisis there has been a growing trend in the EU of higher-educated individuals taking up jobs requiring lower skills than they possess (European Commission, 2012a; ILO, 2014). Searching for a job in a depressed labour market, when individuals are confronted with financial constraints or inadequate labour market opportunities, contributes to individuals accepting mismatched jobs. At times of declining average incomes in

⁽⁴³⁾ <http://www.bruegel.org/publications/publication-detail/view/795-manufacturing-europes-future/> [accessed 12.8.2015].

many European households, the provision of social insurance and social security benefits could potentially provide adequate breathing space to individuals to seek and find jobs that are a better match with their skills.

The ability to compete on the basis of skills is dependent on significant investment on behalf of both workers and organisations with a long-term horizon. The prolonged economic crisis is jeopardising these investments because the incentives and rate of return on human capital is undermined by increased uncertainty in finding and sustaining a good job. Willingness to invest in improving job quality on the part of employers is also compromised by the greater threat of bankruptcy and need for business survival in the current economic climate.

Given the subdued level of employment creation in the EU economy relative to the pre-crisis era, it is evident that stimulation of aggregate demand is necessary to avoid unsuitable and wasteful skill-job matches, which can have a lasting and damaging effect on the health of the EU labour market. A commitment by governments to the goal of full employment and to the stability of industrial relations is a key ingredient that can serve as collateral to support the decisions of all labour market agents (individuals, firms and VET providers) in investing in better and stronger skills for the EU's future.



List of abbreviations

AES	adult education survey
CVET	continuing vocational education and training
CVT	continuing vocational training
EULFS	European labour force survey
ESJ	European skills and jobs
EU	European Union
EWCS	European working conditions survey
HRM	human resource management
ICT	information and communications technology
ISCO	international standard classification of occupations
IVET	initial vocational education and training
LTU	unemployed for more than one year before starting current job
NACE	statistical classification of economic activities in the European Community
OECD	Organisation for Economic Cooperation and Development
OLS	ordinary least squares
PIAAC	survey of adult skills
SMEs	small and medium-sized enterprises
VET	vocational education and training
WBL	work-based learning
NEETs	individuals neither in employment nor in education or training

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Details of the data collection

The ESJ survey is a Cedefop funded project. Cedefop commissioned Ipsos MORI, a survey company, to conduct a European-wide employee survey on skill mismatch which will help to understand better the extent of skills mismatch and contribute towards development of VET policies across Europe. The global objective of this research was to deliver a data set which enables detailed empirical analysis of skill mismatch among European workers. In response to the global objective, and after consideration of the key concept of skill mismatch, a survey instrument was designed to capture valid and reliable data that would allow Cedefop to:

- (a) quantify the incidence and speed of skills obsolescence and skill mismatch experienced by employees aged between 24 and 65 years;
- (b) identify the drivers of skills obsolescence and skill mismatch among European employees;
- (c) allow for the examination of the relationship between the process of skills obsolescence and skill mismatch and various demographic, socioeconomic and workplace characteristics, as well as differences among EU countries;
- (d) explore the capacity of continuous vocational training and of various human resource and organisational practices for mitigating skills obsolescence and skill mismatch.

A1.1. Methodology overview

The survey was carried out by Ipsos and its network partners in the EU-28 Member States between 7th March and 26 June 2014. In total, 48 676 respondents from different demographic groups took part either by telephone or online. On average, the questionnaire length for the online interviews was 20 minutes, and 31 minutes for the telephone interviews.

The main reason for using mixed methodology was to ensure that the data collected pro-

vided a representative sample of the 24 to 65 working age population in each of the EU-28 countries. Most data were collected using Ipsos' and partner agencies online panels because of time and the cost effectiveness of this method of data collection. The mixed mode approach ensured that the survey could benefit from the advantages of an online survey in terms of cost and time required for fieldwork, while avoiding the problem of lack of coverage among some sections of the target population by conducting some of the fieldwork by telephone. Non-coverage bias arises when not all members of the target survey population have a chance of being included in the sample. Online approaches can suffer from coverage bias because, in some countries, internet penetration is still quite low, particularly among older people. A mixed mode approach meant that in countries with low internet penetration, telephone interviews could ensure that the proportion of the population without access to the internet had a greater chance of inclusion.

A1.2. Questionnaire design and translation

A1.2.1. Questionnaire design

The questionnaire used in this study was predominately designed by Cedefop and their expert group (Box 6). The initial questionnaire had been previously piloted by Cedefop in 2011 and was further refined by Ipsos and Cedefop collaboratively. Ipsos provided additional input drawing on their experience developing questionnaires that limit mode effects in mixed mode surveys prior to the cognitive and pilot interviews phase.

The design of the questionnaire reflected several important considerations:

- (a) a need for the survey to work over the telephone and online;
- (b) a need to restrict the questionnaire to 25 minutes;

Box 6. Members of the expert group of the ESJ survey

- Dr **G. Quintini** (OECD)
- Dr **M. Curtarelli** (Eurofound)
- Prof. **K. Mavromaras** (NILS, Flinders University, S. Australia)
- Dr **S. McGuinness** (ESRI, IE)
- Prof. **A. de Grip** (ROA, NL)
- Prof. **M. Tahlin** (SOFI, Stockholm University, SE)
- Prof. **W. Gijssels** (University of Maastricht, NL)
- Prof. **F. Mañé** (Rovira and Virgili University, ES)
- Prof. **K. Mayhew** (SKOPE, University of Oxford, UK)
- Prof. **F. Rycx** (Universite Libre de Bruxelles, BE)
- Dr **D. Verhaest** (HUBrussel and Ghent University, BE)
- Prof. **T. Zwick** (Ludwig-Maximilians University, DE)
- Prof. **I. Theodossiou** (University of Aberdeen, Scotland)

- (c) that questions were unambiguous and that their meaning was consistently interpreted by the survey audience;
- (d) a need to collect information to measure skill mismatch accurately;
- (e) a need to ascertain the occupation and industry of the respondent, so that it could be classified under ISCO and NACE.

There were three stages to the questionnaire design and translation: one before the cognitive testing; one after the cognitive testing and before the pilot; and one after the pilot before the mainstage fieldwork. A summary of these stages can be found in the following.

A1.2.2. Translation

Translation ran concurrently with the questionnaire design in three stages. In the first stage, the English version of the cognitive testing questionnaire was signed off by Cedefop and then sent to the local agencies for translation. The local translations were back-translated into English by Language Connect, a translation company. The English back-translations were reviewed against the master questionnaire by the central coordination team in London and discrepancies were queried with the local teams. The finalised versions of the questionnaire were then sent for sign off by Cedefop.

After the cognitive testing, Ipsos made recommendations for changes to the questionnaire/translations. The master questionnaire was updated and back-translations were completed for the five countries not included in the cognitive test. The existing translations were updated for the other countries and proofread. Written instructions were provided to the translators outlining the meaning of key terms and consistency checks made to ensure high quality translations. The main challenges of the translation process were ensuring consistency of terminology throughout the questionnaire, and that appropriate terms were used for the key concepts such as 'skills' and 'workplace'.

Translators were briefed by the research team via teleconference. This helped ensure that the translation process was focused on creating equivalent meaning across the languages rather than on literal translations. After the pilot, further changes were made to the source questionnaire and the changes were implemented by linguists at Language Connect, who had worked on the earlier translations.

The final translations were further checked by linguists and researchers in Ipsos offices and by Cedefop. Particular emphasis was placed on ensuring that the translations of the education, NACE and ISCO codes were sensitive to local markets. The translations were then finalised and signed-off by Cedefop prior to the start of main stage of fieldwork.

The survey was finally carried out in the official national languages of the EU Member States.

A1.2.3. Cognitive pilot survey

A cognitive pilot survey was conducted in 24 countries: Belgium, the Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Lithuania, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovakia, Finland, Sweden and the UK. In each country, up to 10 cognitive interviews were conducted. Quotas were set on age, level of education, occupation, and industry to ensure a good mix of respondents. The length of time respondents had spent in their current job was also covered to ensure that all sections of the questionnaire were tested. Fieldwork took place between the 26th of June and the 9th of July 2014.

The interviews were conducted face to face in most cases, with the interviewer sitting next to the respondent as the respondent completed the survey online. The interviewer observed the respondent, and asked follow-up questions on the key questions answered by the respondent; the interviewer paid attention not only to the answers the respondent gave, but also how they behaved when completing the survey. For example, they watched for looks of confusion or delays in responding which might indicate problems with comprehension or the layout of the script. As a result of the cognitive test, the questionnaire was adapted for the pilot to take into account difficulties encountered by the respondents. The most important of these included difficulty in correctly identifying a broad occupation group (ISCO), answering questions on a seven-point scale or at repeated period in time and reluctance to rate skills as unimportant or to rate their level of skills as lower than required to do their job. The test also highlighted country specific issues such as problems with translation of words and phrases, and issues with the formatting and functionality of the online script.

Following the cognitive test, the questionnaire was adapted for the pilot, with several changes: inclusion of four-digit examples of the ISCO occupations to illustrate the types of jobs that are

included within one-digit categories; the use of 11-point scales and the labelling of a mid-point to make them easier to use; the adding of introductory sentences to the questions on skills to try to soften the language and reduce social desirability bias (i.e. underreporting of skills that are rated as unimportant and lower than required); and limitation of the cognitive effort required by the respondents to answer questions about their jobs and skills at several periods of their career.

A1.2.4. Main pilot survey

In total, 30 pilot interviews were conducted in each country. In countries using a mixed mode approach, the interviews were split between online and telephone modes. Ipsos collated and analysed feedback from the telephone interviewers and both online and telephone respondents. In addition to the survey questions, the pilot also asked the respondents to assess the difficulty of some of the questions and provided the opportunity to provide feedback on the survey experience. In response to this feedback, the length of the questionnaire was significantly reduced so that the duration of interviews did not exceed 25 minutes. The questionnaire was also restructured so that it respects a chronological sequence of events: current job, start of current

Table 15. **Overview of questionnaire structure**

	Content of section
Selection criteria	Questions on age, gender and employment status to confirm that the respondent is eligible to take part
Current job	Questions including occupation, industry, type of organisation, changes in role since starting job, contract type
Education attainment	Questions on the respondents' highest level, type and subject of education and assessment of whether it was needed to get their current job
Skills and job demands	Questions on the type, level and importance of skills respondents require to do their current job
Situation since start of current job	Questions about respondents' development of skills and the demands of their job since they started their job
Training and learning	Questions on type and reasons for training, and attitudes to learning
Situation before current job	Questions on employment status before starting current job, reasons for accepting current job, and level of skills in current job
Background information	Demographics

Source: Cedefop ESJ survey.

job, before entry to current job, previous job. The overall skills mismatch question was adapted to try to minimise social desirability bias which might have impacted on the proportion of respondents reporting levels of skills below those required for their job. Questions were also redesigned to account for the different data collection methodologies. The main reasons for doing this was to reduce the cognitive burden placed on respondents, reduce the length of the telephone survey, and ensure accurate coding of the ISCO codes.

A1.2.5. Structure of final questionnaire

The final questionnaire was split into eight sections. An overview of each section can be found in Table 15.

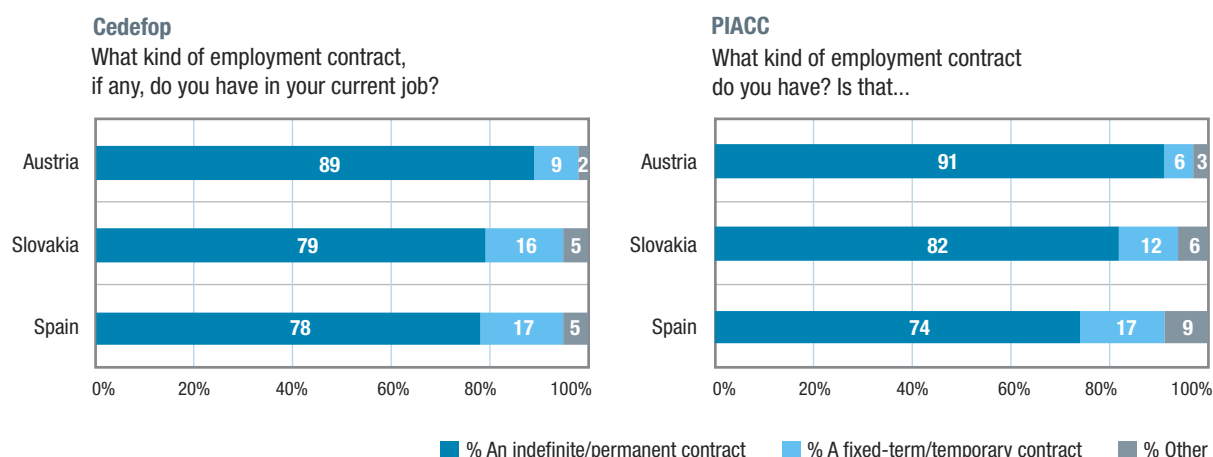
A1.2.6. Sampling approach

The survey employed a quota approach because of its advantages in terms of time and cost when compared to random probability sampling and the fact that it allowed for the collection of greater sample sizes, which can aid country-specific

statistical analysis. While quota sampling lacks the statistical robustness of random probability sampling, quota sampling can achieve representativeness by using quotas and weights which align the sample with the population on key control variables. This method guarantees representativeness on these control variables and makes it likely on other variables that are correlated with them. For the main survey flexible quotas were set on age, gender, occupation and industry. The quotas were based on 2012 Eurostat data from the labour force surveys ⁽⁴⁴⁾.

To evaluate the extent to which the quota sampling used to collect the ESJ data are biased relative to other surveys that employ a random probability sampling approach, a few of the Cedefop ESJ estimates were compared with estimates from the OECD survey on adults skills and Eurofound's 2010 EWCS. These comparisons are limited to questions that were identical or similar in both surveys. In most cases it is validated that small differences exist between the different surveys, also taking into account reasonable levels of sampling error.

Figure 65. Cedefop ESJ and OECD PIACC: employment contract



Base: Cedefop: all respondents in Austria (1 000), Slovakia (1 019) and Spain (4 009);

PIACC: all employees aged 24-65 excluding those with 'apprenticeship contracts' and 'don't know' / refused in Austria (2 690), Slovakia (2 478) and Spain (2 485).

Source: Cedefop ESJ survey and OECD PIACC.

⁽⁴⁴⁾ The main differences between quota and random probability sampling are at the stage of drawing the sample. Random probability sampling uses systematic selection procedures which ensure that each member of the survey population has a known and non-zero probability of selection, and a lot of effort is made to contact and persuade those selected to take part through processes such as repeat contact, reissues and incentives, which help to ensure a good response rate and therefore limit non-response bias. Selection probabilities, however, cannot be calculated for quota samples. Quota sampling ensures that the achieved sample structure will match that of the population for the variables on which quotas are set. The advantage of probability sampling is that it is based on statistical theory and so can demonstrate why samples are free of selection bias and why it is possible to calculate standard errors and confidence intervals. In contrast, with a quota sample it is not possible to use deductive methods to demonstrate a lack of bias or to calculate standard errors or patterns of variable error. Nonetheless, the quality of a quota sample can be assessed by comparing survey estimates from a quota sample with those from random probability surveys.

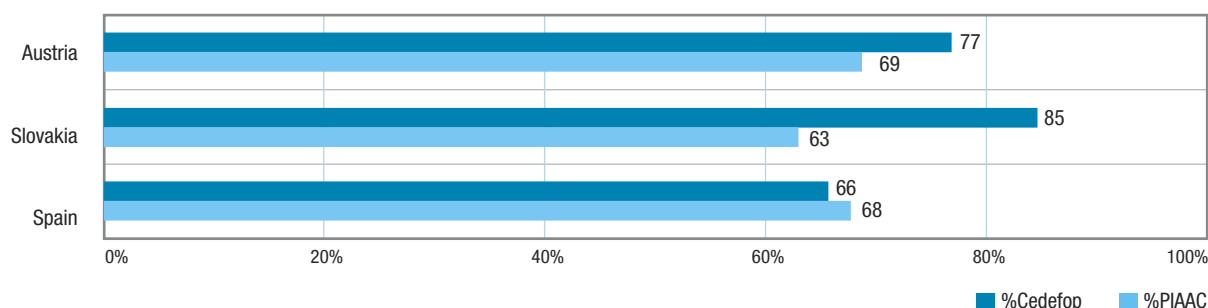
Figure 66. **Cedefop ESJ and OECD PIACC: employer paid for training**

Cedefop

Who paid for this training (e.g. tuition, registration, fees)?
Your employer paid/your employer paid part of the cost

PIACC

Did an employer or prospective employer pay for tuition or registration, exam fees, expenses for books or other costs resulting from your participation in this activity



Base: Cedefop: all respondents who have undergone training in Austria (728), Slovakia (747) and Spain (2 851);
PIACC: all employees aged 24-65 who have undergone training in Austria (1 576), Slovakia (1 043) and Spain (1 390).
Source: Cedefop ESJ survey and OECD PIACC.

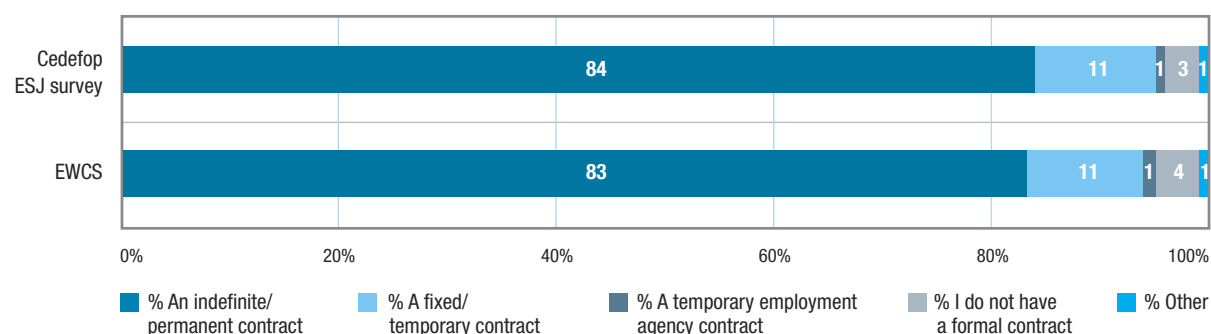
Figure 67. **Cedefop ESJ and Eurofound EWCS: employment contract**

Cedefop

What kind of employment contract, if any, do you have in your current job?

EWCS

What kind of employment contract do you have?



Base: EWCS employees in EU-28 aged 24-65 (27 842), Cedefop all respondents (48 676).
Source: Eurofound EWCS 2010 and Cedefop ESJ survey.

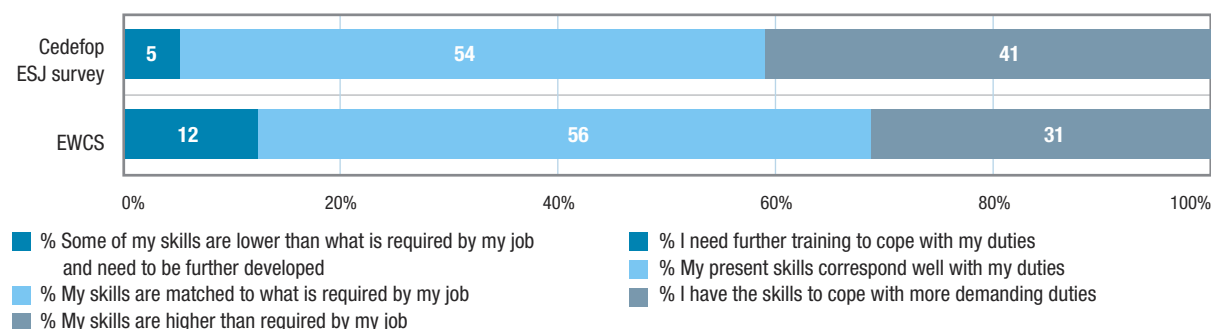
Figure 68. **Cedefop ESJ and Eurofound EWCS: overall skill mismatch**

Cedefop

Overall, how would you best describe your skills in relation to what is required to do your job?

EWCS

Which of the following alternatives would best describe your skills in your own work?



Base: EWCS employees in EU-28 aged 24-65 (27 762), Cedefop all respondents excluding 'don't know' (48 214).
Source: Eurofound EWCS 2010 and Cedefop ESJ survey.

A1.3. Weighting, statistical reliability, interpreting the data

Weighting is an important aspect of a quota sampling approach. The variables that the data are weighted on are selected based on variables that one would expect to be closely correlated with questions on skill mismatch.

For the Cedefop ESJ survey, the following variables were used in the weighting scheme:

- (a) age and gender (with age bands 24 to 39, 40 to 54 and 55 to 65);
- (b) education (with three bands being low – ISCED 1997 levels 1 and 2; medium – ISCED 3 and 4; and high – ISCED 5 and 6);
- (c) economic activity (NACE section level, collapsed into weighting classes: agriculture, industry, services, public administration and other);
- (d) occupation (ISCO 1 digit, collapsed into weighting classes: managers and professionals; technicians and associate professionals; skilled/semi-skilled; and other).

The weightings were calculated using the LFS population counts of employees aged 24 to 65 based on an up-to-date Eurostat data set released in 2013. Rim weighting was used: this uses a form of regression analysis to weight according to various demographic characteristics

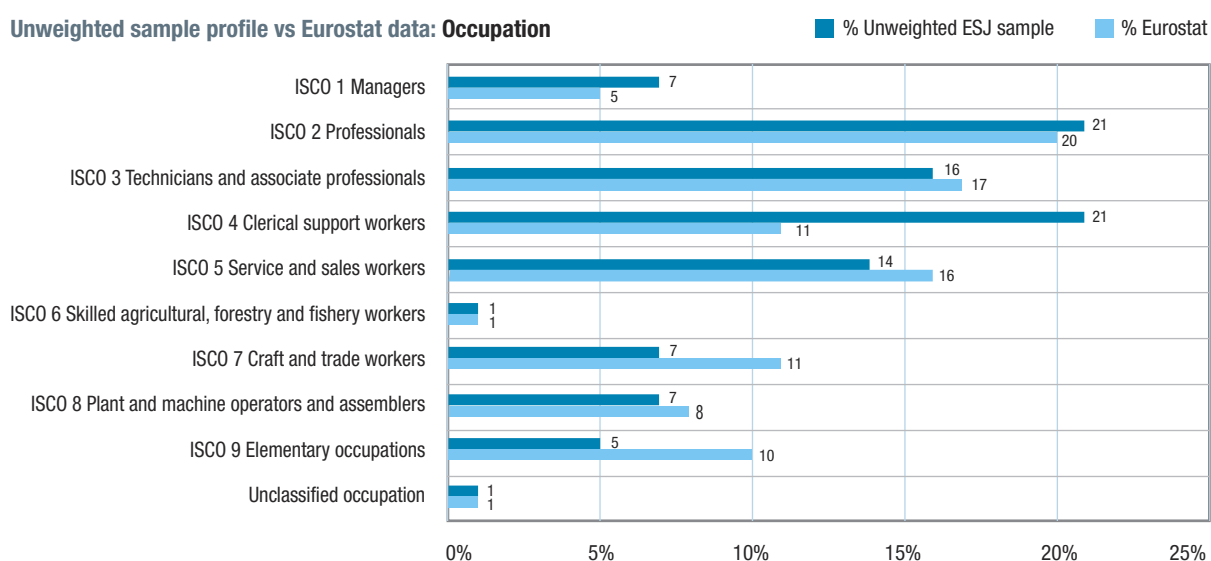
when the relationship of the various combinations of those characteristics is not known. The weightings were capped so that respondents with a weighting larger than four were capped at four to reduce the impact that the weighting had on the weighting efficiency, and to reduce the bias that would result from having a few respondents in the data who are heavily unweighted. Prior to capping the weightings, 1.2% of respondents had been assigned a weighting larger than four.

While the reported results are weighted by occupation, industry, education, age and gender, the unweighted data are broadly in line with the population profile and are outlined in the charts for occupation and industry below. The difference between the official Eurostat data and the sample profile occurs because flexible quotas were used during fieldwork, meaning that for a couple of occupation and industry quotas, the number of interviews achieved are higher or lower than the Eurostat data.

However, for education, the sample profile is different from the Eurostat data in some countries, with people with higher levels of education being underrepresented in some countries and over-represented in others. To correct for this, we weighted the data by education, though it was necessary to cap the large weights; this means that in Italy, in particular, the weighted data still underrepresent people with primary education.

Figure 69. **Sample profile: occupation**

Unweighted sample profile vs Eurostat data: Occupation

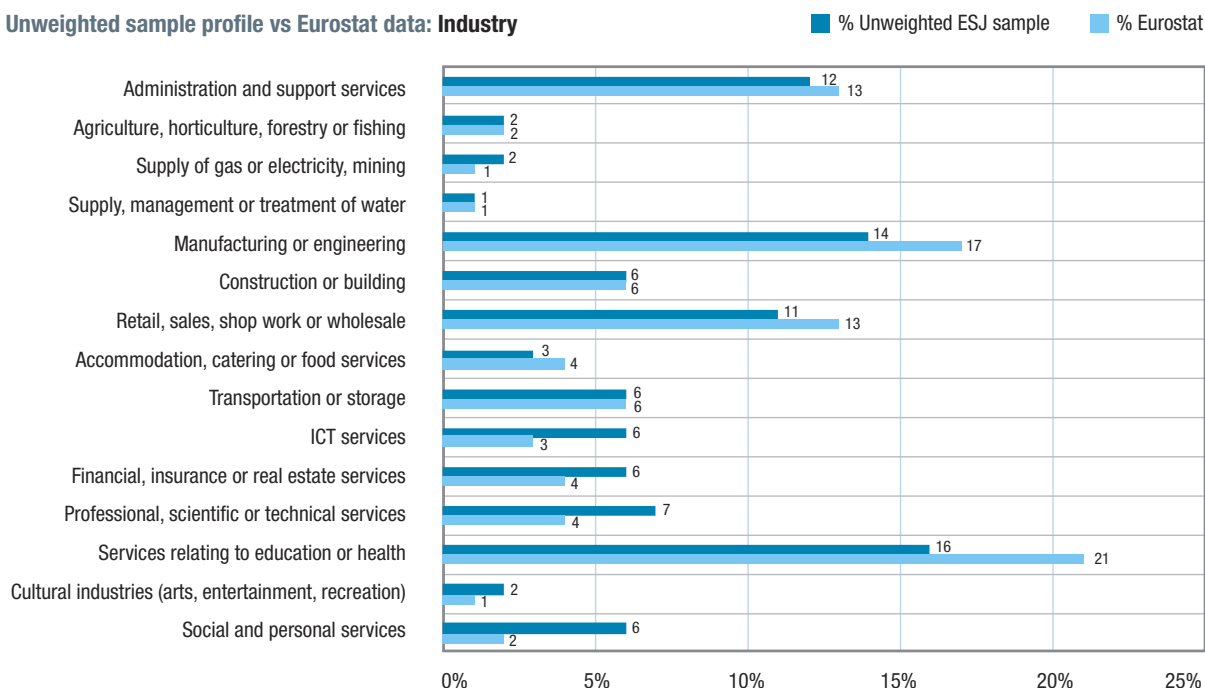


Base: All respondents (48 676).

Source: Cedefop ESJ survey and Eurostat.

Figure 70. **Sample profile: industry**

Unweighted sample profile vs Eurostat data: Industry

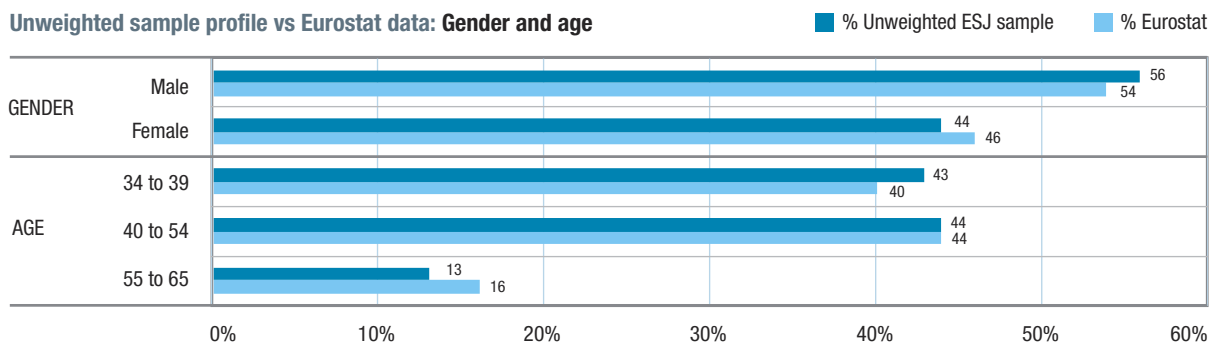


Base: All respondents (48 676).

Source: Cedefop ESJ survey and Eurostat.

Figure 71. **Sample profile: gender and age**

Unweighted sample profile vs Eurostat data: Gender and age

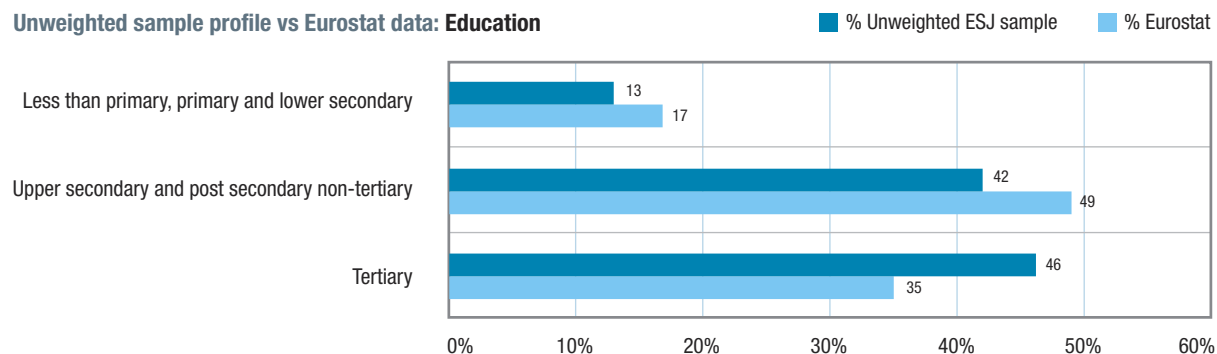


Base: All respondents (48 676).

Source: Cedefop ESJ survey and Eurostat.

Figure 72. **Sample profile: education**

Unweighted sample profile vs Eurostat data: Education



Base: All respondents (48 676).

Source: Cedefop ESJ survey and Eurostat.

A1.4. Sample sizes: EU and by country

Table 16 specifies the final unweighted and weighted national sample sizes for the EU-28 area.

Table 16. **Unweighted and weighted national sample sizes in ESJ survey**

	Unweighted sample size	EU-28 weighted sample size
European Union total	48 676	48 676
Austria	1 000	927
Belgium	1 502	1 065
Bulgaria	1 000	719
Croatia	1 004	315
Cyprus	500	85
Czech Republic	1 506	1 123
Denmark	1 000	610
Estonia	1 001	149
Finland	2 004	556
France	4 011	6 217
Germany	4 013	9 428
Greece	2 037	652
Hungary	1 500	983
Ireland	1 004	418
Italy	3 016	4 797
Latvia	1 004	211
Lithuania	1 010	308
Luxembourg	500	61
Malta	500	38
Netherlands	1 502	1 722
Poland	4 017	3 341
Portugal	1 503	987
Romania	1 502	1 785
Slovakia	1 019	549
Slovenia	1 010	211
Spain	4 009	3 902
Sweden	1 001	1 090
United Kingdom	4 001	6 423

Source: Cedefop ESJ survey.



Empirical methodologies used to derive reported findings

A2.1. Discrete choice empirical estimation of qualification and skill mismatch

Probit regressions have been estimated to identify the determinants of the probability that an individual employee is affected by a particular type of vertical mismatch (a binary outcome, e.g. the individual is either mismatched or not). The probability of an individual being either over- or underqualified is modelled on the basis of a latent variable model, where it is assumed that an individual's unobserved propensity to be in a particular state of qualification mismatch is determined by the equation:

$$m_i^* = \beta_0 + \mathbf{x}_i\boldsymbol{\beta} + T_i + C_i + u_i, \quad m_i = 1[m_i^* > 0] \quad (1)$$

where m_i , individual i 's mismatch status in time period t , takes the value one if $m_i^* > 0$ and zero if $m_i^* \leq 0$. \mathbf{x} is a vector of explanatory variables, including demographic, socioeconomic and job-related characteristics of the respondents, while u_i , the disturbance term, is assumed to follow a normal distribution and to be independent of \mathbf{x} . The estimated parameters, $\boldsymbol{\beta}$, denote the effect of each explanatory variable on the probability of a positive response i.e. $P(y = 1|x)$. In all regressions, country-specific conditions (e.g. differences in labour market institutions) are taken into account via the inclusion in the empirical specification of country (C) dummies. The reported estimates are interpreted in terms of the change in the probability of an individual being vertically mismatched in relation to a particular individual or job characteristic (e.g. gender).

A2.2. Derivation of a new categorisation of skill mismatch among EU workers

To derive a new categorisation of the skill mismatch status of EU adult workers that relies on talent management and adopts a lifelong learning perspective, two separate questions from the ESJ survey were combined. The first question measures the skill mismatch status of workers: the correspondence of their skills to what is needed to do their job at the current time. The second question measures the lag between the skills of respondents and the level of skills needed so they can perform with maximum proficiency in their job, at the best level possible.

Prior to combining the two questions, respondents in the survey were categorised according to whether or not they suffer from a larger than average skill deficit. An average skill deficit has been estimated on the basis of an OLS regression, which computes the conditional mean skill deficit of workers in different countries on the basis of their age, gender, level of education, native status, prior labour market status, years of employer tenure, characteristics of the job (part-time work, type of contract, sector, size of workplace, hours of work, multisite organisation) and industry and occupation. A comparison of each respondent's skill deficit with the average implied by his/her characteristics is subsequently used to categorise the individuals in the sample according to whether they have higher or lower than average skill deficits.

Following this, individuals have been categorised according to whether they are 'talent un nourished', 'talent in dead end' or 'talent in standstill' as follows:

- (a) talent un nourished: individuals have greater than average skill deficit, regardless of whether their skills are above, below or matched to what is needed to do the current job tasks;

- (b) talent in dead end: individuals have an equal or smaller than average skill deficit and have stated that they have higher skills than needed to perform their current job tasks;
- (c) talent in standstill: individuals have an equal or smaller than average skill deficit and have stated that they have matched skills to what is needed to perform their current job tasks.

A2.3. Matching estimators of effect of prior unemployment status on skill formation

The empirical analysis undertaken to investigate the impact of a prior spell of unemployment on the subsequent skill formation of individuals has followed a so-called matching approach. The methodology first estimated the probability that individuals were unemployed before entry into their current job as a function of a number of explanatory variables that preceded or are exogenous to their actual status of joblessness, such as their gender, their native status, highest level of education attainment, age at the time they began their new job and skill mismatch status in the job they had prior to becoming unemployed. In addition, in the spirit of Oswald's theory underpinning the wage curve (Oswald, 1991), the likelihood of experiencing a previous spell of unemployment was linked to whether individuals owned their main residence (either outright or with a mortgage) before finding their new job and to if they (or their family) were faced with family obligations prior to accepting the new job ⁽⁴⁵⁾.

At the second stage, and on the basis of the estimated probability of individuals being unemployed before entering into their current job conditional on specific characteristics, the programme compared improvement in the skills between two comparable groups of individuals: those who actually experienced an unemployment spell prior to job entry (the

treated); and individuals who moved into their current job directly from another, but who are characterised by a similar probability of being unemployed on the basis of their observed characteristics as the former group (the untreated or counterfactual group).

The estimated average treatment effect on the treated reveals that there is a statistically significant difference in the improvement of skills scores between the two comparable groups of individuals who differ on the basis of their prior labour market status.

A2.4. Derivation and determinants of skill intensity index

The indicator used to measure the skill content of jobs is derived from self-reported accounts of the perceived importance of a range of cognitive, digital and transversal skills. The skill content index is derived from the orthogonal latent dimensions of the set of skills (the factors on which a wider set of skills can be reduced, Mañé, 2013).

The skills surveyed in the questionnaire are: literacy, numeracy, ICT, technical skills, communication skills, teamwork skills, foreign language skills, customer handling skills, problem solving, learning skills, and planning and organisation skills ⁽⁴⁶⁾.

These 11 skills have been additively collapsed into an index of skill requirements or skill content of jobs. However, the indicator is imperfect in that it is based on a small set of skills (even though skills spanning different skills domains were used). It is built on subjective statements of the importance of these skills (scale 0 to 10, where zero is 'not important at all' and 10 is 'essential'). The index performs well (Cronbach alpha 0.84) across countries (the country with the lowest reliability indicator is Croatia, alpha 0.75) and occupations (the index's performance is

⁽⁴⁵⁾ In a secondary analysis, additional explanatory variables that are not strictly predetermined have been also added in the first step regression of the matching estimation, such as whether the respondents live with a partner/spouse, with children or with their parents, if they moved home or changed occupation before starting their job with their current employer and if they (and their family) were faced with considerable financial constraints at that time.

⁽⁴⁶⁾ The robustness of the results has also been verified by excluding foreign language and customer communication skills from the derived index. The reason for doing so is that the Anglo Saxon countries naturally score much lower than other countries on the importance of foreign language skills, while these skills are also of a lesser generic nature and more specific to particular occupations relative to the remaining set of skills used in the index.

lower in the first three ISCO categories 0.76, 0.74, and 0.74; respectively).

The empirical analysis is based on the following regression:

Model 1:

$$S_i = \beta_0 + \beta_1 JC_i + \beta_2 \Delta JC_i + \beta_3 \Delta WP_i + \beta_4 FC_i + \beta_5 X_i + \varepsilon_i$$

where S denotes a job's skill content, JC denotes a vector of job characteristics (job complexity, team work), ΔJC denotes the change in job complexity, WP denotes workplace dynamism, FC denotes a vector of firm characteristics (type of organisation, private or public, establishment size, number of employees, full-time, type of contract, tenure, education requirements to be hired in the job and the education requirement needed to do the job) and X is a vector of additional controls (country, industry and occupation dummies.). To investigate the impact of personal characteristics the above model has been augmented with a set of variables (denoted by PC) including: age (in log), highest education qualification, an indicator variable capturing whether the current job is the first job, the previous labour market position (employed, self-employed, unemployed, long-term unemployed, out of the labour force, in education), current mismatch status, initial mismatch status, and mismatch status in the previous job, an index of the degree of occupational change (if individuals held a job in the same occupation, in a similar occupation, or in a completely different occupation), if the new job involved relocation, the reasons that made them accept the job, family composition, whether they were born in the country, personal constraints (family obligations) and job search effort.

The final model reads:

Model 2:

$$S_i = \beta_0 + \beta_1 JC_i + \beta_2 \Delta JC_i + \beta_3 \Delta WP_i + \beta_4 FC_i + \beta_5 PC_i + \beta_6 X_i + \varepsilon_i$$

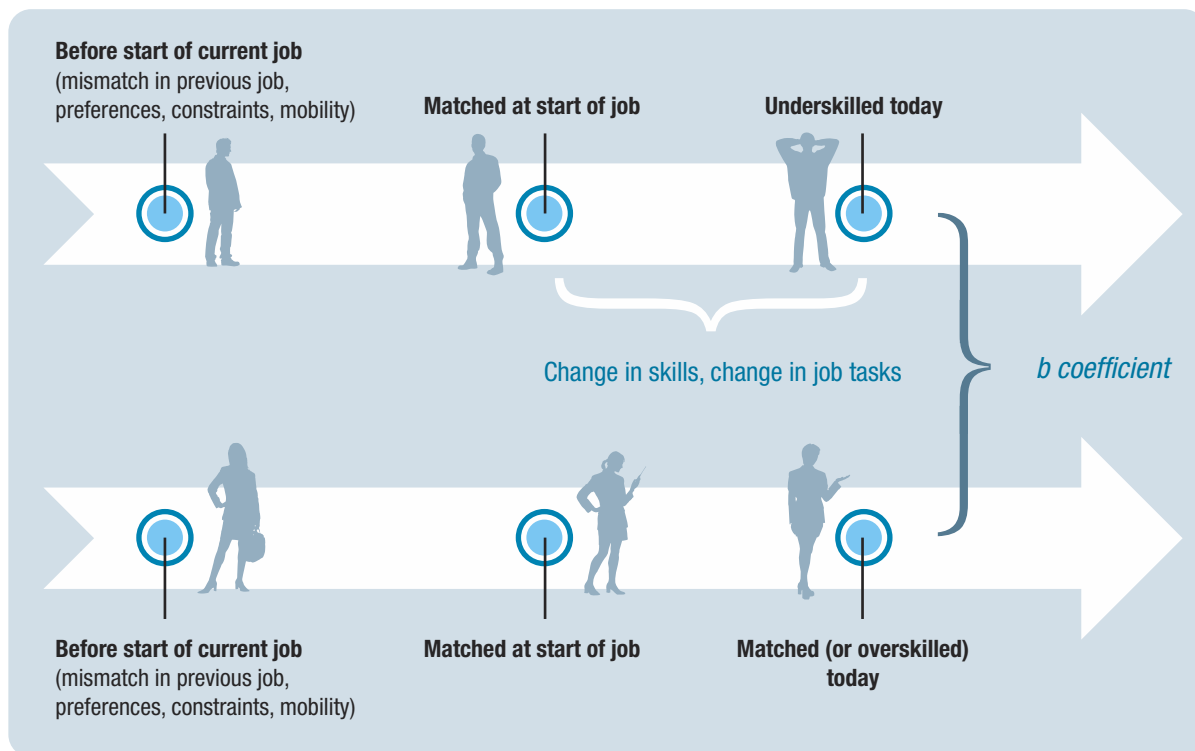
Regressions are carried out using appropriate weights and the standard errors reported are clustered by country.

A2.5. Multinomial logit regressions of skill mismatch transitions

Analysis of dynamic changes in skill mismatch status has taken place by either estimating a probit regression for each possible state of a skill mismatch transition (e.g. matched to overskilled; underskilled to matched) or by undertaking multinomial logit regressions. In the spirit of a matching-type analysis, the reference value has been defined in each instance to correspond to the respective initial state: if interested in the changes in individuals who were matched at the start of their current job and became underskilled over time, the reference category would be [matched-matched, matched-overskilled] and not the whole remaining sample (which also includes individuals who were overskilled or underskilled at start of their job). The reason for doing this is to ensure that the comparison/reference group has similar characteristics at the time of entry to the job and to minimise the potential heterogeneity that is likely to exist in the circumstances of matched, overskilled and underskilled people (Figure 73).

For robustness, the analysis was also replicated by including only those cases where the reference category remains unchanged over time (matched-matched, overskilled-overskilled, underskilled-underskilled).

Figure 73. **Schematic illustration of estimation methodology of determinants of skill mismatch transitions in ESJ survey**



Source: Cedefop ESJ survey.



Access to the Cedefop ESJ survey

The microdata of Cedefop's ESJ survey will be made available to the general public and researchers in spring 2016.

Additional results and key indicators from the ESJ survey will be available from Cedefop's website (<http://www.cedefop.europa.eu>) and the European skills panorama web portal (<http://skillspanorama.cedefop.europa.eu>).

For further information about the survey, including background documentation, interested readers may contact the responsible project managers of the ESJ survey:

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Skills, qualifications and jobs in the EU: the making of a perfect match?

What has been the impact of the economic crisis on skill mismatch? Is there a cost in getting the unemployed quickly into any job? Why is skill mismatch prevalent among the EU workforce? To answer these and other timely questions on skill mismatch, in spring 2014 Cedefop carried out the European skills and jobs (ESJ) survey. The findings caution that the prolonged economic downturn is threatening the long-term potential of the EU human resources. A greater share of recent job finders has entered into jobs that need lower qualifications and skills than their own. The unemployed also run a greater risk of misplacement into jobs of lower skill intensity. More than one in five EU employees has not developed skills since they started a job, as over one third of EU jobs are characterised by poor task complexity and lack of continued learning. Closer stakeholder collaboration and policy action is needed in the EU to generate not only more skills but also, crucially, better jobs for better-matched skills.

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